

## Friday, 8:30-10:00 Sessions

←	Friday, 8:30-10:00, Finback <b>Session:</b> Service Quality	Track: SOM, 1	Chair: Mingang Fu
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### 015-0114: Past Powerpoint: Engaging Students in Operations

*Alistair Brandon-Jones, University of Bath, United Kingdom*

*Carrie Queenan, U. of Notre Dame, United States*

Do you struggle to get students really excited about Operations? Do they sometime seem to switch off after your first few slides? And are there topics that you have difficulty bringing alive in the class? Inventory Management, anyone?! In this session we'll explore the use of "hooks" as a way of engaging students, generating excitement, and enriching understanding of Operations. Come and listen to others, share your own experiences, and generate new ideas in this interactive session. Whilst we will touch on some teaching theories in relation to sensory learning, the focus of the session is on applications that you can bring back to the classroom and directly incorporate in your teaching. Everyone attending will be expected to participate.

↷	Friday, 8:30-10:00, Galiano <b>Session:</b> Supply Chain Theories and Perspectives 1	Track: SCM, 2	Chair: Kayvan Lavassani
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### 015-0083: Supply Chain Management and Performance: A Conceptual Systematization of Terminology

*Silvio Pires, Methodist University of Piracicaba, Brazil*

*Eliciane Silva, Methodist University of Piracicaba, Brazil*

Over the last decade the concept of Supply Chain Management (SCM) has expanded and has become a key subject on Operations Management area. Therefore, a series of practices of SCM has been implemented worldwide often without having its real impact measured adequately. Thus, a significant set of recent research has sought to study the impact of these practices on business and operational performance. However, this task has been hampered by the diversity and lack of standardization of the nomenclature that characterize the SCM practices. In this context, this paper presents a conceptual systematization in the area, grouping 41 practices found in the SCM literature with different terminologies (but with similar meanings) in a set of 9 major concepts. Finally, the article reinforces the need for standardization of terminology and variables that compose the concepts of SCM practices, as well as points out demands for further researches in the area.

### 015-0666: Supply Chain Management and its Antecedents: An Empirical Investigation in Brazil

*Priscila Miguel, EAESP - Fundação Getúlio Vargas, Brazil*

*Luiz Artur Brito, EAESP - Fundação Getulio Vargas, Brazil*

This paper tests the impact of four dimensions - credibility, benevolence, top management support and internal relationship - on the supply chain management, using structural equation modeling and a sample of 103 companies that have operations in Brazil. Although measurement models for the constructs defined as antecedents proved to be appropriate, results did not support the literature, as the relationships were not statistically significant. A possible explanation for this is the Brazilian environment, where the relationship between chain members are still based on market negotiations and bargaining power, with a volatile and unstable demand.

### 015-0758: Journal Rankings: Which List Do You Use?

*Kevin Watson, Iowa State University, United States*

*Frank Montabon, Iowa State University, United States*

The issue of journal rankings continues to be important at many schools. The field of supply chain management has a particular problem: it is often the case that this major is not a free-standing department and is instead part of another department. This may influence how journals are viewed by that department. This research asks the department chairs, whether they have a supply chain background or not, to give their perspective on how supply chain management research is ranked. By talking directly to those who make decisions on annual evaluation and pay raises, this research hopes to offer career guidance.

### 015-0976: Roundtable Discussion on Infrastructure Investment and Supply Chain Performance

*Willard Price, University of the Pacific, United States*

This is a proposal to conduct a very informal roundtable discussion on the relationship between public and private infrastructure capacity/capability and the performance of supply chain services. Given the prevalent JIT strategy and the demand for direct and rapid delivery of materials and products, this discussion will examine the extent to which logistics operations are burdened by inadequate infrastructure systems. The roundtable will include infrastructure/public works professionals, major logistics carriers and terminal operators who serve the Vancouver region and selected academics who study this topic. The longer-term purpose is to stimulate scholarly papers for submission to the journal Public Works Management and Policy.

### 015-0545: Critical Analysis of the Supply Chain Management Theories: Toward the Stakeholder Theory

*Kayvan Lavassani, Carleton University, Canada*

*Bahar Movahedi, Carleton University, Canada*

Several authors have echoed the gap in the literature with regards to theory development in supply chain management studies. The literature on supply chain management has been mostly concerned with definition of concepts, and less attention has been paid to identifying and describing the main theories that can address various aspects of the supply chain operations (Halldorsson et al. 2003). This study provides a critical analysis of eight commonly-used theories of supply chain management. After describing the application and shortcomings of these theories, stakeholder theory is introduced as a complementary theory in supply chain management studies. A trend analysis of over 300 academic publications is conducted to illustrate the application of stakeholder theory in various aspects of supply chain management studies.

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☞	Friday, 8:30-10:00, Grand Ballroom A <b>Session:</b> Supply Chain Management 2	<b>Track:</b> SCM, 3	<b>Chair:</b> Whan-Seon Kim
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### 015-0603: A Neural Network Model for Forecasting Production Time Series in Brazilian Industries

*Fábio Zoucas, FEI University Center, Brazil*

*Patrícia Belfiore, FEI University Center, Brazil*

*João Chang Junior, Centro Universitário da FEI, Brazil*

This paper aims to propose a neural network model for forecasting the production time series of eleven different industries in Brazil. These data were collected from IBGE (Brazilian Institute of Geography and Statistics). Firstly, we study different types of networks that have been implemented in the literature in recent years, such as Perceptron, Linear networks, Multi-Layer Perceptron, probabilistic network, Hopfield, Kohonen, TDNN (Time delay neural network), Elman and Jordan Network, in addition to the Backpropagation and Levenberg-Marquadt algorithms. Studying the behavior of these time series and the main characteristics of the each network type, we conclude that the Multi-Layer Perceptron network with delay in time (TDNN) is the best to estimate the production time series of eleven industrial segments. The neural network was then applied considering two different strategies of structural model. We conclude that the neural network model proposed was effective for forecasting production time series in these industries.

### 015-0596: Forecasting Practices in the Brazilian Food Industries

*Cristiano Cecatto, FEI University Center, Brazil*

*Patrícia Belfiore, FEI University Center, Brazil*

*João Chang Junior, Centro Universitário da FEI, Brazil*

This paper studies the forecasting practices that have been used by food industries in Brazil. Based on literature review, a questionnaire was developed and sent to a sample of 450 food companies from ABIA (Brazilian Association of Food Industries) which represents 70% of the universe, and a response rate of 14.4% (65/450) was achieved. The objective is to detect how these companies have been used forecasting methods, what are the main factors that influence their choice and what are the main difficulties in the use of forecasting methods. Data were analyzed by multivariate statistics techniques as discriminant analysis using the SPSS software. The results show that the historical analysis model is the most used. The factors that influence the choice of the models are the type of product and the time spent during the forecasting, and the main difficulties are the availability of software and difficulty in understanding.

### 015-0807: A Rolling-Horizon Flexibility Contract as a Risk Sharing Mechanism for Demand Forecasting in a Supply Chain

*Whan-Seon Kim, Myongji University, Korea, Republic of (South Korea)*

Demand forecasting is one of the main causes of the bullwhip effect in a supply chain. To cope with demand uncertainty more effectively, I have designed a bilateral contract of rolling-horizon flexibility on order quantity as a risk-sharing mechanism for demand forecasting in a supply chain. In this contract, the buyer places orders in advance for the predetermined horizons and makes a commitment for minimum quantity to be purchased. The supplier, in return, provides the buyer with the flexibility to adjust the order quantity later, according to the most updated demand information. To conduct simulations, I have developed four-echelon supply chain models employing the proposed schemes under dynamic market demands. By looking into the impact of the schemes on the global and local performances of the models, I have verified that the contract designed plays a role as an effective coordination mechanism in a decentralized supply chain context.

### 015-0697: Cognitive Biases and Managerial Experience Impact on Performance in Emerging Economies: The Case of Venezuelan SCM Managers

*Candido Perez, IESA - Instituto de Estudios Superiores de Administración, Venezuela*

This paper looks to see how cognitive biases explain the performance of SCM managers, and the results from 720 managers show statistical support for such biases in decision-making, in the form of conservatism (managerial experience) and overconfidence (both measured via questionnaire before playing the Beer Game). Independent of gender, my results showed that no one performs better than the copycat strategy (pass-orders). Additional time-series analysis of orders suggests subjects' overconfidence because of inventory availability becomes a more intense order deterrent than customer's demand, and a small representativeness effect from the diminishing impact along time of previous orders.

☜	Friday, 8:30-10:00, Grand Ballroom D <b>Session:</b> Capacity and Scheduling in Health Care	<b>Track:</b> HOM, 1	<b>Chair:</b> Tugba Cayirli
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### 015-0971: Creating Simple Scheduling Rules for Complex Clinical Operations

*Sherry Weaver, University of Toronto, Canada*

*Michael Carter, University of Toronto, Canada*

The average waiting time for joint arthroplasty across Canada varies widely depending upon factors including surgeon-assessed urgency, regional capacity, and treatment of patient co-morbidities. With many sources of resource uncertainty (OR, pre/rehab, post-surgical) there has been a reluctance to move to a system where the patient books a surgical date once the decision has been made for joint replacement. This talk demonstrates simple queueing models to develop scheduling rules that may be used by clinicians to help project surgical dates that are often 3-12 months in the future and dependent upon urgent patient arrivals that have not yet been seen. The performance of these scheduling rules is measured using detailed discrete event simulation of actual clinic operations. Guidelines for implementing these rules in a prototype patient booking system are given and the impact of their use on the elderly patient base explored.

### 015-0041: A Simulation Optimization Approach for Long-Term Care Capacity Planning

*Yue Zhang, University of British Columbia, Canada*

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**Martin Puterman**, *University of British Columbia, Canada*

**Matthew Nelson**, *University of Toronto, Canada*

**Derek Atkins**, *University of British Columbia, Canada*

This paper describes a methodology for setting long-term care capacity levels over a multi-year planning horizon, to achieve target wait time service levels. Our approach integrates demographic and survival analysis, discrete event simulation, and optimization. We illustrate this approach through two case studies. We also compare our approach with the fixed ratio approach used in practice and the SIPP (stationary, independent, period by period) approach developed in the call center literature.

### 015-0167: Appointment Scheduling: Facts and Fantasies and the Impact on Clinical Operations

**Linda LaGanga**, *Mental Health Center of Denver, United States*

**Stephen Lawrence**, *University of Colorado-Boulder, United States*

Appointment scheduling is the front door to patient access to services that are constrained by provider resources; thus, research has focused on evaluating appointment scheduling rules and policies that balance patient service needs with provider capacity. Such rules and policies are built on many assumptions about clinical operations. In particular, analytical scheduling models require certain operating assumptions that may not be realistic in actual clinical practice. To improve the fit and practical usefulness of appointment scheduling models, we survey providers to discover actual practices and operating conditions, and consider the impact of unrealistic assumptions in clinical appointment scheduling models on operational decisions and results. We explore needs and preferences of providers and patients to propose realistic, effective performance measures to guide scheduling decisions and operational policies.

### 015-0214: Appointment Scheduling in Presence of Seasonal Demand and Walk-ins in Outpatient Care

**Tugba Cayirli**, *Ozyegin University, Turkey*

**Evrin Gunes**, *Koc University, Turkey*

This study investigates a hierarchical model that links two models in order to integrate capacity and appointment decisions. The first model deals with access rules that determine the number of slots to make available for each period. The goal is to better match demand and capacity by anticipating and planning for seasonal variation in demand, both in terms of requests for appointments as well as walk-ins. The second model deals with appointment rules based on pre-scheduled number of patients from the earlier model. Performance is evaluated in terms of both direct and indirect wait, doctor idle time and overtime. The study evaluates strategies for coping with seasonality that include double-booking when seasonal walk-ins exceed average walk-ins and leaving open slots otherwise. Best slot positions are investigated for each case. The main and interaction effects of access rules, appointment rules and environmental factors including walk-ins and their seasonality patterns are analyzed.

LN	Friday, 8:30-10:00, Granville	Track: HOM, 2	Chair: Joseph Van Orden
Session: Process Improvement in Healthcare Delivery			

### 015-0823: Improving Surgical Trays Logistics – Reduction of Complexity

**Carl Christian Røstad**, *SINTEF Technology and society, Norway*

**Erik Gran**, *SINTEF Technology and Society, Norway*

**Tore Jo Nilsen**, *St Olavs Hospital, Norway*

**Mari Haugen**, *St. Olavs Hospital, Norway*

**Andreas Seim**, *SINTEF Technology and society, Norway*

Ineffective processing, handling, transport and sterilization of surgical trays with sterile equipment necessitate large reserve stocks and frequently lead to delays, waste, and even cancellations of scheduled operations. We report on a case study where we sought to improve the logistics within and between central sterilization and the surgical departments of a large Norwegian university hospital. The improvement project was initiated in the context of large surgical services moving into new buildings while also adopting a new organizational model. We developed a control model for the hospital's sterile equipment logistics, sought to reduce the diversity in surgical trays in order to reduce complexity, and estimated the future need for surgical trays as a basis for procurement. In this case study, we report on the process of the improvement project, effects, and implications for the hospital.

### 015-0594: Competitiveness and Efficient Management in Organizations of Health Services

**Fernanda Moreira**, *Universidade Federal de Santa Catarina, Brazil*

**Rolf Erdmann**, *Universidade Federal de Santa Catarina, Brazil*

In a complex environment, organizations need to adapt and improve their processes continuously. The growing competitiveness forces organizations to look for new management techniques. Research in secondary sources allowed us to delineate 14 factors that generate competitiveness in industrial organizations: information, flexibility, integration, cost, agility, quality, innovation, lean production, environment responsibility, customer relationship, training, technology, reliability, and benchmarking. Those factors, crossed with operational environment analysis categories, allow the proposition of an instrument able to, besides detecting weaknesses and strengths, propose management improvements and perfectionings. The present article searches to analyze these factors in service's organizations. The result of this research consists of a method proposal to be applied in an organization of health services.

### 015-0141: Mental Health Integration - Improving Healthcare Through Process Integration

**Joseph Van Orden**, *West Point Military Academy, U.S. Minor Outlying Islands*

**Glen Schmidt**, *University of Utah, U.S. Minor Outlying Islands*

In 1998 IH instituted a mental health integration program in its primary care clinics. Mental health patients typify complex customers: those who supply multiple inputs into service processes whose inputs can expand across multiple service providers or multiple service visits. In this study, customer complexity is measured by the number of co-morbidities of the patient.

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practices' compliance to Intermountain Healthcare's mental health integration program. We test the hypothesis that integrated clinics decrease patients' healthcare asset usage, which is assumed to also correlate with better care.

### 015-0994: CMC Perspective to Manage Risk in Drug Development Process

*Arvinder Loomba, San Jose State University, United States*

*Yilma Aden, Genentech Inc., United States*

The biopharmaceutical industry is confronted with many challenges during development of novel therapeutic drug interventions. Challenges such as (1) rapidly escalating costs, (2) long development cycles, (3) low success rate due to high attrition rates, and (4) the issue of economic manufacturability of these drugs (evaluated in the Chemistry, Manufacturing, and Control or CMC process), makes it to be a high risk industry. Understanding the risk involved requires appreciation of the differing perspectives of risk held by the various stakeholders involved in drug development. Risk can be reduced by thoughtful management of drug candidate selection, careful planning and program execution by a team of engaged experts, and disciplined decision making. Potential solutions involve better management of drug development process through the application of the project and operations management disciplines as discussed in this paper.

### 015-0242: Integrating the Decentralized Healthcare Delivery Supply Chain

*David Dobrzykowski, University of Toledo, United States*

*T.S. Ragu-Nathan, University of Toledo, United States*

*Mark Vonderembse, University of Toledo, United States*

The healthcare industry is experiencing disturbing trends related to cost, quality, and increased competition. Interest in improving performance in these areas has increased in recent years, highlighting the need for better operational coordination of healthcare delivery. In response, questions have been raised regarding the application of supply chain management (SCM) principles to healthcare delivery to derive the benefits achieved in manufacturing. However, generalizing these integration concepts from manufacturing (a centralized structure) to healthcare (a decentralized structure) can be problematic. This has not been adequately addressed by practitioners and researchers. This study describes how the healthcare delivery supply chain is decentralized - in other words, lacking in traditional financial and contractual coordination mechanisms among supply chain actors. It suggests partner relationship as a coordinating mechanism capable of influencing a hospital's integrative information and resource strategy and partnership culture leading to integration of the supply chain during care delivery.



Friday, 8:30-10:00, Junior Ballroom A

Track: PITM, 1

Chair: Saeed Najafi Tavani

Session: Project Management and Product Innovation

### 015-0263: Agile Project Management and Innovative Product Development: Benefits and Challenges of Two Companies from São Carlos Tech-Pole, Brazil

*Edivandro Conforto, University of São Paulo / São Carlos Engineering School, Brazil*

*Daniel Amaral, University of São Paulo / São Carlos Engineering School, Brazil*

An emergent theory entitled "Agile Project Management" (APM) appears as an alternative to deal with the challenges of general use of traditional models and approaches to non-traditional, innovative and complex product development environments. This paper examines the correlation among project management (PM) practice alignment to APM theory (degree of agility) versus its benefits. The research was carried in two technology-based companies of São Carlos Technology Pole, Brazil considering single and multi-project environments. It combines an extensive literature review followed by an action research methodology. Research results were evaluated using descriptive statistical analysis supported by questionnaire application, interviews and document investigation. From the theoretical standpoint, this paper starts a new discussion about the correlation among innovative projects performance and the degree of agility of PM practices. It presents relevant evidences regarding benefits and challenges in applying APM practices as alternative to traditional PM practices to innovative development environments.

### 015-0705: The New Product Development Challenge

*Jennifer Udeh, The University of Warwick, United Kingdom*

*John Garside, The University of Warwick, United Kingdom*

*Mairi Macintyre, The University of Warwick, United Kingdom*

*Steven Maggs, The University of Warwick, United Kingdom*

Messages of the importance of product innovation to survival are not new and exclusive. It follows that in order to achieve continued success with new products, organisations need to: develop an understanding of the factors critical to success, effectively implement these factors and develop the capability to change their approach amidst a constantly changing environment. Over a three-year period, Action Research based within an engineering business has sought to investigate and overcome the challenges faced in identifying, implementing and managing improvements to an organisation's approach to new product development (NPD). Research efforts have found that these challenges can be categorised into four areas: people, process, politics and technology (PPPT). This paper presents the analysis, which has resulted in the conceptualisation of a "Logical Learning" framework. This framework seeks to overcome the PPPT challenges to sustained success with new products, taking organisations through logical steps towards transforming their approach to NPD.

### 015-0963: Agile Product Innovation

*Saeed Najafi Tavani, University of Liverpool, United Kingdom*

*Hossein Sharifi, University of Liverpool, United Kingdom*

*Hossam Ismail, University of Liverpool, United Kingdom*

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Innovation and innovative approaches to new product development have become increasingly important as factors for achieving sustainable competitiveness. These issues, however, are in need of examination when addressing new questions on how firms should adopt innovation, considering the emergence of new concepts such as network economy and open innovation. Adopting the concept of “future proof supply chain,” this research theoretically examines the concept and practice of integrated product innovation and re-examines the literature on collaborative based models of product development. Three main elements that impact the process of product innovation, including dynamic capabilities, market, and collaborative networks have been identified and theoretically examined. As a result, a number of hypotheses are developed, which are primarily setting the ground for interplays between these main dimensions and how they impact on the agile product innovation and the organisations’ innovation performance. The ideas have been preliminarily examined using three industrial case studies.

Friday, 8:30-10:00, Junior Ballroom B	Track: OMM, 1	Chair: Arcan Nalca
Session: OMM1		

### 015-0310: Supply Chain Efficiency and Contracting in the Presence of Gray Market

**Mehmet Altug**, *George Washington University, United States*

**Garrett van Ryzin**, *Columbia University, United States*

We consider a supply chain with one manufacturer and several authorized retailers that face uncertain demand and a potential gray market. While the gray market can be seen as an opportunity to sell any excess inventory, it also is a threat for authorized retailer's demand. We characterize the equilibrium market-clearing gray market price and retailer's quantity decision. We compare decentralized and centralized systems and show that wholesale pricing contract itself is “almost” coordinating. We also introduce a partial buy-back contract that results in perfect coordination for this system. We analyze several other contracts that are designed disregarding the potential for gray market. By comparing and contrasting the performance of these contracts in the presence of gray market, we derive several managerial insights and position gray market as an external business factor that could provide one explanation for the commonality of certain contracts in industry.

### 015-0286: Selling with Money-Back Guarantees: Impact on Retail Prices and Profits

**Tamer Boyaci**, *McGill University, Canada*

**Yalcin Akcay**, *Koc University, Turkey*

We study a retailer adopting a “money-back-guaranteed” (MBG) sales policy, which allows customers to return products that do not meet their expectations for a full or partial refund. In a two-stage setting, the retailer maximizes profits by first deciding on the quantity to procure and then setting the prices. In addition to customer returns, our framework allows the retailer to sell returned products as open-box items. This enables the retailer to generate more revenues from reduced initial stock. We identify the ideal conditions under which this practice is most beneficial to the retailer. We also show that the effect on the new product price depends on the restocking fee charged for returns as well as the retailer's flexibility in adjusting new product prices over time. Offering MBGs improves retailer profits; we illustrate the market and operating factors that command this profit gain and their impact on retail decisions.

### 015-0220: Pricing and Assortment Planning with Private Labels

**Marc Sachon**, *IESE Business School, Univ. of Navarra, Spain*

**Victor Martinez de Albeniz**, *IESE Business School, Univ. of Navarra, Spain*

Private labels are being extensively used by retailers to appropriate value from consumers and promote competition among brand manufacturers. In this paper, we study how optimal assortments and prices change with the introduction of a private label into a category of branded products. We show that the mixed-integer optimization problem is well behaved and analyze the effects of introducing a private label.

### 015-0325: Private Labels vs. National Brands: New Product Introduction and Design

**Arcan Nalca**, *Queen's School of Business, Canada*

Traditionally, retailers introduced private labels not only to gain profits directly from the private label but also to use it as a strategic weapon to gain better terms of trade from the national brand manufacturers. Today, retailers also focus on design, innovation and introduction of new private labels in order to improve existing national brand products utilizing their ability to learn from consumers. In this paper, we investigate the decision of a private label introduction and design for a retailer and its effects on the manufacturer.

Friday, 8:30-10:00, Junior Ballroom D	Track: SOHL, 1	Chair: Madeleine Pullman
Session: Teaching Sustainability		

### 015-0078: Teaching Sustainable Business Practices

**Robert Klassen**, *University of Western Ontario, Canada*

**Robert Sroufe**, *Boston College,*

The triple-bottom line, encompassing financial, environmental and social performance, is a great starting point for many business students. Drawing from this, my teaching focuses on the very real potential for competitive advantage to be increasingly rooted in such new capabilities as pollution prevention, design for environment, and social responsiveness. The course emphasizes a general management viewpoint, whereby students are pushed to confront difficult challenges, balance multiple stakeholder agendas and make decisions despite scientific uncertainty. Definitive answers do not always emerge, and the class is designed to explore directions and opportunities for more sustainable business models. The primary pedagogical vehicle is business cases that capture both leading firms and struggling companies.

### 015-0064: Teaching Sustainability

**Madeleine Pullman**, *Portland State University, United States*

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The next great challenge in the evolution of Operations Management is toward Sustainable Operations. How can we transform our conventional business approach from “manipulating abstract quantitative variables” in blind allegiance to maximizing profits into a learning organization approach that reshapes business operations into a means of creating wealth that fits our finite planet? Toward this end, this course provides an overview of issues facing operations managers in service and manufacturing companies with a sustainability focus. The course uses Toyota as a model but incorporates other cases with a sustainable operations and supply chain focus.

10	Friday, 8:30-10:00, Orca	Track: CIM, 1	Chair: Goker Aydin
	<b>Session:</b> Inventory and Capacity Management with Pricing Considerations		

**015-0613: Heuristic Coordination of Decentralized Inventory Systems Using Induced Backorder Costs**

*Peter Berling, Lund University, Sweden*

*Johan Marklund, Lund University, Sweden*

A method will be presented for controlling a two-level distribution system in a decentralized yet coordinated manner by using a near optimal induced backorder cost at the central warehouse. It is a continuation of earlier work by Berling/Marklund (POMS 2006) that during implementation has shown to provide service level well below the target used to design the system, particularly for low and lumpy demand products. Extensions include adjustment of the reorder point at the retailer level and improved estimates of the demand process at the central warehouse. An extensive numerical study based on real-life data show great improvement with regards to meeting the service level target at the same time as the total inventory level is decreased.

**015-0469: Network Revenue Management with Product Specific No-shows**

*Sumit Kunnumkal, Indian School of Business, India*

*Kalyan Talluri, ICREA and Universitat Pompeu Fabra, Spain*

*Huseyin Topaloglu, School of Operations Research and Information Engineering, Cornell University, United States*

We consider the revenue management problem of jointly making the capacity control and overbooking decisions on an airline network. We propose a tractable solution approach to this problem, which involves solving a linear program that uses samples of the demand and show-up random variables. We show that our method results in a tighter upper bound than that obtained by a deterministic linear program. Numerical experiments indicate that our method can also yield significantly higher revenues than the deterministic linear program.

**015-0464: Dynamic Pricing of Limited Inventories When Customers Negotiate**

*Chia-wei Kuo, National Taiwan University, Taiwan, Republic of China*

*Hyun-soo Ahn, University of Michigan, United States*

*Goker Aydin, Indiana University, United States*

An increasing number of retailers reportedly allow price negotiation when haggle-prone customers initiate it. Many of these retailers sell short lifecycle products such as high-tech consumer electronics (e.g., BestBuy) or style goods (e.g., Nordstrom). For such products, retailers frequently change the posted price over time. In such a retail environment, the outcome of the negotiation (and the final price a customer pays) depends on the inventory level, remaining selling season, retailer's bargaining power, and posted price. We model the retailer's dynamic pricing problem as a dynamic program, where the possibility of negotiation is embedded in each period. We characterize the optimal posted price and the resulting negotiation outcome as a function of inventory and time. We also show that negotiation is an effective tool to achieve price discrimination, particularly when the inventory level is high and/or the remaining selling season is short, even when implementing negotiation is costly.

12	Friday, 8:30-10:00, Pavilion Ballroom A	Track: PLQ, 1	Chair: Ebrahim Soltani
	<b>Session:</b> Role of Management and Culture		

**015-0006: The Application of Pelz Effect to Managing TQM Programmes**

*Ebrahim Soltani, University of Kent, United Kingdom*

*Ying-Ying Liao, University of Kent Kent, United Kingdom*

This study extends the Pelz Effect (1951) to explain the effects of incongruence between senior managers' orientations and underlying assumptions of TQM on middle managers' own orientations and on TQM itself. Using a multi-case study approach of three organisations from different sectors, the authors conducted 68 semi-structured interviews with managers at both senior and middle levels. The findings largely support the Pelz Effect in that senior management exerts a major influence in establishing the tone and atmosphere of the TQM organisation by their orientations and attitudes towards the underlying principles of it. It has been found that senior managers' reliance on detection, reactive strategies and hard aspects of TQM—as opposed to prevention, proactive strategies and soft people-based issues—resulted in: first, middle managers' compliance with short-term tactical orientations rather than long-term commitment; and second, middle managers' increased control over the workforce rather than the work-related processes.

**015-0788: Organizational Culture by Change Management: DHL Global Forwarding Case Study**

*Camila Lopes, Unisantos, Brazil*

*Getulio Akabane, Unisantos, Brazil*

*Rafael Barreto, Unisantos, Brazil*

*Ulisses Shimizu, Unisantos, Brazil*

This paper presents a qualitative analysis of the organizational culture influence in managing change, about business logistics. It is understood that transformation only becomes possible through the commitment of all company professionals, which is provided by the organizational culture, as it introduces values that build on the programs changes, methodologies and activities. A case study about change perspective was carried out on

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continuous improvement in service delivery and processes. This methodology is Lean Six Sigma, which helps to establish criteria and procedures consistent with the company culture.

### 015-0265: International Transfer of Japanese Kaizen: An Empirical Study of Japanese Manufacturers in the Netherlands

*Kodo Yokozawa, University of Twente, Netherlands*

*Harm-Jan Steenhuis, Eastern Washington University, United States*

*Erik de Bruijn, University of Twente, Netherlands*

This study investigates the relationship between success of international Kaizen transfer (KT), personal initiative (PI), organizational culture (OC) and structure (OS). Three hypotheses are proposed. Firstly, KT is positively associated with PI (H1). Secondly, successful KT is positively related to organically structured firms (H2a) and negatively associated with mechanistically structured firms (H2b). Lastly, flexibility-oriented culture leads to positive and control-oriented culture leads to negative outcome (H3a); internal-oriented culture leads to positive and external-oriented culture leads to negative outcome (H3b). An interview survey of Japanese manufacturers in the Netherlands was conducted. Findings show that H1, H2a and b, and H3a were confirmed but H3b was rejected. This study suggests that the successful Kaizen transfer is associated with high PI, flexibility-oriented organizational culture and organic structure. Furthermore, it suggests a necessity to investigate whether it is the Kaizen implementation that leads firms to have more flexibility-oriented organizational culture and organic organizational structure.

13	Friday, 8:30-10:00, Pavilion Ballroom B <b>Session:</b> Teaching POM: Perspectives and Techniques	Track: GENL, 1	Chair: José de Souza Rodrigues
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### 015-0918: Waves of Changes and the Emergent Society of the Knowledge - Rethinking the University

*Sandra Brito, Universidade Federal de Santa Catarina, Brazil*

*Rolf Erdmann, Universidade Federal de Santa Catarina, Brazil*

This article has the objective to provoke reflections on the University's role about the human capacity building, facing social changes and the economic-technological advances, in a world linked by globalization. Thus, it presents some theories on the subject that reflect an analysis in six stages: the first one presents brief considerations about globalization; the second tries to understand the phenomena leading to emergent knowledge's society; third, it analyzes the concept of knowledge and next learning how to manage this knowledge, in the fifth stage there will be presented the importance of the education as the responsible for building human capacity, building and operationalizing this knowledge and finally in the sixth there will be new challenges of the university in the knowledge's society, in which some historical considerations are made about the university's role, as well as evidences of its new functions are made.

### 015-0654: Operations Management in an Entrepreneurship Program of Study

*Debra Bishop, Drake University, United States*

Entrepreneurship has been a growing academic field across campuses for the past twenty years. What role can or should operations management coursework play in the entrepreneurship education arena? This presentation will address that question and give an example of how an advanced operations management course has become a vital component of an entrepreneurship program of study.

### 015-0932: Application of Conversation Theory and Experiential Learning in A Blended OM Course

*James Gilbert, Rollins College, United States*

Many colleges and universities are looking at blended learning for OM courses. This paper examines the application of conversation theory and experiential learning for both synchronous and asynchronous environments.

### 015-0800: Using Business Games in Engineering Courses of UMINHO/Azurém and UNESP/Bauru

*José Rodrigues, UNESP, Brazil*

*José Dinis Carvalho, UMINHO, Portugal*

*Rui Lima, UMINHO, Portugal*

*Manoel Henrique Salgado, UNESP, Brazil*

This paper presents the results obtained from using the business game Mercado Virtual in engineering courses in two different universities: Minho University, campus of Azurém/Portugal and at UNESP campus of Bauru/Brazil. Data provide only an exploratory assessment of results due to the courses characteristics. The paper will present the main characteristics of each course and, later, discuss the results obtained from the business game Mercado Virtual. Decision-making-related data will be analyzed for two groups of players during eight rounds focusing on finding a balance regarding: adequacy between production order and installed capacity, financial resources management concerning cash flow, loans payment and investments of surplus funds. For both universities, experiments were conducted separately. In Bauru, the experiment was conducted in the first half of 2009; in Azurém it was conducted in the second half of 2009.

14	Friday, 8:30-10:00, Pavilion Ballroom C <b>Session:</b> Logistics Case Study Applications	Track: LM, 1	Chair: Balan Sundarakani
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### 015-0699: A Multi-product, Multi-depot Periodic Vehicle Routing Problem in a Reverse Logistics System

## Friday, 8:30-10:00 Sessions

**Tânia Ramos**, ISCTE - IUL and CEG-IST, UTL, Portugal

**Maria Gomes**, CMA - FCT, UNL, Portugal

**Ana Barbosa-Póvoa**, CEG - IST, UTL, Portugal

This paper aims to support tactical decisions on recyclable waste collection systems design. It focuses on the definition of service areas in waste packaging collection systems with more than one depot. In addition to the definition of the vehicle routes to collect the waste materials that can be recycled (glass, paper and plastic/metal), it is also necessary to decide which containers are collected on each day (since the containers have different collection frequencies) and from which depot the collection is to be performed. These aspects add two decision levels to the classical Vehicle Routing Problem, where more than one product is to be collected in different routes. The resulted problem is modelled as a multi-product, multi-depot periodic vehicle routing problem. A mixed-integer linear programming model is developed. The model is applied to some problem instances based on a real problem under study.

### 015-0748: Reverse Logistics Operation of a Unit of Mineral Water Filling the City of Recife-PE

**Rodrigo Guerra**, University of Caxias do Sul, Brazil

**Maria Emilia Camargo**, University of Caxias do sul, Brazil

**Marta Ventura da Motta**, University of Caxias do Sul, Brazil

**Eric Dorion**, University of Caxias do Sul, Brazil

This article was designed to study the reverse logistics operation of a unit of mineral water filling the city of Recife-PE. The company has a source in Village and a distribution center in Imbiribeira. The study was aimed at highlighting the return of bottles of mineral water of 20 liters, with a view to reusing them in the process of filling of mineral water. The physical distribution of the bottles of mineral water is made by 8 pockets delivery in the city. The study describes all the reverse process and outlines key issues and limitations of the practice of reverse logistics of bottles due to lack of adequate infrastructure for the practice of returning the bottles.

### 015-0879: Reverse Logistics Applied to Oily Wastes Management

**Rosani de Castro**, Univ Estadual Paulista, Brazil

**Marcos Gomes de Castro**, Univ Estadual Paulista, Brazil

Reverse logistics seeks to manage logistics in reverse, dealing with products from point of consumption to point of origin. Its strategic objective is to restore the value of a returned product. This paper proposes an analysis of reverse logistics in lubricant sector, placing the oily wastes return in the productive chain and identifying some aspects which influence efficiency in the reverse management process. An analysis of oily wastes generation in Brazil was performed, as well as an investigation of the best practices for environmentally friendly final destinations. The investigation carried out made it possible to identify critical points interfering with the reverse chain and draw a parallel between Brazil and other countries. It contributed to understanding the dimensions of the problem and challenges in an attempt to minimize environmental impact.

15	Friday, 8:30-10:00, Pavilion Ballroom D	Track: HBOM, 1	Chair: Volker Groetsch
	Session: Organizations 1		

### 015-0362: Sources of Organizational Attractiveness and Identification among Blue- and White-collar Workers

**Freek Van Baele**, Ghent University, Belgium

**Paul Gemmel**, Ghent University, Belgium

This study aims to reveal the main differences between blue- and white-collar workers regarding the sources of organizational attractiveness and organizational identification in a production environment. To this end, we use the instrumental-symbolic framework to study factors relating to both employer image and perceived organizational identity. This study introduces this framework as a new and powerful management tool for production organizations. Two samples are used: a sample of 247 blue-collar workers and a sample of 243 white-collar workers, both from a European medical equipment manufacturer. Results show that organizational attractiveness has largely the same sources for blue- and white-collar workers and that organizational identification has very different sources for blue-collar workers in comparison with white-collar workers. Theoretical and practical implications, limitations and directions for future research are discussed.

### 015-0677: Integrating Organizational Behavior Concepts Into the 'Core' Operations Management Course

**Joel Goldhar**, Illinois Institute of Technology/Stuart School of Business Admin, United States

**Cheryl Druehl**, George Mason University/College of Business, United States

Most OM course syllabi today reflect the mathematical optimization emphasis of OM research, while students need a more balanced approach to prepare them for jobs where they will need to manage people as well as processes. We offer a set of the key behavioral concepts that support OM, and discuss one example of an MBA core OM course and a syllabus based upon this concept. We also find that adding the OB concepts significantly enriches the student's understanding of service operations, and also of the mathematical models that make critical, but not always accurate, assumptions about human behavior.

### 015-0690: The Optimal Level of Maverick Buying

**Volker Grötsch**, European Business School (EBS), Germany

Maverick Buying is a significant problem of today's firms. Companies mitigate it by lowering its attractiveness and by making compliant buying easier. Common strategies comprise the detection of maverick buying via information systems or external auditors, and/or the reduction of effort for compliant buying. Additionally, firms create direct incentives for compliant behavior. Yet, due to increasing marginal costs of mitigation, reaching total compliance is sub-optimal for companies. We model this situation as a principal-agent problem, where the agents get financed by a principal and buy uniform supplies, either compliantly via a central purchasing department or non-compliantly from private sources. We analyze the impact of the above mentioned different mitigation techniques on the agents' decisions and on the principal's total costs. We expect to find at least one optimal level of maverick buying for each mitigation strategy.

## Friday, 8:30-10:00 Sessions

**015-0383: Behavioral Dynamics in Supply Chain Contract Design: An Analysis of Retailer Piracy**

*Naveen Sundaresan, Indian Institute of Management ,Bangalore, India*

*Janat Shah, Indian Institute of Management, Bangalore, India*

Cable television piracy and high-end software counterfeiting are very rampant phenomena, especially in emerging economies. In this study, we shall focus on supply chain contracts in scenarios where the retailer has incentive to replicate the original product and understate to the manufacturer the actual sales. We shall analyze the coordination issues from both a neoclassical and behavioral perspective. In the neoclassical approach we model a Stackelberg game and identify the best strategy to be employed by the manufacturer for three replication cost structures (linear cost, increasing marginal cost and decreasing marginal cost) of the retailer. In the behavioral model we incorporate "social preference aspects" where the players are also motivated by factors like fairness and reciprocity. We introduce the concept of distributive fairness and demonstrate how retailer piracy and coordination issues depend not only on individual profits, but also on factors like inequity perception of players.

17	Friday, 8:30-10:00, Port Hardy <b>Session:</b> GOSSM 1	<b>Track:</b> GOSSM, 1	<b>Chair:</b> Canan Kocabasoglu Hillmer
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**015-0023: Do Buyers and Suppliers Perceive Their Relationship Similarly: An Empirical Study**

*Canan Kocabasoglu Hillmer, Cass Business School - City University London, United Kingdom*

*ManMohan Sodhi, Cass Business School - City University London, United Kingdom*

*Byung-Gak Son, Cass Business School - City University London, United Kingdom*

Key suppliers have a significant impact on a company's performance in the marketplace. Prior studies have suggested supplier evaluations to be one mechanism that can be used for the purpose of communicating the buying company's needs. Empirical studies have shown that supplier evaluations are an effective tool in supplier development from the buyer's perspective (Krause, 1999). Yet, recent research has suggested that suppliers do not perceive this to be true (Prahinski and Benton, 2004). In addition, few studies have measured both parties simultaneously.

Using data from 74 for pairs of buyers and suppliers, we test the level of congruence of the perception of the relationship by both parties. Our results suggest that there is disagreement on the perception of the relationship. We further analyze the data to identify the drivers of the phenomena and discuss the implications.

**015-0159: Strategic Buyer-Supplier Relationship Dissolution as Divorce: An Experimental Analysis**

*Yi-Su Chen, University of Minnesota, United States*

*M. Rungtusanatham, University of Minnesota, United States*

Strategic buyer-supplier relationships are ideally intended to continue without interruption. In reality, many strategic buyer-supplier relationships are often intentionally and prematurely dissolved. We analyze a model relating specific antecedents to the likelihood of strategic buyer-supplier relationship dissolution. This model is derived from a metaphorical transfer of the divorce metaphor that demonstrates the equivalence between divorce and strategic buyer-supplier relationship dissolution at the levels of ontology, analogy, and identity. We test this model with data collected from sourcing professionals participating in a role-playing, four-factors, repeated-measures experiment.

18	Friday, 8:30-10:00, Port McNeill <b>Session:</b> Hedging and Commodity Management	<b>Track:</b> OMF, 1	<b>Chair:</b> Jiri Chod
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**015-0181: Operational Flexibility and Financial Leverage**

*Jiri Chod, Boston College, United States*

*Jianer Zhou, Boston College, United States*

We consider a two-product financially constrained firm that has to choose the optimal mix of flexible and dedicated capacities, as well as the optimal level of external financing, while facing demand uncertainty. We study the relation between the firm's mix flexibility and financial leverage, and how it is impacted by the bankruptcy cost and agency conflict between shareholders and bondholders.

**015-0101: Managing Storable Commodity Risks: Role of Inventories and Financial Hedges**

*Panos Kouvelis, Washington University in St Louis, United States*

*Rong Li, Singapore Management University, Singapore*

*QING Ding, Singapore Management University, Singapore*

This paper studies the integrated physical and financial risk management of storable commodities used as inputs in end-products facing uncertain demand. In our multi-period mean-variance model, we study a problem of dual sourcing with financial hedging for a risk-averse buyer (the seller of the end product) who procures a single storable commodity from a supplier via a fixed price, fixed quantity long-term contract and then fine-tunes his stock level via spot market participation. We obtain multi-period optimal inventory and financial hedging policies for a risk-averse buyer. For most cases, the optimal policies are myopic and easy to compute and implement. We examine different cases of financial hedging, single hedges and portfolio hedges, and characterize their optimal hedging amounts and portfolio structure.

We also offer insights on the role and impact of the operational hedge (physical inventory) and financial hedge on the profitability, risk control, and service level to the customer.

**015-0297: Value of Processing Flexibility in Uncertain Supply and Demand Environments**

*Xiaole Wu, Olin Business School, Washington University in St. Louis, United States*

## Friday, 8:30-10:00 Sessions

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*Lingxiu Dong, Olin Business School, Washington University in St. Louis, United States*

*Panos Kouvelis, Olin Business School, Washington University in St. Louis, United States*

We consider a refining process that transforms commodity inputs of various quality levels into intermediates and blends them to make various outputs. We focus on a specific type of processing flexibility that is used in the oil refinery industry; that is, converting low quality intermediates to high quality ones. We examine the value of such operational flexibility in environments where input and output prices are volatile.

### **015-0504: Effect of Term Structure of Futures Price on Spot Procurement Policies**

*Ankur Goel, Case Western Reserve University, United States*

*Genaro Gutierrez, University of Texas-Austin, United States*

In this research, we explore the effect of term structure information of futures prices on the procurement policies from the spot market. We compare a one-factor stochastic price model with a two-factor model to quantify the benefits of higher term structure model on operating policies. We conclude that for gasoline and wheat, the two factor price model leads to substantial inventory cost savings. In addition, the frequent calibration of the price process has marginal benefits.

## Friday, 10:30-12:00 Sessions

19	Friday, 10:30-12:00, Finback <b>Session:</b> Impact of Firm Power in Supply Chain Management	<b>Track:</b> SCM, 4	<b>Chair:</b> Inga-Lena Darkow
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**015-0824: Does Firm Size and Power Affect the Effectiveness of SCM Practices on Firm Performance?**

*Zach Zacharia, Lehigh University, United States*

*Robert Trent, Lehigh University, United States*

Much of the research about the benefit of supply chain management practices focuses on large firms who are powerful in comparison to their suppliers and customers. Our research seeks to determine whether there is a benefit for smaller firms to utilize supply chain management practices. The specific questions our research considers include the effect of the following factors on firm performance: 1) firm size, 2) industry type, 3) firm power, 4) position within the supply chain (supplier, manufacturer, wholesaler, distributor, retailer), and 5) level of adoption of SC practices. Our research seeks to ascertain the different effects of size, industry, power, position and adoption of SC practices on overall firm performance.

**015-0470: Supply Management in Small and Medium Sized Enterprises (SMEs)**

*Seung-Kuk Paik, California State University, Northridge, United States*

Despite the importance of supply management in SMEs, there has been limited empirical research, and it remains elusive how SMEs manage their purchasing practices and how their supply development impacts on purchasing performance. Using empirical data, this study seeks to obtain information about the current status of supply management in SMEs and to examine the impact of supply development on purchasing performance.

**015-0570: The Impact of Power on Supply Chain Integration**

*Inga-Lena Darkow, European Business School (EBS), Germany*

*Heiko Woehner, European Business School (EBS), Germany*

*Gernot Kaiser, European Business School (EBS), Germany*

This study extends the developing body of literature on supply chain integration (SCI). The previous literature is inconsistent in its findings about the relationship between SCI and performance. We attribute this to incomplete perspectives on SCI, in particular the tendency to neglect the impact of power distribution within supply chains. We study the impact of power distribution within supply chains on SCI and supply chain performance. A German-based survey was conducted and partial least square modelling was used to determine the impact on performance. The findings indicated that the power distribution between suppliers and customers has an impact on the attitude to SCI and thus on supply chain performance. Additionally, the results show that the relationships depend on the dimension of SCI – supplier, internal and customer integration – and there is a difference between mediated (reward and coercive) and non-mediated (expert, reward and legitimate) power.

20	Friday, 10:30-12:00, Galiano <b>Session:</b> Supply Chain Theories and Perspectives 2	<b>Track:</b> SCM, 5	<b>Chair:</b> Calin Gurau
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**015-0644: Lost in Translation? The Role, Application and Applicability of Extant Theories in O&SCM Research**

*Mark Johnson, Cranfield School of Management, United Kingdom*

*Marko Bastl, Cranfield School of Management, United Kingdom*

In recent years, there has been an increase in the use of extant theories from fields such as economics (e.g. Transaction Cost Economics) sociology (e.g. Social Exchange Theory and Balance Theory), and management (e.g. Resource Dependence Theory and the Resource-Based View) in O&SCM research. In this work, we explicate the role of theory in management research. We then examine the origins and the purpose of the abovementioned theories and detail how they have – rightly or wrongly - been applied in the O&SCM field. We focus our analysis in the context of dyadic and triadic relationships. Our analysis show that application of extant theories in the examined context suffers from:

- a) A lack of a critical evaluation of the contextual particularities in which a theory was originally developed, and;
- b) A mismatch between the maturity of the research phenomena, the chosen theoretical lens and choice of research method(s).

**015-0617: Supply Strategy: Old and New Debates**

*Christine Harland, UNIVERSITY OF BATH, United Kingdom*

*GUIDO NASSIMBENI, UNIVERSITY OF UDINE, Italy*

*MARCO SARTOR, UNIVERSITY OF UDINE, Italy*

Historically, the bulk of operations strategy papers has focused primarily on manufacturing strategy: suppliers were seen as a sort of a contour condition, as an independent variable not included in the strategic space of organisations. Only in recent times have scholars begun to reflect on how to incorporate suppliers (and more generally the external resources) into the strategic design of enterprises. However, this literature has reproduced many of the ambiguities that still surround the concept of corporate strategy. Following an extensive literature review, this paper identifies the main issues of this debate and its development path. By analogy with the corresponding streams in business strategy, it points out and discusses the two main poles in this field: the 'design' and the 'process' views of supply strategy. Finally, this paper highlights some recent approaches to the 'strategic' management of the supply side of firms, identifying the underlying common denominator.

**015-0320: The Influence of New Marketing Paradigms on Supply Chain Management Theories: Interdependence and Crossfertilisation**

*Calin Gurau, GSCM - Montpellier Business School, France*

The composite nature of the Supply Chain Management (SCM) concept, which includes procurement, production, marketing, management, sales and distribution elements, indicates that the theoretical models developed in other business disciplines can significantly contribute to the development of a SCM business theory. Many authors emphasized the common roots and goals of marketing and SCM, and demonstrated the importance of the central marketing concept for SCM theory and practice. However, this process of mutual interdependence cannot be considered

## Friday, 10:30-12:00 Sessions

from a static perspective. The introduction of new marketing paradigms may influence directly the existing SCM models, creating novel perspectives and methods that are better adapted to the modern competitive conditions. This paper attempts to investigate and discuss the influence of three new marketing paradigms (the service-dominant logic, the multi-stakeholder approach in relational marketing and the sustainable marketing) on the SCM theory, and to outline possible future directions for theory development.

21	Friday, 10:30-12:00, Grand Ballroom A <b>Session:</b> Supply Chain Integration 1	<b>Track:</b> SCM, 6	<b>Chair:</b> Tai Oun Kim
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### 015-0949: Governance Analysis and Transaction Cost in the Relationship Among Companies

*Erika Ikeda, Universidade de Sao Paulo, Brazil*

*Tamio Shimizu, Universidade de Sao Paulo, Brazil*

*João Neto, Universidade de Sao Paulo, Brazil*

Companies can take advantage of the characteristics of the relationship with their partners to plan the strategies and to reach better performance. The paper shows and evaluates the structures of the existing types of governances found in the literature, and it suggests the best one considering the transaction cost in a specific value chain as an example to improve the value chain. One of the conclusions is that the governance structures evolve over time according to the needs of the companies to create mechanisms to assist the coordination of the activities when they face uncertainties and risks. The previous knowledge, understanding and correct application of the transaction cost and governance may bring sustainable competitive advantage to the whole supply chain.

### 015-0562: Supply Chain Integration Operational Issues: Impact on Supplier Relationships and Order Fulfillment in New Zealand Public Hospitals

*Kabossa Msimangira, Auckland University of Technology, New Zealand*

Academics and practitioners acknowledge that supply chain integration (SCI), supplier commercial relationships (SCR), and order fulfillment (OF) are key areas for reducing operational costs and improving service level to meet customers' requirements. Nevertheless, little is known concerning supply chain integration operational issues and their impact on SCR and OF in public hospitals. This paper reports the critical SCI operational factors and their impact on SCR and OF from a study conducted in New Zealand public hospitals. A survey methodology was used to collect data. The findings and suggestions to improve SCI in public hospitals are discussed.

### 015-0782: The Role of Cost Management in Buyer-Supplier Joint Efforts

*Scott Ellis, Clemson University, United States*

*Janis Miller, Clemson University, United States*

While extant supply chain management research demonstrates the utility of buyer-supplier integration, few studies consider how cost management facilitates such joint efforts. To lend new insights into this phenomenon, we develop a four-stage causal model that examines the linkages amongst: (i) relationship importance, (ii) supplier cost management practices, (iii) buyer-supplier joint efforts, and (iv) supplier performance. We operationalize cost management as a second-order construct that consists of three related practices: (i) target costing, (ii) value analysis, and (iii) cost structure analysis. Further, we conceptualize joint efforts in terms of supplier development, joint design, and integrated logistics activities. We test our hypotheses using survey response data from 223 direct material buyers and find significant empirical support for our model. Consistent with relational governance and knowledge theories, our results suggest that cost management practices indirectly affect supplier performance through joint buyer-supplier efforts.

22	Friday, 10:30-12:00, Grand Ballroom D <b>Session:</b> Health Care Improvement	<b>Track:</b> HOM, 3	<b>Chair:</b> Davood Golmohammadi
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### 015-0163: Sequencing Outpatient Appointments in Healthcare Clinics with Variable Service Times

*Stephen Lawrence, University of Colorado, United States*

*Linda LaGanga, Mental Health Center of Denver, United States*

We investigate algorithms and heuristics for sequencing outpatient appointments in a healthcare clinic where service times are uncertain. We assume that the clinic has several classes of services (e.g., check-ups, follow-ups, minor procedures, etc.), each with its own service time distribution. The problem facing the clinic is to sequence a set of appointments for these services so that the greatest number of patients are seen, while keeping patient wait times and clinic overtime at sustainable levels. We develop and compare several algorithms and heuristics to generate good sequences, and identify which perform best under alternative scenarios. Finally, we develop several generalized rules for sequencing appointments with variable service times.

### 015-0143: Appointment Scheduling with Discrete Random Durations

*Mehmet Begen, University of Western Ontario / Richard Ivey School of Business, Canada*

*Maurice Queyranne, University of British Columbia / Sauder School of Business, Canada*

We determine optimal appointment schedules for a given sequence of jobs (e.g., surgeries) on a single processor (e.g., operating room), to minimize the expected total underage (idle-time of the processor) and overage costs (waiting time of jobs and overtime of the processor) when each job has an integer random processing duration given by a joint discrete probability distribution. Our model can handle a given due date for the total processing (e.g., end of day for an operating room) after which overtime is incurred and, no-shows and some emergencies. Besides surgeries, there are many applications of the appointment scheduling problem such as project scheduling, container vessel and terminal operations, gate and runway scheduling of aircrafts in an airport. We believe that our framework is sufficiently generic so that it is portable and applicable to many

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appointment systems in healthcare as well as in other areas.

### 015-0169: Patient Unpunctuality and Priority Rules for Scheduling Appointments

*Kenneth Klassen, Brock University, Canada*

*Reena Yoogalingam, Brock University, Canada*

This study uses empirical data on patient arrivals to model an appointment system with unpunctual patients (i.e., patients who arrive either early or late for their scheduled appointment). The data is used to develop realistic distributions for and insights into patient arrival behavior. The objective is to determine the impact incorporating this factor has on the design of an optimal variable-block schedule. In cases where patients are unpunctual, this introduces the notion of priority rules. It has to be determined in what order patients will be seen in order to minimize the effects of unpunctuality. This study examines different priority rules including First-Come-First-Served and First-Scheduled-First-Served. The goal is to determine the impact patient unpunctuality has on the performance measures of the system and which schedules result in the best performance.

23	Friday, 10:30-12:00, Granville	Track: HOM, 4	Chair: Ken Klassen
	Session: Scheduling Outpatient Appointments		

### 015-0204: Operating Room Capacity Management

*Diwakar Gupta, Industrial & Systems Engineering Program, Univ. of Minnesota, United States*

*Sandra Potthoff, Univ of Minnesota, School of Public Health, Div. of Health Policy & Mgmt, United States*

Developing models for managing operating room (OR) capacity requires understanding of the perspectives of OR Directors, Service Managers, and Nursing Directors. This talk will present a data-driven approach for understanding these perspectives and a series of models to address the following questions. What is the optimal number of exclusive-use hours for each service in each period? How to split these hours into blocks and day-of-week allotments? What are the impacts of different block-release rules and rules that govern the use of non-exclusive time?

### 015-0830: Using Estimates of Surgical and Anesthesia Case Durations for Creating Day-of-Surgery Schedules

*Vikram Tiwari, University of Houston, United States*

*David Berger, Prof. Baylor College of Medicine / Chief Div of Gen Surgery MEDVAMC, United States*

*Bruce Ehni, Chief of Neurosurgery, Michael E. DeBakey VA Medical Center, United States*

*Panagiotis Kougias, Chief of Vascular Surgery, MEDVAMC / Asst. Prof. Baylor College of Medicine, United States*

Variability in surgical and anesthesia procedures' durations makes surgical schedule creation a difficult task. Lack of historical case duration data, when segregated by procedure type, anesthetist and surgeon complicates the problem even more. Using two and half years of data, empirical probability distributions for case duration and anesthesia procedure duration for each CPT code (Current Procedural Terminology) are developed. Simulations using the retrospective dataset help establish the best critical fractile to use for scheduling each surgery-type. This is achieved by comparing the potential improvement (on different measures of resource utilization, lateness and overtime) if daily surgical schedules were created based on the identified best critical fractile. Following the successful results achieved from pilot-testing of the developed scheduling methodology, a simple MS-Excel-based application has been created and shared with the surgical specialist in charge of putting the cases first on the schedule. Improvements, if any, will subsequently be measured prospectively.

### 015-0802: Performance Measurement in Perioperative Environments: Current Practice at Two Large University Hospitals

*Lars Onsøyen, SINTEF Technology and society, Norway*

*Warren Sandberg, Massachusetts General Hospital, Department of Anesthesia and Critical Care, United States*

*Ola Sæther, St Olavs Hospital, Department of Surgery, Norway*

*Valborg Sund, St. Olavs Hospital, Norway*

*Andreas Seim, Norwegian University of Science and Technology, Department of Computer and Infor, Norway*

Surgical suites and the perioperative environment of hospitals are resource intensive high cost – high risk areas wherein performance is pivotal for patients' health, as well as hospitals' reputation and financial position. Obtaining and staying in a position as a high performing unit in a highly complex organization such as hospitals requires access to and treatment of data that only a well-founded performance measurement approach can provide. We review current performance measurement and management practice in the perioperative domain at two large university hospitals – one Norwegian and one in the USA. We then contrast these practices with how performance measurement systems should be designed according to performance measurement literature. Finally, we discuss how performance measurement can be used to enhance transparency and improve the quality, efficiency and coordination of perioperative work.

24	Friday, 10:30-12:00, Junior Ballroom A	Track: PITM, 2	Chair: Martin Steinert
	Session: Complexity, Networks, and Coordination in Product and Production Management		

### 015-0348: Complex Thinking in the Production Management

*Darlan Roman, University Federal of Santa Catarina, Brazil*

*Rolf Erdmann, University Federal of Santa Catarina, Brazil*

This article discusses the contributions of the approach complex in the context of organizations, focusing on the area of production management. In this sense, the evolution of Systems Theory and the emergence of Complex Thinking are presented. The article emphasizes the importance of relationships in complex systems. In developing the study, we created categories of analysis, inspired by the work developed by Professor Chris Voss of London Business School. Thus, the following categories were established: cycle time, quality, plant, equipment and technology investment, operational performance, environmental management, health policy and security, new product development, and organization and culture. Next, we

## Friday, 10:30-12:00 Sessions

discuss the applications of Complex Thinking in the context of business organizations, presenting a model of diagnostic business. It is concluded that Complex Thinking can improve the performance of the production on two fronts: the strengthening of inter-relationships between the parts and the emergence of interdisciplinary knowledge.

### 015-0351: Leveraging Network Relationship Capabilities to Foster Innovation: The Moderating Role of Internal Coordination

*Graça Silva, Faculdade de Economia, Universidade Nova de Lisboa, Portugal*

*Paulo Gomes, Faculdade de Economia, Universidade de Lisboa, Portugal*

This paper employs coordination theory and network theory to understand how relationship capabilities influence innovation. Three types of relationships are analyzed: internal relationships, namely inter-functional coordination, relationship with customers and relationship with suppliers, or external network relationships. We investigate the relationship with customers in two different periods: during product development and during production. We test whether the contribution of these relationships to product innovation varies according to different levels of internal coordination. We contribute to the understanding of the conditions that allow a company to create value through a well-established relationship.

### 015-0443: The Organization for Corporate Foresight: A Multiple Case Study in the Telecommunication Industry

*Cinzia Battistella, University of Udine, Italy*

*Alberto De Toni, University of Udine, Italy*

The present paper focuses on the organization for Corporate Foresight (CF): how the companies design their organization to anticipate future trends and detect weak signals. The research focuses on a multiple case-study in the telecommunication sector. Through a comparison of six international companies that perform CF and three that do not, the paper highlights the organizational variables that characterize an organization for CF, subdividing them into fundamental and additional. In order to foster CF, different organizational forms have been found: a dedicated foresight unit, a strong interrelation among strategy, R&D and marketing, specific task projects. These forms have in common specific organizational variables: a future-oriented culture, CF cross-units teams, horizontal distribution of power, lateral coordination, etc. These variables have been related to CF performance measures. Finally, the research identified the control variables that we hypothesise are influencing the CF organization: industry, dimension, being multinational, level in the value chain, etc.

### 015-0477: Coordination and Cooperation During Production Ramp-up: An Empirical Study of the European Manufacturing Industry

*Uwe Gross, RWTH Aachen University, Germany*

*Tim Renner, RWTH Aachen University, Germany*

Production ramp-up appears to be the main challenge during the late phases of innovation processes: new product specifications have to walk along with new production processes and even new production facilities. Bringing new products to market at a required level of quality, while meeting targeted time and cost, is the main goal of production ramp-up management. Literature stresses the importance of coordination and cooperation mechanisms during production ramp-up. Unfortunately, up to date, no empirical study has been conducted to confirm this issue. Our paper aims to fill this gap based on a survey among 71 manufactures in Germany and other European countries. We analyse a multitude of possible impact factors on production ramp-up success and show that cooperation and coordination have a significant influence. Surprisingly, this influence is not as strong as suggested in literature.

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Friday, 10:30-12:00, Junior Ballroom B

Track: OMM, 3

Chair: Rachel Chen

Session: OMM3

### 015-0572: New Product Design and Pricing Policies in a Stackelberg Duopoly with Consumer Rational Expectations

*Aysun Ozler, University of Washington, United States*

*Ted Klastorin, University of Washington, United States*

*Yong-Pin Zhou, University of Washington, United States*

We study a duopoly market where a firm initializes the design and production of a new durable good. After a random time, a competing firm becomes aware of this new product development effort and begins the design and production of a competing product. We assume that consumers' purchase decisions in this market are a function of their utility surplus as well as their expectation of future products and prices. We develop a model that allows us to determine the optimal design and pricing for both firms and suggests numerous managerial implications.

### 015-0207: Complexity Management in Practice - A Long Way to Go

*Kai Hoberg, University of Cologne, Germany*

Complexity has long been identified as a major cost driver in supply chains: efforts in development, sourcing, manufacturing, and distribution increase significantly with the number of SKUs managed. Nevertheless, SKUs are frequently added to generate incremental revenues without considering complexity-induced costs. In recent months, we have analyzed the product portfolio of various major global players across different industries. The results of our study are disillusioning. There is a long way to go: processes to manage complexity are not in place, organizational setups are driving complexity rather than reducing it, and visibility on complexity-induced cost is rare. We show how transparency on complexity-induced costs can be created and how to fix the basics in order to advance to the next level of mathematical optimization.

### 015-0094: Group Buying of Competing Retailers

*Rachel Chen, University of California at Davis, United States*

*Paolo Roma, University of Palermo, Italy*

Under group buying, quantity discounts are offered based on the buyers' aggregated purchasing quantity, instead of individual quantities. Previous studies on group buying focus on the benefit buyers receive in reduced acquisition costs or enhanced bargaining power. In this paper, we show that buyers can instead get hurt from such cooperation. Specifically, we consider a two-level distribution channel with a single manufacturer and two retailers who compete for end customers. We show that group buying is always preferable for symmetric retailers. For asymmetric retailers, group buying is beneficial to the smaller (or less efficient) player. However, it can be detrimental to the larger (or more efficient) one. Despite the lower

## Friday, 10:30-12:00 Sessions

wholesale price under group buying, the manufacturer can receive a higher revenue. Interestingly, group buying is more likely to form when retailers are competitive in different dimensions.

### 015-0151: Advance Demand Information, Price Discrimination, and Pre-order Strategies

*Cuihong Li, University of Connecticut, United States*

*Fuqiang Zhang, Washington University in St. Louis, United States*

Pre-order refers to the practice of a seller accepting customer orders before the product is released. It allows a seller to obtain advance demand information for inventory planning, and to implement price discrimination. We analyze the value of advance demand information and the impact of price guarantees in pre-order strategies in the presence of consumers' strategic waiting behavior.

26	Friday, 10:30-12:00, Junior Ballroom C <b>Session: OMM4</b>	Track: OMM, 4	Chair: Yen-Ting Lin
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### 015-0052: Manufacturing Integration and Performance

*Ely Paiva, UNISINOS, Brazil*

*Iuri Gavronski, UCS, Brazil*

*Livia D'Ávila, UNISINOS, Brazil*

Manufacturing integration with other functional areas and suppliers is a key aspect for achieving sustainable competitive advantage, given its complex capabilities creation. We address this important issue by relating manufacturing integration and performance. More specifically, we hypothesize that the manufacturing integration with suppliers, marketing, and R&D is positively related to profit and sales growth. We surveyed manufacturing plants in Brazil, in the food and fabricated metal products industries, and analyzed the data from 99 plants using structural equations modeling, in two steps. To address validity and reliability issues, and address the problem of common method variance (CMV), we used the MTMM model and CFA, and to test the structural relations, we used path analysis. We found that all manufacturing integration aspects are positively related with sales growth, but only manufacturing-R&D integration is positively related to profitability.

### 015-0031: Characteristics of the Demand of Transport Service: What Matters to Small and Medium-Sized Industrial Shippers in Brazil?

*Ricardo Martins, UFMG/CEPEAD, Brazil*

*Wescley Xavier, UFMG/CEPEAD, Brazil*

*Osmar Souza Filho, NIPÉLOG-UFMG, Brazil*

*Guilherme Martins, FGV-EAESP, Brazil*

The objective of this study was to evaluate the relevant factors in the decision making for the hiring and the satisfaction of small size shippers in relation to transport services. The research was developed with 400 companies (with up to 100 employees) of Brazilian manufacturing industry. The results indicated that the constructs of transport services most valued by the shipper companies were, in order, Safety, Reliability, Time, Price, Attention to the special needs of customers and Customer relationship. However, differences were found in priorities, as the groups are oriented by the characteristics of customers. On the other hand, the companies showed they practice the trade off between cost and service level. Like any act of purchasing, the price (freight) is relevant, but in the case of transport and logistics in its mission, it was not a variable that prevailed in any cluster.

### 015-0499: The Effect of Logistical and Promotional Services on Retailers' Satisfaction and Loyalty

*Mourad Cheour, HEC Montréal, Canada*

*Claudia Rebolledo, HEC Montréal, Canada*

Logistical and promotional services are two key instruments manufacturers can use to increase the satisfaction and, thus, the loyalty of their retailers. Most of the studies on the subject focus on the sole impact of logistical services, and very few examine the combined effect of logistical and promotional services. In this study, the relationships between logistical and promotional services, retailer satisfaction and loyalty are empirically analyzed. The research model is tested using data from a survey directed to retailers of tobacco products in a Canadian city. The Tobacco Industry is an interesting setting for this study because of the strict regulation regarding the sale, labeling and promotion of tobacco products. Results indicate that high-quality performance of both types of services is similarly important in determining retailer satisfaction and loyalty.

27	Friday, 10:30-12:00, Junior Ballroom D <b>Session: New Perspectives on Problems in Product Re-X</b>	Track: SOHL, 2	Chair: Beril Toktay
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### 015-0039: Return Policies and Informational Tools in Experience Goods Markets

*Eylem Koca, University of Maryland, United States*

*Gilvan Souza, Indiana University, United States*

We investigate the role of return policies and informational tools provided by the seller in the consumer purchasing behavior and on the overall market outcome. We build a novel model of consumer learning, and study the seller's decision process involving the design of return policies, amount of information to provide and the prices in a two-period setting. With no distributional assumptions, we attain significant analytical findings. Most notably, a) we find that the seller can choose to not provide any information even if it has no cost, and b) we find that ex-ante efficient allocation of the product is possible by appropriately designing the return policy even without full information. We fully study the joint optimization problem analytically under uniform valuations.

### 015-0068: The Effect of Remanufacturing on the Perceived Value of New Products

*Vishal Agrawal, Georgia Institute of Technology, United States*

*Atalay Atasu, Georgia Institute of Technology, United States*

## Friday, 10:30-12:00 Sessions

**Koert van Ittersum**, *Georgia Institute of Technology, United States*

We experimentally investigate the effect of remanufactured products on the perceived value of new products. We find that the perceived value of an OEM's new product depends on who sells the remanufactured product: in our experiment, the perceived value of new products decreases when the OEM sells the remanufactured product, but it increases when the remanufactured product is sold by a third-party remanufacturer. We incorporate this effect to analytically investigate an OEM's strategy in the presence of competition from third-party remanufacturers. Existing literature has argued that because the presence of third-party competition is detrimental for the OEM, it should pursue remanufacturing or collection of used products to preempt third-party remanufacturers. By incorporating the effect of remanufacturing on the perceived value of new products, our research shows that an OEM may find it more profitable to allow third-party competitors to remanufacture its products.

### 015-0152: To Sell or To Provide? A Comparison of Selling and Membership

**Ioannis Bellos**, *Georgia Institute of Technology, United States*

**Mark Ferguson**, *Georgia Institute of Technology, United States*

**Beril Toktay**, *Georgia Institute of Technology, United States*

In recent years, we have observed new business models flourishing in the transportation business. Such models include membership and fractional ownership schemes, which focus more on the provision of mobility services and less on the pure selling of products. In this paper, we study the sell versus provide decision faced by a monopolist who wants to enter the transportation business. We assume the existence of a representative customer with certain characteristics, such as frequency of product use, expected duration of use and perceived value per use; we borrow from queueing theory to model the membership business. Through a strategic level approach we shed light on the conditions under which each strategy dominates the other and identify the parameters that affect profitability most.

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Friday, 10:30-12:00, Orca

Track: CIM, 2

Chair: Ton de Kok

Session: Supply Chain Optimization and Simulation

### 015-0946: Validating Supply Chain Optimization Models

**Ton de Kok**, *Eindhoven University of Technology, Netherlands*

In this presentation we report about a series of in-depth validation studies of multi-echelon inventory system models. These models emerged during MSc projects focused on supply chain design and planning improvement. Using a generic multi-echelon inventory system model, we gathered data about transformation processes, demand processes, actual and target customer service, actual inventory deployment and costs. The validation process was based on a comparison between actual and "predicted" customer service performance. The contribution of our work is that we assess the power of OR in capturing real-life phenomena for an important class of problems in OM. We discuss our findings and possible pitfalls.

### 015-0950: Simulation of the Decision Models to Align Forecast and Inventory in the Supply Chain Strategy

**Erika Ikeda**, *Universidade de Sao Paulo, Brazil*

**Tamio Shimizu**, *Universidade de Sao Paulo, Brazil*

The sales forecast is a prerequisite for the inventory decisions in practical life. Selecting the right forecasting model to improve inventory management can increase the customer service level and lead to a better performance for the supply chain. The forecast performance should not only be evaluated by its standard error, but also by its impact in the organization performance measures. The sales forecast should not be considered an individual function, but as an important part of supply chain management. The paper presents the forecasting models found in the literature and evaluates their impact on inventory management, using real data to simulate and to compare the behavior of each variable of the more representative models used in the companies.

### 015-0465: Improving Design and Analysis of Multi-product Inventory Simulations with Correlated Stochastic Demands

**Canan Gunes**, *Carnegie Mellon University Tepper School of Business, United States*

**Bahar Biller**, *Carnegie Mellon University Tepper School of Business, United States*

The common practice in performing inventory simulations is to estimate demand models using historical data sets of finite length, and drive the simulations with the random variates generated from the estimated demand models. However, this practice ignores the uncertainty around the estimated demand model and its parameters (i.e., parameter uncertainty), and accounts only for stochastic uncertainty (i.e., the uncertainty that arises from the dependence of the output on the simulation's input streams) in the output analysis. Consequently, it provides inaccurate estimates for mean fill rates and low coverage for confidence intervals. Motivated by the need to build multivariate demand models for multi-product inventory simulations, we introduce a Bayesian model that accounts for both stochastic and parameter uncertainties in the output analysis of multi-product inventory simulations with correlated demands. We demonstrate that the resulting model improves both the accuracy of the mean fill rates and the coverage of the confidence intervals.

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Friday, 10:30-12:00, Parksville

Track: EROM, 2

Chair: Czaja Lothar

Session: Global Issues

### 015-0356: Relevance of Operations Management to Practising Managers in Emerging Economies

**David Owen**, *University of Bedfordshire, United Kingdom*

**John Beaumont-Kerridge**, *University of Bedfordshire, United Kingdom*

The distance learning MBA of the University of Bedfordshire, England UK, includes an operations management module, and has graduates in the emerging economies of India, Oman, Poland and South Africa in addition to students in Germany and Switzerland. The university has an innovative blended learning approach which includes collaborative group learning, but has not researched whether what is taught on an operations management course originally designed for UK students is fully compatible with emerging economy practitioner requirements. Several previous

## Friday, 10:30-12:00 Sessions

studies have shown that practitioners favour quantitative concepts and the purpose of this paper is to identify whether there are any gaps between practitioner requirements and what is taught. The paper will report on a survey of graduate practitioners and current students. It will explore whether there is a requirement for more project management content in the operations management curricula and whether there are any specific requirements for emerging economy practitioners.

### 015-0398: Spatial Concentration of Logistics Firms

*Frank van den Heuvel, Eindhoven University of Technology, Netherlands*

*Peter de Langen, Eindhoven University of Technology, Netherlands*

*Karel van Donselaar, Eindhoven University of Technology, Netherlands*

*Jan Fransoo, Eindhoven University of Technology, Netherlands*

Research on economic geography has shown that manufacturing firms cluster geographically due to several synergy effects. Such research is lacking for logistics firms, even though such an analysis would be relevant for policymakers and logistics companies. Spatial clustering of logistics activities may result in comparable synergy effects and is also expected to result in opportunities to combine cargo flows. Especially the combination of cargo flows results in important societal advantages, since congestion and CO2 emissions can be reduced. Based on employment data available for all firms located in one of the southern provinces of the Netherlands, the hypothesis that logistics firms concentrate spatially is tested. Furthermore, we test whether location patterns have changed in the last five years. This analysis serves as input for further research into incorporating synergy effects of spatial clustering in location decision models for logistics firms.

### 015-0389: The Relevance of RFID Solutions in Production and Operations Processes – An Empirical Analysis within the German Automotive Industry

*Lothar Czaja, University of Erlangen-Nuremberg, Germany*

*Daniel Gerhard, University of Erlangen-Nuremberg, Germany*

*Stefanie Herrmann, University of Erlangen-Nuremberg, Germany*

*Kai-Ingo Voigt, University of Erlangen-Nuremberg, Germany*

"In the 21st century the technology revolution will move into the everyday, the small and the invisible" (Weiser 1988). With these words, the American scientist Mark Weiser describes the idea of ubiquitous computing, i.e., the omnipresence of computer-aided solutions and technologies which support both companies and people to better fulfill their daily duties and responsibilities. Within this paper, we will focus on the technology of radio frequency identification and its adoption in production and operations processes. For this, an empirical study within the German Automotive Industry has been conducted, showing that even if RFID is mostly regarded as a common standard in modern production and operations processes in scientific literature, there is still a remarkable gap in companies' daily practice. Therefore, the aim of this paper is to present the status quo of RFID usage within the German Automotive Industry as well as to clarify the remaining potential for further development.

### 015-0767: Congruency Fit: Beyond Performance in the Auto Supplier Industry

*Cesar Ortega, UNAH-University of Seville, Honduras*

*Jose Dominguez Machuca, University of Seville, Spain*

*Pedro Garrido, University of Seville, Spain*

*Nelson Raudales, UNAH, Honduras*

*Jose Perez, University of Seville, Spain*

*Antonio Moreno, University of Seville, Spain*

The effects of manufacturing strategy (MS) and technology (T) on performance have been studied separately, but few studies have examined the relationship between MS and T practices clusters that improve effectiveness when implemented jointly, and even then they do not consider possible congruency between the two. This paper develops a congruency (selection) model to test for any interconnection between said clusters, without addressing causation or their combined effect on performance. The implicit outcome is that the plant will achieve a desirable effectiveness level. Through a wide-ranging survey of auto supplier plants, two approaches are considered: 1) grouping both clusters in pairs (canonic correlation analysis), and 2) a more general selection view version, with practices from both clusters related multidimensionally and subordinated by bivariate analysis (regression) to test for any congruent pattern. Both methods find a congruent relationship between manufacturing strategy and technology practice clusters, although the second provides greater detail.

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Friday, 10:30-12:00, Pavilion Ballroom A

Track: PLQ, 2

Chair: Bjonar Henrikson

Session: Quality

### 015-0367: A Framework for Measuring the Eight Dimensions of Quality

*George Kenyon, Lamar University, United States*

*Mary Meixell, Quinnipiac University, United States*

*Peter Westfall, Texas Tech University, United States*

Quality measurement is fundamental to many research problems. Yet little research addresses how best to evaluate and compute this essential element of competitive advantage. In his seminal 1987 paper on the dimensions of quality, Garvin proposes that quality comprises: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. The purpose of this research is to review the implementation of quality measurement in the operations management literature and propose a framework for a one-dimensional quality measure that is multi-attribute in composition.

### 015-0022: Approaches to Quality Used by Companies on Both Sides of the Atlantic

*Peter Burcher, Aston Business School, United Kingdom*

*Gloria Lee, Aston Business School, United Kingdom*

## Friday, 10:30-12:00 Sessions

**Jamison Kovach**, *University of Houston, United States*

Many high profile approaches to quality improvement are currently used by organisations around the world. As part of an international programme of research on quality issues, this paper presents a study of current approaches and their challenges for companies in the U.S. and Britain. The samples in both countries fell into two groups, the “stayers” who had not changed their systems in the last five years and the “changers” (75% of the U.S. companies and 87% of the British). The pressure to change was mainly internal and top down in both samples but organisations in the U.S. stressed human factors and teamwork, whereas British companies favoured more formalised systems of control. The main barriers to change were motivational (workforce) or resources (timescales and funding). But despite different coping mechanisms, the outcomes were generally successful in both countries. Here the different routes taken and their implications are presented.

**015-0851: Improving Competitiveness in Craft Manufacturing - Quality Improvement in the Automotive and Leisure Boat Industry**

**Bjørnar Henriksen**, *NTNU, Norway*

**Carl Christian Røstad**, *SINTEF, Norway*

**Andreas Seim**, *SINTEF, Norway*

**Eva Amdahl**, *SINTEF, Norway*

High quality craft manufacturers adapting industrialized approaches to design and production face the challenge of maintaining the unique quality in their craft while realizing improvements in efficiency through their industrialization process. We studied how quality is ensured and built into the products of one highly industrialized lean manufacturer and one hand craft manufacturer in order to better understand these challenges, comparing and contrasting the two companies' approaches to quality. Based on our empirical study of the two companies, we discuss how the craft manufacturer could adopt lean principles without sacrificing the company's product- and customer knowledge and its unique product quality, thus improving the competitive position of the company.

31	Friday, 10:30-12:00, Pavilion Ballroom B	Track: GENL, 2	Chair: Dana Johnson
	Session: Teaching POM: Technology and Resources		

**015-0865: Improvement of Teaching and Learning in Management of Production**

**Sergio Brun**, *UFGD, Brazil*

**Rolf Erdmann**, *UFSC, Brazil*

Instruction Management Production is facing many problems, with the current and traditional techniques showing signs of exhaustion. The objective of this study was to determine aspects, combined or not, that are capable of triggering an effective relationship of teaching and learning in Administration of Production. This study is an action research undertaken in four Brazilian universities and following the logic of self-organization are presented the basics of teaching and learning that provide effectiveness in the classroom. From these technologies that have been developed for the classroom, certain important aspects relating to the teacher's voice and use of practical examples are discussed.

**015-0222: Online Learning Versus Face-to-Face Instruction in a Project Management Course**

**Dana Johnson**, *Michigan Technological University, United States*

The increase in online distance learning has led to the creation of courses using a hybrid approach consisting of a blend of online learning modules and face-to-face instruction. To validate that student learning outcomes are being achieved, exams and other assignments results should be compared. Four chapters from an undergraduate project management course were covered using the online learning modules and the other ten chapters were taught through face-to-face instructions. A statistical analysis was conducted between two semesters using two sections and there was no statistical difference between test scores for the third exam and optional final exam. The instructional approaches for the hybrid course along with a discussion of the results will be described.

**015-0959: Web-based Interactive Resources for Teaching a POM Course with Balanced Service and Supply Chain Content**

**Kenneth Boyer**, *Ohio State University, United States*

**Mellie Pullman**, *Portland State University, United States*

**Rohit Verma**, *Cornell University, United States*

Increasingly, core POM courses are designed to provide a balanced overview of manufacturing and service operations along with supply chain management concepts. Furthermore, there seems to be a greater need to incorporate online learning resources for various instructional needs (e.g., assignments, multi-media cases, etc). This workshop will review some of the new resources available for instructors of core POM classes.

32	Friday, 10:30-12:00, Pavilion Ballroom C	Track: LM, 2	Chair: LI Liu
	Session: Logistics and IT		

**015-0881: The State of Empirical Research in Logistics**

**Thomas Goldsby**, *University of Kentucky, United States*

**Craig Carter**, *University of Nevada, United States*

**Stanley Griffis**, *Michigan State University, United States*

**Michael Knemeyer**, *The Ohio State University, United States*

The examination of logistics research questions by empirical means has gained a strong foothold over the past twenty years. This panel session will explore the current state of empirical research in logistics with an eye toward future developments. Panelists will present the merits and challenges associated with using empirical methods and the prospects for achieving publication of works featuring these methods.

## Friday, 10:30-12:00 Sessions

33	Friday, 10:30-12:00, Pavilion Ballroom D <b>Session:</b> Cross-Cultural Issues	<b>Track:</b> HBOM, 2	<b>Chair:</b> Elmira Hajiaghazadeh Marandi
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**015-0099: Human Resource Practices in Emergent Economies: The Case of the South Latin-American Countries**

*Alejandro Bello-Pintado, Universidad Pública de Navarra, Spain*

*Alberto Bayo-Moriones, Universidad Pública de Navarra, Spain*

*Ricardo Kaufmann, University ORT-Uruguay, Uruguay*

Using data from 301 Argentinean and Uruguayan manufacturing firms with at least twenty workers, we examine the incidence of High-Involvement work practices. We analyse what factors (contextual and organizational) are associated with the adoption of these practices. The paper has several distinctive contributions to the scarce evidence about the use of human resource practices (HRP) and its determinants in Latin-American countries. Moreover, we offer empirical evidence of a representative sample of manufacturing firms of a wide region, using data collected by means of personal interviews with plant managers. The results reveal the existence of diversity in the factors that affect the use of HRP.

**015-0131: Free to Communicate in Operations Management: Facilitating Research in Emerging Economies**

*Helen Wagner, Loughborough University, United Kingdom*

*Susan Morton, Loughborough University, United Kingdom*

*Chris Backhouse, Loughborough University, United Kingdom*

For those wishing to undertake research in emerging economies, language will become a major obstacle. The problem of interpretation has been addressed within social sciences; however, it is considered that different issues exist when interviewing in business situations. Conducting case study (CS) research at a large automotive parts manufacturer in Slovenia, the language issues involved in interpretation for interviews were addressed. Findings show that, in order to successfully obtain the desired information from the case, significant planning and consultation is required to find a local, external interpreter, with the right experience and approach to facilitate data collection. This will enable interviewees to speak freely and, moreover, provide information on cultural issues that may not be immediately obvious to a visiting researcher. Contribution from this paper is primarily a suggested guideline for those wishing to undertake research in emerging economies, while adding to the extant literature on CS research methods.

**015-0693: Does Educational Background Better Explain SCM Performance in Emerging Economies? The Case of Venezuelan Hospitals**

*Candido Perez, IESA - Instituto de Estudios Superiores de Administración, Venezuela*

This paper empirically analyzes the usual practice of relying on specific background professionals to become supply chain managers in Venezuela. My study focuses on 952 supply chain managers, including 472 physicians (public and private hospital directors) and 480 engineers from other industries, comparing their performances through the Beer Game. I found evidence against the hypothesis of relying on specialized professional managers to lead supply chains, mainly caused by memory recency effect, conservatism, and overconfidence, all of them measured before and after the subjects played the game.

**015-0093: Maestro as Manager: The Work of Conductors Beyond the Stage**

*Rita de Cássia Fucci-Amato, University of São Paulo, Brazil*

*Edmundo Escrivão-Filho, University of São Paulo, Brazil*

*João Amato-Neto, University of São Paulo, Brazil*

This paper aims at presenting a specific perspective of the interface between music and operations management. Firstly, it points out the usages in business literature and imagery of the conductor as a metaphor for the leader and the manager. Soon after, it looks to show that the managerial role of the conductor is not so relevant in its performance on stage as it is in pre-concert activities, when the maestro carries out such tasks as material and human resources management, coordination, planning, motivation and leadership. The research is based on a bibliographical revision and on a case study with participant observation as a choir conductor in a chamber vocal group: Madrigal InCanto, from São Carlos city, State of São Paulo, Brazil.

34	Friday, 10:30-12:00, Port Alberni <b>Session:</b> Service Performance Measurement	<b>Track:</b> SOM, 2	<b>Chair:</b> James Fitzsimmons
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**015-0133: Servitization of Manufacturing and Product-Service Integration**

*Martin Spring, Lancaster University Management School, United Kingdom*

*Andy Neely, University of Cambridge, United Kingdom*

Novel approaches to configuring, trading and accessing combinations of products and services are increasingly important in practice, and are attracting scholarly interest, notably from OM and marketing. An increasing number of firms who have hitherto been devoted to manufacturing are combining manufacturing with service provision - so-called 'servitization'. Meanwhile, firms in service sectors are reconfiguring their service offerings to make them more reproducible and, in some ways, 'product-like'. Performance-based operation and procurement has become widespread, with capital equipment in many sectors such as aerospace being accessed under a 'rental/access paradigm' rather than being bought outright. This invited session will explore these phenomena, building on the enthusiastic discussion of this subject in the Service Operations track at POMS 2009. It will take the form of a panel discussion comprising – depending on attendance at POMS 2010 – Profs Neely, Baines, Swink, Sampson, Voss and, hopefully, one or two practitioners.

## Friday, 10:30-12:00 Sessions

36	Friday, 10:30-12:00, Port Hardy Session: GOSSM 2	Track: GOSSM, 2	Chair: Afonso Fleury
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### 015-0335: Governance Architectures for Inter-Organizational R&D Collaboration

**Ben Clegg**, *Aston Business School, Aston University, United Kingdom*  
**Mario Binder**, *ZLU Consulting and Management GmbH & Co. KG, Germany*  
**John Edwards**, *Aston Business School, Aston University, United Kingdom*  
**Simon Chandler**, *Jaguar Land Rover, United Kingdom*

Inter-organizational relationships are becoming an increasingly important source of competitive advantage and innovation. This study looks at these relationships in the context of inter-organizational R&D collaborations in the European automotive industry. Previous work led to the proposal of a competence-based portfolio framework that explains the design of the inter-organizational architecture and an indicative relationship strategy. This framework comprises four distinct types of governance architecture and relationship strategy. This paper reports on the first confirmatory transfer study, conducted at Jaguar Land Rover, in the UK. The study illustrates developmental paths and patterns in the evolution of inter-organizational relationships using empirical insights. Their configuration and dynamic evolution is contingent upon the 'engageability' of the partner companies' competences based on their attractiveness, transferability and maturity. The study shows that the contingency framework is transferable and practically useful, as well as yielding further practical narrative about inter-organizational practice.

### 015-0517: Road Map for the Internationalization of Firms from Emerging Economies

**Afonso Fleury**, *University of Sao Paulo, Brazil*  
**Maria Tereza Fleury**, *Fundacao Getulio Vargas, Brazil*  
**Andre Fleury**, *University of Sao Paulo, Brazil*

The initial stages of internationalization, prior to firms having established a firm position among international competitors, is an unexplored area of International Manufacturing and International Business literature. From the firm's point of view, the challenges start from the decision to internationalize: "should I stay or should I go?" Then the organizational challenge comes in: "organizing a company to do business on a global scale remains one of the most complex managerial responsibilities: choices must be made, challenges must be met and mind-sets must be transformed", as Galbraith (2000) points out. Those are the challenges that are faced by firms from emerging countries. The aim of this paper is to present a road map for the internationalization of firms. It is built from the outcomes of a multidisciplinary research project that studied Brazilian multinationals for more than three years.

### 015-0177: Full Service Vehicle Manufacturing

**Alan Pilkington**, *Royal Holloway, University of London, United Kingdom*  
**Luciano Ciravegna**, *Royal Holloway, University of London, United Kingdom*

The literature and theory of supplier involvement in the design and manufacture of products in the automotive sector has not kept pace with developments in the industry. We explore the previously undocumented emergence of full service vehicle manufacturers (FSV) which produce finished products for the large manufacturers. The emergence of FSVs is explained using transaction cost ideas, as they do not carry the costs of developing engines and power trains and so have been competitive in traditionally marginal markets. FSVs have recently seen a shakeout with some developing whilst others have faltered, and we explain the differing success through a changing focus of capability from design to production once vehicles have become established in the market.

### 015-0332: Total Cost of Ownership and Strategic Implication Considerations in Global Sourcing Processes

**Robert Alard**, *ETH Zurich / BWI Center for Enterprise Sciences, Switzerland*  
**Philipp Bremen**, *ETH Zurich / BWI Center for Enterprise Sciences, Switzerland*

Manufacturing companies in developed countries often procure direct materials from low-cost countries like China or India. One of the main reasons is the expected cost savings for the buying company. However, decision-making in global sourcing is rarely based on profound analyses of the total cost of ownership or the long-term strategic implications of this global sourcing intention. The objective of this paper is to develop a generic, application-oriented method targeted at industrial practice for the ex-ante evaluation of crucial product-related cost elements and their strategic implications (e.g. supplier development needs). The broadened transparency concerning the total cost of ownership of globally sourced direct materials shall support the supplier selection process, taking into account logistics, transaction and risk costs as well as long-term implications. The research is accomplished according to action research principles in close cooperation with four Western companies from the medical technology, electronics and plant engineering industry.

36	Friday, 10:30-12:00, Port McNeill Session: Operational Decision and Financial Value	Track: OMF, 2	Chair: Clovis Luiz Galdino
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### 015-0792: A Financial Perspective on Inventory Holding Cost

**Alejandro Serrano**, *MIT-Zaragoza Logistics Program, Zaragoza Logistics Center, Spain*  
**Santiago Kraiselburd**, *MIT-Zaragoza Logistics Program and INCAE Business School, Spain*  
**Rogelio Oliva**, *Mays Business School Texas A&M University and MIT-Zaragoza Logistics Program, United States*

In the operations management literature, the capital holding cost in inventory models is usually assumed to be the weighted average cost of capital (WACC) of the firm. We study two widely used models: the Economic Order Quantity (EOQ) Model and the Periodic-Review, Order-Up-To-Level Model (R,S), to find out what is the correct value of the capital holding cost. For each model, we derive expressions that link the cost of capital for shareholders with the decision variable. We find that, by and large, the WACC of the firm is not appropriate to calculate the inventory holding cost. Instead, in the EOQ Model, the risk-free rate should be used, and in the (R,S) Model, an expression that depends on the pdf of the demand at the

## Friday, 10:30-12:00 Sessions

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optimal order-up-to-level, should be used. These results hold even if the firm undertakes simultaneous investments which modify the firm cost of capital. As a result, optimal inventory policies should be revised to correctly account for inventory holding cost.

### **015-0328: Supplier Finance in Emerging Economies**

*Daniel Corsten, IE Business School, Spain*

Recently, the concept of reverse factoring as a way to enable supplier to obtain liquidity before retailer invoice maturity has become popular. Compared to traditional factoring, which is initiated by the supplier, in reverse factoring the retailer sets up a factoring programme with a bank. The suppliers then benefit from the often higher creditworthiness of the retailer to obtain lower interest rates and higher advances than he would with traditional factoring. The retailer often concurrently extends his payment terms with the supplier. Nestlé in Russia, for instance, has introduced such a programme for its Russian suppliers with great success. We develop hypotheses on the drivers of a supplier's decision to join such a programme and test it with data from 113 supplier-retailers relationships in Eastern Europe. Our results generally confirm our arguments but some results are surprising.

### **015-0399: Working Capital Exposure: A Methodology to Control Economic Performance in Production Environments by Projects**

*Diego Manotas Duque, Universidad del Valle - Escuela Ingeniería Industrial y Estadística, Colombia*

*Leonardo Rivera Cadavid, Universidad Icesi - Departamento de Ingeniería Industrial, Colombia*

The Cost-Time Profile (CTP) is a tool that presents graphically the accumulation of direct costs on a product as it moves through the manufacturing process. CTP incorporates the time dimension to the cost accumulation, and the area under the CTP curve is the Cost-Time Investment (CTI). In this paper we propose a new measure, derived from the CTP: The Working Capital Exposure. It will be calculated valuing the times and money amounts in which the company worked with their own money at a certain rate, and the areas of the graph in which the company worked with the client's money at a different rate. It will show for how long and for how much was the company exposed when working in a project with their own money instead of the customer's money. The associated risks will be discussed and further possibilities for probabilistic research will be presented.

### **015-0743: The Transmission of Credit Risk in the Brazilian Shoes Supply Chain**

*Ricardo Jorge, Fundacao Getulio Vargas de Sao Paulo, Brazil*

*Luiz Carlos Di Serio, Fundacao Getulio Vargas de Sao Paulo, Brazil*

This paper aims to diagnose the existence of relationships in credit risks of Brazilian shoes manufactures within the context of a supply chain, to pinpoint the direction of the credit risk fluctuations in the chain (up and downstream), and to propose a mathematical model that establishes the relationships in the credit risk of at least two agents in a selected supply chain. Since there has been little empirical and theoretical research into credit risk in a supply chain context, we researched supply chain management literature, supply chain risk management, credit risk and credit risk management to learn more about this phenomenon. Since the issues related to company credit risk took on new contours when subjected to the theories of SCM, this paper aims at identifying and explaining potential relationships in company credit risks when moving up and downstream in the chain.

### **015-0203: Impact of Economic Capitalization on Scoring Decisions within Consumer Credit**

*Kanshukan Rajaratnam, University of Virginia, United States*

*Peter Beling, University of Virginia,*

A topic of interest in recent literature is the incorporation of forecasts of future economic conditions into acquisition decisions for scored retail credit and loan portfolios. Rajaratnam, Beling, and Overstreet [1], for instance, study a model in which the performance of a cutoff policy is dependent on prevailing economic conditions during the loan period, and yet the policy must be specified and implemented before the loan period and hence before the economic environment is known with certainty. We extend the existing model to incorporate economic capital requirements. Given an economic capital requirement (e.g., Basel II), the portfolio manager must choose both a cutoff score and the level of economic capitalization prior to account performance. Overcapitalization results in higher cost of capital while under-capitalization results in a reduction of portfolio size, with both possibilities having profit consequences. We construct the set of non-dominated points describing the tradeoff between profit and market-share.

## Friday, 1:30- 3:00 Sessions

37	Friday, 1:30- 3:00, Finback <b>Session:</b> Supply Chain Management 3	<b>Track:</b> SCM, 7	<b>Chair:</b> Afshin Mansouri
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### 015-0155: Robust Decision Model for Facility Location in a Global Supply Chain Network

**Balan Sundarakani**, *University of Wollongong in Dubai, United Arab Emirates*

Firm location and relocation in a modern business environment has been stressed with many additional constraints under probable and possible uncertainties. Handling both the possibilities and probabilities in plant relocation problems are large scale optimization problems, and they were seldom dealt by researchers considering either one of the cases. It's been a big challenge to account these two uncertainties together while decision making process. This research explores a way to combine the possibilities and probabilistic scenarios together by proposing a Hybrid Robust Optimization and Fuzzy Mixed Integer Linear Programming. By proposing a novel hybrid model this research critically investigates the possibility of establishing a facility plant or moving an existing plant/distribution center (DC)/Regional distribution center (RDC) in the global supply chain. Insights gained from this research would be helpful for practitioners who are willing to locate and or relocate an existing plant/DC/RDC in the global supply chain network.

### 015-0250: Robust Optimization for Coordination of Integrated Multirefinery Networks

**Adriana Leiras**, *Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), Brazil, Brazil*

**Ali Elkamel**, *University of Waterloo, Canada, Canada*

**Silvio Hamacher**, *Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), Brazil, Brazil*

This paper considers the problem of strategic planning under uncertainty for optimal integration and coordination of a multirefinery network. We extend the deterministic model proposed by Al-Qahtani and Elkamel (2008) [Computers and Chemical Engineering, 32, 2189–202] to account for uncertainty in raw material costs and final product prices as well as product demand. We apply the robust optimization methodology of Bertsimas and Sim (2004) [Operations Research, 52, 35-53] which deals with uncertainty in a tractable way and does not add complexity to the deterministic problem. An industry scale study demonstrates that modeling uncertainty in the process parameters provides a more practical perspective for this type of problem in the refining industry. In addition, we calculate the probability bounds of constraint violation to help the decision-maker adopt more appropriate parameters to control robustness and judge the tradeoff between conservatism and total profit.

### 015-0430: Making the Transition to Agility: Insights from a Scottish Cashmere Manufacturer

**Omera Khan**, *University of Manchester, United Kingdom*

Businesses must acknowledge that effective supply chain management 'begins on the drawing board' and that design decisions can dramatically impact the responsiveness and risk profile of a business. As well as enabling a company to run as usual after disruption, a responsive enterprise gains competitive advantage by being quicker than its rivals. This paper describes the organizational challenges and changes that were required by the UK's last remaining vertical textile mill in making a transition to agility and becoming a more design-centric business. The findings from the case study highlight the importance of developing a better interface between product design and supply chain, investing in responsive technologies such as hank dyeing and seamless knitting machines, which enable the firm to produce faster and smaller quantities of products and simultaneously reduce waste and obsolete inventory. In addition, the case shows significant transformational steps are required in making this transition to agility.

### 015-0393: Pareto Optimization for Informed Decision Making in Supply Chain Management

**Afshin Mansouri**, *Brunel University, United Kingdom*

**David Gallear**, *Brunel University, United Kingdom*

This paper discusses application areas of Pareto optimization (PO) to support informed decision making in supply chain management (SCM). The main features of supply chain decisions are discussed and the capabilities of PO as a support to enhance decision making across the chain are examined. Two sample applications from online purchasing and supermarket retailing are leveraged to illustrate typical support that can be provided to customers and retailers in the process of decision making. In the first application, an online retailer deals with trade-off analysis between total purchase/delivery cost and delivery due date. The second application concerns inventory management in a supermarket where inventory cost and lost sale conversely correlate. The key decision points in a typical supply chain are then identified and mapped to potential applications of PO. Based on these analyses, the paper concludes with the elaboration of salient avenues for further research.

38	Friday, 1:30- 3:00, Galiano <b>Session:</b> Inventory and Replenishment Planning	<b>Track:</b> SCM, 8	<b>Chair:</b> Yen-Ting Lin
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### 015-0913: A Formal Stochastic Analysis Approach for Order Splitting Policy

**Li Tan**, *Washington State University, United States*

**Shenghan Xu**, *University of Idaho, United States*

The policy of pooling lead-time risk by simultaneously splitting replenishment orders among several suppliers has continued to attract the attention of researchers and industrial practitioners in the past two decades. Nevertheless, traditional risk analysis approaches used in studying order splitting policy have their limitations on scalability (e.g. stochastic modeling and proving) and/or accuracy (e.g. statistic experiments). To address these shortcomings, in this paper we propose a probabilistic-model-checking-based approach to study the impact of different factors of order splitting policy on risk reduction. We model stochastic behaviors of supply chains using an extension of Markov Decision Processes and translate the goal of risk analysis into a temporal logic. We then use probabilistic model checking to analyze different risk factors in a stochastic supply chain model with order splitting policy, and to identify some key factors that can help reduce lead-time risk.

### 015-0645: Upper and Lower Bounds on Inventory Control Model with a Fluctuating Currency

**Tekle Wanorie**, *Northwest Missouri State University, United States*

Currency exchange rate fluctuation does have a significant impact on inventory decisions. In situations where hedging cannot be implemented as a

## Friday, 1:30- 3:00 Sessions

an inventory ordering model developed by utilizing a currency exchange model. The inventory model was developed and used to make inventory decisions in such situations, including importation duties levied. A simpler closed form, which can be utilized each time a new order is placed to determine how many periods of demand to include in the order, is needed. The upper bound and the lower bounds will be established and how to utilize each will be presented. It will be shown that there will be significant savings using this model.

### 015-0840: An Online Multiplayer Supply Chain Management Game for Services

*Brad Meyer, Drake University, United States*

This paper describes an online supply chain management game for services. The software is a multiplayer adaptation of the Mortgage Service Game developed by Anderson and Morrice (POM Journal, Vol. 9, No. 1), and runs in Flash. The game uses a graphical interface which borrows concepts from virtual world software. The gameplay is simple, with each stage of a four-member mortgage supply chain making daily capacity decisions in an effort to minimize the total of salary, hiring, firing, and backlog costs in processing mortgages. Capacity changes are delayed from the decision point, yielding a bullwhip effect that is similar to, but not as extreme as, the traditional beer game.

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Friday, 1:30- 3:00, Grand Ballroom A

Track: SCM, 9

Chair: Suresh Tadisina

Session: Supply Chain Integration 2

### 015-0374: Using Cloud Computing to Integrate Processes in the Supply Chain

*Silvio Pires, Methodist University of Piracicaba, Brazil*

*João Camargo Junior, Methodist University of Piracicaba, Brazil*

Usually, to obtain the most benefits provided by Supply Chain Management, an appropriate integration of processes between companies along the supply chain is required. For such, the contemporary development in Information and Communication Technologies (ICT) can provide some alternatives to deal with most of the issue. But a series of relevant hurdles still remain, such as a better and effective managerial systems integration (and exchange of information) between the tiers in the supply chain. Thus, the adoption of a new technological paradigm called as Cloud Computing has recently emerged as a potential solution to the exposed challenge. In this sense, this article discuss the main pros and cons in using Clouding Computing as a way of integrating processes in the supply chain, and proposes a manner in which to conduct it. The research was conducted through a bibliographical review and a study of a large ICT company.

### 015-0831: Achieving Supply Chain Performance Through Business Process Orientation

*Kayvan Lavassani, Carleton University, Canada*

*Bahar Movahedi, Carleton University, Canada*

*Vinod Kumar, Carleton University, Canada*

The attention to the process view of organizational operation has attracted the attention of many scholars and practitioners in the past few years. Few studies have previously explored the role of process orientation in various aspects of organizational outputs; however, less attention has been paid to the role of process orientation in supply chain management. This study begins with describing the shift of attention in supply chain management studies from one which emphasizes the network view, to one which is focused on the process view of operations. After that, the process view of operations in the context of supply chain management studies is described. Finally, a research model is proposed to illustrate the role of process orientation on various aspects of organizational supply chain performance.

### 015-0322: A Multi-dimensional Framework for Vertical Integration Decisions

*SAMIR SRIVASTAVA, Indian Institute of Management Lucknow, India*

Vertical integration decisions answer the question about how much of the value chain a firm should hold. Given the rapidly growing business in most sectors, firms now have an option of vertical integration, horizontal diversification, global diversification or even hiving off certain parts of their value chains. We pick up a few firms operating in different sectors in India and try to assess vertical integration options for them using technology capability, transaction frequency, asset specificity and product/ service architecture as the prime discriminators. The sample consisted of firms in paints industry, retailing, textiles, PVC pipes, FMCG, telecom and energy sectors. The data for our analysis were primarily drawn from secondary sources. The findings indicate that the decision is very much context-specific. Based on our findings, we develop a multi-dimensional framework for taking vertical integration decision. The same is yet to be empirically validated.

### 015-0278: Organizational Culture Context, Supply Chain Integration and Performance

*Erlinda Yunus, Southern Illinois University Carbondale, United States*

*Suresh Tadisina, Southern Illinois University Carbondale, United States*

The increasing emphasis on integration among members of a supply chain has led to new mechanisms to help firms coordinate the flow of products, services, and information through the supply chain. Many studies support the importance and influence of supply chain integration on firm performance, but only a few focus on the organizational contextual factors influencing the integration. This research proposes organizational culture as a potential determinant of supply chain integration effectiveness. Specifically, this study would investigate the impact of different types of organizational culture (i.e.: Group, Developmental, Hierarchical, and Rational culture; Quinn and Rohrbaugh, 1981) on supply chain integration. Based on two dimensions of organizational culture (flexibility-control orientation and internal-external focus) and four dimensions of supply chain integration (logistics synchronization, information sharing, incentive alignment and collective learning), it is hypothesized that a Developmental culture will be the most effective in implementing supply chain integration.

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Friday, 1:30- 3:00, Grand Ballroom D

Track: HOM, 5

Chair: Vikram Tiwari

Session: Capacity Management & Productivity in Operating Rooms

## Friday, 1:30- 3:00 Sessions

### 015-0987: Patient-Centric Station Planning for EMS

*Dan Haight, University of Alberta, Canada*

The most capital-intensive consideration in emergency service planning is station location. EMS stations are difficult to site, expensive to build, and costly to maintain. To make matters worse, improperly located stations can have a significant impact on overall system performance. There are some software tools that can aid in this process. The best of them allow planners to evaluate different station scenarios by simulating or modeling performance under various conditions. These tools (and the resulting plans), however, are only as good as the assumptions and data that are fed into them. We will look closely at three of the most important assumptions: Expected call demand, candidate locations, and response goals. Our aim is to show that by carefully choosing input parameters, planners can create a system that better meets the needs of their patients.

### 015-0986: Habitual Citizenship Behavior

*Kenneth Schultz, University of Alberta, Canada*

*Reidar Hagtvedt, University of Alberta, Canada*

Nosocomial infections in hospitals are a serious problem. The best way to reduce nosocomial infections is proper hand hygiene. Although survey results routinely report near 100% compliance, actual compliance is quite low. Hand hygiene falls into a category we call Habitual Citizenship Behavior which involves behaviors that are low cost, where failure is of low or no risk to the user but risk to a third party is very high but with a very low probability. We explore the motivations and procedures that will increase hand hygiene compliance.

### 015-0988: A Markov Chain Model for the Performance of an EMS System with Re-positioning

*Ramon Alanis, University of Alberta, Canada*

*Armann Ingolfsson, University of Alberta, Canada*

*Bora Kolfal, University of Alberta, Canada*

Abstract: We propose and analyze a two-dimensional Markov chain model to analyze an Emergency Medical System (EMS) that repositions ambulances using a compliance table policy, which is commonly used in practice. The model is solved via a fixed-point iteration. We validate the model against operational data and against a detailed simulation model. We demonstrate that the model provides accurate approximations to the response time distribution and the distribution of the number of busy ambulances and that it can be used to identify near-optimal compliance tables.

### 015-0989: Empirical Analysis of Ambulance Travel Times: The Case of Calgary Emergency Medical Services

*Susan Budge, University of Alberta, Canada*

*Armann Ingolfsson, University of Alberta, Canada*

*Dawit Zerom, California State University at Fullerton, United States*

Using administrative data for high-priority calls in Calgary, Alberta, we estimate how ambulance travel times depend on distance. We find that a logarithmic transformation produces symmetric travel-time distributions with heavier tails than those of a normal distribution. Guided by non-parametric estimates of the median and coefficient of variation, we demonstrate that a previously proposed model for mean fire engine travel times is a valid and useful description of median ambulances travel times. We propose a new specification for the coefficient of variation, which decreases with distance. We illustrate how the resulting travel-time distribution model can be used to create probability-of-coverage maps for diagnosis and improvement of system performance.

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Friday, 1:30- 3:00, Granville

Track: HOM, 6

Chair: Armann Ingolfsson

Session: Emergency Medical Services

### 015-0026: Evaluating Lean Healthcare Programs: A Panel Discussion

*Martin Puterman, Sauder School of Business, University of British Columbia, Canada*

*Jennifer MacKenzie, PHSA, Canada*

Development of a rigorous approach to measuring the impact and cost of lean health care initiatives is challenging but necessary. Little has been published on this topic so we believe what we have developed is original and timely. In this session, panelists will provide an overview of the lean program at a British Columbia health authority and describe how we went about developing and executing an evaluation framework. There will be ample opportunity for audience impact and feedback.

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Friday, 1:30- 3:00, Junior Ballroom A

Track: PITM, 3

Chair: Tracey Stock

Session: Technology Services and Systems

### 015-0028: Shaping Business Value of Information Technology through Innovation-Supportive Culture

*Jose Benitez-Amado, University of Granada, Spain*

*Maria Nieves Perez-Arostegui, University of Granada, Spain*

*Virginia Fernandez-Perez, University of Granada, Spain*

This paper analyzes the relationships between two types of information technology (IT) resources (technological IT and managerial IT resources), the organizational capability of innovation-supportive culture and firm market performance. A proposed research model and hypotheses are tested using cross-sectional survey data from a sample of 203 leading Spanish firms. Data analysis using the partial least squares technique shows that: (1) innovation-supportive culture is a valuable capability that predicts firm market performance, (2) both technological and managerial IT resources have a positive effect on the development of a culture that supports innovation in the firm, and (3) investment in both technological IT and managerial IT resources influences firm market performance positively by means of the capability of innovation-supportive culture. This study provides a better understanding of how technological IT and managerial IT resources influence innovation-supportive culture positively to affect market performance.

## Friday, 1:30- 3:00 Sessions

### 015-0625: The Paradox of Hyper-bureaucracy and Lean in High-tech Manufacturing

*Gaute Knutstad, SINTEF Technology & Society, Norway*

*Torbjoern Netland, SINTEF Technology & Society, Norway*

Lean is supposed to be waste-less, simple and non-bureaucratic. Practice shows that it is not. This paper draws on insight from two manufacturing companies in the aerospace industry, to argue that the pursuit to be lean in modern high-tech industry conflicts with core lean design principles. The attempt to simultaneously be high-tech and try to become lean results in an unintended hyper-bureaucracy, hindering both effective use of technology in place and efficient implementation of lean.

### 015-0875: Information System Design in Transaction Processes

*Tracey Stock, University of Calgary, Canada*

*Victoria Mitchell, University of Calgary, Canada*

*Barrie Nault, University of Calgary, Canada*

This is an empirical study of an industry-level information system (IS) technology in the oil and gas sector. It applies the tri-core model for IS in organizational design and measures alignment of the operationalization of IS transaction inputs with the strategic orientation of the organization. The degree of alignment between an organization's centralized and decentralized design and its administration, IS, and technical operations is found to be a mechanism for IS moderation of performance. Organizational performance is partially explained by organizational size and the alignment between design and the stability of the business environment, or the amount of uncertainty that must be managed by the organizational design. Our analysis indicates that performance improves when there is alignment between a centralized design in the administrative and technical cores with a stable business environment.

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Friday, 1:30- 3:00, Junior Ballroom B

Track: OMM, 5

Chair: Sreekumar Bhaskaran

Session: OMM5

### 015-0067: Design and Introduction of Conspicuous Durable Products

*Vishal Agrawal, Georgia Institute of Technology, United States*

*Stylianos Kavadias, Georgia Institute of Technology, United States*

*Beril Toktay, Georgia Institute of Technology, United States*

It has long been recognized that the purchasing behavior of consumers depends not only on the product characteristics but also on other considerations such as their intrinsic desire for exclusivity. We study the implications of such consumer behavior on the design and introduction decisions for a durable product, namely the durability and pricing choices of the firm. An extensive body of literature argues for the benefits of planned obsolescence. We draw upon these traditional market models of vertically differentiated durable products to incorporate exclusivity-seeking behavior, and show that firms should instead consider designing products that undergo slow value erosion in conjunction with a high-price, low-volume product introduction strategy. The rationale is to use the high price to jointly exploit the value inherent in a more durable product and to sell a low volume to achieve the product exclusivity valued by exclusivity-seeking consumers.

### 015-0123: Creating Sales with Stock-outs

*Laurens Debo, University of Chicago, United States*

*Garrett Van Ryzin, Columbia University, United States*

Stock-outs convey information about the propensity of other consumers to purchase a product, and this can increase the willingness of marginally interested consumers to buy. But in order to leverage stock-outs, firms must be able to capture the extra demand. We show how asymmetric inventory allocations to ex ante identical retailers may increase the expected satisfied demand compared to symmetric inventory allocations; when one retailer stocks out, the other retailer faces increased demand, not only due to overflow demand, but also due to an increase in the residual demand triggered by the stock-out information.

### 015-0224: Don't Ask, Don't Tell: Revenue Sharing with Dishonest Retailers

*Hans Sebastian Heese, Indiana University, United States*

*Eda Kemahlioglu-Ziya, University of North Carolina, United States*

Revenue sharing contracts are widely used to align the incentives of different channel members. Under a typical revenue sharing contract, if it is impossible or prohibitively expensive for the manufacturer to verify the retailer's sales reports, the retailer has incentive to underreport sales and cheat the manufacturer out of part of its profit. We develop a simple analytical model to investigate the impact of cheating on the different supply chain constituents.

### 015-0247: Sales Force Incentives and Supplier Capacity Investment

*Stephen Gilbert, McCombs School of Business at UT Austin, United States*

*Liwen Chen, McCombs School of Business at UT Austin, United States*

*Xiaohui Xu, California State Polytechnic University, United States*

Based on our observations of the performance measures that are applied to sales managers by a large manufacturer of semi-conductor equipment, we have developed a game theoretic model to capture the way in which these performance measures serve as a mechanism for committing to higher output quantities and increase suppliers' willingness to provide capacity. We show that an appropriately designed managerial performance measure can provide an important strategic lever in mitigating supplier hold-up, particularly in settings where non-verifiable contingencies can interfere with the efficiency of long-term supply contracts. In addition, we analyze how an appropriately designed managerial performance measure can serve as a complement to a relational contract.

## Friday, 1:30- 3:00 Sessions

44	Friday, 1:30- 3:00, Junior Ballroom C <b>Session:</b> OMM6	<b>Track:</b> OMM, 6	<b>Chair:</b> Ming Chen
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### 015-0449: Maximizing Revenue in the DVD Rental Industry Through Two-Dimensional Shelf Space Allocation

*Neil Geismar, Texas A&M University, United States*  
*Milind Dawande, University of Texas at Dallas, United States*  
*Chelliah Sriskandarajah, University of Texas at Dallas, United States*  
*B.P.S. Murthy, University of Texas at Dallas, United States*

We consider a two-dimensional shelf space allocation problem. The domain is the DVD rental industry, in which each newly-released title has its own revenue potential based on its box-office sales. Each display location within a store has its own effectiveness, based on visibility, so placing a DVD in a particular location generates an expected revenue. Maximizing the total expected revenue is especially important because each title's potential decays rapidly, so the display changes weekly. Constraints on the display configuration and the variety of titles further complicate this problem. We consider two subproblems, each of which is NP-hard: assigning titles to cabinets and arranging the disks of each cabinet. Solution approaches include efficient mixed integer programs, genetic algorithms, first-fit bin-packing algorithms, and Layout Optimization with Guillotine Induced Cuts (LOGIC).

### 015-0883: Integrated Inventory Allocation and Markdown Pricing at Multiple Stores

*Ming Chen, University of Maryland at College Park, United States*  
*Zhi-long Chen, University of Maryland at College Park, United States*

We study a real-world problem faced by a large retailer that owns multiple (e.g., 50) stores within the context of clearance sales. These stores are served by a central warehouse. The retailer needs to determine jointly how much inventory to allocate to each store and what markdown prices to implement over time at each store, subject to a number of business rules. The complex business rules involved make most existing insights in the pricing literature inapplicable. Due to the intractability of this problem, we propose a Lagrangian relaxation-based approach to solve the problem and implement this approach on a rolling horizon basis. We conduct extensive numerical experiments and show that the proposed approach can generate close-to-optimal solution within a reasonable amount of computational time for large problems. A number of managerial insights are also obtained. These insights can help store managers make better decisions and achieve higher revenue.

### 015-0534: Can E-textbooks Lower Education Cost?

*QIANNONG GU, Sam Houston State University, United States*

The emergence of the E-textbook is expected to lower students' education expenses and benefit publishers by lowering production and inventory costs. In order to meet this target, the publisher needs to design a price scheme for new textbooks and E-textbooks under the consideration of the competition with used textbooks in the market. In this research, we develop a two-stage pricing model for the publisher to determine the prices for new textbooks and E-textbooks by maximizing the total expected profit. With a well-defined price scheme, the publisher can influence the availability of used textbooks in market and takes advantage of the lower production, inventory, and handling costs for E-textbooks to compete with used textbooks sellers on price as well. In turn, the students can save on their education costs by using E-textbooks.

### 015-0692: Blurring the Boundry: The Convergence of Factory and Service Operations in the Modern Economy

*Joel Goldhar, Illinois Institute of Technology/Stuart School of Business Admin, United States*

Most current OM scholarship/teaching makes a simplistic distinction between 'service' and 'factory' operations and fails to properly relate process design to 'goods' vs. 'services' outputs. These concepts should be the 'end-points' of a single integrative operations and marketing decision model for the design of effective production processes that create sustainable competitive advantage. Based upon a historical analysis of the trends in both OM and marketing; we can illustrate the convergence of both factory and service operations and goods and services products: and suggest a better model for the design of processes to better 'fit' with the firm's marketing and business strategy. We also can see the critical, but different, roles of Information Technology along the spectrum of service to factory operating systems.

45	Friday, 1:30- 3:00, Junior Ballroom D <b>Session:</b> Design Issues in Product Re-X	<b>Track:</b> SOHL, 3	<b>Chair:</b> Beril Toktay
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### 015-0038: Quality Choice and Product Recovery

*Atalay Atasu, Georgia Institute of Technology, United States*  
*Gilvan Souza, Indiana University, United States*

We study the impact of product recovery (remanufacturing or recycling) on design quality. Remanufacturing can be differentiated (where remanufactured and new products are identical), or differentiated (when remanufacturing and new products are sold at different prices). Recycling can be profitable or non-profitable. Further, we study this problem under two legislative scenarios: with a take-back legislation that mandates fixed collection and recovery levels for used products and without legislation, where the firm decides upon the collection and recovery level so as to maximize its profitability. We find that, in general, the availability of recovery increases the product's design quality. We also find that consumer surplus increases when there is a recovery option; this suggests that there are societal benefits of take-back legislation when there are no economic incentives for firms to engage in product recovery.

### 015-0188: The Impact of Legislation on Product Recovery: Reuse or Recycle?

*Tamer Boyaci, McGill University, Canada*  
*Ibrahim Karakayali, McGill University, Canada*  
*Vedat Verter, McGill University, Canada*

## Friday, 1:30- 3:00 Sessions

*Luk Van Wassenhove, INSEAD, France*

In this study, we develop stylized models to assess the effects of material recovery targets (induced by legislation such as WEEE) on industry decisions pertaining to product reusability and recycling. We study the conditions under which an OEM will integrate or outsource recovery operations. We conduct a comparative analysis of centralized and decentralized settings where there is cannibalization among the new and the remanufactured products. Our analytical framework also incorporates multiple stakeholders including the OEM, remanufacturer, consumers, regulator, and environmentally conscious groups.

### 015-0396: Environmental Implications for Online Retailing

*Janice Carrillo, University of Florida, United States*

*Asoo Vakharia, University of Florida, United States*

*Ruoxuan Wang, University of Florida, United States*

Recent press has highlighted the environmental benefits associated with online shopping, such as emissions savings from individual drivers, economies of scale in package delivery, and decreased inventories. We formulate a dual channel model of a retailer which has access to both online and traditional market outlets to analyze the impact of customer environmental sensitivity on its supply. In particular, we analyze stocking decisions for each channel, incorporating price linear demand, customer preference/utility for environmental goods, and channel related costs. We compare and contrast results from both deterministic and stochastic models, and utilize numerical examples to illustrate the implications of industry specific factors on these decisions.

### 015-0468: Industry-Relative Environmental Risk and Firm Performance

*Ashley Metcalf, University of South Carolina, United States*

*Alan Mackelprang, University of South Carolina, United States*

*Michael Galbreth, University of South Carolina, United States*

Using EPA data, we classify the environmental risk of firms relative to their industry. Our environmental risk measure is based on pollution volume, adjusted for level of toxicity and population density of the affected area. By linking this EPA data to performance measures obtained from COMPUSTAT, we are able to examine whether a deviation of environmental risk from industry norms (either higher or lower) is linked to firm performance.

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Friday, 1:30- 3:00, Orca

Track: CIM, 3

Chair: Hossein

Session: Service Capacity Management

Abouee-Mehrizi

### 015-0058: Classifying Service Processes for the 21st Century

*Joy Field, Boston College, United States*

*Mark Davis, Bentley University, United States*

A number of service classification schemes have been previously developed to provide service managers a broader understanding of service processes and their associated challenges (e.g., Schmenner's 1986 Service Process Matrix). However, advances in technology, particularly information technology, have significantly impacted the way many services are delivered and the role of the customer, suggesting the need for a new classification of services that reflects these changes.

### 015-0541: Pricing and Guaranteed Delivery Time to Maximize the Total Profit with Consideration of Lateness Penalties

*Chulung Lee, Korea University, Korea, Republic of (South Korea)*

*Joong Hyun Hahm, Korea University, Korea, Republic of (South Korea)*

*Ki-Sung Hong, Korea University, Korea, Republic of (South Korea)*

In this paper, we study guaranteed delivery time and dynamic pricing as a competitive strategy for service industries where demands are sensitive to both the price and the delivery time. We assume that a firm provides two substitutable products in a price and time sensitive market. The products differ only in their prices and delivery times. We develop an analytical model to determine the optimal price and guaranteed delivery time to maximize the total profit. We also consider the lateness penalty.

### 015-0291: Joint Queueing-Inventory Problem in a Three Echelon Supply Chain

*Hossein Abouee-Mehrizi, University of Toronto/Rotman School of Management, Canada*

*Oded Berman, University of Toronto/ Rotman School of Management, Canada*

We consider a three echelon supply chain with a firm which has a central warehouse close to the manufacturer and multiple distribution centers close to the markets. The manufacturer has a finite production rate and stochastic production time. DCs are supplied by the central warehouse. Every order at facility is affected by the congestion. DCs also keep inventory to fulfill the customers from different markets. Customers from different market can get the product from different DCs. Holding and backordering costs are incurred at the central warehouse and DCs. We obtain a simple closed form for the optimal objective function. We also demonstrate a simple equation for the optimal base stock level at each DC. We then find a very simple lower bound and upper bound for the manufacturer's base stock level. We prove that the optimal demand allocation is always discrete. We also demonstrate several interesting managerial insights.

### 015-0007: A Model for Optimizing Repairshop Capacity and Spare Parts Inventory

*Pedram Sahba, University of Toronto, Canada*

*Baris Balcioglu, University of Toronto, Canada*

We develop a new spare parts inventory model where significant transportation time and cost exist. We consider a system consisting of  $m$  manufacturing plants with identical machines at different locations. When a machine fails, the defective component should be repaired in a designated repair shop. This unit can be replaced immediately if a spare part is available. Otherwise, the machine is down until a component is

## Friday, 1:30- 3:00 Sessions

should be placed to minimize overall system costs.

### 015-0218: Periodic Review Inventory Policy for Perishable Items with Random Lifetime

*Chaaben Kouki, Ecole Centrale Paris, France*

*Zied Jemai, Ecole Centrale Paris, France*

*Evren Sahin, Ecole Centrale Paris, France*

*Yves Dallery, Ecole Centrale Paris, France*

We consider a periodic review inventory system for perishable items with lost sales. Demands arrive according to a Poisson process. The lifetime of each item is exponentially distributed and the procurement lead time is constant. This type of modeling is motivated by the recent application of the so called Time Temperature Technologies. With this technology, it is possible to detect any perished item. The lifetime is therefore represented by a stochastic duration. We deal with the discrete time monitoring instead of the continuous one since it is often used in practice. We model the behavior of this inventory system as a Markov process which we can characterize the stationary regime. This model allows us to get some insights on the impact of the parameters on the overall performance in terms of costs or profit.

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Friday, 1:30- 3:00, Parksville

Track: EROM, 3

Chair: Drake David

Session: Operations and the Environment

### 015-0447: Consumer Perceptions of Remanufactured Products in Consumer Markets

*James Abbey, Penn State, United States*

*Selin Atalay, HEC, France*

*V. Daniel Guide, Jr., Penn State, United States*

*Margaret (Meg) Meloy, Penn State, United States*

We explore consumer attitudes toward remanufactured goods produced at different levels of brand equity and discounting. The study is theoretically grounded in previous marketing research on consumer contamination and possessions and the extended self. We evaluate the following propositions: How do customers view (value, perceive) remanufactured products? Does this vary based on product category and degree of intimacy between the consumer and the product? How can existing theories of consumer behavior help explain and understand consumer attitudes and how they are formed? What are the implications of these findings for marketing/sales channel choices? Our results are based on a survey response rate of approximately 20% of a sampling frame of 8000 consumers.

### 015-0829: European Cement Under Carbon Regulation: Old Industry, New Challenges

*David Drake, INSEAD, France*

*Paul Kleindorfer, INSEAD, France*

*Luk Van Wassenhove, INSEAD, France*

In 2005, the European Commission implemented the European Union Emission Trading Scheme (EU-ETS), regulating carbon emissions within nine industrial sectors. With that legislation, some of the most mature industries within the economy now face a combination of competitive and economic forces that portend significant transformation. Their situation is complicated by uncertainties regarding the potential inclusion of border adjustment mechanisms, possible changes in the carbon accounting of alternative fuels, and the allocation of carbon allowances under Phase III of the regulation (beginning January 2013). Through a case study, we explore how the EU-ETS in its current form, and the uncertainties regarding its future form, have impacted the cement industry. We identify the emissions drivers within the sector and the options firms have to mitigate those emissions, including strategic issues such as firms' technology choice and off-shoring decisions. Finally, we assess the impact and importance of the various regulatory uncertainties being considered.

### 015-0837: Marketing and Contracting of ESCO Projects

*Sam Aflaki, INSEAD, France*

*Paul Kleindorfer, INSEAD, France*

An Energy Service Company (ESCO) implements energy efficiency projects for customers, which generate positive net cash flows from the energy and carbon savings. While ESCOs are widely recognized as important vehicles toward achieving energy efficiency, the marketing and contracting issues associated with the ESCO projects have received little attention in the literature. Considerable heterogeneity in the customer pool as well as the existence of widely different contracting mechanisms in practice pose an interesting research challenge of identifying optimal contracts for each customer group. We address this question by developing the theoretical basis for identifying optimal ESCO contract types to meet the needs of different customer segments and contexts. We further discuss a variety of practical and empirical criteria to be considered for identifying such optimal contracts.

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Friday, 1:30- 3:00, Pavilion Ballroom B

Track: GENL, 3

Chair: Kaushik Sengupta

Session: Teaching POM: Online and Distance Learning

### 015-0506: A Framework to Assess Effectiveness of Online Model for Operations Management Courses

*Vishwanath Hegde, California State University, East Bay, United States*

*Zinoviy Radovitsky, California State University, East Bay, United States*

As business schools extend their online offerings, concerns are being expressed about the effectiveness of online courses compared to traditional

## Friday, 1:30- 3:00 Sessions

management (OSCM) courses. Further, we evaluate the effectiveness of an OSCM course using this new framework. The results of this study show that the online teaching model is as effective as the traditional in-class model for the evaluated course.

### 015-0657: Favorable Personality Traits of Students for Operations and Supply Chain Management Distance-Learning Courses

*Kaushik Sengupta, Hofstra University, United States*

Business schools are increasingly offering distance-learning courses. There are clear signs that this trend will continue, as universities seek to generate additional revenue by attracting a broader pool of students and reducing overhead costs. Online learning is different, and one of the key issues relate to the types of students that are suitable for such courses. This research focuses on the personality traits of students with respect to online learning and how it relates to their performance. A second objective of this research is to understand which traits fit in more to quantitative courses and which fit in more to qualitative courses in the areas of Operations and Supply Chain Management. Using data from online classes at an AACSB accredited school, we examine the relevant personality traits and track these with course performance to develop a normative scale regarding capabilities and traits of a "good online course student."

### 015-0874: The Use of Distance Education Tools in Teaching Statistics

*Daielly Nassif Mantovani, University of São Paulo, Brazil*

*Maria Gouvêa, University of São Paulo, Brazil*

*Adriana Noronha, University of São Paulo, Brazil*

This article aims to assess the use of distance education tools in teaching statistics applied to administration. In order to reach this objective, a partially offline discipline was focused on. Digital instructional materials and some interactions via a forum, chat, e-mail and polls were provided in this study. Most students accessed texts and tutorials available; however, the glossary was little used. Among the tools of communication, there was intense participation in forums and e-mail and low participation in chat. There was participation of the majority of students in the polls proposals. Generally, the use of distance education was successful in the discipline addressed, which shows that the use of technology in teaching statistics is viable and can turn more flexible the educational process.

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Friday, 1:30- 3:00, Pavilion Ballroom C

Track: LM, 3

Chair: Maciek Nowak

Session: Logistics Modeling

### 015-0271: Variance of the Forecasting Error: Revisiting Top-down and Bottom-up Approaches under Different Updating Conditions

*Peter Wanke, The COPPEAD Graduate Business School / Federal University of Rio de Janeiro, Brazil*

*Beatriz Mendes, COPPEAD/IM, Brazil*

*Rebecca Arkader, The COPPEAD Graduate Business School / Federal University of Rio de Janeiro, Brazil*

The literature is still inconclusive as to the most appropriate sales forecasting approach. This paper aims at analyzing the behavior of the variance of the sales forecasting error during the lead-time under Top-Down or Bottom-Up approaches and under different conditions of forecast updating, in order to identify the best alternative for achieving lower safety inventory levels. The paper revisits the Top-Down vs. Bottom-Up discussion in light of today's collaborative planning initiatives; corroborates empirical evidences on the choice of the forecasting approach by means of the analytical demonstration of the formulae relating intervening variables; and contributes to practice by providing straightforward equations to accurately determine safety inventory levels.

### 015-0284: Translog Cost Function for Pharmaceutical Distribution

*Christian Rossetti, North Carolina State University, United States*

*Gaurav Jetly, North Carolina State University, United States*

*Robert Handfield, North Carolina State University, United States*

*Michael Kay, NCSU, United States*

*Donald Warsing, North Carolina State University, United States*

Average wholesale drug prices (AWP) continue to rise at twice the rate of general inflation. Consolidation among distributors, which should increase efficiency, has done little to decrease the upward trend in prices. To better understand the cost structure of pharmaceutical distribution, we derive a transcendental logarithmic (translog) cost function using publicly available data. To our knowledge, this is the first application of production cost economic analysis performed on distribution centers using public data. We collected data for 92 pharmaceutical distribution centers (DC), representing ninety-five percent of industry sales, from four databases. We calculated five cost related variables for each DC based on US Census data, corporate financials, and site specific data. We specified Cobb-Douglas and complete translog models. Both models converged using various non-linear techniques to minimize residual errors. We discuss implications for logistics researchers, policy makers, and managers.

### 015-0358: A Field-Based Investigation of Service Part Inventory Management: Implications for Supply Disruption Mitigation

*Christopher Boone, Air University, United States Air Force, United States*

*Christopher Craighead, The Pennsylvania State University, United States*

*Joe Hanna, Auburn University, United States*

*Anand Nair, University of South Carolina, United States*

Researchers frequently point to inventory as a time-proven strategy for reducing supply chain risk and as a necessary component of an effective disruption strategy. However, this strategy has not been sufficiently tested empirically. This study uses longitudinal field data to assess the performance of a strategically aligned inventory strategy as a means of disruption mitigation. Results from the nine test locations and one control location suggest that the strategic alignment of inventory is effective in mitigating both the occurrence and duration of supply chain disruptions.

### 015-0270: Empirically Analyzing Cost Tradeoffs in Distribution Networks with Correlated Demands

## Friday, 1:30- 3:00 Sessions

**Donald Warsing**, North Carolina State University, United States

**Michael Kay**, North Carolina State University, United States

**Michael Bucci**, North Carolina State University, United States

We investigate large-scale facility location models that consider the risk pooling effects of centralizing safety stocks when demands are correlated across customer locations, and we study how these effects are influenced by the relative levels of inventory holding and transportation costs. Our analysis relies on related research that experimentally generates statistically valid matrices of correlations between customer demands when these correlations are assumed to be inversely proportional to the distance between customer locations. Using this matrix generation technique and a metaheuristic solution procedure, we study a set of test instances that incorporate both safety stock holding costs and outbound transportation costs. In our computational experiments, transportation costs are modeled using empirical data gathered from various industry-wide statistics on truckload and less-than-truckload freight transportation, and customer locations and demand levels are determined through parameters and values derived or extracted from various U.S. Census Bureau databases.

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Friday, 1:30- 3:00, Pavilion Ballroom D

Track: HBOM, 3

Chair: Yaozhong Wu

Session: Behavioral Ops 1

### 015-0102: Coordination in Supply Chains When Demand Forecasts Are Not Common Knowledge: Theory and Experiment

**Kyle Hyndman**, SMU, United States

**Santiago Kraiselburd**, Zaragoza Logistics Center, Spain

**Noel Watson**, Zaragoza Logistics Center, Spain

We study the coordination problem of a two-firm supply chain in which firms simultaneously choose a capacity before demand is realized. We examine the role of common knowledge of demand forecasts on firms' ability to align their decisions. When forecasts are not common knowledge, there are at most two equilibria: a complete coordination failure or a monotone equilibrium. The former always exists, while the latter exists only when the marginal cost of capacity is low. In the monotone equilibrium, capacities are always misaligned and profits are lower than in the efficient equilibrium of the common knowledge game. We conduct an experiment to test the model's predictions. We find: Most subjects use monotone strategies and those that do not earn significantly less. When forecasts are not common knowledge, alignment suffers, though profits do not. Information sharing improves earnings through greater accuracy and alignment. Subjects' earnings and alignment improves over time.

### 015-0154: The Core Functions of Leadership

**Christoph Loch**, INSEAD, France

**Ghufran Ahmad**, INSEAD, France

We hypothesize, based on evidence from anthropology and biology, that a core function of leadership is to help the group of followers to coordinate actions and resolve interest conflicts. We conduct an experiment in which subject pairs each play one of six strategic games over ten consecutive rounds. Subjects can at the beginning of each round choose whether they make individual decisions, have the right to punish the other side, or whether the group is assigned a leader. We find that subjects demand more leadership the more difficult the coordination and conflict resolution problem present, and we show that leadership enables the group to achieve higher value outcomes as compared to individual actions and mutual punishment the harder the coordination and interest conflict problems present.

### 015-0525: Simple Reactive Strategies in Repeated Supplier-Retailer Interactions

**Yaozhong WU**, National University of Singapore, Singapore

Supply chain coordination theory usually assumes that supplier and retailer are forward-looking rational decision makers that maximize discounted future profit. However, recent experimental studies show that individuals behave systematically different from the theoretical predictions in supply chain coordination games. In a simple supplier-retailer dyad with wholesale price contracting, we relax the rationality assumption and study how simple reactive strategies evolve and affect supply chain performances in repeated interactions. We find that in equilibrium, simple reactive strategies together with competitive selection are sufficient to improve the supply chain performance significantly.

### 015-0846: Supplier Capacity Investment Under Retailer Competition

**Paulo Goncalves**, University of Lugano, Switzerland

In a single-supplier multi-retailer supply chain, we study the supplier's capacity investment decision when supply shortages leads to retailer order inflation. Using optimal control, we characterize the optimal supplier capacity investment trajectory. We consider the actual capacity investment trajectory of subjects taking the supplier role in an experiment with different delays between investment and capacity acquisition and different magnitude of retailer order inflation.

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Friday, 1:30- 3:00, Port Alberni

Track: SOM, 3

Chair: Pedro Oliveira

Session: New Service Development and the Customization of Services

### 015-0173: Designing and Executing an Effective Services Operations Management Course

**Randall Chapman**, LINKS-simulations.com, United States

**Terry Harrison**, Pennsylvania State University, United States

**John Dischinger**, IBM Global Integrated Supply Chain, United States

IBM has been a thought and action leader in championing services sciences. This special session explores IBM's initiatives in services sciences education, with particular attention to its recent launch of a distance-learning mode services supply chain course. Program and teaching strategies and tactics are discussed, as well as progress to date, initial participant feedback, and likely future initiatives in services operations management education.

## Friday, 1:30- 3:00 Sessions

53	Friday, 1:30- 3:00, Port Hardy <b>Session:</b> GOSSM 3	<b>Track:</b> GOSSM, 3	<b>Chair:</b> Stevenson Mark
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### 015-0404: Internationalizing Operations into Emerging Economies: A Cross-Case Analysis

*Marta Zorzini, Lancaster University, United Kingdom*

*Mark Stevenson, Lancaster University, United Kingdom*

*Linda Hendry, Lancaster University, United Kingdom*

Araujo & Rezende (2003) contested the assumption that firms internationalize operations in a path-dependent manner, suggesting it can be a discontinuous process, but without presenting any empirical evidence. By studying 27 subsidiaries of Italian companies located in the emerging economy of Argentina, we investigate the evolutionary dynamics of internationalization. Evidence suggests internationalization is sometimes path-dependent but in other cases discontinuous, thereby supporting the argument of Araujo & Rezende (2003). For example, in some cases the emerging influence of the foreign subsidiary changes the internationalization strategy of the organization. Furthermore, most existing models neglect tactical internationalization issues, e.g., how to coordinate operations that are globally dispersed. Evidence suggests coordination partly depends on the foreign subsidiary's role. Coordinating modes include people-, information- and formalization-based techniques. Some major successful and unsuccessful internationalization cases were observed; the most appropriate practices depend on factors such as product features, production cost structure and local network relationships.

### 015-0422: Integrated Global Supply Chain Design

*Ronald Bogaschewsky, University of Wuerzburg, Germany*

*Klaus Kohler, University of Wuerzburg, Germany*

We developed a mathematical model for optimizing the structure of the global supply chain, thus supporting decisions regarding the opening/closing of facilities around the world, the (technical) capacities to be de-/installed, the products to be manufactured, which supply markets/suppliers should deliver to which facilities, and from where the products should be shipped to which markets/customers using alternative transport modes. In addition to existing models, we take into account financial goals (free cash flow to the firm) as well as total cycle times (from the supplier via the internal supply chain to the final customer), resulting in a multi-objective, multi-period optimization problem. Cross-border as well as country-specific factors are extensively modeled, especially duties, duty drawbacks, local/domestic content rules, exchange rates, taxes, etc. We applied the model to a real-life case. Carbon footprint of the supply chain is added as a further objective.

### 015-0461: How the Fashion and Luxury Industry Challenges the Crisis Redesigning Value Chains

*Pamela Danese, University of Padova, Italy*

*Laura Macchion, University of Padova, Italy*

*Andrea Vinelli, University of Padova, Italy*

*Romano Cappellari, University of Padova, Italy*

*Giorgia Dal Pont, University of Padova, Italy*

The fashion and luxury industry is part of the Made in Italy fashion system that represents an important constituent of the Italian industrial system, where Italian apparel sector represents 7.1% of the national manufacturing industry turnover, with 516,700 employees, 59,750 firms and total revenues of 52,835 million euro in 2006. However, the industry turnover has been -15.1% in the first quarter of 2009, due to the global crisis and fierce low labour cost country competition. This research project aims at studying Italian fashion and luxury apparel firms to: understand how companies can react to the current crisis in order to remain competitive; to explain how companies can redesign their value chain to improve their efficiency; and to evaluate new managerial and organizational models that support business development. The multiple-case study method is adopted to investigate these research questions. We conducted 12 in-depth case studies using a semi-structured interview protocol specifically designed for this research.

### 015-0471: A Structural Equations Modeling Approach to Monitoring and Modifying Operational Hedging Positions

*Chieh Lee, Washington State University, United States*

*Charles Munson, Washington State University, United States*

Managers around the world face the increasing challenge of managing the risks of supply chain networks that cross international borders. In addition to typical uncertainties, such as stochastic demand, that any firm faces, the global company must also contend with exchange rate risk. One technique to manage this risk is to implement operational hedging. Different from traditional financial hedging, which amounts to purchasing currency options, operational hedging involves establishing excess capacity around the world and then shifting production to favorable countries as exchange rate fluctuations dictate. Assuming a convex cost function for expansion and contraction from current operating levels, we apply global sensitivity analysis to a linear programming formulation in order to develop a structural equations representation of the problem. Specifically, we seek a simplified mechanism for managers to estimate, based on new exchange rate and demand information, appropriate modifications to plant production levels over time.

54	Friday, 1:30- 3:00, Port McNeill <b>Session:</b> Value of Flexibility and Control	<b>Track:</b> OMF, 3	<b>Chair:</b> Ling Dong
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### 015-1003: The role of seniority in supply-chain trade-credit terms

*John Birge, University of Chicago, United States*

Trade credit plays a critical role in the function of supply chains, representing the dominant source of firms' short-term financing. Various motivations, such as differential credit terms and quality inducement, have been offered for its prevalence. In this paper, we use an operational

## Friday, 1:30- 3:00 Sessions

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the chain. We find conditions when efficiency improves if all trade creditors are junior to short-term financial credit and discuss the implications of these findings for policies governing recovery claims in the event of bankruptcy.

### **015-0910: Decentralized Control of a Stochastic Pricing-service System**

**Andrew Lim**, *University of California, United States*

**George Shanthikumar**, *Purdue University, United States*

**Peng Li**, *University of California, United Kingdom*

This paper concerns decentralized control of a stochastic and dynamic resource allocation problem. The system consists of a pricing agent and a service agent. The pricing agent controls the customer arrival rate by dynamically setting prices, while the service agent controls the rate at which customers are served. We show that the integrated pricing-service problem can be decoupled into a dynamic pricing problem (for the pricing agent) and a service rate control problem (for the service agent), and that these single-agent problems can be specified so as to deliver the centralized optimal policies. We also present an iterative algorithm that enables pricing and service agents to construct the centralized optimal policies without having to reveal private knowledge about the system to the other agent.

### **015-0993: Optimal Operating Control and Dividend Distribution Policies**

**Rene Caldentey**, *New York University, United States*

We consider a firm whose net earnings evolve according to a Brownian motion which is influenced by the firm's operating strategy. The firm has to decide on the optimal operating policy (controlling the drift of the earnings process) as well as the leverage ratio and the distribution of dividends.

### **015-0139: A Cournot-Stackelberg Model of Supply Contracts with Financial Hedging**

**Martin Haugh**, *Columbia University, United States*

**Rene Caldentey**, *NYU, United States*

We study a supply chain where multiple retailers and a single producer compete in a Cournot-Stackelberg game. At  $t=0$  the retailers order a single product from the producer and upon delivery at time  $T$ , they sell it in the retail market at a stochastic clearance price. We assume the retailers' profits depend in part on the realized path of some tradeable financial market. Because delivery does not take place until  $T$ , the producer can offer a menu of wholesale prices to the retailer, one for each realization of the market. We also assume the retailers are budget-constrained and therefore limited in the number of units they may purchase. They partly overcome this by trading dynamically in the financial market and therefore transferring cash from states where the budget constraint is not binding to states where it is. We solve for the Nash equilibrium and consider extensions of the basic model.

## Friday, 3:30- 5:00 Sessions

55	Friday, 3:30- 5:00, Finback <b>Session:</b> Supply Chain Design	Track: SCM, 10	Chair: Pauline Found
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### 015-0433: Mapping Supply Practices onto Supply Chain Outcomes

*Steven Melnyk, Michigan State University, United States*

*Stan Griffis, Michigan State University, United States*

*Bixby Cooper, Michigan State University, United States*

*John Macdonald, Michigan State University, United States*

Supply chain management involves the extensive usage of practices – undifferentiated highly structured routines that can be readily transferred across organizations and industries to help the personnel in those organizations address specific problems. Practices bring with them several important challenges. First, it is not clear to what extent certain supplier base management practices are applicable to certain outcomes or if they should be applied irrespective of the specific outcomes being pursued. Second, assuming that certain practices are correlated with certain specific outcomes (e.g., efficiency, responsiveness, sustainability, security, resilience, and innovation), there is the challenge of determining what practices are correlated with which specific outcomes. Third, it is not known whether certain practices can be used together to improve overall. Finally, there is the challenge of determining if there are certain practices that should not be used together because of the negative interactions. This presentation explores these issues.

### 015-0437: Understanding the Concept of Fit in Supply Chain Management

*Steven Melnyk, Michigan State University, United States*

*Edward Davis, University of Virginia, United States*

*Nick Little, Michigan State University, United States*

*Joseph Sandor, Michigan State University, United States*

The concept of fit underlies a great of the thinking in strategy and operations strategy. Yet, there is evidence of its increasing importance in supply chain management. However, as the presentation will show, the concept of fit is far more complex in supply chain management, as it involves issues of outcome fit, strategic fit, organizational fit, and context fit. This presentation explores these various dimensions and discusses their implication for issues such as supply chain design and performance measurement.

### 015-0498: The Link Between Purchasing Practices and Manufacturing Strategy

*Claudia Rebolledo, HEC Montréal, Canada*

*Marie Jobin, HEC Montréal, Canada*

Previous research establishes that aligning supply management with the overall business strategy is crucial. Indeed, recent empirically papers link purchasing capabilities and purchasing practices to business performance. In this paper, we explore the alignment of supply management and business strategy using a different approach. First, instead of considering the business strategy, we focus on the manufacturing strategy of the firm. Second, instead of analyzing the impact of different practices on performance, we want to know if different manufacturing strategies translate into different supply management practices. To do that, we replicate Miller and Roth (1994)'s taxonomy of manufacturing strategies and compare the purchasing practices of members of manufacturing strategy groups. Exploratory case studies in the Canadian manufacturing sector suggest that caretakers, marketers and innovators actually implement dissimilar purchasing practices. We pursue our analysis using a large sample of manufacturing firms participating in the International Manufacturing Strategy Survey (IMSS).

### 015-0136: Rethinking Strategic Orientations to Manage Contemporary Supply Chains, as Applied to the UK Touring Caravan Industry

*Jane Lynch, Cardiff University, United Kingdom*

*Pauline Found, Cardiff University, United Kingdom*

*Robert Mason, Cardiff University, United Kingdom*

*Anthony Beresford, Cardiff University, United Kingdom*

In the context of the UK touring caravan industry, this paper examines the tensions which can emerge in supply chains between various 'orientations' of strategy; in this case the dilemma of following a production-, market- and relationship-based orientation strategy, particularly in the current economic climate. Within the framework of these three orientations, research findings are reported and the challenges for the industry developed and presented. It is argued that the recent economic turbulence has fundamentally shaken the business model of the sector and changes are required to re-build sales and confidence. Managing the supply chain to ensure that a balance amongst production, market and relationship orientations is reached is difficult, yet desirable, to achieve a return to growth.

56	Friday, 3:30- 5:00, Galiano <b>Session:</b> Supply Chain Structure	Track: SCM, 11	Chair: Xiaole Wu
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### 015-0573: Who Should Be Your Partner?: A Two-echelon Supply Chain Case

*Takamichi Hosoda, Aoyama Business School, Japan*

Using a two retailers and one manufacturer supply chain model, we consider the benefit to the manufacturer of establishing a Vendor Managed Inventory (VMI) scheme with only one of two retailers. In many real cases, a manufacturer provides many different retailers with its products. A question put to the manufacturer is that of with whom the manufacturer should establish a VMI scheme. For the market demand process, a white noise process is assumed for both two retailers. These two market demand processes are correlated with each other. It is shown that the degree of correlation between two market demand processes and the magnitude of the demand variance have an impact on the supply chain cost, and an ideal VMI partner for the manufacturer would be the retailer whose market demand process has higher variability and is highly correlated with the other market demand process faced by a non-VMI retailer.

## Friday, 3:30- 5:00 Sessions

### 015-0674: Applying Game Theory to the Analysis of Multiple-Seller and Multiple-Buyer Supply Chains

*DIEGO RIVERA PARRA, UNIVERSIDAD DE LOS ANDES, Colombia*

*JOSE TORRES DELGADO, UNIVERSIDAD DE LOS ANDES, Colombia*

In recent decades, both academics and professionals have shown an inclination for the study of coordination between the different agents of the supply chain, in order to gain a competitive advantage for them. Game theory is a powerful tool for analyzing situations where agents interact to make decisions will affect the behavior of other agents. This paper models the interaction between agents in a multiple-seller and multiple-buyer supply chain through game theory. The sellers determine the prices and the buyers the lot sizes. Both non-cooperative and cooperative scenarios are investigated. Based on this consideration, this paper discusses different strategies to encourage cooperation between agents and fits a variety of scenarios such as bargaining, quantity discounts and cooperative Shapley value. In each suggested model, an example with the proposed scenarios is discussed. Finally, the paper presents an application of the proposed theory in a real context.

### 015-0272: The Impact of Manufacturing and Supply Chain Improvement Initiatives: Comparing Make-to-Order and Make-to-Stock Firms

*Jan Olhager, Linköping University, Sweden*

*Daniel Prajogo, Monash University, Australia*

Manufacturing firms aim at improving both internal and external processes to improve the competitive advantage. Such initiatives include lean practices as well as supplier rationalization and integration. In this paper, we analyze these improvement initiatives and their impact on business performance. In particular, we explore potential differences between make-to-order (MTO) and make-to-stock (MTS) firms. We use data from 216 Australian manufacturing firms. We find a clear differentiation of improvement focus between MTO and MTS firms. MTO firms exhibit a significant impact of supplier integration on business performance, but not for lean practices and supplier rationalization. The situation is completely reversed for MTS firms, since they have significant effects for internal lean practices and supplier rationalization, but not for logistics integration with supplier. These results show that the distinction between MTO and MTS firms is important when analyzing manufacturing and supply chain improvement initiatives.

### 015-0309: Capacity Expansion and Contracts for Horizontal Capacity Coordination under Demand Uncertainty with Semiconductor Industry Applications

*Xiaole Wu, Olin Business School, Washington University in St. Louis, United States*

*Panos Kouvelis, Olin Business School, Washington University in St. Louis, United States*

*Hirofumi Matsuo, Graduate School of Business Administration, Kobe University, Japan*

Within the semiconductor industry, there are integrated device manufacturers (IDM), fabless firms and foundries. Fabless firms specialize in device design, while foundries are dedicated to device manufacturing. IDM integrates both functions. Typically foundry has production cost advantage because of its specialization and economies of scale. The IDM needs to make decisions for each device on whether to manufacture internally, sub-contract to foundries, or both. If the IDM decides to sub-contract part or all of the demand to the foundry, how the two parties should contract is a key decision problem. This paper studies two types of contracts:  $\alpha$ -contract (or fixed commitment contract) and reservation contract, from both the IDM's perspective (Stackelberg game with IDM as the leader) and as a Nash Bargaining equilibrium. We analyze the different contracts and their optimal parameters and suggest the most reasonable contractual solutions taking into account profitability and risk of the contracting firms.

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Friday, 3:30- 5:00, Grand Ballroom A

Track: SCM, 12

Chair: Boyana Petkova

Session: Supply Chain Integration 3

### 015-0009: An Empirical Investigation of Relationship between Antecedents of Supplier Integration and Supply Management Performance

*Asif Salam, University of the Fraser Valley, Canada*

This research examines the relationship between antecedents of supplier integration and supply management performance. A conceptual model has been developed based on the literature on strategic supply management skills, supplier integration, the perceived status of supply management, and supply management performance. To test the model a survey interview was conducted to obtain primary data from the purchasing managers or equivalent within the highly competitive garment industry in Bangladesh. Finally, the model was tested using Structural Equation Modeling.

The findings from this study indicate that there is significant evidence to support the hypothesized model in which strategic supply management skills, supplier integration and the perceived status of supply management have a direct impact on supply management performance. This implies that firms can improve their supply management performance through an increased emphasis on strategic supply management skills, supplier integration and improving the perceived status of supply management.

### 015-0153: Inter-organizational ICT and Supply Chain Performance: the Role of Supply Chain Integration and Uncertainty

*Dirk Pieter Van Donk, University of Groningen, Netherlands*

*Xuan Zhang, University of Groningen, Netherlands*

*Taco Van der Vaart, University of Groningen, Netherlands*

Inter-organizational ICT (IOICT) has been recognized as a critical factor for supply chain (SC) performance. Empirical papers show mixed findings on both the direct effect of IOICT on performance and its indirect effect through supply chain integration practices, which might indicate that important factors are not considered. In this paper we investigate whether uncertainty moderates the influence of IOICT on SC performance via SC integration. While uncertainty has been mentioned as a potential important context factor in SCM and in ICT research, no combined examination has been executed, so far. To simultaneously estimate multiple relationships between latent constructs, AMOS 7.0 was used to analyze data collected among Chinese manufacturers. Our results indicate that supply chain integration mediates the relationship between IOICT and SC performance and that uncertainty moderates this mediated relationship. Together, our findings suggest that IOICT is more an antecedent of SC integration, specifically effective in more uncertain contexts.

## Friday, 3:30- 5:00 Sessions

### 015-0346: The Antecedents and Performance Outcomes of Integration Intensity: A Multi-period Study

*Cynthia Wallin, Brigham Young University, United States*

*Stanley Fawcett, Brigham Young University, United States*

*Chad Allred, Brigham Young University, United States*

To achieve superior market performance, companies must coordinate value-added activities across both internal and external boundaries. However, achieving the coordination necessary to improve performance has been a persistent challenge. In this paper we consider both the antecedents and performance outcomes of integration intensity. The antecedents form six factors: information sharing, goal alignment, leadership, supplier development, customer management, and measurement. Then, with an understanding of how each antecedent affects the level of integration intensity, we analyze the relationship between integration intensity and a firm's financial and operational performance.

### 015-0786: The Effect of Resource Dependence on Supply Chain Integration and its Benefits

*Boyana Petkova, University of Groningen, Netherlands*

*Taco van der Vaart, University of Groningen, Netherlands*

*Eric Molleman, University of Groningen, Netherlands*

Supply chain integration can lead to various benefits, such as lower inventory levels and higher responsiveness. Although these benefits have been stressed by practitioners and scientists, many firms are anxious to collaborate with buyers and suppliers. We adopt a resource dependence perspective to understand why and how firms integrate and how this affects their operational and strategic performance. Through a survey in the discrete manufacturing industries in The Netherlands (n=140), we show how the two core concepts of resource dependence theory (power imbalance and mutual dependence) influence integration and performance. We investigate these effects in more detail through a multiple case study of four extreme dependence situations in two world class companies in the Electronics industry. Our findings can help firms select the partners who are most likely to agree to the desired level of integration and with whom the relationship will thus deliver the largest benefits.



Friday, 3:30- 5:00, Grand Ballroom D

Track: HOM, 7

Chair: Martin Puterman

Session: PANEL: Lean Health Care Implementation and Evaluation Challenges

### 015-0370: Optimal Screening Strategies of Patients on the Kidney Transplant Waiting List

*Alireza Sabouri Bagh Abbas, University Of British Columbia, Sauder School of Business, Canada*

*Steven Shechter, University of British Columbia, Sauder School of Business, Canada*

*Tim Huh, University of British Columbia, Sauder School of Business, Canada*

The health condition of patients on the kidney transplant waiting list deteriorates while they are waiting for an organ to become available. Moreover, patients may develop a condition that makes them no longer suitable for transplant. Therefore, transplant centers screen waiting patients at various intervals to identify and place ineligible patients on inactive status so that when the donated organ arrives, they offer it with a higher probability to a candidate who is suitable for transplant. We investigate different screening policies to develop dynamic cost-effective screening strategies to maximize transplant outcomes.

### 015-0156: Radiation Therapy Treatment Scheduling

*Antoine Sauré, University of British Columbia, Canada*

*Jonathan Patrick, University of Ottawa, Canada*

*Martin Puterman, University of British Columbia, Canada*

Motivated by the adverse effect of delays on patients' health, such as physiological distress, deterioration of quality of life and inefficiencies in the use of expensive resources, we formulate and solve a discounted infinite-horizon MDP model for scheduling cancer treatments into radiation therapy units. The main purpose of this model is to identify good policies for allocating available treatment capacity to incoming demand, while achieving wait time targets and maintaining high unit utilization. We use an affine approximation for the value function in the MDP formulation and solve the resulting equivalent approximate linear programming model through column generation to obtain an approximate optimal policy for this problem. The benefits from the proposed method are evaluated by simulating the performance of this policy for a medium-size cancer centre in British Columbia, Canada.

### 015-0142: A Sampling-Based Approach to Appointment Scheduling

*Mehmet Begen, University of Western Ontario / Richard Ivey School of Business, Canada*

*Retsef Levi, Sloan School of Management / MIT, United States*

*Maurice Queyranne, University of British Columbia / Sauder School of Business, Canada*

We consider the problem of appointment scheduling on a single processor (e.g., operating room, exam physician) with discrete random durations, recently studied by Begen and Queyranne, under the assumption that the duration probability distributions are not known and only a set of independent samples is available, e.g., historical data. For a given sequence of jobs (e.g., surgeries, patients), the goal is to determine optimal planned start times (i.e., optimal appointment times) such that the expected total underage (processor idle-time) and overage costs (jobs waiting time and processor overtime) are minimized. We show that the objective function of the appointment scheduling problem is convex under a simple sufficient condition on cost coefficients. Under this condition we characterize the subdifferential of the objective function with a closed-form formula. We use this formula to determine bounds on the number of independent samples required to obtain provably near-optimal solution with high probability.

### 015-0091: User-Equilibrium Models for Facility Network Design in Healthcare

*Yue Zhang, University of British Columbia, Canada*

*Derek Atkins, University of British Columbia, Canada*

## Friday, 3:30- 5:00 Sessions

Motivated by a real case study, this paper describes a methodology for optimizing the facility network of a health service provider to maximize its market share in a competitive environment. Facility locations and capacities are the main determinants of the configuration of a facility network. We attempt to compare the impact of two modeling assumptions about patient choice behavior of where to obtain service. We formulate the two problems as mathematical programs with equilibrium constraints and develop a location-allocation framework to solve the problems.

5	Friday, 3:30- 5:00, Granville	Track: HOM, 8	Chair: Warren Sandberg
	Session: Capacity & Resource Management in Perioperative Systems		

### 015-0480: Quality Index and Hospital Accreditation: A Case Study in Brazil

*Suzana de Souza Santos, Universidade Paulista - UNIP, Brazil*

*João Chang Junior, Centro Universitário da FEI, Brazil*

*Mateus Chang, Universidade de São Paulo - ESALQ-USP, Brazil*

Assessing the quality of services provided by hospitals has become increasingly important to the decision of its users, health plans and organizations providing these services. For these, obtaining a seal of accreditation gives to the hospital a reputation in the market that sets it apart from others. However, the assessment of quality in hospitals is a complex task, requiring the analysis of many variables, making it expensive and time consuming for hospitals and difficult to understand for users. The objective of this study is to analyze the indicators used by the Program Commitment to Quality Hospitals - PQHC, developed in the State of Sao Paulo, Brazil, in order to improve the assessment system which gives the seal of accreditation, making this information more transparent to administrators and health service users.

### 015-0857: The Complexity of Using Indicators for Quality Improvement: A Multiple Case Study in Breast Cancer Teams

*Manda Broekhuis, University of Groningen, Netherlands*

*Marjan Gort, Comprehensive Cancer Centre North East, Netherlands*

*Gerdien Regts-Walters, Faculty of Economics and Business, Netherlands*

Measuring performance is regarded to be an important driver for quality improvement, as it raises awareness of existing practice. However, only a few studies focus on the actual use of indicators as well as on how improvements are facilitated by indicator use. This study investigates the impact of several factors: the process of indicator use, the type of indicator (structure, process, outcome), and teams factors. A multiple case study design was adopted, and four breast cancer teams were selected who worked in a Breakthrough Project with six predetermined indicators. Results show that none of the factors has a clear impact on improvements in indicators scores. The process of indicator use and team factors only affected each other, and affected the perceived quality of the relationships within the team. Therefore, additional factors that might influence improvements on indicator scores should be included in future research.

### 015-0793: Developing Appropriate Performance Measurement of Mental Health Services

*Mairi Macintyre, University of Warwick, United Kingdom*

*Richard O'Conner, University of Warwick, United Kingdom*

*Stuart Bestwick, University of Warwick, United Kingdom*

*Jannis Angelis, University of Warwick, United Kingdom*

National Policy in the UK supports the change in value proposition posed by the mental health services from 'cure' to 'recovery'. The method of translating the principles of recovery-oriented care to organisation-wide practice has not yet been determined. In organisations as large and as complex as a Mental Health Trust, inevitably areas of the organisations transition at different rates. The performance measurement system to support such an organisation is equally as large and complex and needs to adjust accordingly. This paper uses evidence from interviews using a case study approach to scope the issues around performance measurement in a service based organisation. It tracks the initial stages of the performance measurement system development within a UK Mental Health Trust as it uses lean to meet the challenges of service redesign against significant public spending cuts and identifies problems and opportunities for performance measurement to aid the transition.

### 015-0264: Innovative Approach to Patients Satisfaction: A Case of Indian Private Hospitals

*Sadia Samar Ali, Institute of Management Studies, Associate Professor & Area Chairperson: OM, India*

*Eric Dorion, University of Caxias do Sul, Brazil*

*Paulo Barcelos, University of Caxias do Sul, Brazil*

Exposure to global markets and competitors has placed increasing demands on all sectors of the Indian market. Introducing consumer choice was one of the key motivations underpinning the various healthcare utility privatizations of the 1980s, along with enhancing the quality of service provided to patients. Suitable satisfaction drivers have been identified from the literature and talks with experts. A new patient satisfaction index has been discussed. This index is based on American Customer Satisfaction Index (ACSI). The concept is developed specially for the private hospitals operating in New Delhi and NCR area of India. A survey was done and 180 responses were collected. This paper aims to study the effect of service facilities provided to patients in private hospitals of India.

The analysis suggests an acceptable and generic model that can be used by managers and researchers to evaluate satisfaction level. This paper concludes with a bright outlook for the future.

### 015-0452: Are Healthcare Mistakes All the Same? A Look at Rankings of Error Proofing Strategies

*Jamison Kovach, University of Houston, United States*

*Lee Revere, University of Houston-Clear Lake, United States*

*Ken Black, University of Houston-Clear Lake, United States*

Quality improvement efforts in healthcare often focus on patient safety initiatives that address the reduction of medical errors or mistakes. Error proofing is a quality improvement technique, which was originally developed for manufacturing, but is now used successfully in healthcare to prevent or mitigate the negative impact of medical errors. This approach uses process and design features to prevent, detect, and/or mitigate mistakes by

## Friday, 3:30- 5:00 Sessions

institutions. This work also discusses the principles that can be used to develop new error proofing systems or devices.

60	Friday, 3:30- 5:00, Junior Ballroom A <b>Session:</b> Resource Allocation and Project Scheduling	<b>Track:</b> PITM, 4	<b>Chair:</b> Mehmet Gumus
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### 015-0230: Dynamic Resource Allocation Policies for R&D Portfolio Management

*Mehmet Gumus, McGill University, Canada*

*Senay Solak, University of Massachusetts Amherst, United States*

We consider a firm allocating its resources to a set of projects or technologies. Facing stochastic returns with unknown parameters, the firm needs to decide on both which projects to select and how much to invest on the selected projects with the objective of maximizing total expected discounted profit. A dynamic programming formulation is proposed and some numerical results are presented.

### 015-0408: A Decision Support System for Resource-constrained Multi-project Scheduling Problem Using Genetic Algorithm

*Karuna Jain, INDIAN INSTITUTE OF TECHNOLOGY- BOMBAY, India*

*M Suresh, INDIAN INSTITUTE OF TECHNOLOGY- BOMBAY, India*

*Pankaj Dutta, INDIAN INSTITUTE OF TECHNOLOGY- BOMBAY, India*

Companies usually manage various projects simultaneously, sharing a pool of renewable resources. Often, the availabilities of common resources are limited and not sufficient to execute all the concurrent activities. In such circumstances, decision making about their schedule is necessary. A comprehensive review of the literature on resource-constrained multi-project scheduling problem (RCMPSP) reveals that an important issue of total cost minimization with cyclic resources vacation in parallel project environment has not received due attention. The purpose of this paper is to develop a decision support system (DSS) for RCMPSP using a genetic algorithm in the context of a cyclic off days for labours, cyclic preventive maintenance of machines, overtime allowed for critical activities, scheduling the casual workers with the objective to minimize total cost of all projects and mean project delays. As an application, an extensive computational experiment is reported.

### 015-0551: Planned Preemption for Flexible Resource Constrained Project Scheduling

*Karuna Jain, Indian Institute of Technology (IIT), Bombay., India*

*Kanchan Joshi, IIT Bombay., India*

The classic resource constrained project scheduling problem (RCPSP) schedules non-preemptive activities while minimizing total lead time of project. There is always a need for tradeoff between resource allocation and project lead time minimization. This paper reveals the benefits of allowing preemption when scheduling activities in a resource constrained project. The focus is on analyzing the impact of preemption on project length under the condition of constant resource availability. The paper deals with comparison of the models for planned preemption in the first part, and provides a framework for reducing uncertainty due to unplanned preemption in the latter. The model provides an opportunity for flexible scheduling with the help of a monitoring and control system.

### 015-0299: The Impact of Priority Uncertainty and Power Distribution on Product Specification Decisions

*Zhijian Cui, INSEAD, France*

*Christoph Loch, INSEAD, France*

Product is usually viewed as a bundle of multiple attributes and the choice of product specification as a multiple dimensional optimization problem. However, this view is often questioned in practice because of its two underlining assumptions: the central product planner has perfectly consistent preference with the firms, and each participant of new product development has no private information. In our study, we drop these two assumptions and take a "stakeholder management" view to look at product specification decisions. Motivated by the field studies, we built two game theoretical models to compare the product specification decisions under various priority uncertainty and power distribution structures. Our studies show how various stakeholders' private career concerns interact with the power distribution and how significantly they affect product specifications. We argue that product specification is not only optimization but also equilibrium of the strategic interactions among stakeholders. Our study highlights the importance of internal factors contributing to product positioning in the market. A systematic approach to adjust both the stakeholder's priority uncertainty and power structure is prescribed to help firms transform from status quo to the target product positioning.

61	Friday, 3:30- 5:00, Junior Ballroom B <b>Session:</b> OMM7	<b>Track:</b> OMM, 7	<b>Chair:</b> Benny Mantin
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### 015-0019: Benefits of Decentralization When Customers are Strategic

*Hangjun (Gavin) Yang, UBC, Canada*

We consider a two-period model consisting of one manufacturer who sells a durable product, without a used market, through multiple retailers who are engaged in Cournot competition. No firm can make credible commitments on future actions. We re-examine a widely-held belief in the supply chain literature that the profit of a decentralized channel cannot exceed that of a centralized channel. With strategic customers, we find that a decentralized channel may have higher profit than a centralized channel in a two-period model under linear wholesale price contracts. Existing results in the

literature identify double marginalization as the key driving force, however, we show that the effect alone is not enough to explain the higher decentralized channel profit in our setting. Indeed, we show that customer and firm discounting, and downstream retailer competition are also driving forces of the higher decentralized channel profit.

## Friday, 3:30- 5:00 Sessions

### 015-0523: The Hidden Information Content of Price Movements

*Benny Martin, University of Waterloo, Canada*

*David Gillen, University of British Columbia, Canada*

Dynamic patterns of prices in different markets may motivate (strategic) consumers, who could be monitoring price movements over time, to game vendors. Do past price movements carry information about the direction and magnitude of future price movements?

Conducting empirical work in the airline industry on near 1,000 U.S. domestic routes, we find that some price-metrics carry information about future price swings: these variables can assist in predicting the likelihood and magnitude of a price drop (or increase) in the immediate future. These price-metrics yield radically different signals and, furthermore, they are not symmetric for predicting lower and higher prices.

### 015-0752: Competitive Pricing with Reference Effects

*Srinivas Krishnamoorthy, Ivey School of Business, Canada*

We examine the effect of reference prices on the pricing strategies of two competing firms. We show that, in a two period game, the effect of reference prices motivates firms to price higher at equilibrium than they would if there were no reference pricing effect. The analogy drawn within the paper is to the MP3-player market, wherein incumbents have large reference price advantages over effectively equivalent new entrants.

### 015-0656: Strategic Channel Selection and Optimal Pricing

*Chris Anderson, Cornell University, United States*

We develop a model to set optimal multi-channel prices for a retailer selling goods/services on regular full information channels (Expedia.com), posted price opaque channels (Hotwire.com) and opaque bidding channels (Priceline.com). Consumers strategically choose their purchase channel by maximizing their surplus (minimizing their costs).

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Friday, 3:30- 5:00, Junior Ballroom C

Track: SOHL, 4

Chair: Camila Papa Lopez

Session: Case Studies in Sustainability

### 015-0438: Integrating Sustainability Programs Across Supply Chains – An Exploratory Study

*Michael Knemeyer, Fisher College of Business, OSU, United States*

*Wolfgang Kersten, Technische Universität Hamburg-Harburg, Germany*

*Sebastian Brockhaus, Technische Universität Hamburg-Harburg, Germany*

The concept of sustainability has become an actively debated topic and point of increased focus in the business and academic world over the past few years. Numerous companies are actively implementing sustainability programs; however, our findings indicate that most of these activities are internally focused and independently pursued. Motivated by this perceived lack of supply chain coordination, the current study explores the views of company representatives from both the USA and Europe as to the potential benefits as well as the perceived challenges of coordinating sustainability activities across one's supply chain. Based on our initial results, it is hypothesized that there is an inherent need for a comprehensive supply chain partnership model that includes triple-bottom-line performance measurement with an extended set of key performance indicators to support the achievement of value chain integrated coordination of sustainability efforts. The session will highlight our initial findings and propose opportunities for further research.

### 015-0781: Toyota Motor European (TME) Sustainable Logistics: An Example to Brazil

*Camila Lopes, Unisantos, Brazil*

*Getulio Akabane, Unisantos, Brazil*

*Washington Luiz Soares, Unisantos, Brazil*

*Rafael Barreto, Unisantos, Brazil*

This paper analyzes the Toyota Motor European (TME) sustainable logistics as a concept can be used in Brazilian operations as part of supply chain strategies. Sustainable logistics targets eco-efficiency achieved by management of all processes in the chain that focuses on customer service level, which involves from raw materials to product delivery to customers through design, procurement, production, distribution, use, reuse and disposal, including aspects such as reduction of time and resources, costs and environmental impacts. The results show that Toyota's example means the improvement of Brazilian logistics operations in a business environment of rapid growth and changes, and makes possible a great reflection on business logistics practices in this country. Thus it is possible to conclude that sustainable logistics makes for easy pro-active monitoring of business management, which is key to achieving a high level of sustainable performance in logistic operations.

### 015-0812: Comparison About the Oil Royalties Debate in Brazil Versus Energy Shift in the World

*Camila Lopes, Unisantos, Brazil*

*Getulio Akabane, Unisantos, Brazil*

With the discovery of new oil wells, discussions were initiated in Brazil about the fate of financial resources obtained from oil royalties. While this discovery will bring development and regional investment, it may also negatively impact environment and quality of life. The dangers of global warming are increasing, and fossil fuel use is the chief source of destabilizing greenhouse gas emissions. Thus, this paper analyses how to reduce CO2 emissions, invest for cleanup and cope with the effects of climate change. Countries invest in creating new types of energy and cleaner energy sources, which may represent the replacement of oil as the major fuel source in the world. This article analyzes the comparison between these two realities, petroleum versus clean energy. The results show that in Brazil, with the discussion on the newly discovered oil reserves, companies have been investing in energy shift to reduce costs and resources, especially in transportation logistics.

### 015-0820: Natural Gas as Alternative Fuel for Integrating Environmental Management System in Logistics: A Case Study in a Shipping Compan

*Camila Lopes, Unisantos, Brazil*

## Friday, 3:30- 5:00 Sessions

*Getulio Akabane, Unisantos, Brazil*

*Breno Lima, Unisantos, Brazil*

Logistics demand new transport modes and fuel. The energy shift is the most important investment to replace petroleum, a non-renewable source of energy. The article identifies the social and competitive advantages for a company for replacement of part of traditional fuels with natural gas, a process that is economically viable in view of its abundance in Brazil. This is a case study of a shipping company, in the ferry crossing in the Salvador city Bahia, in Brazil. The results show that is a great option because natural gas is an energy type with abundance in Brazil, and in this case, represents the reduction of CO2 emissions by 40%, reduced time for transport to an hour (50%) and the consequent reduction of costs, economic and environmental, thereby promoting sustainability.

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Friday, 3:30- 5:00, Junior Ballroom D

Track: SOHL, 5

Chair: Rob Zuidwijk

Session: Value of Information in sustainable supply chains

**015-0500: How Do Consumers Perceive Re-manufactured Electronic Products?**

*Joao Quariguasi Frota Neto, Bradford School of Management, United Kingdom*

*Jacqueline Bloemhof, Wageningen University, Netherlands*

*Charles Corbett, Andeson School of Management, UCLA, United States*

Research on the marketing of remanufactured electronic products is still in its infancy. This paper provides more insight into how consumers perceive remanufactured products in comparison to used and new products. We test the hypothesis that, ceteris paribus, remanufactured products are sold with a premium (discount) vis-a-vis used (new) products. Furthermore, we test whether the Willingness to Pay (WTP) for used and remanufactured products can be improved by including favourable descriptions of the items (e.g., "in excellent condition"). We hypothesize that the effect of such descriptions should be stronger for used products than for remanufactured ones, since the former products are likely to suffer from a higher level of asymmetric information. Using a unique data set of 1,500 used, remanufactured and new iPods auctioned at eBay, we find strong empirical confirmation for these hypotheses. Our findings are robust to controlling for a wide range of objectively measurable iPod characteristics.

**015-0755: Defining a Technical Agenda for Green Innovation: Drivers and Trajectories**

*Paulo Gomes, Universidade Nova Lisboa, Portugal*

A growing body of research has focused on the reasons that lead firms to deploy green innovation initiatives. Several instruments and standards have been introduced to assess environmental performance of products and companies. Less attention has been devoted to the choice of improvement paths towards sustainable innovation. This study explores the dynamic relationship between organizational commitments to green innovation (why) and goal setting decisions regarding the internal technical agenda for R&D (what). We propose that goal setting for green innovation is facilitated by shifts in the broader institutional context and the strategic orientation of the firm, but also by micro-level actions of engineers involved in product and process design. Engineering knowledge is rich and complex, the growth of knowledge tends to be constrained by "what we know and how we know it." Case study evidence validates the framework, and suggests new lines of research on these topics.

**015-0832: The Economic and Environmental Value of Information for Product End-of-use Operations**

*Vered Doctori Blass, Tel Aviv University, Israel*

*Roland Geyer, University of California, Santa Barbara, United States*

In this research we introduce a generic framework for measuring the value of information in the context of closed-loop supply chains. We measure the economic and environmental values of information for product end-of-use operations and provide numeric examples to demonstrate the application of the framework. We also discuss how the framework can be used as a tool for prioritizing information needs based on contribution to the performance on one hand, and based on the cost to obtain the information on the other hand. Finally, we discuss the next stage of the research, which includes modeling the value of information flows between the closed-loop supply chain agents.

**015-0472: Impact of Information on Sustainability of Maritime Container Transport: A Quantitative Analysis**

*Rob Zuidwijk, Rotterdam School of Management, Netherlands*

*Albert Veenstra, Rotterdam School of Management, Netherlands*

Planning the transport of maritime containers from the sea port to final destinations can be a daunting task, as important planning parameters are uncertain. By providing more timely or more accurate information about some of the planning parameters, such as the time the container arrives for further transport, planning and execution can be improved. This paper assesses the value of information in container transport in terms of multiple performance dimensions, i.e. logistics costs, reliability, security, and emissions. The analysis is done using a stylized two-period model where a decision maker allocates arriving containers to two transport modes (slow, low price, no flexible departure times versus fast, high price, flexible departure times). The performance of decision policies under various information scenarios are quantified using Pareto frontiers and are compared. Pareto optimal decision policies are identified.

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Friday, 3:30- 5:00, Orca

Track: CIM, 4

Chair: Karthik Ramachandran

Session: New Product Operations

**015-0386: Diverse Preferences as a Source of Systematic Project Evaluation Biases**

*Nektarios Oraopoulos, Judge Business School, Cambridge University, United Kingdom*

*Stylianos Kavadias, College of Management, Georgia Institute of Technology, United States*

New product development teams are often prone to two types of errors: terminating too early a project that would have been successful, or continuing a project that eventually fails. Our work studies how the corresponding probability for each type of error changes as the team members become more diverse with respect to their preferences. Unlike previous studies, we allow for strategic considerations that might lead a team

## Friday, 3:30- 5:00 Sessions

member to vote against their individual preferences.

### 015-0378: Inventory Planning for Product Rollovers

*Sreekumar Bhaskaran, Southern Methodist University, United States*

*Ankur Goel, Case Western Reserve University, United States*

*Karthik Ramachandran, Southern Methodist University, United States*

End-of-life inventory decisions of existing products are often made before technological uncertainties about a new product are resolved. We model the inventory planning and introduction timing decisions surrounding product rollovers of innovating firms. Optimal inventory & launch policies are characterized for competitive markets with single and dual rollovers.

### 015-0922: Managing the Inventories of Perishable Goods with Controllable Shelf Lives

*Xiaoli Wu, HKUST, China*

*Qing LI, HKUST, China*

The shelf lives of many perishable goods can be determined by retailers' decisions on purchasing and on how the perishable goods are maintained during delivery and on retail shelves. How should the retailers coordinate the shelf-life decision and inventory decision? In this study, we show that the answer depends critically on how the inventories are issued. If the inventories are depleted on a first-come-first-serve basis, then the retailer may sometimes order (or maintain) items of different lifetimes at the same time to balance the cost against the risk of overage. Such a strategy, however, should never be used if the inventories are depleted on a last-come-first-serve basis. Furthermore, the retailers are less likely to order items with a longer lifetime under LIFO than under FIFO. Our numerical studies demonstrate that the cost savings from dynamically coordinating the shelf-life decision and inventory decision over time can be quite significant.

66	Friday, 3:30- 5:00, Parksville	Track: EROM, 4	Chair: Gray John
	<b>Session: Outsourcing</b>		

### 015-0459: The Influence of Capabilities and Opinions on the Outsourcing Decision-making Process

*David Hall, Clemson University, United States*

*Aleda Roth, Clemson University, United States*

*M. Johnny Rungtusanatham, University of Minnesota - Twin Cities, United States*

We study the production outsourcing decision-making process when quality and cost capabilities are strategic concerns. The production outsourcing decision-making process essentially involves comparison and evaluation. Consistent with social comparison theory from psychology, we posit this: when managers cannot evaluate their product and production capabilities in an objective manner, their eventual sourcing decisions and expectations of sourcing performance are subject to social behaviors, biases, and subjective motivations. We propose a role-playing behavioral experiment involving supply management professionals to test hypotheses pertaining to the production outsourcing decision-making process. We conclude with guidelines and recommendations for modifying social comparison theory to the organizational level and furthering research into operations and supply chain management phenomena.

### 015-0773: Defining and Spanning Boundaries in Globally Distributed Innovation

*Jason Amaral, Booz & Company, United States*

*Edward Anderson, University of Texas at Austin, United States*

*Geoffrey Parker, Tulane University, United States*

Historically, companies have protected product and process development as part of their "crown jewels." Recently, however, the increase in outsourcing, offshoring, and alliance building has resulted in innovation efforts that require the orchestration of multiple organizations separated by cultural, geographic, and legal boundaries. At the extremes, some arrangements remain fairly centralized with clear lead organizations and subsidiary "supplier" organizations, while others operate as decentralized "open-source" networks. As a relatively new phenomenon, the processes for successfully managing distributed innovation efforts are not widely practiced. Therefore, our work has dual objectives. The first is to explain why some well-considered strategies fail to deliver hoped-for financial and performance results. The second objective is to help managers tasked with implementing distributed innovation avoid the most common pitfalls.

### 015-0691: Drivers of Outsourcing and Offshoring in the Global Semiconductor Industry

*John Gray, Ohio State University, United States*

*Michael Leiblein, Ohio State University, United States*

Researchers from various disciplines have studied the drivers of outsourcing and offshoring decisions. Regarding outsourcing, researchers have articulated and empirically tested the effect of constructs such as asset specificity, uncertainty, and relative capabilities on the decision. Regarding offshoring, scholars have articulated and tested the effect of factors related to country- and region-level institutions as well various conceptualizations of inter-country distance. Empirical studies have typically considered the drivers of these decisions separately and at a single point in time. Taking advantage of a unique 16-year panel of actual production sourcing and facility investment decisions in the high-clockspeed semiconductor industry, we examine how various factors relate to both offshoring and outsourcing decisions. Further, we study the stability of these effects over time.

66	Friday, 3:30- 5:00, Pavilion Ballroom A	Track: PLQ, 4	Chair: Sanjay Kumar
	<b>Session: Knowledge and Learning</b>		

## Friday, 3:30- 5:00 Sessions

### 015-0615: Using Systems Thinking to Enhance Lean Manufacturing Learning

*Leonardo Rivera, Universidad Icesi, Colombia*

*Diego Manotas, Universidad del Valle, Colombia*

Lean Manufacturing seeks to eradicate waste. This pursuit is conducted changing many pre-conceptions inherited from the mass production traditions. It is necessary to understand immediate and delayed impacts of the changes, as well as direct and indirect results of these changes. This systemic approach should enhance the learner's understanding of the system (the manufacturing company), its variables, its outcomes, and the relationships among the system's components. This paper presents the process of designing a course to teach Lean Manufacturing to working professionals using systems thinking. This design process is conducted for the development of job competencies and using Active Learning Strategies. The professionals who take this course will gain a more holistic understanding of the workings of their companies, and better tools to handle complexity, system variables, system constraints and outcomes.

### 015-0927: Balancing the 'Know-how' and 'Know-why' of MTO Product Development

*Iain Reid, University of Liverpool, United Kingdom*

This paper develops an application of Knowledge Transfer and process assessment within the realms of MTO product development. Prior studies on the new product development (NPD) have delivered various tools and techniques in a generic context. A more realistic scenario, however, is to consider the needs of MTO organisations, one of the main problems associated with such organisations which what are sometimes essentially "one-off" projects. By extending the integrated definition for function modelling (IDEF0)-based modelling approach the paper demonstrates how to calculate the 'process quality' of the activity output and the robustness of the processes within the MTO. Two longitudinal case studies provided an empirical method of inquiry which enabled the researcher to investigate the knowledge transfer within 'live cases' using multiple resources of evidence. The results highlight that this is a valuable tool for assessing 'robustness' and a mechanism for organisation learning in order to support future MTO projects.

### 015-0491: Application of Fuzzy-QFD for Improving Academic Processes

*Juan Osorio, Universidad del Valle, Colombia*

*Ana Giraldo, Universidad del Valle, Colombia*

*Luisa Martínez, Universidad del Valle, Colombia*

This paper presents an improvement proposal for the Industrial Engineering program at the Universidad del Valle, which has been raised from the needs and requirements of stakeholders (students, graduates, teachers, managers and employers). These applications were treated with a fuzzy-QFD approach, so that will translate into specific features of the program. The information was lifted from surveys designed for each of those involved, and the handling of ambiguity in the information was processed from the elements of fuzzy logic, specifically the triangular numbers. Finally, with the construction of the house of quality, strategic lines of action were defined to direct improvement efforts and to define specific plans that will raise the performance of the program, geared towards the real needs of stakeholders.

### 015-0670: Applying Value Stream Mapping to a Healthcare Study Case: A System Approach

*Oscar Rubiano Ovalle, Universidad del Valle, Colombia*

*Camilo Micán Rincón, Universidad del Valle, Colombia*

The application of value stream mapping to improve the performance of service companies, at least in Latin America, is still developing. When applying this Lean tool with a System approach for mapping these value streams, we look for a) representing both customers' actions and their interactions with the entire service system, as well as the internal interactions between contact employees and the back office employees, and b) identifying the component segments of the value stream like loops, and defining these loops like partial units of improvement. For applying this mapping tool, we identify the existing flows among the processes in the value stream in a typical clinical laboratory, based upon the identification of interactions (interrelations) above. Complementarily, the Lean Thinking principles and tools are applied in order to improve value flow to customers and the system's productivity. Results indicate that the critical operational indicators were improved in values above 20%.

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Friday, 3:30- 5:00, Pavilion Ballroom B

Track: GENL, 4

Chair: Karen Brown

Session: Teaching Sustainability and Project Management

### 015-0134: Workshop - Integrating Sustainability in the Core Operations and Supply Chain Management Course

*F. Robert Jacobs, Indiana University/Kelley School of Business, United States*

In this workshop, we describe how sustainability can be woven into major topics. Strategy, Sourcing, and Value-chain analysis are specific areas where topics such as triple-bottom-line, total-cost-of ownership, and carbon footprint analysis can be integrated. The structure of classes, useful exercises, and cases will be discussed in the session.

### 015-0034: Cinematic Ticklers for Project Management: A Workshop

*Karen Brown, Thunderbird School of Global Management, United States*

*Nancy Hyer, Owen Graduate School of Management, United States*

Instructors can find useful and memorable lessons for project management in many commercially- and web-available films. Keys to success in using what we call 'Cinematic Ticklers' are: 1) find the right clip, 2) edit it to the essential content, 3) place it in the appropriate spot, and 4) build on it through discussion to deliver a point.

During this workshop, we will discuss the rationale for using video clips, highlight ideas for their most effective use, show a few of our favorites, identify potential pitfalls, and welcome audience input.

## Friday, 3:30- 5:00 Sessions

68	Friday, 3:30- 5:00, Pavilion Ballroom C <b>Session:</b> Heuristic Approaches in Logistics	Track: LM, 4	Chair: Pasi P. Porkka
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**015-0822: Optimisation of Logistics Operations Using Global Positioning Satellite Technology Solutions: A Case Study**

*Roula Michaelides, University of Liverpool, United Kingdom*

*Zenon Michaelides, The University of Liverpool, United Kingdom*

Contemporary logistics are becoming more sophisticated. With increasing demands of responsive, agile, global integration of complex dispersed multi-tiered suppliers, subcontractors and manufacturers, logistics is facing the challenge of moving from straightforward transaction-oriented to open/collaborative supply management. This challenge is visibly demonstrated in distributed supply-networks where multiple providers such as shipping carriers, dock management, hauliers, and manufacturers, are involved in collaboratively fulfilling transactions and services. Cross-organisational connectivity with data visibility and real-time synchronisation across distributed providers is an ongoing challenge for many transport companies. Modern transportation face challenges such as: congestion growth; lower costs; improved customer service; heightened terrorism/theft/security; information-sharing; regional multi-modal logistics growth; and proliferation of new complex tools to optimize/schedule routes. The case study presented focuses on development of an integrated GPS/portal solution with an objective of enhancing control and visibility over inland transport thus improving customer service through the application of next generation information systems, utility computing and web-services.

**015-0870: E-enabling Maintenance, Repair and Overhaul (MRO) Operations for an African Air Transport Operator: A Case Study**

*Zenon Michaelides, The University of Liverpool, United Kingdom*

Air transport remains a highly competitive sector, with the global economic downturn adding to the already challenging operational environment. The International Air Transport Association (IATA) forecast heavy losses of around \$9 billion in 2009, but in reality these losses amounted to \$6 billion in the first half year alone (Seattle Times, 2009). According to Maple (2001), maintenance, repair and overhaul (MRO) costs typically account for 10-20 percent of aircraft-related operating costs, as they are process-intensive and controlled at all levels of the product life cycle in order to meet robust certification requirements. Current methods of managing MRO are limited due to their inherent legacy structures, restricted visibility and reactive modes of operation, leading to excessive operating costs. Such costs account for lost revenue when measured in terms of aircraft downtime. The objectives of this research are to propose new methods of e-enabling MRO operations in global aerospace supply chains.

**015-0947: Study of Cold Chain Logistics Implementation Strategies: Insights from UAE Industry**

*Balan Sundarakani, University of Wollongong in Dubai, United Arab Emirates*

*Mohammed Tamimi, University of Wollongong in Dubai, United Arab Emirates*

This article highlights the concept of cold chain logistics, the importance of cold chain logistics and the role and benefits of cold chain logistics among different industries. Then the article presents the cold chain logistics implementation by taking a case of pharmaceutical drugs industry located in the United Arab Emirates (UAE) and introduces some general cost and concerns of cold supply chain practices associated with this region. Finally, it discusses risks associated with the implementation and potential opportunities of the cold chain logistics in the UAE region.

69	Friday, 3:30- 5:00, Pavilion Ballroom D <b>Session:</b> Panel Discussion	Track: HBOM, 4	Chair: Neil Bearden
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**015-0957: Reviewing Behavioural Operations: A Panel Discussion**

*Neil Bearden, INSEAD, Singapore*

*Elena Katok, Penn State University,*

*Christoph Loch, INSEAD,*

*Karen Donohue, University of Minnesota,*

*Brent Moritz, University of Minnesota,*

*Enno Siemsen, University of Minnesota,*

Research in behavioural operations seems to be growing at an increasing rate. The field is still quite new, and researchers from quite diverse backgrounds have started to do work and publish on behavioural issues. This session will involve a panel discussion of a number of issues than any new field or area (normatively speaking) ought to think through. For example: What have we learned so far from doing behavioural operations? What are the appropriate criteria for reviewing and evaluating a behavioural operations paper? Are there strategies for increasing the impact of behavioural work? Our panel will be quite diverse – in terms of experience, editorial responsibilities, training, etc. – and we will encourage audience participation.

70	Friday, 3:30- 5:00, Port Alberni <b>Session:</b> Designing and Executing an Effective Services Operations Management Course	Track: SOM, 4	Chair: Randall Chapman
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**015-0176: Dynamic Control of the Flexible N Queueing Network under CONWIP with Application to Flexible Shipbuilding**

*Fang Dong, University of Michigan, United States*

*Hoda Parvin, University of Michigan, United States*

*Mark Van Oyen, University of Michigan, United States*

*David Singer, University of Michigan, United States*

The U.S shipbuilding industry faces a difficult challenge of building ships on time and at budgeted cost. We introduce operational flexibility to ship production to alleviate the effects of delays, which ultimately create issues such as high variability in production workload, ineffective production

## Friday, 3:30- 5:00 Sessions

flexible, controlled closed queueing network and propose new heuristic control policies. We employ simulation performance analysis with respect to three performance criteria: (1) throughput rate of blocks, (2) block cycle time, and (3) ship completion time. Under an effective control policy, the flexible CONWIP system can significantly increase the system's block throughput rate, reduce ship completion time, and improve utilization.

### 015-0194: Dynamic Assignment Policies for an "N" Network with Impatient Customers and Finite Queue Capacity

*Hoda Parvin, University of Michigan, United States*

*Mark Van Oyen, University of Michigan, United States*

*Hyun-Soo Ahn, University of Michigan, United States*

In this research we study the dynamic assignment of cross-trained agents to multiple classes of impatient customers. We consider a finite capacity queueing system with a penalty associated with rejecting arriving customers, a queue length dependent on customer reneging rates, lump-sum reneging penalties, and linear holding costs per unit time. We model this problem as a continuous-time Markov decision process and investigate the structure of the optimal assignment policy. We report the sufficient conditions that guarantee the optimality of strict priority policy and characterize the optimal policy properties. We also develop a novel, computationally efficient heuristic algorithm to improve the customer-to-agent assignment process under general parameter regimens. We compare the performance and tractability of our proposed heuristic to other well known assignment policies such as the longest queue and cmu rule.

### 015-0355: Scheduling and Predictive Maintenance via an MDP Model

*John Hasenbein, University of Texas at Austin, United States*

*Erhan Kutanoglu, University of Texas at Austin, United States*

*Yiwei Cai, Freescale Semiconductor, Inc., United States*

In semiconductor wafer fab operations, there has been increasing interest in performing predictive maintenance (as opposed to preventive maintenance). Predictive maintenance integrates information on current WIP and machine status (usually gleaned from model predictive control systems) into a joint decision on maintenance and wafer scheduling. In this work, we develop a stylized Markov decision model to represent the PM process. We give characterizations of the optimal policy in both the single and multiple job type problems, and calculate optimal policies. In some cases, the optimal policies suggest counterintuitive decisions.

### 015-0983: Exploiting Limited Customer Flexibility in Service Systems

*Douglas Down, McMaster University, Canada*

Limited customer flexibility can be observed in many service systems;

for example, bilingual services where a subset of customers are bilingual. More generally, some customers may be willing to receive service at some subset of providers (whether through geographic preference or by perceived value). In this talk, we provide theoretical and numerical studies that suggest that accommodating a small amount of this flexibility can lead to significant performance gains, and suggest some practical scenarios where this may be applied.

### 015-0066: Effective Management of Customer Feedback: Can one trust online product reviews?

*James Fitzsimmons, The University of Texas at Austin, United States*

*Elif Kongar, University of Bridgeport, United States*

*Suleyman Aydogan, University of Bridgeport, United States*

Motivated by the growing importance of E-commerce sales in the US economy, this paper critically evaluates the current online product review process after the purchase. At issue is the reliability of the review provided by an anonymous author. If the author has a vested interest in a "good" review (seller), or a "bad" one (competitor), the review may or may not reflect the actual quality of the product. In this study, the authors analyze product review services of major online sellers, identify the shortcomings of these services and propose a scoring model to ensure reliable feedback to improve the evaluation process. Effective management of a customer community to ensure creation of valued information is addressed.

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Friday, 3:30- 5:00, Port Hardy

Track: TECO, 1

Chair: Maria Gouvêa

Session: Considerations in the Design of Online Retail Services

### 015-0864: Identification of Influencing Factors on Product Purchase Through the Internet

*Sandra Yamashita Nakagawa, University of São Paulo, Brazil*

*Maria Gouvêa, University of São Paulo, Brazil*

The aim of this study was to identify influencing factors in the adoption of online channels for the buying of books, CDs and DVDs. Keeping this aim in mind, the main references adopted were UTAUT (Unified Theory of Acceptance and Use of Technology) model by Venkatesh et al. (2003) and models developed by Heijden, Verhagen and Creemers (2003) and Bramall, Schoefer and McKechnie (2004). A descriptive research was carried out with the approaching of offline buyers of these products, and the collected data were submitted to uni-, bi- and multivariate statistical techniques. Among the main results, it was suggested that factors such as attitude toward using technology, trust and performance expectancy are more important for offline buyers to decide to go online.

### 015-0867: Offline and Online Channels for Requesting Tourist Services

*Maria Gouvêa, University of São Paulo, Brazil*

*Fanny Niño, University of São Paulo, Brazil*

*Mathias Barth, University of São Paulo, Brazil*

## Friday, 3:30- 5:00 Sessions

This study investigated the perceived quality of tourism agencies visited by customers and located in São Paulo city and the willingness of migration of their customers to the Internet in requesting a tourist service. Based on the models SERVQUAL by Parasuraman et al (1988), SERVPERF by Cronin and Taylor (1992 and 1944), TAM2 by Venkatesh and Davis (2000), two types of research were carried out, one of qualitative nature and the other one of quantitative nature, with tourist service users. For the analysis of the results, the cluster analysis technique was applied. The study revealed that there is not an inverse relation between the quality of services of tourism agencies (offline channel) and intention level of requesting tourism services through the Internet (online channel). Thus, the tourism companies may consider the Internet as a partner in the process of conquest and retention of clients.

### 015-0342: The Value of Online Trust Seals and Some Operational Suggestions to Make Best use of Trust Seals in E-commerce

*Koray Ozpolat, University of Maryland, College Park, United States*

*Guadong Gao, University of Maryland, College Park, United States*

*Wolfgang Jank, Univ of Maryland, College Park, United States*

*Siva Viswanathan, Univ of Maryland, College Park, United States*

In this study, using a unique dataset of over a quarter million actual online shopping carts collected by a field experiment, we first validate the value of online trust seals in increasing shopper conversion rates. Then, we find an inverted U-shaped relationship between the number of trust seals at an online store and completion likelihood of the shopping carts. Furthermore, we see that trust seals are more effective on new shoppers and at smaller online stores. Interestingly, the trust seals' impact on cart completion is not influenced by the value of shopping carts. Our findings can be used by e-merchants to re-design their operations processes in management of online trust seals.

### 015-0190: Effects of E-Service Ambition on Resource Profile and Performance of Small Enterprises

*Yun Kyung Cho, University of British Columbia-Okanagan, Canada*

The e-service industry is the emerging economic sector wherein many entrepreneurial ambitions are tested and then go on to prosper. Our research identifies a variety of market ambitions among small brick-and-click retailers, since some target only the local market while others play within an extended market. To understand the relationships between e-service ambition and resource profile, we examine four key resources in e-retailing: market acuity, operational agility, IT human resources, and e-service experience. Our study shows that operational agility is the most critical resource that characterizes these different e-service ambitions, and e-service experience can marginally explain the difference. We also demonstrate that small e-retailers who operate within an extended target market derive a higher performance with respect to objective sales and profit. Our research confirms the significant effects of market ambition on resource profiles and firm performance, thereby delivering an important message to small e-retailers that work under limited resources.

### 015-0536: Adoption of Electronic Government: A Process Paradigm Perspective

*Bahar Movahedi, Carleton University, Canada*

*Ren-Xiang (Paul) Tan, University of London, Canada*

*Kayvan Lavassani, Carleton University, Canada*

The concept of Electronic Government (EG) has evolved significantly during the past few decades. Several development models have been presented to illustrate the advancement and adoption of EG practices. The recent developments in the EG adoption, which emphasizes the process view of the EG, calls for a new perspective to EG adoption. Based on the review of most cited stage models of EG adoption, a comprehensive stage model is recommended. This paper utilizes the proposed six-stage model and recommends a process-based framework for analyzing the EG adoption. Furthermore, the stages of EG adoption are described from the process development perspective.

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Friday, 3:30- 5:00, Port McNeill

Track: OMF, 4

Chair: Seung-Jae Park

Session: Supply Chain Value

### 015-0776: Optimal Redistribution Policies

*Sridhar Seshadri, University of Texas at Austin/ IROM department, United States*

*Seung Jae Park, University of Texas at Austin/ IROM department, United States*

We study a multi-period supply-demand matching problem in which selling prices and demand are uncertain and negatively correlated. Products are distributed to a retailer at the beginning of a period, and an abundance (or shortage) is redistributed to other retailers under a previously fixed strategy. We analyze two strategies. One is purchasing (or selling) in market prices from other retailers when the demand is more (or less) than inventory. The other is borrowing (or lending) physical products, and then returning (or receiving) products without financial transactions in next period. We (will) show that the strategy without financial transactions is more profitable than that with financial transactions.

### 015-0627: A Model for an Integrated Fare Pricing and Seat Allocation for the Airline Industry

*Syed Raza, Qatar University, Qatar*

*Idress Al-Malik, Qatar University, Qatar*

*Waheed Uzzman, Qatar University, Qatar*

The aviation industry is perhaps among the service industries that face precarious market situations, yet it requires large capital for its operations. At present, airlines need to adopt sound scientific methodologies to improve their revenues. Airlines could improve their revenues by developing strategies in four distinct categories: forecasting, overbooking, seat inventory control and pricing. Each of these categories is well researched; however, in the experts' opinion, an integrated strategy may lead to significant revenue gains. Besides this fact, it is not uncommon to notice that customers select among substitutable products based upon several rationalities, but the price is the paramount factor that leads to a purchase decision. This research presents a model for an airline which enables the exercise of fare pricing and seat inventory control jointly in order to maximize its revenue. The proposed model is studied using simulation-based numerical experimentation.

## Friday, 3:30- 5:00 Sessions

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### **015-0497: Outsourcing Contract Selection and Timing Decisions Under Cost Uncertainty**

*Tao Yao, Pennsylvania State University, United States*

*Susan Xu, Pennsylvania State University, United States*

*Yongma Moon, Pennsylvania State University, United States*

*Bin Jiang, DePaul University, United States*

This paper studies how a pre-outsourcing firm facing uncertain operating costs selects the right outsourcing contract and decides the optimal outsourcing timing. We develop a real options model to investigate the value of this firm's option to outsource and the choice between a fixed-price contract and a cost-plus contract, the two common types of outsourcing contracts. We show that this option value can be significant and plays a key role in outsourcing contract selection and timing decisions. Our results may help managers gain a better understanding of the closely intertwined relationship between the contract type and contract timing, so that they can make appropriate outsourcing decisions.

## Saturday, 8:00- 9:30 Sessions

73	Saturday, 8:00- 9:30, Finback <b>Session:</b> Supply Chain Management 4	Track: SCM, 13	Chair: Xinghao Yan
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### 015-0734: Benchmarking Component Allocation Rules in Assemble-To-Order Systems

*Kai Huang, McMaster University, Canada*

In a multi-product, multi-component Assemble-To-Order system, component allocation policy (i.e., rationing policy) has a big influence on the system cost and service performance measures. In this research, we use three exact component allocation models to test the performance of the component allocation policies in the literature. The three models aim at aggregate cycle service level maximization, aggregate fill rate maximization, and overall operational cost minimization, separately. Furthermore, while most existing policies use First-Come-First-Serve (FCFS) as the first principle in component allocation, we propose and test three classes of non-FCFS component allocation rules, i.e., Current-Come-First-Serve, priority based allocation, and myopic optimization. By using the exact models as benchmarks, we are able to compare the FCFS and non-FCFS rules. The major observation is that the non-FCFS rules can significantly increase the service levels or decrease the system costs, with the price of increasing the system variability.

### 015-0486: Seat Pricing and Inventory Management with Last Minute Getaways

*Srinivas Krishnamoorthy, Richard Ivey School of Business, University of Western Ontario, Canada*

We model the seat pricing and inventory management problem of an airline supplying seat inventory to a "last minute getaway" merchant like Expedia. We focus on a single flight leg and allow demand to be of two types: "regular" customers and "last minute getaway" customers. "Regular" customers choose a fare from the ones made available by the airline. We incorporate a customer choice model to capture the buying process of "regular" customers. "Last minute getaway" customers do not observe the airline fares; instead, their request arrives via the travel merchant with a specific revenue amount. At any point in time, the airline has to choose the set of fares to keep open to "regular" customers. Simultaneously, the airline may have to decide whether to accept/reject a seat request from a "last minute getaway" customer. We provide managerial insights about the revenue benefits of selling to "last minute getaway" customers.

### 015-0236: Combating Strategic Counterfeiters in Licit and Illicit Supply Chains

*Soo-Haeng Cho, Carnegie Mellon University, United States*

*Xin Fang, Carnegie Mellon University, United States*

*Sridhar Tayur, Carnegie Mellon University, United States*

Today counterfeit products are being produced and consumed in all economies. They are in a wide range of simple to sophisticated products including items that have an impact on personal health and safety. When a counterfeiter sells his goods as low-price substitutes for brand-name products, he tends to distribute the goods through illicit supply chains. Conversely, a counterfeiter must break into licit supply chains of brand-name products when he intends to deceive consumers. Using a normative model of counterfeiting, we show how a counterfeiter's decisions of his price, quality and type depend on product characteristics and counterfeit costs and risks. Understanding such decisions of a counterfeiter is important because they have a significant impact on the effectiveness of anti-counterfeiting strategies of industry and governments. Although it is ideal that strategies which are effective against counterfeiting also benefit consumers, we find that this is not always the case.

### 015-0463: Quality Improvement and Supplier Selection

*Xinghao Yan, Richard Ivey School of Business, University of Western Ontario, Canada*

*Hui Zhao, Krannert School of Management, Purdue University, United States*

*Kwei Tang, Krannert School of Management, United States*

We explore quality-based supplier selection when quality can be improved and quality itself also exhibits some uncertainty. To hedge against the quality uncertainty, the buyer can choose from two different approaches in selecting the supplier. With a quality requirement approach (QR), the buyer first posts quality requirements and other associated strategies to the potential suppliers and selects a supplier based on the reactions from the suppliers. With a quality promise approach (QP), the buyer first requests each supplier to provide a quality promise and other associated strategies, based on which she selects a supplier. We investigate how these two different approaches affect the suppliers' / buyer's quality improvement efforts, their costs, and the social welfare. We find that while achieving the same final product quality as what the first-mover's efficiency allows, QR and QP can not achieve what the second-mover's efficiency allows. Further, the first-mover right does not always benefit the buyer.

74	Saturday, 8:00- 9:30, Galiano <b>Session:</b> Buyer-Supplier Relationships 1	Track: SCM, 14	Chair: Ian Stuart
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### 015-0047: Examining Exchange Conditions and the Role of Reciprocity in Buyer-Supplier Relationship

*Christina Wong, The Hong Kong Polytechnic University, China*

*Kee-Hung Lai, The Hong Kong Polytechnic University, China*

*T.C.E. Cheng, The Hong Kong Polytechnic University, China*

*Venus Lun, The Hong Kong Polytechnic University, China*

Recognizing the importance of relationship continuity between buyers and suppliers for business gains from the theoretical perspectives of (i) relational governance, (ii) social embeddedness, and (iii) transaction cost economics, we empirically examine a model on how trust and exchange conditions (namely business uncertainty, explicit contract, and implicit control), together with the moderating role of reciprocity affect relationship continuity in buyer-supplier relationship (BSR). Our survey data collected from 358 suppliers indicate that trust is positively associated with reduced business uncertainty as well as more severe explicit contract and implicit control in BSR, where all these exchange conditions were found to have positive links with relationship continuity. We found further that the positive link between explicit contract and relationship continuity is strengthened

## Saturday, 8:00- 9:30 Sessions

when the reciprocity in BSR is high, whereas such moderating effect of reciprocity on relationship continuity does not exist for the other two exchange conditions.

### **015-0660: Buyer-supplier Relational Characteristics: An Autoethnographic Research in a Brazilian Subsidiary of a European Multinational Firm**

*Gustavo Pereira, Fundação Getulio Vargas - SP, Escola de Administração de Empresas de São Paulo, Brazil*

*Susana Pereira, Fundação Getulio Vargas - SP, Escola de Administração de Empresas de São Paulo., Brazil*

Multinational firms are increasing their investments and business in Brazil. Relationships are one of the most important elements in Brazilian business culture. This includes dealing with suppliers, an issue that Procurement is in charge of. Carr and Pearson (1999) affirm that a strategic procurement function is important for the firm's success as to implement supplier evaluation systems. This article investigates the negotiation process in a subsidiary of an European multinational firm with operations in Brazil, based on the Lamming et al. (2008) relationship evaluation model. The methodology applied is autoethnography – a reflective writing genre in which the researcher becomes the object of inquiry. Data were gathered through observations, interviews and documentation. Results are based on reflections and impressions collected by the author. Relationship based on transaction characterizes the process that was observed. Conflict and power-dependence were predominant; interpersonal inconsistency was evident.

### **015-0737: Two Faces of Collaborative Buyer-Supplier Relationships: Social Capital versus Social Liability**

*Verónica Villena, IE Business School, Spain*

*Elena Revilla, IE Business School, Spain*

*Thomas Choi, Arizona State University, United States*

Many SCM scholars have argued the benefits of having a collaborative buyer-supplier relationship (BSR). However, in addition to this “bright side,” this study posits there is a downside or “dark side” to such a relationship. Building on social capital and SCM literature and using data from a sample of 130 Spanish firms, we argue and empirically confirm that there is an inverted curvilinear relationship between social capital and performance: both too little and too much of social capital hurt value creation. On the one hand, fostering social capital improves a buyer's ability to leverage resources available within a BSR. On the other hand, if taken to extreme, it can reduce the buyer's ability to be objective and make effective decisions as well as increase its supplier's opportunistic behavior. We conclude by discussing the implications of our arguments for SCM literature and social capital literature.

### **015-0228: Trust in Buyer-Supplier Relationships: Relevance Lost or Semantic Differences?**

*Ian Stuart, UBC Okanagan, Canada*

*Jacques Verville, UBC Okanagan, Canada*

*Nazim Taskin, UBC Okanagan, Canada*

Trust between buyer and supplier firms has played an integral role in recent supply chain research. As firms have pursued a more collaborative approach to supplier-buyer governance, scholars have pointed to the development of trusting relationships as an insurance policy against supplier greed and guile. However, there is considerable scholarly debate about the relative importance of two approaches towards building trust: interpersonal relationship enhancement and the supplier's repeated achievement of performance objectives. Using survey data and structural equation modeling, our research suggests that, under most circumstances, going the extra mile in building interpersonal bonds (e.g. exchange of personnel) is irrelevant for building trust. Instead, the emphasis should be placed on ensuring the suppliers' achievement of basic contract terms such as on-time delivery and quality conformance. These turn out to be the normative industry understanding of the term “trust,” at least within a North American context.

### **015-0420: Predicted and Routine Supply Chain Risks Are More Important than Unknown Risks: Managerial Perspectives on Supply Chain Disruption Risk**

*Amrik Singh, Aston Business School, United Kingdom*

*Naomi Brookes, Loughborough University, United Kingdom*

*David Bennett, Aston Business School, United Kingdom*

Supply Chain Risk Management (SCRM) has become a popular area of research and study in recent years. The aim of this paper is to explore the managerial perspectives of an aerospace manufacturer with regard to supply chain disruption risk. These include a discussion and analysis of ways of improving risk management in the supply chain, through social network information gathering and push and pull concepts of risk information management. This allowed discussions of the ideal position of the organisation's SCRM information management system, in terms of push and pull concepts. Two focus groups were conducted within an aerospace manufacturer to discuss the managerial views of SCRM. These were then thematically analysed using NVivo 8. Emergent themes from the discussions were that predicted and routine risks are more important than unknown risks. These routine risks are managed through internal and external information gathering through individuals in the supply chain.

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Saturday, 8:00- 9:30, Grand Ballroom A

Track: SCM, 36

Chair: Srinagesh Gavirneni

Session: POMS College of Supply Chain Management Student Paper Competition

### **015-0999: College of Supply Chain Management Student Paper Competition - Finalists' Presentation**

*Srinagesh Gavirneni, Cornell University, United States*

*Michael Fry, University of Cincinnati, United States*

This session will contain the presentations of 3-5 finalists from the College of Supply Chain Management Student Paper Competition.

## Saturday, 8:00- 9:30 Sessions

76	Saturday, 8:00- 9:30, Grand Ballroom D <b>Session:</b> Optimization Models in Health Care	Track: HOM, 9	Chair: Yue Zhang
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### 015-0014: Improving Processes and Quality within Healthcare Operations: Issues, Root Causes and Options

*Cyril Foropon, I.H. Asper School of Business, University of Manitoba, Canada*

*Genevieve Desbiens, HEC Montreal/CSSS Ahuntsic Montreal-Nord, Canada*

The concern with process improvement within healthcare provider organizations is explained by the escalating pressures to simultaneously increase service effectiveness and efficiency while maintaining service quality. The purpose of this presentation is to provide an overview of both operating issues and operations management (OM) options with which several concerned healthcare providers have dealt with. Options focusing on process improvement do not necessarily take into account service quality. We try to present a portrait of the reasons why these options and their respective contribution are valuable or not to process versus quality improvement with a view to give healthcare managers a better understanding of their choices implications for service quality.

### 015-0071: Access Blocking of ER Patients at an Academic Hospital: A TPS Approach.

*Paul Gemmel, Ghent University, Belgium*

Emergency rooms (ER) in acute care hospitals are regularly confronted with the phenomenon of overcrowding (Weiss et al., 2004). One of the major causes of overcrowding is access blocking (Forero et al., 2004). Access blocking can be labeled as one of the most important problems of the urgency medicine in a hospital context (Richardson, 2002). In this study some basic principles of the Toyota Production System are used to trash out the problem of access blocking at the Ghent University Hospital, a large 1,000-bed academic hospital in Belgium (Gemmel et al., 2009). Using the 4P-model of the Toyota Way (Liker, 2004), the case study clearly shows how Genchi Gembutsu and Hejunka were useful principles. One of the major lessons of the case study is that access blocking is not only an operational problem, but also the result of different work cultures in the ER and the nursing departments.

### 015-0061: Assessing the Service Quality of Executive Education Programs: SERVQUAL Gap Analysis of an OM/SCM Program for Healthcare Professionals

*Cyril Foropon, I.H. Asper School of Business, University of Manitoba, Canada*

*Laoucine Kerbache, HEC Paris, France*

Service quality in higher education has been a somewhat under-researched area, and where investigations have been undertaken, the SERVQUAL scale tends to be largely ignored (Barnes, 2007), even if it is largely used elsewhere in the service sector. This study analyses the service quality of an executive education program in operations and supply chain management for healthcare professionals. Firstly, we have conducted a preliminary analysis of satisfaction questionnaires filled in by the participants of the 2007/2008/2009 cohorts. Secondly, we used the SERVQUAL instrument (Panasuraman et al., 1988) with the 2010 cohort to draw comparisons between healthcare organization top management and professionals regarding their expectations and perceptions of the program. Both analyses deepen our understanding of issues related to executive education services to healthcare professionals. Preliminary results are reported and tentative recommendations are formulated.

### 015-0130: Improving Hospital Processes with the Two-bin Kanban Replenishment System

*Sylvain Landry, HEC Montréal, Canada*

*Richard Philippe, Logi-D Inc., Canada*

Lean healthcare has emerged in recent years as a way of using innovative ideas to improve hospital processes. Among the lean healthcare tools used by hospitals in a wide range of countries is the two-bin kanban system. In our presentation, we will address how the two-bin system can increase the efficiency of hospitals and reduce various types of waste, including surplus inventory, expired products, and unnecessary staff movements, through built-in stock rotation and visual controls, among others. We will also address how recently introduced technologies, such as RFID and voice recognition, enhance the performance of the two-bin system by, respectively, allowing the status of stock on wards to be known in real time and providing mistake-proofing or poka yoke features during the put away process. These latest innovations also have the potential to generate new research opportunities in healthcare operations management.

77	Saturday, 8:00- 9:30, Granville <b>Session:</b> Quality and Performance indicators	Track: HOM, 10	Chair: Jami Kovach
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### 015-0300: Nurse Scheduling with Censored Data

*Wen-Ya Wang, Industrial and Systems Engineering Program, Univ. of Minnesota, United States*

*Diwakar Gupta, Industrial & Systems Engg., University of Minnesota, United States*

*Sandra Potthoff, Div of Health Policy and Mgmt, Sch of Public Health, Univ. of Minnesota, United States*

Large hospitals provide varying levels of patient care by grouping inpatient beds into nursing units, each specializing in caring for patients with certain diagnoses. Hospitals need to determine a target level of nurses to have in each unit by shift and by day of week to develop nurses' work schedules. Choosing the right targets is difficult because nursing needs' distributions are difficult to estimate from available data. A key problem arises on account of data censoring, which occurs when patients are turned away because a unit reached its staffed-bed capacity. Hospitals do not track turn-aways. We propose a series of models to assist hospital managers in estimating nursing needs' distributions and setting staffing targets for groups of interchangeable units that serve patients with similar diagnoses. We also propose models for disaggregating nursing needs by unit and investigate the interactions between patient placement rules and the choice of disaggregation strategy.

### 015-0301: Effect of Integrated Scheduling and Capacity Policies on Clinical Efficiency

*Denise White, College of Business, University of Cincinnati, United States*

## Saturday, 8:00- 9:30 Sessions

**Craig Froehle**, College of Business, University of Cincinnati, United States

**Kenneth Klassen**, Department of Finance, Operations & IS, Brock University, Canada

In outpatient clinics, capacity, patient flow and scheduling policies are rarely managed in an integrated fashion. A question of interest is whether clinic performance can be improved if decisions on these aspects are integrated. Despite the importance of this issue, we find no concentrated study of how the allocation of capacity paired with various appointment scheduling policies affects end-to-end patient flow and clinic efficiency. An empirically-based discrete-event simulation is used to examine the interactions between patient appointment policies and capacity allocation policies and how they affect various performance measures, such as resource utilization and patient waiting. Findings suggest that scheduling shorter appointments earlier in the clinic results in shorter overall patient waiting without reducing physician utilization or increasing clinic duration. Additionally, exam rooms exhibited classic bottleneck behavior: there was no effect on physician utilization by adding exam rooms beyond a certain threshold, but too few was devastating to clinic throughput.

### 015-0302: Improving Appointment Scheduling with Data Mining

**Michele Samorani**, Leeds School of Business, University of Colorado at Boulder, United States

**Linda LaGanga**, Director of Qual Sys & Operational Excellence, Mental Health Center of Denver, United States

Efficiently scheduling clinic appointments leads to better resource allocation and ultimately to lower health care costs. LaGanga and Lawrence (2007) showed that overbooking can increase expected overall clinic performance in the presence of no-shows. In their model every appointment has the same probability of no-show and overbooking policies are applied uniformly throughout the clinic session without regard to specific patient probabilities of showing up. We apply data mining techniques to actual clinical data in order to predict the no-show probability of patients, and we use this information to formulate a stochastic mathematical model to schedule appointments with the goal of maximizing the expected overbooking utility function. We show that by using the information learned through the data mining process the clinic performance significantly improves, and that this improvement is positively correlated to the computational effort performed upfront by the data mining process.

### 015-0303: New Inventory Policies in Health Care: Taking Advantage of Technology

**Claudia Rosales**, University of Cincinnati, United States

**Michael Magazine**, University of Cincinnati, United States

**Uday Rao**, University of Cincinnati, United Arab Emirates

Healthcare providers are investing in new technology to improve availability of supplies and reduce total costs, allowing the use of inventory policies not previously considered. For a small-to-moderate number of items we study a hybrid inventory policy that combines the advantages of periodic replenishment, to achieve economies of scale, with the flexibility of out of period replenishments to respond to imminent stockouts. We discuss the benefits of this new policy versus traditional policies under single and multiple item scenarios. For large number of items we consider a two-bin policy motivated by lean principles. Under a two-bin policy all items are stored in two bins. Replenishment of items can be triggered by the accumulation of empty bins with no need to track individual item inventory continuously. The benefits of the two-bin policy are discussed.

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Saturday, 8:00- 9:30, Junior Ballroom A

Track: PITM, 5

Chair: Svenja Sommer

Session: Issues Related to Product Design and Development

### 015-0494: Unintended Consequence of Front-loading in New Product Development: Shortcutting Concept Development

**Sebastian Fixson**, Babson College, United States

**Tucker Marion**, Northeastern University, United States

Front-loading has been suggested as a way to improve product development performance by earlier and faster problem-solving activities (Thomke & Fujimoto, 2000). In particular, it advocates shifting simulation and testing with help of physical prototypes late in the process – a slow and expensive activity – to doing similar activities with virtual prototypes (e.g., 3D-CAD) that allow faster and less costly iterations and can be conducted earlier in the process.

In a longitudinal comparison, we study two similar PD projects, one conducted in 2001, the other in 2009. Our findings confirm that the use of 3D-CAD has significantly increased, but we do not find substantial differences in product development performance. In-depth analysis reveals that front-loading can be associated with a temptation to short-cut the up-front concept development phase, which risks eliminating some of the advantages achievable through front-loading.

### 015-0887: Social Influence and Product Strategies

**Jiong Sun**, Illinois Institute of Technology, United States

**Tao Chen**, University of Maryland, United States

**Jinhong Xie**, University of Florida, United States

Consumers who want to signal their uniqueness gain social utility if their products contrast with others, whereas those who wish to conform gain social utility by acquiring what others already have. We analyze how such socially-driven preferences affect firms' new product design and marketing decisions. Specifically, we examine when to introduce a new version of a product, and how to differentiate the new version from the existing ones in terms of technical content and exterior form.

### 015-0412: Product Modularity and Consumer Valuation of Upgradeable Products

**Sezer Ulku**, Georgetown University McDonough School of Business, United States

**Glen Schmidt**, University of Utah, United States

**Claudiu Dimofte**, McDonough School of Business Georgetown University, United States

While product modularity is often advocated as a design strategy in the operations management literature, little is known about how customers react to modular products. In this paper we undertake several lab experiments to explore consumer response to modularly upgradeable products in settings featuring technological change. First, we show that consumers tend to undervalue (overvalue) the savings from upgrades that become

## Saturday, 8:00- 9:30 Sessions

perceived effort or increase the utility associated with the modular alternative.

### 015-0329: Product Rollover Decisions During Regulatory Changes

*Svenja Sommer, HEC Paris, France*

*Ananth Iyer, Purdue University, United States*

*Mohammad Saoud, Purdue University, United States*

New environmental regulations are imposing increasingly strict standards on manufacturers, requiring them to redesign products and cease producing older versions by a specific date. We consider the technology choice made by the manufacturer during redesign and its effect on product availability of both product versions to the distribution channel. Among other topics, we explore how the product architecture and competition affects the technology choice of manufacturers facing such regulatory changes.

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Saturday, 8:00- 9:30, Junior Ballroom B

Track: OMM, 8

Chair: Muge Yayla-Kullu

Session: OMM8

### 015-0104: Assortment Planning for Vertically Differentiated Products

*Dorothee Honhon, University of Texas at Austin, United States*

*Xiajun Pan, University of Texas at Austin, United States*

We consider the problem of a retailer managing a category of vertically differentiated products. The retailer has to pay a fixed cost for each product included in the assortment and a variable cost per product sold. Quality levels, fixed and variable costs are exogenously determined. Customers differ in their valuation of quality. First, we consider a setting in which the selling prices are also fixed and the retailer's only decision is to determine the set of products to offer. We develop an efficient algorithm to identify an optimal assortment. Second, we consider a setting in which the retailer also determines the selling prices. We develop several efficient algorithms to identify an optimal assortment and optimally price the products.

### 015-0280: Influencing Tailgaters through Strategically Managing Information in R&D Projects

*Manu Goyal, University of Maryland, United States*

*Yi Xu, University of Maryland, United States*

Information on current R&D pursued by a 'Leader' firm inevitably gets disseminated to competing tailgaters. These tailgaters leverage this information to customize their own research foray, thereby competing away potential gains of the Leader firm. We show that the Leader firm therefore strategically manages the information emanating from its R&D endeavor. Such information management often distorts the optimal R&D investment made by the Leader – the distortion depends critically on whether the uncertainty is on the technological dimension of the R&D project, or on the market potential.

### 015-0353: Pricing and Assortment Decisions for a Manufacturer Selling through Dual-Channels

*Betzabe Rodriguez, University of Puerto Rico, United States*

*Goker Aydin, Indiana University Bloomington, United States*

In many supply chains, the manufacturer sells not only through an independent retailer, but also through its own direct channel. This work studies the pricing and assortment decisions in such a supply chain in the presence of inventory costs. In our model, the retailer offers a subset of the assortment that the manufacturer offers through its direct channel. We model the customer demand by building on the nested-logit model, which captures the customer's choice between the manufacturer and the retailer. This model produces several insights into the optimal pricing strategies of the manufacturer. For example, we find that variants with high demand variability will carry a lower wholesale price. Furthermore, we characterize scenarios in which the manufacturer's and retailer's assortment preferences are in conflict. In particular, the manufacturer may prefer the retailer to carry items with high demand variability while the retailer prefers items with low demand variability.

### 015-0005: Asymmetric Competition in Vertically Differentiated Markets

*Muge Yayla-Kullu, RPI Lally School of Mgmt. Tech., United States*

*Jayashankar Swaminathan, Kenan-Flagler Business School, UNC-CH, United States*

We study an asymmetric Stackelberg competition in a vertically differentiated market. The products are differentiated by their quality, unit cost and resource consumption levels. Customers are heterogeneous in their willingness to pay for quality. In this context, we investigate how a traditional incumbent would respond to a focused strategy entrant that has to make capacity investments. We discuss the implications on product variety and capacity choices.

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Saturday, 8:00- 9:30, Junior Ballroom C

Track: SOHL, 6

Chair: Benita Beamon

Session: Sustainable Development and Operations

### 015-0854: Social and Environmental Agreement and Conflicts Involved in Urban Solid Waste Management: The Case of Caximba Landfill in Brazil

*José Lopes, UFMS, Brazil*

*Adriane Queiroz, UFMS, Brazil*

*Luís Pereira, FGV-EAESP, Brazil*

This research analyzes urban solid waste management in the region of Curitiba, Brazil. It is based on the premise of the institutional changes

## Saturday, 8:00- 9:30 Sessions

environmental conflicts. The hypothesis is that although there is an environmental limitation of a landfill combined with resilience, agreement and conflicts among public agents involved, it does not have disruption of institutional rules about urban solid waste management in this region. To investigate this hypothesis, an empirical research was carried out with the use of a case study at Caximba Landfill. Results show that there are established relationships among the parts involved in this matter. However agreements related to management proposals do not eliminate the main problem identified here as the first source of urban solid waste: today's standard of consumption.

### 015-0873: The Influence of Innovation Management for Sustainable Development Practices in the Internationalization Process

*Clandia Gomes, Santa Maria Federal University, Brazil*

*Isak Kruglianskas, São Paulo University, Brazil*

*Flavia Scherer, Santa Maria Federal University, Brazil*

*Lucia Rejane Madruga, Santa Maria Federal University, Brazil*

A survey was carried out on Brazilian industrial companies with innovative characteristics, and its aim was to provide new inferences on the relationships between the management of technology information, sustainable development and the innovative performance of the companies studied. The study seeks to understand how management practices of technological innovation that take social and environmental responsibility into account influence the internationalization process of companies. The independent and dependent variables suggest the existence of an association between the management of technology for sustainable development and the innovative performance. We sought to identify the main technological management practices that showed commitment to sustainable development. The results suggest that the company's international success and high degree of competitiveness are based on its offering innovative technology solutions that show a commitment to the environment. The study identifies important elements of an emerging knowledge area in the field of management sciences.

### 015-0520: Environmental Sustainability in Support of Disaster Resilience in Food Supply Chains

*Caroline Krejci, University of Washington, United States*

*Benita Beamon, University of Washington, United States*

Large-scale natural disasters can critically damage food supply chains, thereby potentially destroying a community's source of food security as well as its economic means. A food supply chain's ability to recover depends on many factors, including the severity, type and predictability of the disaster; the characteristics of the affected region; the structure of the supply chain; and the food production practices of the region. Of particular interest are relationships between a food supply chain's resilience to disasters and the presence of environmentally-sustainable structures/practices within the supply chain. If such relationships exist, the challenge is to determine which structures/practices are most appropriate, given disaster and regional characteristics, and to implement them to provide the greatest resilience against future disasters. This paper describes food supply chain structures/practices and relates them to environmental sustainability, and then discusses the degree to which these structures/practices support the supply chain's resilience to disasters.

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Saturday, 8:00- 9:30, Junior Ballroom D

Track: SOHL, 7

Chair: Fuminori Toyasaki

Session: Supply Chains for Humanitarian Relief operations

### 015-0147: Reducing the "Gap of Pain": An Operations Management Strategy

*Curtis Heidtke, U.S. Naval Postgraduate School, United States*

*Aruna Apte, U.S. Naval Postgraduate School, United States*

*Javier Salmeron, U.S. Naval Postgraduate School, United States*

In large-scale domestic disasters, a temporal gap frequently develops between the exhaustion of state and local resources and the arrival of federal resources. To date, approaches to the problem of ensuring timely delivery of needed goods and services to a disaster zone have been largely ad hoc, reactive and tactical in nature. We propose a strategic approach that integrates preemptive optimization tools with more conventional means, such as surge transportation. We introduce a prototypic tool that demonstrates the importance of accurately assessing required system capacity across a range of variables and a variety of scenarios. We conclude that this or a similar tool could permit long-range strategic planning to achieve optimal system capacity and therefore, reduce the "gap of pain."

### 015-0172: The Impact of Funding Systems on Humanitarian Operations

*Tina Wakolbinger, University of Memphis, United States*

*Fuminori Toyasaki, Atkinson Faculty of Liberal and Professional Studies, York University, Canada*

The paper explores the interdependence of financial flows and material flows in humanitarian relief operations. Specifically, the paper shows how the characteristics of funding flows and the structure of funding systems impact humanitarian operations. Based on insights concerning this interrelationship, we provide recommendations on how to improve funding systems to ensure that donations are used in the most effective and efficient way.

### 015-0221: Decision Making During Emergencies

*Paulo Goncalves, University of Lugano, Switzerland*

How many people need assistance in a disaster affected area? How many items (water jerry-cans, blankets, etc.) should be pre-positioned in a regional depot? How much money should organizations appeal for? Correctly answering such questions during emergencies may make the difference between an effective and an ineffective relief operation. The research presents a number of experiments on common humanitarian relief situations. We evaluate the decisions of trained humanitarians and discuss possible causes.

### 015-0049: An Analysis of Fundraising Strategies for Disaster Relief Operations

*Fuminori Toyasaki, York University, Canada*

## Saturday, 8:00- 9:30 Sessions

**Tina Wakolbinger**, *University of Memphis, United States*

Aid agencies involved in disaster relief are currently facing multiple changes and challenges in their environment: increasing demand for disaster relief, increasing competition for donations, and donors who are more demanding in terms of accountability. Aid agencies employ different strategies to deal with these trends. We analyze the impact of three aid agencies' strategies: cooperation, differentiation, and allowing donors to earmark donations.

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Saturday, 8:00- 9:30, Orca

Track: CIM, 5

Chair: Tolga Aydinliyim

Session: Capacity Management Models

### 015-0338: Supply Side Story: Risks, Guarantees, Competition and Information Asymmetry

**Mehmet Gumus**, *McGill University, Canada*

**Saibal Ray**, *McGill University, Canada*

**Haresh Gurnani**, *University of Miami, United States*

The risk of supply disruption has increased as firms have started procuring more from cheaper, but unreliable, suppliers. In this paper, we model a supply chain comprising a single buyer and two suppliers who compete for the buyer's order. One of the suppliers is more expensive but reliable, while the other (unreliable) one is cheaper but faces risk of supply disruption. The risk level of the unreliable supplier might be private information for her, and this lack of visibility further contributes to the buyer's purchasing risk. In such settings, the unreliable supplier often offers a price and quantity (availability) guarantee to the buyer as part of her contract terms. Our objective is to understand the underlying motivation for such a guarantee offer and the effects such an offer have on the performance of the chain partners.

### 015-0496: Capacity Allocation and Sharing Games

**Zhixin Liu**, *University of Michigan - Dearborn, United States*

**Nicholas Hall**, *The Ohio State University, United States*

Two problems are investigated. First, we consider a joint capacity ordering game where multiple manufacturers order capacity from a common supplier. Each manufacturer receives revenue and incurs a scheduling cost as a function of its order completion time if capacity is allocated to process its order. Second, we consider a capacity sharing game where multiple manufacturers share their allocated capacity to process their orders, where each order generates a profit if processed. For both the problems, mechanisms for capacity and profit allocation are designed to facilitate the coordination of the manufacturers.

### 015-0741: Capacity Allocation and Scheduling with Multiple Products

**Selcuk Karabati**, *Koc University, Turkey*

We consider the capacity allocation and scheduling problem in the presence of buyers with demands for bundles of products. The multi-product facility of the supplier can process at most one unit of a product at any time. The objective of the supplier is to maximize the revenue generated by selling the products, minus the production and inventory holding costs. Similarly, the objective of each buyer is to maximize the difference between the time-dependent utility of the bundle she wants to buy and the price of the bundle. We develop ascending price auctions where products are considered as market goods, and introduce anonymous and linear pricing strategies that include quantity discounts, time-dependent product and delivery prices. After we discuss the properties of the Winner Determination Problem under different pricing strategies, we present a computational analysis of the allocation efficiency of the proposed pricing strategies.

### 015-0377: Time-Sensitive Capacity Allocation Issues in Subcontracting

**Tolga Aydinliyim**, *University of Oregon, United States*

**George Vairaktarakis**, *Case Western Reserve University, United States*

We study the subcontracting strategies of a manufacturer utilizing processing capacity both in-house and at a third-party common to competing manufacturers. In this setting, a time-sensitive capacity allocation problem arises, since every manufacturer balances the in-house production and outsourcing costs, his sensitivity to delay, and the effects of competitors. We evaluate the third-party's and the manufacturers' performance in both centralized and equilibrium schedules, and provide a transfer payment scheme that ensures a grand coalition of manufacturers.

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Saturday, 8:00- 9:30, Parksville

Track: EROM, 5

Chair: Linderman Kevin

Session: Quality Learning, and Coordination

### 015-0164: Contingency Theoretic Quality Management Research

**Tom Foster**, *Brigham Young University, United States*

In this presentation we present the results of contingency-based research. First, we discuss a method for identifying quality context and its influence on firm performance. This research utilizes the Adam (1994) survey instrument to identify contextual variables. We then examine these variables to gauge their influence on operational and financial results in a firm. Second, we adopt a contingency perspective to study the consistency between quality improvement approaches used within a firm. We then performed discriminant function analysis which identified two independent functions that were utilized to different extents in different plants within a firm. Third, we generalize and present a model for informing practitioners about contingency theory. Finally, suggestions for future research in this area are proposed.

### 015-0287: The Moderating Role of Contextual Factors: Performance Implication of Quality Exploitation versus Quality Exploration

**Dongli Zhang**, *Fordham University, United States*

**Roger Schroeder**, *University of Minnesota, United States*

This study investigates how certain contextual factors influence the relationship between QM practices and manufacturing performance. It

## Saturday, 8:00- 9:30 Sessions

practices: Quality Exploitation (QEI) and Quality Exploration (QER). The moderating effects of two contextual factors on the relationship between QER, QEI, and operational performance are empirically investigated: organizational structure and environmental uncertainty. The results provide strong support for the context-dependent argument of QM practices. The findings also provide useful guidance for managers to customize the QM programs to gain more performance benefits.

### 015-0317: A Contingency Theory Perspective of Explorative and Exploitative Learning

*Aravind Chandrasekaran, Ohio State University, United States*

*Hung-Chung Su, University of Minnesota, United States*

*Kevin Linderman, University of Minnesota, United States*

This research develops a contingency explanation to the exploration-exploitation dilemma. Given the inherent tension between exploration and exploitation learning mechanisms, organizations often struggle to balance resources along both these learning dimensions to obtain superior performance. This study classifies 750 public organizations into four distinct learning clusters: Balancers, Explorers, Exploiters and Trend Setters. The analysis reveals that the effectiveness of investments in explorative and exploitative learning depends on industry clockspeed and competitive intensity.

### 015-0777: The Contribution of an Integrated Management System to the Manufacturing Strategy: A Case Study

*Sergio Pepino, Pontificia Universidade Catolica do Parana, Brazil*

*Sergio Gouvea da Costa, Pontificia Universidade Catolica do Parana, Brazil*

*Edson Pinheiro de Lima, Pontificia Universidade Catolica do Parana, Brazil*

This article studies the contribution of the implementation of an integrated management system (Quality, Environmental and Healthy and Safety Systems) to manufacturing strategies. A case study was carried out in an automotive company in the south region of Brazil. After the development of a conceptual framework, the study searched for the identification of the predominant characteristics of the integrated system and their utilization as managerial tools by the company leadership. Ten respondents were considered from the supervision level and another ten respondents from the managerial level, and the AHP method was applied. In a second step, a comparison was done between strategic indicators values from before and after the integration of the individual systems. The results obtained are showing higher values for the compared indicators after the system integration, and also are pointing out the linear contribution of the integrated system's main characteristics to the indicators.

84	Saturday, 8:00- 9:30, Pavilion Ballroom A	Track: PLQ, 5	Chair: Michiya Morita
	<b>Session:</b> International Comparisons		

### 015-0811: Corporate Governance and Effectiveness of the Lean Production System: Contrasts Between Japanese and Western Manufacturing Companies

*Lumbidi Kupanhy, Wakayama University, Japan*

*Eustache Ebondo Wa Mandzila, Euromed Ecole de Management, France*

*Nsenda Lukumuena, Kwasei University/Setomoto Architects Office, Japan*

The successes or failures of lean methods in and outside Japan have been so far explained from the point of view of the methods' implementation at the workplace. We want to shed a new light on the impact of the corporate governance on the effectiveness of lean methods. We contend in particular that the sustainability of lean methods results (successes or failures) depends on the sustainability of a corporate strategy, whose formulation and deployment are themselves impacted by the structure of the corporate governance.

### 015-0467: Empirical Study on Transferability of Kaizen Practices

*Phan Anh, Yokohama National University, Japan*

*Yoshiki Matsui, Yokohama National University, Japan*

Kaizen is a Japanese business strategy that calls for a never-ending effort for improvement, involving everyone in the organization, from managers to workers. This study examines the transferability of Japanese continuous improvement in different national and organizational cultures. Utilizing the High Performance Manufacturing (HPM) Project database, we start by examining the link between eight typical Kaizen practices and Hofstede's five cultural dimensions in Japanese manufacturing. The good fit between the Kaizen and Japanese cultural values might explain its success in Japan. Then, we continue to test whether Kaizen can be successful in other environments, such as Germany, Korea, Sweden, and the United States. The findings of this study indicate that while national culture can moderately influence the adoption of Kaizen practices, the biggest barrier to Kaizen success is the lack of organizational supports: top management leadership for quality, training, and open communication and information sharing.

### 015-0197: Review of the New Japan Global Production Model "NJ-GPM": Strategic Development of Advanced TPS

*Kakuro Amasaka, Aoyama Gakuin University / School of Science and Engineering, Japan*

The Toyota Production System (TPS) exemplifies Japanese manufacturing, though it has since been further developed and spread in the form of internationally shared global production systems, including Just in Time (JIT). As a result, TPS is no longer a proprietary technology of Japan. This study focuses on the strategic deployment of Advanced TPS through New JIT, an innovative management technology principle that surpasses conventional JIT practices. Specifically, the author develops the New Japan Global Production Model "NJ-GPM", a system designed to achieve worldwide uniform quality and production at optimal locations—keys to successful global production. The effectiveness of NJ-GPM is demonstrated at Toyota, a leading international corporation.

## Saturday, 8:00- 9:30 Sessions

LO 00	Saturday, 8:00- 9:30, Pavilion Ballroom B <b>Session:</b> POM Research and Direction	Track: GENL, 5	Chair: Susana C. Farias Pereira
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**015-0672: Brazilian International Publications in Production and Operations Management from 1980-2007: A Review of the Literature and Directions**

*Diego Kelen, FGV-EAESP, Brazil*  
*Susana C. Pereira, FGV-EAESP, Brazil*

This research reviews and analyzes the publications of Brazilian authors in the main journals of Production and Operations Management (POM) between 1980 and 2007. The research objective is to investigate the participation and contribution of Brazilian authors in the evolution of the POM field and to propose directions for future research. The methodology is grounded in the selection of articles available in four electronic databases: Business Source Premier, Emerald, ABI/Inform, e Science Direct. A thorough search selected 161 articles, through the key-word "Brazil." After the classifications, the research proceeded with social network analysis, through the use of the software UCINET 6.0. The main results show the concentration of articles related to operations strategy and competitiveness (27%) 40% of the articles collected data in companies located in Brazil and co-authorships are polarized in 5 clusters of authors with little inter-institutional relation.

**015-0632: Productivity and Scientific Cooperation: An Analysis of the Operations Management Field**

*Guilherme Martins, Getulio Vargas Foundation (FGV-EAESP), Brazil*  
*Michele Martins, Getulio Vargas Foundation (FGV-EAESP), Brazil*  
*Samara Vieira, Vicosa Federal University, Brazil*  
*Afonso Lima, Vicosa Federal University, Brazil*  
*Andre Duarte, Insper - Institute of Education and Research, Brazil*

This paper is based on the assumption that the construction of scientific knowledge is a social process characterized by the recursive dynamic between the social and intellectual dimensions. We investigated how the relationship between the researchers' network and scientific production in Operations Management field was structured internationally, in the 1997-2008 period. The study is based on documentary research of papers published in the top three relevant operations journals identified by Soteriou et al. (1999) and Barman et al. (2001): POM, JOM and IJOPM. For this purpose, we analyzed social networks and used bibliometric indicators in order to map the cooperation relationships between researchers and institutions, based on co-authorship. The results allow the identification of the most prolific authors and institutions. The findings also point out a fragmented network surrounding clusters of scientific collaboration that concentrates the most part of the scientific production and researchers in the field.

**015-0561: Research in Operations Management: Insights, Trends and Portents Using Latent Semantic Analysis**

*Uday Apte, Naval Postgraduate School, United States*  
*Nicholas Evangelopoulos, University of North Texas, United States*  
*Shailesh Kulkarni, University of North Texas, United States*

In this paper we examine the Operations Management (OM) field, as reflected in three decades of literature derived from four journals that are widely regarded as among the most influential in the discipline. To the best of our knowledge, our research represents the field's first treatment with Latent Semantic Analysis, an emerging quantitative method for content analysis that combines rigorous statistical techniques and scholarly judgment as it proceeds to siphon and decipher key latent factors that constitute the field's intellectual core. Our findings are indicative of paradigmatic shifts in research methodology, of significant trends of topical emphasis and of emerging research areas. While our analysis sheds light on past and current directions of the OM field, it also signals potential areas of concern. Overall, we believe that our work aids OM scholars in examining trends in OM research and thereby also lends itself to their scrutiny and action.

**015-0995: Student Research Programs in Greater China: Overview and Experience from an SCM Research Methodology Course**

*Martin Stöblein, Jilin University, China*

After a brief comparison of Student Research Programs (SRPs) in Greater China with those in the U.S., we describe our endeavors to provide active research experiences at Jilin University (P.R. China). Although SRPs are increasingly discussed as an "innovative" teaching model among scholars and policy makers in the Chinese mainland, implementations and student perceptions are rarely published. We therefore present the design and pedagogical features of our programs and its effectiveness. A repeated experience with structured course format, including a high degree of "thinking and writing" workshops, personal coaching sessions, and a 'student research conference', has been encouraging. Lessons learned could help to develop research-based courses to an audience with a range of previous knowledge, skill-sets, interests, available time, and cultural backgrounds.

07 00	Saturday, 8:00- 9:30, Pavilion Ballroom D <b>Session:</b> Organizations 2	Track: HBOM, 5	Chair: Rachel Yee
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**015-0761: Social Knowledge**

*Wagner Damiani, BYU / FGV, Brazil*  
*Fernando Chertman, FGV, Brazil*

The world economy is experiencing a time of great change. In the transition of the economic environment, proactive knowledge management acquires a central role for the competitiveness of firms and countries. This, however, is a recent phenomenon, because in the past, the advantages of location, access to cheap labor, natural resources and financial capital were much more decisive. Knowledge management goes far beyond the investment in technology and management innovation; it includes the understanding of the characteristics and demands of the competitive environment and an understanding of individual and collective needs associated with the processes of creating and learning.

## Saturday, 8:00- 9:30 Sessions

### 015-0724: How Trust Influences Transactions in E-sourcing of Logistics Services

*Rossella Moramarco, Politecnico of Bari, Italy*

*Ilaria Giannoccaro, Politecnico di Bari, Italy*

*Pierpaolo Pontrandolfo, Politecnico di Bari, Italy*

In business to business transactions, logistics services are often procured by means of electronic sourcing mechanisms, e.g. e-negotiation or e-reverse auction. The use of these mechanisms enables companies to reduce costs while conducting the transaction on a set of service attributes, such as price, quality, flexibility, and reliability. "Soft" factors characterizing companies' behavior may impact the buyer-supplier relationship and the outcome of the transaction. A critical factor is trust, which facilitates collaboration and affects supply chain performances. By focusing on the e-sourcing of logistics services, this paper attempts to analyze how interpersonal trust and interorganizational trust between buyer and supplier affect transactions. It proposes a conceptual framework based on the literature review, which identifies the influence of trust on operational performances (e.g. price or utility) and relational performances (e.g. satisfaction) in e-sourcing.

### 015-0255: Servant Organization: A Comprehensive Approach to Servant Behavior from the Customer Point of View

*Kleber Nobrega, Potiguar University, Brazil*

*Patricia Whebber, Potiguar University, Brazil*

From the fundamentals of service management, aiming to identify structural components of companies with superior service, the servant behavior, structured in previous research, was submitted to customers' point of view. This paper aims to present, in a hierarchical way, the degree of importance of attributes for servant behavior. A survey was conducted among 1,800 randomly selected customers. A Likert scale was used, with varying degrees of importance ranging from 1 to 9 for each attribute. The attributes were sorted in order of importance, with the following sequence: responsibility, practice of good and useful (8.1); initiative (8.0) and desire to help (7.9). Simplicity and resignation had less importance in comparison to others and received, respectively, the scores 7.1 and 6.5. Factorial analyses were made, in order to group the attributes to evaluate the performance of organizations in the service sector.

### 015-0258: Learning Orientation and Service Quality: The Impact of Employee Attitudes in High-contact Service Industries

*Rachel W. Y. Yee, The Hong Kong Polytechnic University, Hong Kong*

*Peter K. C. Lee, The Hong Kong Polytechnic University, Hong Kong*

*Andy C. L. Yeung, The Hong Kong Polytechnic University, Hong Kong*

*T. C. Edwin Cheng, The Hong Kong Polytechnic University, Hong Kong*

The extant operations management literature has rarely examined the influences of employee attributes and management on operational performance indicators. In this study, we examined the hypothesized associations among management commitment to service quality, learning orientation, organizational commitment and customer satisfaction using triadic data from employees, customers and firms, based on an empirical study of 234 high-contact service shops in Hong Kong. Using structural equation modeling, we found that management commitment to service quality upholds a firm's operational performance through improving employees' learning orientation and commitment. We also found that with the mediating effect of learning orientation, organizational commitment impacts service quality. Our results suggest that management commitment to service quality is the underlying driver to enhance employees' morale at work and a firm's operational performance. We provide empirical evidence that learning orientation plays an important role in enhancing the operational performance of organizations in high-contact service industries.

### 015-0135: Critical Thinking and its Role in Effective Problem Solving

*Pauline Found, Cardiff University, United Kingdom*

*Lyndon Hughes, ConvaTec Limited, United Kingdom*

Many organisations striving to become a Lean Enterprise have set their end goal as achieving perfection, whilst perceived as unattainable; this fifth and final principle of Lean ensures a continual drive to improve the way the organisation does business. These organisations understand that to achieve perfection they need to have a culture of identifying and resolving problems so they do not re-occur. Organisations faltering in their Lean transformation often cite a failure to capitalise on the benefits of problem solving as one of the primary reasons. It can be argued that there are three key elements to effective problem solving, one of which is critical thinking and the others motivation and knowledge; this paper explores the interface between these.



Saturday, 8:00- 9:30, Port Alberni

Track: SOM, 11

Chair: Marco Sartor

Session: Services Outsourcing

### 015-0798: Innovative Ideas in Firms Through Idea Management Systems

*Rosa Padre-Eterno, Instituto Superior Técnico, Portugal*

*Ana Povoas, Instituto Superior Técnico, Portugal*

*Pedro Oliveira, Universidade Católica Portuguesa, Portugal*

The main objective of this study is to explore the antecedents and impacts of an idea management system in firms. An idea management system (IMS) is defined as a formalized method of capturing, examining and developing ideas from everyone in the organization. We attempt to answer the following research questions: What are the antecedents of an effective Idea Management System? What is the impact of an effective Idea Management System on a company's New Service Development capability? The conceptual idea behind our research is that employees' participation, its work environment, and the supporting communication networks are the antecedents of an effective idea management system, which ultimately leads to successful ideas, conceptualized as the company's ability to develop new services. In our model, the organization life context (work environment) and communication networks also affect employees' participation.

### 015-0730: Managing Variations: Operational Integration of New Services in Financial Institutions

*Marie-Pierre Spooner, Université du Québec à Montréal, Canada*

## Saturday, 8:00- 9:30 Sessions

In this turbulent era, many financial institutions are competing and developing new services to increase their market share and their customer base and to outrun their competitors. The content of the new service is only one of the challenges. The ability to deploy it with rigor and speed in the financial institution's operational system is another challenge. Many new services are developed with an eye to marketing but with a limited understanding of the operational system. Therefore, a majority of new service development literature comes from marketing. The results of two case studies on new services present how the operational integration of a new service was planned, how these services were deployed, how managers coped with the resulting variations as they arose, and the feedback that was provided at the end of the project in order to improve the next one.

### 015-0020: Service Customization Through Dramaturgy

*Ian McCarthy, Simon Fraser University, Canada*

*Leyland Pitt, Simon Fraser University, Canada*

*Pierre Berthon, Bentley University, United States*

The customization of a service often depends on the "performance" delivered by front-stage service employees. Drawing on the theory of dramaturgy and service marketing, we present a typology identifying four distinct and viable configurations for achieving different types of service customization. We explain how variations in the time pressure to customize a service and the degree of customization required, combine to determine the characteristics and fit of each configuration. With service organizations increasingly operating on a global basis, we discuss the fit between the preferences of different multicultural segments, the operational characteristics of a configuration and the level of customization offered.

### 015-0740: Incorporating Sequence Effect into the Service Bundle Scheduling Problem

*Michael Dixon, Cornell University, United States*

*Rohit Verma, Cornell University, United States*

*Gary Thompson, Cornell University, United States*

Service bundles can include a number of different experiences packaged and purchased together, e.g., performing arts venues combine a number of different events together and sell season subscription bundles. These subscriptions generally consist of a number of events that have a similar genre or theme; however, often times the popularity and utility derived for individual events are not uniform across the bundle, i.e., the package includes both highly desired events and less desired events. In our previous work, we found evidence from one performing arts venue that the ordering of the events within a bundle impacted repurchase behavior of patrons mirroring sequence effect finding from psychology and behavioral economics. In this paper, we investigate the complexity of scheduling and creating bundles in order to maximize sequence effects under different scenarios, using local search heuristic techniques.

### 015-0340: Assessing the 'Use Value' of Servitized Offerings: The Customer Perspective

*Jawwad Raja, Cranfield University, United Kingdom*

*Veronica Martinez, Cranfield University, United Kingdom*

*Bjorn Claes, Cranfield University, United Kingdom*

This paper examines how customers perceive and assess the value-in-use of product-service offerings. The literature in the product-service domain fails to give due consideration to the customer perspective within the service-dominant logic. The study uses semi-structured interviews and the repertory grid technique with customers to understand the supplier and customer perspectives across a number of sectors. The preliminary findings suggest that whilst the strategy is one of aligning with customer needs to deliver value, the operational reality is one in which the business fails to understand the localised complexities and needs of individual customers and their sector. This study identifies a number of important constructs in understanding the value-in-use from a customer perspective. The paper demonstrates that value-in-use needs to be assessed from a customer perspective rather than a supplier perspective. It further illustrates the need for examining customer usage processes to better understand how value is derived and assessed.



Saturday, 8:00- 9:30, Port Hardy

Track: ROM, 1

Chair: Elliot Rabinovich

Session: Retail Operations Management One

### 015-0148: Evaluating Store Design Responsiveness to Product Line Margin Changes: An Empirical Analysis of U.S. Retailers

*Jeff Shockley, Radford University, United States*

*Lawrence Plummer, University of Oklahoma, United States*

*Aleda Roth, Clemson University, United States*

*Lawrence Fredendall, Clemson University, United States*

This paper examines whether designing store systems to be responsive to product line gross margin changes improves retail firm performance (ROA). Similar to studies examining inventory and sales co-movements, "responsiveness" means that retailers should align product margins with store system design strategies over time to achieve superior financial performance. Moreover, firms that increase or decrease labor and capital intensity in their store systems at a faster rate than these product margin shifts should see worse operating performance year to year. An econometric model tests this theory using store-level panel data collected from Compustat, 10-K, and S&P industry reports for store retailers for the period 1994 – 2006. The study findings bring insight as to when retail store systems should be designed to be responsive with store labor and capital intensity, and when these elements need to be leveraged to design a more efficient retail store system.

### 015-0002: Examining the Role of Brick-and-Mortar and Internet Retail Channels on Inventory Record Inaccuracy

*Mark Barratt, Arizona State University, United States*

*Elliot Rabinovich, Arizona State University, United States*

*Annibal Camara-Sodero, Arizona State University, United States*

Inventory record inaccuracy (IRI) is an ongoing but often understated issue for firms. Cycle counting, despite being used by most firms for capturing

## Saturday, 8:00- 9:30 Sessions

the issue of physical product availability between counts. This lack of visibility creates potential shortfalls in product availability. Adopting Cost-of-Price Adjustment theory from the information economics literature this paper tests a number of hypotheses relating to the nature of demand across brick-and-mortar and Internet retail channels and in the context of a distribution center. In addition, we find that, in the Internet retail channel, the magnitude of IRI is dependent on the gap between the minimum and the maximum levels of inventory carried for products over time. The paper concludes by proposing future research directions and issues that must be further considered.

### 015-0315: Improving Retail Performance: An In-store Experiment

*Howard Chuang, Mays Business School, Texas A&M University, United States*

*Rogelio Oliva, Mays Business School, Texas A&M University, United States*

*Sheng Liu, CROSSMARK, United States*

The impact of Inventory Record Inaccuracy on retailers' performance has been well studied in the last few years. To date, most of the research is descriptive and, when normative, the models propose ways to work around IRI, rather than directly reduce it. In this paper we report the results of an in-store experiment where we had the capability to provide operational feedback to the store when we suspected an IRI or a high probability of an out-of-stock. Our experiment monitored the performance of 8 SKUs across 60 stores of a national retailing chain that already had excellent operational performance. We evaluate whether it is possible to proactively and economically reduce out-of-stocks and IRI.

### 015-0397: Removing Bullwhip from the Tesco Supply Chain

*Andrew Potter, Cardiff University, United Kingdom*

*Stephen Disney, Cardiff University, United Kingdom*

We demonstrate how bullwhip reduction principles generated through generic supply chain modelling have been used to tackle the bullwhip problem within Tesco, the largest UK grocery retailer. In the context of bullwhip research, this bridging between theory and practice has not been extensively demonstrated previously. The research involved examining the computer system that generated store replenishment orders, through which seven replenishment algorithms were identified. We demonstrated that three of these algorithms (accounting for 65% of the sales value) were deemed to generate excessive bullwhip and could be altered to avoid such practice. Their essential structure also reflected an Order-Up-To policy. A simulation model of the system was developed and, based on experience from generic bullwhip research, order variability was reduced to approximately 75% of sales variability while maintaining customer service levels. The change was implemented by the retailer, producing significant economic benefits in line with the suggested model.

### 015-0567: An Examination of Heuristics for the Shelf Space Allocation Problem

*Meiting Wong, The Chinese University of Hong Kong, Hong Kong*

*Chun-Hung Cheng, The Chinese University of Hong Kong, Hong Kong*

Retailers have to make efficient and effective use of shelf space. Products must be displayed in the right quantities and at the right position on the shelves. In this work, we examine various heuristics for the problem. In particular, we attempt to enhance the performance of a tabu search. An extensive computational experiment will be carried out to assess the use of these heuristics.

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Saturday, 8:00- 9:30, Port McNeill

Track: OMF, 5

Chair: Daniel Corsten

Session: Supplier Finance, Credit Risk and Inventory

### 015-0768: Executives' Perceptions of the Value of IS in SMEs in a Developing Country

*CLOVIS GALDINO, METHODIST UNIVERSITY, Brazil*

*Getulio Akabane, Catholic University, Brazil*

*Amarildo Nogueira, Catholic University, Brazil*

As Information Systems (IS) required to fulfill operations are frequently capital and scale demanding, small and medium enterprise (SME) managers face difficult decisions to conduct efficient business, especially in a developing country where capital is not abundant. This research identifies SME executives' perceptions of effectiveness and strategic value of IS investments. The results of case study research based on in-depth interviews in five typical SMEs in the Brazilian market, revealed that executives see IS as (a) essential to support both process execution with clients/suppliers and structured decision-making; and (b) company size specific, as the need to process information increases with business transaction volume in opposition to constrained personal capacity of processing data. Interestingly, SME workers do not share the same understanding as executives about the importance of IS.

### 015-0040: Application of the Integral Model of Productivity for Textile and Apparel Industry in Columbia

*JORGE MEDINA, UNIVERSIDAD SERGIO ARBOLEDA, Colombia*

The integral model of productivity presents a new classification of the managerial processes for creation of value. The previous activities are done in order to maximize the economic value added, the utilization of resources needed and a sustainable growing of the organizations. The textile and apparel sector generates 5% of the exports and 20% of the busy workforce of Colombia. Besides, it was selected by the government as one of the eight sectors to be developed in the Program for Productive Transformation from the Ministry of Commerce, Industry and Tourism. Currently, the sector is going through a difficult situation because of factors as multures, smuggling, informality and a cost structure higher than its international competitors. A drastic change of competitive and productive strategies are needed. Inside them a prospective model as the Integral Productivity Model is proposed.

### 015-0458: Product-mix Decision from the Perspective of Time-driven Activity-based Costing

*Abraão Júnior, University of São Paulo, Brazil*

*Reinaldo Costa, University of São Paulo, Brazil*

## Saturday, 8:00- 9:30 Sessions

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This study addresses the "product-mix decision" that, in a Production and Operations Management perspective, can be understood as the optimum quantity to be produced for each type of product in a given period, considering these products compete for limited resources, in order to maximize the firm's economic result (e.g., net profit). Product-mix decision models use information on costs and profitability, which are impacted by the costing method employed. In this context, the paper proposes a quantitative model to underpin the product-decision mix incorporating the logic of Time-driven Activity-based-Costing (TDABC). To meet this objective, a literature search is performed to position the research on product-mix decision and on costing methods, emphasizing TDABC, and a quantitative model is proposed to assist decision making. The model used is illustrated from a didactic example. Finally, it is concluded that the model based on TDABC is useful for the product-mix decision.

### **015-0003: The Relation Between Shareholder Value and Human Resources Management in Manufacturing Settings**

*Roberto Marx, University of São Paulo, Brazil*

*João Paulo Soares, Mackenzie, Brazil*

The paper attempts to expand knowledge about the influence of the shareholder value on human resource management practices, especially in the production environment. Initially, the paper reviews the origins and the bases of the financialization and shareholder value concepts. Next the interface of these concepts with human resource management practices is analyzed. Three main elements that comprise the interface between company guidelines and human resources function are explored more deeply: variable compensation, performance management and work autonomy. Finally, a multiple case study is presented, which attempts to verify how the financial concept of a company has in fact influenced these practices with respect to personnel management at the production level of organizations in Brazil, as well as how much they have contributed to the diffusion of generating shareholder value.

### **015-0457: Supply Chain Value Contribution – Assessing the Economic Value of Supply Chain Initiatives**

*Oliver Schneider, ETH Zurich, BWI, Switzerland*

Logistics and operations management provide for competitive advantage and economic success of a company by ensuring reliable satisfaction of customer needs through focusing on operational excellence, which is also one lever to increase enterprise value. However, existing concepts are not able to clearly show how operational excellence contributes to enterprise value. Thus, managers fail to articulate the real value of their solutions to the primarily finance-driven boardroom. As a result, operational investment decisions are often based on assumptions about their financial impact, leading to high uncertainty about the true return on the investment. The article will fill this gap, by describing a clear and traceable approach for assessing the value created by operational performance improvements. The "Supply Chain Value Contribution" method creates a clear relationship of cause and effect of supply chain initiatives, on operational performance, to enterprise value, on the basis of the Supply Chain Operations Reference (SCOR-) model.

## Saturday, 11:15-12:45 Sessions

01	Saturday, 11:15-12:45, Finback <b>Session:</b> Supply Chain Management 5	<b>Track:</b> SCM, 15	<b>Chair:</b> Jennifer Ryan
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### 015-0122: Two-period Coordination for a Single Supplier Multiple Buyers Supply Chain with Adjustment Contract

*Rong Li, Singapore Management University, Singapore*

*Jennifer Ryan, Rensselaer Polytechnic Institute, United States*

Most of the existing literature studies single-period coordination for single-supplier single-buyer supply chains (without inventory sharing) with one-way inventory adjustment contracts. In this paper, we study the optimal inventory allocation policy for the supply chain with a single supplier and two buyers in a two-period stochastic model. Using this as a benchmark, we study a coordination problem for the supply chain where the supplier offers each buyer a standard replenish opportunity at the start of each period (referred to as the wholesale price contract) and an two-way inventory adjustment opportunity in the middle of each period (referred to as the adjustment contract). We formulate a Stackelberg game between the supplier and each buyer. Pareto improving and coordinating contract parameters are obtained. Note that the coordinating contracts facilitate optimal inventory sharing among the buyers which, to the best of our knowledge, is impossible with all the existing supply contracts.

### 015-0227: Competition and Cooperation in Online Marketplaces

*Jennifer Ryan, Rensselaer Polytechnic Institute, United States*

*Daewon Sun, University of Notre Dame, United States*

*Xuying Zhao, University of Notre Dame, United States*

Online market places, such as those hosted by Amazon and Ebay, have seen rapid growth in recent years. A marketplace firm such as Amazon may sell products and compete with other retailers selling through its marketplace. We study the cooperation and competition among the marketplace firm and those retailers selling on the marketplace. We provide guidance on whether or not to sell similar products on the marketplace and if so, the optimal price to sell them, for the marketplace firm and the retailers.

### 015-0787: Preventing Consumer Returns: Quality Investment Under Information Asymmetry

*Paolo Letizia, The Pennsylvania State University, United States*

*Douglas Thomas, The Pennsylvania State University, United States*

We address the problem of a manufacturer who has to decide under uncertainty whether to invest in product quality to reduce the number of consumer returns. The manufacturer and the retailer hold different beliefs about the outcome of the investment, which can yield either a lower (high-type) or the same (low-type) return. While the manufacturer learns his type before trading with the retailer through a buy-back contract, the retailer maintains her prior beliefs. We consider three buy-back contract formats for returned products: no, full, or partial refund. We find that with a no-refund contract the manufacturer would never gain from his quality investment, whereas with a full refund contract the manufacturer gains from it only if the probability he assesses of becoming high-type is not too low. With a general buy-back contract, the manufacturer would always benefit from his quality investment.

### 015-0106: Price and Service Competition in an Outsourced Supply Chain

*Jennifer Ryan, RPI, United States*

*Yue Jin, Bell Labs Ireland, Alcatel-Lucent, Ireland*

We study the dual-sourcing problem faced by a buyer who outsources the manufacturing of a product to two symmetric suppliers who compete on price and service level. The buyer allocates demand to the suppliers using a two-dimensional score function which specifies the relative importance of price vs. service level, in order to minimize his own costs, while the suppliers choose their prices and service levels to maximize their own profits. We characterize the optimal allocation policy for the buyer, considering the impact of the buyer's decisions on the suppliers and considering how the suppliers compete against each other to earn a larger portion of the buyer's demand. We prove the existence of a unique equilibrium and characterize the equilibrium behavior of the system. We extend the results to consider a system with N suppliers and show that the equilibrium prices and service levels are increasing in the number of suppliers.

02	Saturday, 11:15-12:45, Galiano <b>Session:</b> Buyer-Supplier Relationships 2	<b>Track:</b> SCM, 16	<b>Chair:</b> Mahesh Srinivasan
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### 015-0548: Repeat Procurement with Bidder Defection

*Christopher Held, Georgia Institute of Technology, United States*

*Mark Ferguson, Georgia Institute of Technology, United States*

In this paper, we evaluate policies involved in repeat procurement of large-scale period purchases. Specifically, we examine how firms compete when interacting multiple times after only learning the winner and loser in previous rounds. We examine several policies from practice, namely that of repeat incumbent awarding and entrant biasing, and show that, under general conditions, there exist cases when these policies, despite being counterintuitive, can be optimal for the buyer in a finite number of interaction periods. We show that selecting the lowest cost bidder is not always optimal, as it can drive away bidders as they update their beliefs about the competition in future rounds. We show that the optimal policy maintains a pool of bidders while also awarding to a low-cost firm.

### 015-0722: Toward a Better Understanding of the Bullwhip Effect

*Michael Gorman, University of Dayton, United States*

*John Kanet, University of Dayton, United States*

The Bullwhip Effect has attracted great interest in the academic and practitioner communities. We seek to provide a better understanding of the extent of bullwhip and the desirability of reducing it. We argue that bullwhip may not be as nefarious or ubiquitous as the literature suggests. We

## Saturday, 11:15-12:45 Sessions

We conclude that researchers should be careful when measuring and suggesting remedies for bullwhip. Practitioners are advised to carefully evaluate the economic considerations of remedying bullwhip.

### 015-0478: Buyer-Supplier Partnership Quality and Supply Chain Risk: The Implications for Supply Chain and Firm Performance

*Mahesh Srinivasan, The University of Akron, United States*

*Debmalya Mukherjee, The University of Akron, United States*

We study the relationship of buyer-supplier partnership quality on supply chain performance and eventually firm performance. We also study the moderating effect of supply chain risk on this relationship. We base our study on social exchange theory and the relational view theory. Empirical evidence, based on the survey of supply chain executives from North America, suggests that partnership quality has a positive relationship with supply chain performance, and that this relationship is strengthened in the presence of demand risks and weakened in the presence of supply side risks. Further, we find a negative effect of environmental uncertainty on the partnership quality-supply chain performance relationship.

93	Saturday, 11:15-12:45, Grand Ballroom A	Track: SCM, 37	Chair: Mahesh Nagarajan
<b>Session:</b> Workshop on Bargaining Models in Supply Chains			

### 015-0997: Workshop on Bargaining Models in Supply Chains

*Bill Lovejoy, University of Michigan, United States*

Real b-to-b supply chain negotiations (especially in tiers 1 and 2) involve a series of offers and counteroffers between buyers and sellers in a mutual search for acceptable terms of trade. Especially in tier 1 negotiations (furthest from commodities) both supplier and buyer often have some bargaining power. Bargaining theory is attuned to the practical reality of such negotiations, yet this theory has scant presence in our current POM literature. Instead, most supply chain papers invoke leadership (e.g. principal-agent or Stackelberg) models wherein one party is designated a leader and is granted power to make irrevocable take-it-or-leave-it offers to the other, who has no opportunity to propose a counter-offer. Bargaining theory appears to have more face validity representing many real supply chain negotiations and has an edge in experimental support, as well. Consequently, it is of interest to ask whether the replacement of leadership models with bargaining models changes the results, and our intuition, for managing supply chains. This session will cover the current status of bargaining models in supply chains, the resulting intuition for supply chain management, and the challenges and opportunities in bringing bargaining theory more robustly into our mainstream POM literature.

94	Saturday, 11:15-12:45, Grand Ballroom D	Track: HOM, 11	Chair: Sylvain Landry
<b>Session:</b> Lean Healthcare			

### 015-0216: Donor Coordination using a Supply Chain Performance Model of Performance Metrics

*Santiago Kraiselburd, MIT-Zaragoza International Logistics Program/INCAE Business School, Spain*

*Ananth V Iyer, Krannert School of Management, Purdue University, United States*

*Lijie Song, MIT-Zaragoza International Logistics Program, Zaragoza Logistics Center, Spain*

*Jorge Barnett, MIT-Zaragoza International Logistics Program, Zaragoza Logistics Center, Spain*

The WHO has identified donor coordination as a key task. Improved coordination across donors may permit significant improvement in outcomes for the same level of resource commitment. We propose the use of a model-based approach to assist in this donor coordination effort. The model will permit customization based on disease and country characteristics, incorporation of donor plans and forecast of the impact on multiple performance dimensions. The goal of the model is to permit (a) WHO to work with donors to understand how their choices affect performance, (b) use of the model to assist in evaluating the impact of adjustments to donor choices and thus (c) enable coordination by the WHO. Customization of the model to country and disease characteristics will permit the model to capture field conditions.

### 015-0636: Supply Chain and Resistance Implications of Drug Variety

*Prashant Yadav, MIT-Zaragoza International Logistics Program, Zaragoza Logistics Center, Spain*

*Eirini Spiliotopoulou, MIT-Zaragoza International Logistics Program, Zaragoza Logistics Center, Spain*

Drug efficacy is a public good that is threatened by the emergence and spread of resistance. Multiple studies show that available drugs should be used in a socially optimal way in order to contain drug resistance. In this paper we quantify the benefits associated with drug variety and compare them against the cost of higher variety in the supply chain. Extending a simple general disease model, we show that the percentage of the infected population that cannot be treated is decreasing with the number of available drugs. Furthermore, we show that drug assortment determines the fraction of the infected population that gets treated. We compare the benefits of delayed emergence of resistance and higher treatment seeking with the increase in procurement and safety stock holding costs that result from a wider drug assortment. Our model lends insights to policy makers into the socially optimal size of the drug assortment.

### 015-0900: On Dimensioning Intensive Care Units

*Nico van Dijk, University of Amsterdam, Netherlands*

*Nikky Kortbeek, university of twente, Netherlands*

The paper studies the rejection probability of an Intensive Care Unit (ICU). To capture the interaction of direct and operated patients combined OT-ICU (Operating Theater/Intensive Care Unit) systems are considered. Simple M/G/c/c computations are argued and formally supported by different product form solutions. The results are of particular practical interest for approximate and bounding purposes to dimension the ICU. Numerical case study results are included.

## Saturday, 11:15-12:45 Sessions

### 015-0217: Design and Operation of Stroke Units

*Vedat Verter, McGill University, Canada*

*Beste Kucukyazici, MIT-Zaragoza International Logistics Program, Spain*

*Linda Green, Columbia University, United States*

This research focuses on the design and improvements of stroke units. A systematic approach to the design and operation of stroke units within acute care hospitals would enable effective and efficient use of supply side resources to match the demand for acute stroke services based on intensity of patient need. Accordingly, we develop an analytical approach to assist decision-makers in effective management of the stroke-units by coordinating such complex supply-demand relation. This research has two phases: (i) empirical analysis of the data set of 750+ patients in order to explore the impacts of "supply-demand" mismatches on patient outcomes; and (ii) a simulation model that represents the flow of stroke patients from admitting to ED to discharge to study on to improve efficiency of capacity management and operations of the stroke units. The results of this research provide insights for re-structural initiatives at primary stroke hospitals in Montreal.

96	Saturday, 11:15-12:45, Junior Ballroom A	Track: PITM, 6	Chair: Sanjiv Erat
	<b>Session:</b> Behavioral Research in Product and Service Innovation		

### 015-0765: Designing Experiential Services: The Customer Journey Perspective

*Ioannis Bellos, Georgia Institute of Technology, United States*

*Stylianos Kavadias, Georgia Institute of Technology, United States*

In this paper, we explore the design challenges of a provider organization that develops an experiential service, i.e., a service where, in addition to the functional utility delivered, consumers value the holistic experience acquired through the interaction with the organization. Researchers and practitioners (e.g. the design company IDEO) have repeatedly advocated the value of the customer journey method for analyzing and designing experiential services. According to this method, services can be disaggregated into touchpoints between the consumer and the service provider, where utility and experience depend on the interaction (coproduction). We draw upon this perspective to identify the provider's optimal price, and the optimal number of service touchpoints she chooses to control. Our results reveal the non-monotonic effects of the coproduction losses (due to the misalignment between the customer expectation and the provider offering) and the service complexity (performance interdependencies across the service touchpoints) on the provider design decisions.

### 015-0577: Users as Service Innovators: The Case of Banking

*Pedro Oliveira, School of Economics and Management, Catholic University of Portugal, Portugal*

*Eric Hippel, MIT Sloan School of Management, United States*

Many services can be self-provided. An individual user or a user firm can, for example, choose to do its own accounting (choose to self-provide that service) instead of hiring an accounting firm to provide it. Since users can 'serve themselves' in many cases, it is also possible for users to innovate with respect to the services they self-provide. We explore the histories of 47 functionally novel and important commercial and retail banking services. We find that, in 85% of these cases, users self-provided the service before any bank offered it. Our empirical findings differ significantly from prevalent producer-centered views of service development. We speculate that the patterns we have observed in banking with respect to the dominant role of users in service development will prove to be quite general. Given the importance of services for the economy, this will be an important matter.

### 015-0225: Project Complexity and Resource Allocation Decisions in Product Development Pipelines

*Paulo Goncalves, University of Lugano, Switzerland*

*Nitin Joglekar, Boston University, United States*

*Jaime Castaneda, University of Lugano, Switzerland*

*Paulo Figueiredo, Boston University, United States*

Managers in product development pipelines must make a number of decisions regarding project complexity and resource allocation. Such decisions have a large impact on project success. Here, we develop a simple framework for project complexity and resource allocation decisions in a single stage product development pipeline. We show that both frameworks are analytically equivalent to the traditional newsvendor inventory model. We conclude by presenting results and analyses of a series of experiments of such decisions in a simulated environment.

### 015-0364: Selling Base Products and Add-ons to Waste-averse Consumers

*Sanjiv Erat, University of California, San Diego, United States*

*Sreekumar Bhaskaran, SMU, United States*

Firms in a variety of different industries offer add-on products to consumers who have previously purchased a base-product. We hypothesize that consumers, in making their decision whether to purchase such add-ons, perceive the price paid for the base-product as "wasted" if they do not continue on to purchase the add-on. This waste aversion implies that the demand for a sequentially sold add-on may be positively correlated with the price of the base-product. We conduct laboratory experiments that test the proposed hypothesis, and examine the implications of such consumer waste-aversion to the development and pricing decisions of a firm who sells base-product add-on pairs. The experiment confirms that, consistent with the waste-aversion perspective, the price of the base-product may have a positive impact on the likelihood of purchase of an add-on. Modeling the bias shows that penetration pricing strategies (such as loss-leader pricing) may be sub-optimal when the consumers are waste-averse.

97	Saturday, 11:15-12:45, Junior Ballroom B	Track: OMM, 9	Chair: Suman Mallik
	<b>Session:</b> OMM9		

### 015-0882: Exclusive Channels: The iPhone Introduction

## Saturday, 11:15-12:45 Sessions

**Gangshu Cai**, *Kansas State University, United States*

**Yue Dai**, *Fudan University, China*

**Sean Zhou**, *Chinese University of Hong Kong, China*

Motivated by the introduction of the iPhone, this paper evaluates the impact of a combination of exclusive channels and revenue sharing on suppliers and retailers in a hybrid duopoly common retailer and exclusive channel model. The model not only explains several events related to the iPhone and the wireless market, but also bridges the gap in the literature on hybrid multichannel supply chain with bilateral complementary products and services with/without revenue sharing. The analysis indicates that it can be an equilibrium strategy for the suppliers and retailers to form exclusive deals; however, some type of cooperation, such as revenue sharing and/or Nash bargaining, needs to be employed to achieve supply chain efficiency and a mutually beneficial solution. Moreover, enhanced price-dependent revenue sharing is shown to outperform one with/without integrated channels in the entire feasible domain.

### 015-0415: Joint Mail-in Rebate Decisions in Supply Chains Under Demand Uncertainty

**Qin Geng**, *Robert Morris University, United States*

**Suman Mallik**, *University of Kansas, United States*

We study the joint decisions of offering MIRs in a single-manufacturer-single-retailer supply chain. The manufacturer produces a single product and sells it exclusively through the retailer. Either party can, however, offer an MIR to the end consumer if it is in his best interest. The consumer demand is stochastic. Using a game theoretic framework, we study the Nash equilibrium outcome of the game. Both additive and multiplicative demand functions are considered. We show the existence of a unique Nash equilibrium under both additive and multiplicative demand functions and characterize it completely. Using a numerical study, we show that the average post-purchase price of the product is higher not only than the perceived pre-purchase price but also than the newsvendor optimal price without an MIR. This implies that an MIR makes a product look cheaper while the consumers actually pay more on an average.

### 015-0958: Implications of "Online-to-Store" Channel on Demand Allocation, Retail Pricing and Profitability

**Shuya Yin**, *University of California at Irvine, United States*

**James Cao**, *UC Irvine, USA*

**Rick So**, *UC Irvine, USA*

As internet retailing has become increasingly prevalent, firms have continued to innovate by adopting multi-channel strategies. One of these innovations is the introduction of a third channel of distribution, commonly known as online-to-store. Customers now have the option to purchase online and ship to their home, purchase in-store and pick up in-store, as well as purchase online and pick up in-store. In this project, our focus is on understanding the effects of the online-to-store channel on demand realization among various distribution channels, and the retailer's pricing strategy and profitability.



Saturday, 11:15-12:45, Junior Ballroom C

Track: SOHL, 8

Chair: Gregory Graman

Session: Energy, Electricity and Biofuels

### 015-0479: GIS-based Approach of Identification of the Optimal Pulpwood-to-Biofuel Facility Location in Michigan's Upper Peninsula

**Fengli Zhang**, *Michigan Technological University, United States*

**Dana Johnson**, *Michigan Technological University, United States*

**John Sutherland**, *Purdue University, United States*

One of the critical elements for promoting ethanol production from woody biomass is defining the optimal ethanol plant location. The woody biomass feedstock and transportation costs are geographically dependent. A Geographic Information System (GIS) based approach was applied to identify promising pulpwood-to-biofuel facility locations in Michigan's Upper Peninsula (UP). The approach uses a county-based pulpwood distribution, census, railroad, and state road transportation network. Thirteen candidate locations were identified. The preferred location was selected using a weighted-average transportation cost. The optimal site for biofuel production was identified to be village of Baraga, MI in Baraga County, with the minimal weighted-average transportation cost.

### 015-0783: Volatility Pricing in the Electricity Capacity Market

**Xiaoyue Jiang**, *Tulane University, United States*

**Geoffrey Parker**, *Tulane University, United States*

**Ekundayo Shittu**, *Tulane University, United States*

In recognizing the negative effects of volatility in both electricity supply and demand, we propose a two-sided capacity market mechanism that implicitly prices volatility. More specifically, in this market, electricity generating capacity is to be traded at two quality-of-services (QoS) levels: guaranteed capacity and best-effort capacity. While the best-effort capacity resolves the "missing money" problem, the guaranteed capacity maintains system reliability in face of growing penetration of intermittent (highly volatile) renewable sources. Fair share of reliability responsibility among individual suppliers and load serving entities is induced based on individuals' own optimal strategy. Moreover, volatility of supply and demand is taken into account in the pricing scheme for guaranteed capacity, which becomes financial incentives for technological innovations. In particular, smart grid technologies serve the purposes of reducing supply/demand volatility and supporting guaranteed QoS, which ultimately leads to higher system reliability and higher energy efficiency.

### 015-0033: An Empirical Study on the Determinants of Adoption of Green Procurement in Manufacturing Supply Chains

**Asif Salam**, *University of the Fraser Valley, Canada*

This study investigates the adoption of green procurement methods by Thai electronic companies. The relationships between the adoption of green

## Saturday, 11:15-12:45 Sessions

are studied. Companies in the electronic industry that held ISO 14001 certification in Thailand before December 2004 were sampled for the empirical study. The findings indicate that all of the hypothesized relationships were significantly supported in this study. Of the four variables, influence or pressure from the trading partners e.g., buyer's pressure on suppliers, was found to be the strongest predictor of the adoption of green procurement. This implies that, Original Equipment Manufacturing (OEM) and Original Designing and Manufacturing (ODM) companies in Thailand's electronic industry still have an opportunity to develop a competitive differentiation, if they adopted green procurement practices in response to the current wave of global environmental concern.

### 015-0664: Biomass Feedstock Supply Chains

*Gregory Graman, Michigan Technological University, United States*

*Adam Kastamo, Michigan Technological University, United States*

*Dana Johnson, Michigan Technological University, United States*

The use of ethanol has gained popularity due to the interest in reducing dependency on foreign oil and concerns about potential climate change. Biomass-based ethanol is less costly than other forms of ethanol. The feedstock supply chain for processing timber used in biomass-based ethanol has traditionally followed a forward supply chain format. Unlike traditional forward supply chain formats that are applied to feedstock supply chains in which suppliers, distribution networks, transportation modes, capacity and inventory are important features, this paper proposes an alternative view of the feedstock supply chain in which the concepts found in reverse supply chains, such as uncertainty in supply, collection points, inspection, and quality issues of the timber are applied. This unique application of both forward and reverse supply chain formats takes into account the tree's life and carbon cycles, while at the same time providing a better understanding of the feedstock supply chain.

99	Saturday, 11:15-12:45, Junior Ballroom D	Track: SOHL, 9	Chair: Aruna Apte
	Session: Humanitarian Logistics: A New Field of Research & Action		

### 015-0128: Last Mile Vehicle Fleet Management in Humanitarian Operations: a Case-Based Approach

*Alfonso Pedraza Martinez, INSEAD, France*

*Orla Stapleton, INSEAD Social Innovation Centre, France*

*Luk Van Wassenhove, INSEAD, France*

Transportation is the second largest cost to humanitarian operations after personnel. By using a multiple case research design, we study last mile vehicle fleet management in 4 large international organizations: the International Committee of the Red Cross, the International Federation of Red Cross and Red Crescent Societies, the World Food Program and World Vision International. Our field research includes more than 40 interviews at headquarters, regional and national level in Africa, the Middle East and Europe and 30 interviews with staff from other organizations and service suppliers. We provide a detailed description of different humanitarian fleet management models. We also identify the main factors affecting last mile vehicle fleet management and its impact on last mile distribution. Our field work contributes to a better understanding of transportation management in humanitarian operations.

### 015-0111: Humanitarian Logistics: A Response Supply Chain

*Aruna Apte, Naval Postgraduate School, United States*

Though there are some exceptions, in general a commercial supply chain supplies a pre-established, standardized product to customers to meet a relatively constant and forecasted demand via structured resources and continuous flow. In contrast, at any given time, a response supply chain in humanitarian logistics supplies a wide range of products and services fulfilling spurts of demand while sharing the flow and capacity with other relief items. We discuss the factors common to both commercial supply chains and humanitarian logistics viewed as a supply chain, in addition to an organization's objective and performance measures, and agility, adaptability, and alignment.

### 015-0605: ANP-based Reverse Logistics Model for e-Waste Management

*Hokguan Jo, Jeisys medical Inc., Korea, Republic of (South Korea)*

*Sungmin Yang, Kyungshung University, Korea, Republic of (South Korea)*

*Taioun Kim, Kyungshung University, Korea, Republic of (South Korea)*

*Hongbae Kim, Kyungshung University, Korea, Republic of (South Korea)*

The short life-cycle of electronic products, rapid technology change, low price and planned obsolescence have resulted in a fast-growing surplus of electronic waste (e-waste). To tackle this problem, reverse logistics have been applied in the related field. Reverse logistics deal with all operations related to the reuse or recycle of products and materials in the backward value chain. Many problems in SCM or logistics area are related to the multiple criteria decision making. In dealing with multiple criteria and multi-attribute problems, Analytic Network Process (ANP) is well suited. It can solve feedback and interdependence relationship among criteria, which is not possible in Analytic Hierarchy Process (AHP). The purpose of this paper is to analyze the reverse logistic issues regarding the e-waste. A decision making model about reverse logistics for used cell phones is constructed and analyzed based on an ANP model.

100	Saturday, 11:15-12:45, Orca	Track: CIM, 6	Chair: Shanling Li
	Session: Emergent Topics in Supply Chains		

### 015-0160: Dynamic Pooling of Make-to-Stock and Make-to-Order Operations

*Zhe Zhang, Western Washington Univ./Simon Fraser University, Canada*

*Gangshu Cai, Kansas State University, United States*

*Ilhyung Kim, Western Washington University, United States*

## Saturday, 11:15-12:45 Sessions

**Yugang Yu**, *Rotterdam School of Management, Erasmus University, Netherlands*

We investigate a hybrid manufacturing system which combines "make-to-order" and "make-to-stock" operations by utilizing a multi-server queueing model with service interruptions and server vacations. With such a model, the issue of capacity allocation and inventory control is addressed. The purpose of this research is to demonstrate the beneficial pooling effects of combining different production modes. Using approximations and bounds, we develop some closed form solutions to the optimal policy parameters. Simulation results are presented to show the accuracy of our approximation scheme.

### 015-0285: Contingent Contracts in Procurement Auctions

**Jianqing Chen**, *University of Calgary, Canada*

**Lizhen Xu**, *University of Texas at Austin, United States*

**Andrew Whinston**, *University of Texas at Austin, United States*

Procurement auctions are sometimes plagued with a chosen supplier's failing to accomplish a project successfully. We study a setting in which suppliers differ in both the costs to fulfill the project and the types reflecting their success probabilities. To screen suppliers, the buyer invites suppliers to specify a two-dimensional bid composed of the proposed cost and a penalty payment if the delivered project fails to meet the requirements. We find that a quasi-linear scoring rule can effectively separate suppliers regarding their types. We then study the efficient and optimal design of the scoring rule. The efficient design internalizes the inferred information on suppliers' type and essentially ranks suppliers based on the expected total cost to the buyer. In the optimal design, the buyer may or may not under-reward suppliers' high success probability, depending on the balance between suppliers' success probabilities and the associated cost distributions.

### 015-0149: Markdown Pricing of Seasonal Products in Retail Chains

**Vincent Li**, *Graduate Institute of Logistics Management, National Dong Hwa University, Taiwan, Republic of China*

**Yat-wah Wan**, *Graduate Institute of Logistics Management, National Dong Hwa University, Taiwan, Republic of China*

In this paper, we consider a retailer chain with a single distribution center dealing with a single type of seasonal commodity. Inventory of the commodity is stored in the retailers and the distribution center to satisfy the uncertain and price-sensitive demands of the commodity in a finite planning horizon. The permanent markdown pricing method is adopted by the retail chain. The decisions are the exact pricing strategy across periods and the inventory replenishment of the retailers from the distribution center, so as to maximize the overall profit of the retailer chain. The optimal decisions for small-size problems can be found by dynamic programming. By making use of the concavity of the objective function in adding items to retailers, several iterative heuristics using average demand in each period are developed to approximate the optimal decisions for large-size problems.

### 015-0277: CSR Paradox? — Pricing and Advertising Decisions in a Food Supply Chain

**Wenqing Zhang**, *McGill University, Canada*

**Shanling Li**, *McGill University, Canada*

**Dan Zhang**, *McGill University, Canada*

Many health issues, such as obesity, are caused by inappropriate food consumption. It is therefore important to promote healthy eating among consumers, which is widely believed to be part of the corporate social responsibility (CSR) of food manufacturers and distributors alike. Recently, some major food manufacturers have adopted advertising initiatives which limit the advertising of non-healthy food categories while promote healthier choices. We study the effect of such initiatives in various supply settings.

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Saturday, 11:15-12:45, Parksville

Track: EROM, 6

Chair: Benton W.C.

Session: Sourcing and Supply Chain Management

### 015-0229: Sourcing Cores and Production Planning for Remanufacturing: Insights from the Automotive Parts Remanufacturing Industry

**Toyin Clotney**, *The Ohio State University, United States*

**W.C. Benton**, *The Ohio State University, Ohio*

An important problem faced by a remanufacturer is ensuring a sufficient supply of cores to support remanufacturing operations. The sourcing of cores to be remanufactured is a complex set of activities that requires careful coordination to avoid the uncontrolled accumulation of core inventory, or unacceptable levels of customer service. We report on current practice in the automotive industry via an extensive survey of North American automotive parts remanufacturers. The survey results highlight what a segment of the remanufacturing industry perceives as critical issues in sourcing cores and planning production. These critical issues indicate the research needs in this area.

### 015-0157: Organization Design Approach to the Management of Contract Manufacturing Process – Managing Uncertainties

**Riikka Kaipia**, *Helsinki University of Technology, Finland*

**Aki Laiho**, *Helsinki University of Technology, Finland*

**Virpi Turkulainen**, *Helsinki University of Technology, Finland*

In this paper we study purchasing and supply management, taking the information processing perspective. Based on a framework on optimal coordination mechanisms (Grandori and Soda 2006), a special purchasing situation in an organization, outsourcing manufacturing to a contract manufacturer, is analyzed. The paper includes two in-depth case studies, with different organizational solutions to outsourcing decisions. The first company has to deal with the management of new outsourcing projects, whereas the second company has a more mature relationship with contract manufacturers. It was discovered that despite the different environments and case features, there are similarities in the use of coordination mechanisms. The companies seem to be managing different types of uncertainties in a similar manner. This forms a contribution to the framework, especially in terms of how the different types of uncertainties can be operationalized in the context of contract manufacturing.

### 015-0409: An Empirical Test of the Supply Chain Operations Reference Model

## Saturday, 11:15-12:45 Sessions

*WC Benton, The Ohio State University, United States*

*Honggeng Zhou, The University of New Hampshire, United States*

The Supply Chain Operations Reference (SCOR) model has been widely adopted in many companies. Anecdotal evidence has reported significant improvements after firms have adopted the SCOR model. Although practitioners have been very enthusiastic about applying the SCOR model in the real world, no large-scale empirical study has yet tested the validity of the SCOR model. The purpose of this study is to (1) empirically validate the SCOR model, and (2) explore the relationship between firm strategies and the use of the SCOR model. Data from 125 North American manufacturing firms were collected. The results show that (1) the relationships among the supply chain processes in the SCOR model are generally supported; (2) the firms with cost leadership strategy emphasize the use of the Source, Make, and Deliver processes, while the firms with differentiation strategy emphasize the use of the Plan process; and (3) for firms with differentiation strategy, Plan process does not have significant impact on Source process and Delivery process. The findings provide managers with empirical evidence on the validity of the SCOR model and offer guidance on how to align business strategies with supply chain practices.

### 015-0441: The Influence of Supplier Development on Buyer-Supplier Relationships

*Carol Prahinski, Michigan State University, United States*

*W.C. Benton, The Ohio State University, United States*

*Ying Fan, University of Colorado - Colorado Springs, United States*

Manufacturing firms rely on supplier development programs (SDPs) to improve supplier performance. SDPs include evaluations, incentives, competitive pressure and direct involvement with the supplier. In practice, however, SDPs have had moderate success. We explore how the buyer-supplier relationship – specifically commitment, communication and cooperation – affects the linkage between SDPs and performance. The results from a survey of 142 managers suggest that incentives do not appear to affect either the buyer-supplier relationship or performance. Competitive pressure is not an effective SDP, since it has a negative relationship with performance and the relationship. Evaluations and direct involvement, such as education and training, are positively related to commitment, communication and cooperation, which have an effect on performance.

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Saturday, 11:15-12:45, Pavilion Ballroom A

Track: PLQ, 6

Chair: Jannis Angelis

Session: Lean Production

### 015-0084: Lean and Organisational Fit: Unbundling Implementation

*Jannis Angelis, Warwick Business School, United Kingdom*

*Mark Johnson, Cranfield University, United Kingdom*

Many firms cannot implement lean fully, in terms of level and width of implementation. This may be because of a range of underlying reasons, such as lack of resource, capability or lean understanding. Regardless, the main question remains: what should management do about the lean implementation if there is little chance of full implementation? This study provides an in-depth conceptual understanding of the characteristics of lean and how this translates to the organizational fit needed for a successful lean implementation and application. As such, the study provides both theoretical and managerial insights.

### 015-0841: The Contribution of IT to Lean Production in Japanese Manufacturing: An Empirical Analysis

*Osam Sato, Tokyo Keizai University, Japan*

*Yoshiki Matsui, Yokohama National University, Japan*

*Hideaki Kitanaka, Takushoku University, Japan*

Lean production is an important manufacturing strategy for productivity, but it is not easy to realize it. On the other hand, information technology (IT) has improved rapidly. Therefore, many plants have worked hard to employ IT to accomplish lean production. Japanese plants have pursued it also. However, a good application of IT that realizes lean production is not easy and many factors have affected it. The applications of IT in Japanese plants have been affected by many local and environmental factors too, which showed some different pictures from other developed countries. By using a survey data, we did a set of statistical analyses to find the international difference. This paper reports the results.

### 015-0892: Investigating Barriers to Lean Transformation

*David Marshall, University of Kentucky, United States*

*Thomas Goldsby, University of Kentucky, United States*

To remain competitive in a global market, many organizations are transforming their operations from traditional management approaches to the lean management philosophy. Despite the pervasive nature of lean literature, many organizations struggle to attain successful lean transformation. This research seeks to identify barriers that inhibit lean transformation by conducting a survey of organizations that are in various stages of lean transformation. A conceptual model, grounded in prior literature, is developed to test a variety of relationships among technical, political, and cultural aspects of lean transformation.

### 015-0178: The DNA of Toyota Revisited: Issues and Challenges of Lean Implementation

*Andrej Baranek, Nottingham University Business School, United Kingdom*

*Kim Tan, Nottingham University Business School, United Kingdom*

Spear and Bowen (1999) capture the tacit knowledge that underlies Toyota's outstanding performance as manufacturer in four basic rules. These rules show a) how Toyota sets up all its operations as experiments; and b) how Toyota teaches the scientific method to workers at every level of the organization. Despite these efforts, though, adopters of Lean manufacturing struggle to replicate the success of Toyota and with that its performance. Do the adopters cause this difficulty by simply not following the rules? Or is this difficulty caused by the rules themselves? To address these questions this research sets to empirically investigate the operations of British automotive engine industry. Based on an extensive one and a half year study, the findings of this paper a) contribute to the understanding of adopters' difficulties with Lean implementation; and b) enrich the rules

## Saturday, 11:15-12:45 Sessions

with observations from British automotive engine industry.

103	Saturday, 11:15-12:45, Pavilion Ballroom B <b>Session:</b> New Product Development and Introduction	<b>Track:</b> GENL, 6	<b>Chair:</b> Yael Grushka-Cockayne
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### 015-0187: Multi-Objective Optimization Model for Supply Chain Configuration for New Products

*Bimal Nepal, Texas A& M University, United States*

*Leslie Monplaisir, Wayne State University, United States*

*Femi Famuyiwa, Shneider Logistics, United States*

Configuring a supply chain for new products involves selecting how to source each stage in the supply chain, and also determining the best overall strategy for deploying safety stocks across the supply chain so as to buffer it against demand uncertainty. Traditionally, this has been attempted as single objective cost minimization problem. This article introduces the use of multi-objective optimization model in configuring supply chain during product development. In addition to using various production and inventory costs, the model makes use of subjective criteria such as alignment of business practices and financial objectives of member companies in configuring the supply chain. Fuzzy logic is used to analyze the subjective or qualitative variables such as alignment of business cultures and practices. Genetic algorithm is used to solve the optimization model. A bulldozer case study is then presented to benchmark and demonstrate the benefits of the proposed methodology.

### 015-0240: Leveraging Technology to bring Multicultural and Diversity Issues into the Classroom

*Victor Prybutok, University of North Texas, United States*

*Shailesh Kulkarni, University of North Texas, United States*

We discuss the use of state-of-the-art technology to incorporate multicultural and diversity issues along with an experiential learning experience in a large, multi-section, undergraduate statistics sequence to enhance student learning and engagement. We also demonstrate how similar applications can be used to stimulate interactive discussions of simple as well as complex ideas and models in Operations Management. We discuss the results of a post-hoc survey conducted in two sections of the said course sequence in order to assess if the learning outcomes especially related to multiculturalism and diversity were met or not.

### 015-0710: Operations Strategy and Performance Measurement Roles

*Edson Pinheiro de Lima, Pontifical Catholic University of Parana, Brazil*

*Sérgio Gouvêa da Costa, Pontifical Catholic University of Parana, Brazil*

*Pedro Siqueira Ferreira, Pontifical Catholic University of Parana, Brazil*

*Jannis Angelis, Warwick Business School, United Kingdom*

Companies' environment and global competition are forcing them to revise the way they design and implement their strategies and management systems. Business and functional management systems should develop specific capabilities to deal with a changing and complex environment; that is, strategic and operational plans should be continuously assessed and updated. This paper frames a discussion based on operations strategy framework. The main issue is to interrelate operations strategy and performance measurement in a strategic management framework. Performance measurement roles are revised in order to assess their alignment with new design requirements for operations strategic management. Based on a set of updated performance measurement systems roles, a case study protocol is developed and applied to two engineering service companies. Although classical roles as performance control is still the main focus of operations performance measurement systems, the evidence collected shows a growing use of operations strategic management systems for continuous improvement management.

### 015-0850: The Value of Flexibility in New Product Development: The Impact of Competition

*Janne Kettunen, University of Calgary / Haskayne School of Business, Canada*

*Yael Grushka-Cockayne, University of Virginia / Darden School of Business, United States*

*Bert De Reyck, University College London / Department of Management Science and Innovation, United Kingdom*

*Zeger Degraeve, London Business School, United Kingdom*

*Ahti Salo, Helsinki University of Technology / Systems Analysis Laboratory, Finland*

Managerial flexibility can have a significant impact on the value of NPD projects. Studies have examined how this value depends on the characteristics of the development process; we investigate how competition influences it. Our dynamic programming framework accounts for uncertainties in the product performance and market requirements, different market environments, and varying strength of competition. Using two dimensions of competition, we show that the effect of competition on the value of flexibility is complex. Stronger competition may increase or decrease the value of flexibility, depending on the market environment and whether the options act as substitutes or complements. Surprisingly, we find that flexibility does not necessarily have greater value in a winner-takes-all market, in which the best-performing product captures the entire market, compared to a shared market, where many products can co-exist. Our insights help firms understand how flexibility should be explored, depending on the nature of competition they face.

104	Saturday, 11:15-12:45, Pavilion Ballroom C <b>Session:</b> Reverse Logistics Applications	<b>Track:</b> LM, 6	<b>Chair:</b> Rosani de Castro
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### 015-0182: University Transit System Design

*Satavanan Kuppusamy, University of Cincinnati, United States*

*Michael Magazine, University of Cincinnati, United States*

*Kipp Martin, University of Chicago, United States*

## Saturday, 11:15-12:45 Sessions

*Jeff Camm, University of Cincinnati, United States*

*Changjoo Kim, University of Cincinnati, United States*

The Bearcat Transportation System of the University of Cincinnati is modeled and solved as a multiple vehicle routing problem. Travel time data coupled with client driven constraints are used to design the transportation system. In addition, multiple approaches to model the student population locations are considered and analyzed to derive the insights.

### 015-0100: A Multicriteria Tabu Search Heuristic for Real-life Dial-a-ride Problems

*Julie Paquette, HEC Montreal, Canada*

*Jean-François Cordeau, HEC Montreal, Canada*

*Gilbert Laporte, HEC Montreal, Canada*

Service quality criteria were identified during a study of a Canadian dial-a-ride operator. These criteria were incorporated as a second objective within a tabu search algorithm for the dial-a-ride problem. This new multicriteria solution approach is used to propose a set of non-dominated solutions to the manager of the service. Computational results on real and artificial data will be presented. These results improve the understanding of tradeoffs between quality and cost for the service manager.

### 015-0189: Integrative Cooperative Search for Rich VRP

*Teodor Gabriel Crainic, School of Business Administration, UQAM, Canada*

*Michel Gendreau, Ecole Polytechnique Montreal, Canada*

*Nadia Lahrichi, CIRRELT, Canada*

*Walter Rei, School of Business Administration, Canada*

*Thibaut Vidal, CIRRELT, Canada*

Rich VRP refers generally to routing problems characterized by a high number of attributes typical of actual applications. We present a methodology, denoted Integrative Cooperative Search, aimed at addressing simultaneously the many attributes of Rich VRP. The method is based on an attribute-based decomposition cooperative search principles. It integrates partial solvers for the subproblems generated by the decomposition, as well as integrator algorithms to re-create complete solutions and dynamic learning and search guidance mechanisms. We illustrate the methodology with applications to multi-depot, multi-period problem settings

### 015-0087: Workforce Management in Periodic Delivery Operations

*Karen Smilowitz, Northwestern University, United States*

*Maciek Nowak, Loyola University Chicago, United States*

We explore the addition of operational complexity to the Period Vehicle Routing Problem (PVRP). The PVRP extends the vehicle routing problem by serving customers according to set visit frequencies over a time period. When routes operate over multiple days, issues of operational complexity arise. Operational complexity captures the difficulty of implementing a solution for service providers and customers. We add complexity to the PVRP and evaluate the impact of complexity on solutions.

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Saturday, 11:15-12:45, Port Alberni

Track: PRF, 1

Chair: Farzaneh Fazel

Session: Industry-Academia Collaboration Projects

### 015-0421: Collaborative KPIs: How to Turn Around a Buyer-supplier Relationship

*Willem van Oppen, Provoque Consulting, Netherlands*

*Henk Akkermans, Tilburg University, Netherlands*

This paper describes a research project in which the question of how to achieve a turn-around in an adversarial buyer-supplier relationship in co-producing services was investigated. It depicts the crisis and subsequent turnaround of the buyer-supplier relationship between Atos Origin, a main European IT-outsourcing player, and its customer KPN, the leading Netherlands Telco. The organizational change approach, which is called "Collaborative KPIs," consists of steps, consistent with the Unfreeze-Move-Freeze approach of Kurt Lewin. At the time of the change effort, the author was Chief Procurement Officer of KPN. The second author is Professor Supply Network Dynamics at Tilburg University. In this case, the Collaborative KPI approach resulted in significant operational improvements on the shop-floor level by means of true collaboration. The environment of trust and measurable alignment that was created with concrete measurements and rewards for both supplier and customer has demonstrated its robustness over the past four years.

### 015-0821: Operating Room Efficiency Improvement Project: Collaboration Between Houston's Veterans Affairs Hospital and the University of Houston

*Vikram Tiwari, University of Houston, United States*

*David Berger, Michael E. DeBakey Department of Surgery / Professor Baylor College of Medicine, United States*

The presentation gives an overview of the studies currently underway as part of research collaboration between an academic institution and a large acute-care teaching hospital. The common objective of the various studies is increasing efficiencies of the hospital's operating rooms. Some of the projects are – 1) quantifying surgical workload variability and ascertaining its causes; 2) analyzing the impact of day-of-surgery cancellation rates on OR utilization, and developing a plan to minimize cancellations; 3) surgical case length estimation for better scheduling of surgeries; and 4) conducting a before-after study to measure improvements in patient flow times and average lateness in case completion times, after the implementation of an OR patient flow control system. Also discussed are the opportunities created by this unique model of collaboration between the medical practitioners and academic researchers, the limitations of direct implementation of most of the past research, and the challenges of balancing competing priorities.

### 015-0349: Improving Call Center Staffing

## Saturday, 11:15-12:45 Sessions

*Farzaneh Fazel, Illinois State University, United States*

*Ahmad Fakheri, Bradley University, United States*

Most call centers use commercial software for staff scheduling, but software recommendations usually fall short of providing a reliable estimate of staff needed for a desired customer service level. We have obtained and analyzed data from an insurance company's call center. The analysis shows that although the management generally schedules more employees than the software recommends, the resulting service level is often below the target during periods of rapid change (increase or decrease) in arrival rate, indicating a need for mathematical models that account for the transient nature of the system. Without such models, however, we can still provide effective and easy to implement recommendations that will improve call center operations during times of high variations in demand. The presentation will also include some discussions of benefits and challenges of conducting research at this company.

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Saturday, 11:15-12:45, Port Hardy

Track: ROM, 2

Chair: Saravanan Kesavan

Session: Retail Operations Management Two

### 015-0276: Signaling Quality with Queues

*Laurens Debo, University of Chicago, United States*

*Senthil Veeraghavan, University of Pennsylvania, United States*

We study how a high-quality service firm selects a service rate differently than a low-quality service firm when the firm cannot communicate its service value or service rate to its customer base. As a result, potential customers may take the queue length upon arrival into account when assessing the service value before joining the queue for service. We show that customer queue joining behavior may not be of the threshold type, which is a typical equilibrium structure under observable service value and rate. Furthermore, we find differentiating equilibria in which the high quality service firm selects a slower service rate than the low quality service firm, even if the cost of speeding up is the same for both firms.

### 015-0206: Measuring the Effect of Global Sourcing on Inventory Performance of U.S. Retailers

*Marcelo Olivares, Columbia University, United States*

We combine multiple data sources (Economic Census, U.S. Customs, Compustat) covering global trade flows, sales and inventory trends to identify patterns in global sourcing. We then attempt to understand the drivers of these trends and study their implications on inventory performance.

### 015-0718: Stocking Substitutable Products

*Amr Farahat, Cornell University, United States*

*Joonkyum Lee, Cornell University, United States*

We study the problem faced by a retailer who needs to determine the assortment and order quantities of substitutable products prior to the start of the selling season. Customers arrive stochastically, are served in the order of their arrival, and their choice of product to purchase depends on the set of products available at the time of arrival. We adopt a mathematical programming approach to the problem. Starting from a dynamic programming formulation, we develop a tractable relaxation based on duality arguments. Special cases of our formulation include the independent newsvendor and the fluid approximations. Numerical simulations show that the proposed method performs competitively with the best available methods. Our formulation is guaranteed to provide upper bounds on the optimum value of expected profit, which can be used to assess the optimality gap of stocking decisions.

### 015-0919: The Predictive Power of Abnormal Inventory Growth: Application to Earnings Forecasting for Retailers

*Saravanan Kesavan, UNC Chapel Hill, United States*

*Vidya Mani, UNC Chapel Hill, United States*

In this paper we test the predictive power of Abnormal Inventory Growth (AIG) to forecast retailers' financial performance. We show that this metric is predictive of one-year ahead earnings per share, comparable store sales growth rate, gross margin, and other expenses for a retailer. We find that a one standard deviation change in AIG is associated with a change in one-year ahead earnings, comparable store sales growth, and gross margin by 23%, 13.4%, and 12.9% of their respective standard deviations. We also find that retail managers do not fully incorporate the information contained in the previous year's AIG in their earnings forecasts. Finally, we find that equity analysts also fail to do so, resulting in systematic biases in their earnings' forecasts. We show that incorporating AIG in analysts' forecasts would improve their forecast accuracy by 14.62%.

### 015-0828: Attracting Restaurant Patrons: The Importance of Building Exteriors and Signage

*Helene Caudill, St. Edward's University, United States*

*Nancy Ryan, St. Edward's University, United States*

An important aspect of retail operations concerns interior layouts, or more specifically, the servicescape. In general, the servicescape includes the physical factors that can be observed inside a retail environment, such noise level, lighting, and scent. Another interesting and important aspect of retail establishments focuses on the exterior building and the outside signage/logo. In particular, customers' perceptions of their cleanliness, sophistication, and styling may affect their desire to enter the facility and ultimately become patrons. In a lab experiment, subjects were exposed to slides of five actual restaurants with exterior views of the building and signage manipulated. Preliminary results indicate that the exterior of a restaurant is important in determining customers' likelihood to eat there.

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Saturday, 11:15-12:45, Port McNeill

Track: OEE, 1

Chair: Xiande Zhao

Session: Operations and Supply Chain Management in China: Empirical Studies 1

## Saturday, 11:15-12:45 Sessions

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### 015-0530: Power in Chinese Supply Chains: A Taxonomy Perspective

*Barbara Flynn, Kelley School of Business, Indiana University, United States*

*Baofeng Huo, School of Management, Xi'an Jiaotong University, China*

*Xiande Zhao, Faculty of Business Administration, The Chinese University of Hong Kong, China*

This study explores the patterns of power and linking it with company and supply chain performance in Chinese supply chains. Data were collected from 617 manufacturers in China. The findings indicate that there were eight independent patterns of supply chain power, which can be combined into three major patterns: balanced (power source and power type are similar), type unbalanced (coercive power is weaker than non-coercive power) and source unbalanced (customers have more power than suppliers) supply chain power patterns. Power strength, which is the degree of power used, was the most important differentiator between all types of performance, followed by power type balance and power source balance, which exists when the different dimensions of power are paid equal attention (type) and suppliers and customers have similar levels of power (source).

### 015-0375: An Empirical Assessment of the Link between Industrial Upgrading and Firm Innovativeness in China

*Arash Azadegan, New Mexico State University, United States*

*Stephan Wagner, Swiss Federal Institute of Technology Zurich, Switzerland*

Industrial upgrading (IU) is the stepwise development of manufacturing capabilities from simple to more complicated tasks. IU has proven to be a highly effective approach for late entrants in catching up with incumbents. In essence, IU relies on a sequential and paced approach to organizational learning to develop progressively more complicated industry-established practices. Whether this systematic learning of operational processes would allow latecomers to eventually learn to exploratively innovate is yet to be investigated. We propose and test a series of hypotheses using path analysis on a sample of 535 Chinese manufacturers. Supporting the notion of the cumulative sand cone model of manufacturing capabilities, we show that firms indeed progress from lower rungs of manufacturing and design to higher rungs. Furthermore, the results suggest that IU has a positive association with exploitative innovations. In turn, such exploitative innovations partially mediate the effect of IU on explorative innovations.

### 015-0890: Product Innovation in China's Pearl River Delta: A Field Study of Development Processes and Customer Collaboration

*Xiande ZHAO, Chinese University of Hong Kong, China*

*Mohan Tatikonda, Indiana University, United States*

*Zhiqiang WANG, Chinese University of Hong Kong, China*

*Min ZHANG, Chinese University of Hong Kong, China*

*Guilong ZHU, South China University of Technology, China*

We present an exploratory study of product development and customer collaboration practices at Chinese firms. An in-depth, grounded-theory building, cross-case analysis methodology is employed to collect and analyze data from seven manufacturers in the Pearl River Delta region of China -- a region which opened early to the West and is called "the world's factory." Firms studied include pharmaceuticals, electronics, machine tools, textiles, plastics and consumer appliance manufacturers. Firms differ in manufacturing process type, private- vs. state-ownership, and extent of domestic sales vs. exports. Over 75 hours of interviews were conducted with R & D, marketing, supply-chain and general management executives. Semi-structured interview protocol questions address internal product development processes, cross-functional involvement, product portfolio planning, and timing and nature of customer collaboration in the innovation process. Initial results suggest differing maturity levels of cross-functional internal interaction and identifiable categories of customer involvement in product development.

## Saturday, 1:30- 3:00 Sessions

109	Saturday, 1:30- 3:00, Finback <b>Session:</b> Distribution and Fleet Management in Humanitarian Operations	<b>Track:</b> SCM, 17	<b>Chair:</b> Alfonso J. Pedraza Martinez
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### 015-0057: Challenges in Demonstrating the Effectiveness and Efficiency of Fleet Management for Health Delivery: An Evaluation of Riders for Health

*Hau Lee, Stanford Graduate School of Business, United States*

*Lesley Sept, Stanford Graduate School of Business, United States*

*Sonali Rammohan, Stanford Graduate School of Business, United States*

*Jessica McCoy, Stanford Mgmt Science & Engineering, United States*

Riders for Health is a nonprofit organization focused on improving the accessibility of health care in rural Africa through the provision of transportation solutions to health workers. Rural clinics whose workers previously walked or used bicycles to visit outlying villages have drastically increased the number of health interventions delivered with fleets managed by Riders. To determine the impact that a well-maintained fleet has on health care delivery, we are conducting a pilot evaluation of Riders for Health along three dimensions: logistics efficiencies, health worker productivity, and health intervention coverage. As is typical in the humanitarian sector, data is scarce and at times unreliable. We discuss the challenges of collecting viable and appropriate data in such an environment, as well as our plan for performance analysis. Performance measurement is key in identifying and improving health care delivery supply chains in the developing world.

### 015-0112: Optimal Fleet Trajectory for the Humanitarian Relief Operations

*Mahyar Eftekhari, HEC School of Management, France*

*Andreas Robotis, HEC School of Management, France*

*Luk Van-Wassenhove, INSEAD, France*

This paper studies optimal vehicle fleet sizing over a finite time horizon for humanitarian organizations. First, a deterministic model including vehicle purchasing price, operating costs and salvage value is presented. Then the model is extended to find the optimal solution under uncertainty, including conflicts and disasters. We compare level and chase strategies for determining vehicle fleet size. Based on the data provided by the International Committee of the Red Cross (ICRC), the model is tested and normative prescriptions are provided.

### 015-0053: Incentives in Humanitarian Fleet Management

*Alfonso Pedraza Martinez, INSEAD, France*

*Sameer Hasija, INSEAD, Singapore*

*Luk Van Wassenhove, INSEAD, France*

We study incentive alignment in humanitarian organizations, focusing on last mile distribution fleet management. Headquarters of these organizations recommend policies to national offices that carry out humanitarian projects. From field research we observe that often these policies are not followed by national offices. Using principal-agent models we show that aligning incentives between headquarters and national offices imposes challenges that are unique to humanitarian operations.

110	Saturday, 1:30- 3:00, Galiano <b>Session:</b> Procurement/Strategic Sourcing 1	<b>Track:</b> SCM, 18	<b>Chair:</b> Cuihong Li
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### 015-0118: Supply Base Design for Supplier Competition and Investment of Effort

*Cuihong Li, University of Connecticut, United States*

We consider a buyer investing in capacities for two suppliers facing uncertain demand. Given the capacities, the suppliers invest cost reduction efforts and compete for the buyer's business. The realized production costs are uncertain and private information of suppliers. We analyze the optimal supplier capacity profile for the buyer, and study whether the buyer should pre-commit to purchasing prices before suppliers investing their efforts or allow them negotiated ex post as results of an auction.

### 015-0121: Capacity Sourcing from a Multi-Supplier Base

*Jishnu Hazra, Indian Institute of Management, India*

In this paper we model a scenario where a buyer reserves capacity from multiple suppliers in the presence of demand uncertainty. We derive suppliers' capacity reservation price, which is a function of their capacity, amount of capacity reserved by the buyer and other parameters. The buyer operates in a "built-to-order" environment and needs to decide how much capacity to reserve and from how many suppliers. The buyer also has an alternate source, the spot market, to get additional units of capacity. For a strategy of equal allocation of capacity among the selected suppliers, we develop closed form solutions. The proposed model points to several useful suggestions for practice.

### 015-0241: Stability of Group Purchasing Organizations

*Mahesh Nagarajan, University of British Columbia, Canada*

*Greys Sosic, University of Southern California, United States*

*Hao Zhang, University of Southern California, United States*

We study the stability of Group Purchasing Organizations (GPOs). GPOs exist in several sectors and benefit its members through quantity discounts and negotiation power when dealing with suppliers. However, despite several obvious benefits, GPOs suffer from member dissatisfaction due to unfair allocations of the accrued savings among its members. We first explore the benefits of allocation rules that are commonly used in practice. We characterize stable coalition outcomes when these rules are used and provide conditions under which the grand coalition emerges as a tenable outcome. We find that an allocation mechanism based on the marginal value of a member's contribution to the coalition leads to stable GPOs in many scenarios of interest. In this analysis, we look at discount schedules that encompass a large class of practical schedules and analyze cases

## Saturday, 1:30- 3:00 Sessions

when purchasing requirements of the members are both exogenous as well as endogenous.

### 015-0105: Group Buying Mechanisms under Quantity Discounts

*Rachel Chen, University of California at Davis, United States*

*Cuihong Li, University of Connecticut, United States*

*Rachel Zhang, Hong Kong University of Science and Technology, China*

When a seller offers quantity discounts, buyers may aggregate their purchasing quantities to obtain lower prices, referred to as group buying. A group buying mechanism determines the amount each buyer will purchase and the price each buyer will pay, based on the information submitted from buyers. This paper concerns group buying among heterogeneous buyers given a seller's quantity discount schedule. We show that group buying mechanisms have a direct impact on the buyers' payments, the buyers' purchase quantities, and the seller's revenue.

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Saturday, 1:30- 3:00, Grand Ballroom D

Track: HOM, 13

Chair: Vedat Verter

Session: Improving Care Delivery Processes

### 015-0170: Improving the Chemotherapy Day Unit One Project at a Time

*Peter Vanberkel, University of Twente, Netherlands*

Three improvement projects completed in the Chemotherapy day unit of the Netherland Cancer Institute - Antoni van Leeuwenhoek hospital will be discussed. The first project used Lean and benchmarking to obtained 24% growth in treatments and bed utilization and 81% reduction of overtime. The second project examined the pros and cons of segregating beds by cancer type. We identified under which conditions a division in capacity is beneficial. The third project examined whether improvements could be achieved by working more collaboratively with the hospital's pharmacy. The project evaluated whether the reduction in waiting time resulting from medications being prepared in advance of a patient's visit was justified, given that medications prepared in advance risked being wasted when patients arrived too sick for treatment. A policy considering a medicine's cost and frequency of use was developed to guide staff in determining which medications to prepare in advance.

### 015-0046: Scheduling According to Physician Average Procedure Times in Endoscopy Suites

*Deborah Loach, University of Toronto, Canada*

*Michael Carter, University of Toronto, Canada*

In 2007 Ontario implemented the first Canadian screening program for colorectal cancer (CRC). As a result, the demand for colonoscopies has increased, creating a need to increase capacity in endoscopy suites. After observing six Ontario endoscopy suites, we decided to focus on improving appointment scheduling. We consider how patient throughput as well as staff and resource utilization would be affected by scheduling procedures based on physician average procedure times. We generate appointment schedules and use them as input to a generic discrete event simulation model. In the simulation, we further consider the impact of adding urgent patients, decreasing room turnover time, and changing the physician to room ratio.

### 015-0117: Chemotherapy Appointment Scheduling at BCCA Vancouver Centre

*Pablo Santibanez, BC Cancer Agency, Canada*

*Ruben Aristizabal, BC Cancer Agency, Canada*

*Martin Puterman, University of British Columbia, Canada*

*Kevin Huang, BC Cancer Agency, Canada*

The Ambulatory Care Chemotherapy Unit at the BC Cancer Agency – Vancouver Centre delivers a large variety of outpatient chemotherapy treatments to nearly 15,000 patients per year.

Clinical complexity combined with high resource utilization and scheduling restrictions have led to a series of operational problems, including: significant number of waitlisted patients, late appointment confirmation and fluctuating treatment schedules. These issues affect not only patients and staff, but also the coordination with other departments, such as pharmacy.

We established a series of process changes to improve the overall appointment process, and developed an optimization model to allocate appointments to nurses while balancing workload and complexity across the treatment schedule.

We present the scheduling model and discuss the successes and challenges faced during the implementation of the process changes and the optimization tool.

### 015-0611: Outcome of Lean in Swedish Healthcare - Rationalization or Increased Patient Value?

*Christina Lindskog, Lund University, Sweden*

*Fredrik Nilsson, Lund University, Sweden*

Lean is a philosophy which has gained popularity in a variety of fields and industries. One of these is healthcare. Fundamental in lean philosophy is the focus on creating value for the customers. To do that, organizations must strive to continuously eliminate all non-value creating activities and free time for innovation of activities that increase customer value. As a result of the increasing popularity of lean in Swedish healthcare, there is an ongoing debate about its effects. The purpose of this paper is to elaborate on the drivers for implementing lean in Swedish healthcare and to explore to what extent the outcome is activities and efforts aimed at increasing the value for the patients. The research indicates that the majority of reported results from lean projects found in literature, as well as studied lean projects, focus mainly on productivity and rationalization and very little on value creation for the patients.

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Saturday, 1:30- 3:00, Granville

Track: HOM, 14

Chair: Diwas Kc

Session: Health Care Policy & Strategy

## Saturday, 1:30- 3:00 Sessions

### 015-0289: Pharmaceutical Promotion in the Presence of Off-Label Uses and Spill-Over Effect

*Hui Zhang, Faculty of Business Administration, Lakehead University, Canada*

*Gregory Zaric, Richard Ivey School of Business, the University of Western Ontario, Canada*

Formularies list drugs that have been clinically proved to be safe and effective and have been approved for certain uses by a regulatory authority. However, once a drug is approved, physicians may also prescribe it for unapproved or "off label" indications. Leakages to unlisted labeled uses or off-label uses are common and their cost-effectiveness is uncertain.

Some third-party payers use price-volume agreements to control unspecified drug uses. If actual sales exceed the specified threshold, then the reimbursement price will be reduced. This paper investigates how the threshold is chosen and how the manufacturer makes marketing decisions under such an agreement. We develop several models under various assumptions of threshold decision. We investigate the optimal marketing decisions in the presence of off-label uses and spillover effect. We also compare different models to illustrate the impact of various approaches for choosing the threshold on the optimal solution.

### 015-0292: The Market for Lemons: Predicting Patient Referrals from Physician Owners to Cardiac and Legacy Hospitals

*Liam O'Neill, Health Management and Policy, University of North Texas - Health Science Center, United States*

*Arthur Hartz, Director of Health Services Research Program, University of Utah, United States*

This study examined the potential impact of adverse selection on the risk-adjusted mortality rates (RAMRs) for percutaneous coronary interventions (PCI) at cardiac and community hospitals. Texas hospital inpatient data on 210,135 PCIs were used for 2004 - 2007. RAMRs were determined for physician-hospital owners performing PCIs who split their caseload among two or more hospitals within the same market. Admission to cardiac hospitals was negatively associated with patient severity, expected resource use, being minority, and being under-insured.

Physician owners doing procedures at cardiac hospitals had excellent RAMRs (0.68%). These same physicians performing PCIs at NFP and FP legacy hospitals had poor outcomes (2.31%) as compared to both the statewide average (1.51%) and the average for those NFP hospitals (1.51%;  $P < 0.05$ ). These paradoxical results can best be understood in terms of Nobel economist Akerlof's classic paper on the "market for lemons."

### 015-0223: Improvement Processes in Healthcare - Where did Primary Care Go?

*Claire Bourne, Warwick University, United Kingdom*

*Jannis Angelis, Warwick Business School, United Kingdom*

*Mairi Macintyre, Warwick University, United Kingdom*

The paper assesses the prevalence of healthcare process improvement initiatives in primary care, which is care predominantly located in community settings. Recent years have seen a policy shift in the delivery of healthcare from the acute setting to primary care (for instance, see Department of Health, 2008). The study is based on published articles from all journals listed in the ABSA Journal Quality Guide found in the operations and technology stream. The selection contains 49 journals, and covers articles published between 2000-2009. The results indicate that the majority of research on process improvement conducted within healthcare is focused on the acute care arena. The results also suggest that the use of processes in primary care relies on generic concepts to a higher degree than acute care does, indicating a lesser degree of maturity. The study also provides insights into the type of health focused articles published in the operations field.

### 015-0895: Operations Strategy for the Entrepreneurial Firm: The Case of a Medical Device Start-Up

*Mohan Tatikonda, Indiana University, United States*

*Todd Saxton, Indiana University, United States*

We report an 18-month longitudinal in-depth exploratory case study of a start-up firm which designed a brain tumor surgery product - a highly regulated medical device. We aimed to learn unique challenges in supply chain development for an entrepreneurial life sciences firm; key decisions and their sequence in operations and supply chain development; and barriers to rapid design, manufacturing ramp-up and delivery of the new product. Guiding theoretical development includes literature on new product development, entrepreneurship, supply chain management and organizational learning. Semi-structured interviews were conducted with the firm's executive team approximately monthly, from the announcement of the firm's creation through first product shipment. Additional site and plant visits, observation of meetings and document reviews were conducted. Initial results suggest the executive team's ability to appropriately "explore" internally vs. "exploit" external resources is central to rapid and successful development of the first new product.

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Saturday, 1:30- 3:00, Junior Ballroom A

Track: PITM, 7

Chair: Nitin Joglekar

Session: Meet the Special Issue Editors

### 015-0634: Meet the Special Issue Editors

*Nitin Joglekar, Boston University, United States*

*Geoffrey Parker, Tulane University, United States*

*Moren Levesque, York University, Canada*

*Edward Anderson, University of Texas at Austin, United States*

*Gil Souza, Indiana University, United States*

Three special issues of POM are due after this conference. The themes for these issues are: Integrating Innovation in Distributed Environments; Science & Technology Commercialization/ Startup Operations; and New Product Development, Innovation and Sustainability. This session will feature short presentations by the editors on their vision behind each issue, followed by an interactive discussion with the audience through questions and answers. This session is jointly sponsored by the College of PI&TM and the College of Sustainability.

## Saturday, 1:30- 3:00 Sessions

115	Saturday, 1:30- 3:00, Junior Ballroom B Session: OMM10	Track: OMM, 10	Chair: Ling and Sammi Wang and Tang
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### 015-0107: Joint Pricing and Inventory/Production Decisions in a Dual-channel Retailer Supply Chain

*Run Niu, Webster University, United States*

*Xuan Zhao, Wilfrid Laurier University, Canada*

*Ignacio Castillo, Wilfrid Laurier University, Canada*

*Tarja Joro, University of Alberta, Canada*

The Internet is becoming increasingly important as a sales channel. Thus, most large retail firms have adopted a multi-channel strategy that includes both web-based channels and pre-existing off-line channels. In this paper, we consider joint pricing and inventory/production decision problems for members in a monopoly two-stage dual-channel retailer supply chain. For a dual-channel retailer supply chain, pricing decisions and inventory/production decisions are interacting in each member of the chain and among the members in the chain. We analyze joint pricing and inventory/production problems under three scenarios by incorporating intra-product line price interaction in the EOQ model. A unique equilibrium exists under certain realistic conditions. We also provide numerical results that offer insights for pricing strategies for the dual-channel retailer supply chain and for product design for different channels.

### 015-0418: When and Why Retailers Sell Their Private Labels Through Competitors

*Liwen Chen, The University of Texas at Austin, United States*

*Steve Gilbert, The University of Texas at Austin, United States*

*Yunchuan Liu, University of Illinois at Urbana-Champaign, United States*

We consider a supply chain consisting of a national brand manufacturer and two retailers who distribute the national brand to consumers. One of the retailers has the capability of selling her own private label. We study the strategic issues of when and why the retailer with private label capability sells the private label through the competitor.

### 015-0771: Delegating Pricing Decision and Motivating Marketing Effort: Optimal Retail Contract Design Through Simple Terms

*WENBIN WANG, Kelley School of Business, Indiana University, United States*

*Shanshan Hu, Kelley School of Business, Indiana University, United States*

*Xinxin Hu, Kelley School of Business, Indiana University, United States*

*Robert Jacobs, Kelley School of Business, Indiana University, United States*

Motivated by the interaction between an appliance manufacturer and its regional retailers, this paper investigates the contract design problem for the manufacturer. The main challenges include (a) how to elicit actual demand information from the retailer, (b) how to motivate retailer to promote sales, and (c) how to construct the contract through relatively simple terms used in practice. Our paper characterizes the structures of several optimal contracts under different market conditions and design restrictions. Their performances are examined analytically and numerically.

116	Saturday, 1:30- 3:00, Junior Ballroom C Session: Commodity Procurement and Hedging	Track: CIM, 7	Chair: Ankur Goel
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### 015-0543: Integrated Optimization of Procurement, Processing and Trade of Commodities

*Sripad Devalkar, University of Michigan, United States*

*Ravi Anupindi, University of Michigan, United States*

*Amitabh Sinha, University of Michigan, United States*

We consider the integrated optimization problem of procurement, processing and trade of commodities in a multiperiod setting. We model a firm that operates a network with multiple locations at which it can procure an input commodity, and has processing capacity at a central location to convert the input into a processed commodity. The processed commodity is sold using forward contracts, while the input itself can be traded at the end of the horizon. We show that the single-node version of this problem can be solved optimally when the procurement cost for the input is piecewise linear and convex. We derive properties of the optimal policy for a multi-node network and develop tractable heuristics using these properties. We also develop an upper bound on the optimal expected profits using information relaxation and dual penalties. We conduct numerical studies to evaluate the performance of the heuristics.

### 015-0428: Joint Pricing-procurement Control Under Fluctuating Raw Material Prices

*Jian Yang, New Jersey Institute of Technology, United States*

*Yifeng Liu, New Jersey Institute of Technology, United States*

We consider a firm that periodically procures raw-material units, stores them, and processes them into finished products when orders arrive. The raw-material price process is Markovian, whereas the order-arrival process is time-independent and yet elastic. The firm controls both unit sales prices and raw-material procurement levels in each period. We show the optimality of base-stock-list-price type of policies with the additional raw-price dependency. More importantly, we identify sufficient conditions on the raw-price process and the end-demand elasticity, under which policy parameters change in monotone and yet surprising patterns as the raw price changes.

### 015-0665: Integrated Spot, Forward and Options Procurement Policies in Presence of Logistical Costs

*Ankur Goel, Case Western Reserve University, United States*

*Fehmi Tanrisever, Technische Universiteit Eindhoven, Netherlands*

In this research we develop the optimal spot, forward and options procurement policies when demand and prices are uncertain and logistical costs are present. In our model, demand is price dependent and follows a linear downward sloping curve. The optimal procurement quantity has a

## Saturday, 1:30- 3:00 Sessions

newsvendor-like structure. We also develop insights on the effect of demand and price volatility on the optimal procurement policy. We further extend our model to optimize the portfolio of options with different strike prices.

### 015-0347: Risk Preferences of a Newsvendor with Service and Loss Constraints

*Werner Jammerneegg, WU Vienna, Austria*

*Peter Kischka, Friedrich Schiller University Jena, Germany*

Using the newsvendor framework, we present an approach to determine an order quantity which is more relevant for the observed ordering behaviour of an inventory manager. For that, we first derive the set of admissible order quantities for a service constraint - a lower bound for the level of product availability - and for a loss constraint specified by an upper bound for the probability of loss. Using the order quantity derived from a newsvendor model with a mean-deviation rule as objective function (risk is measured by the conditional value at risk), we characterise the risk preferences of the set of admissible order quantities in dependence of the profit value of the product. The selection of the order quantity then can be based on performance measures like expected profit, expected loss and fill rate.

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Saturday, 1:30- 3:00, Junior Ballroom D

Track: SOHL, 10

Chair: Gal Raz

Session: Environment and Sustainability

### 015-0162: An Analysis of Supply Chain Environmental Management Practices of Sustainability Leaders

*Joana Comas, EPFL - Ecole Polytechnique Fédérale de Lausanne, Switzerland*

*Ralf Seifert, EPFL - Ecole Polytechnique Fédérale de Lausanne, Switzerland*

In the last two decades, attention to environmental issues has grown considerably. Taking a supply chain or life cycle approach when managing such issues has become essential. Supply chain environmental management (SCEM) has arisen from this need. Contributing to the theoretical development of the field, we build a framework for comprehensive and systematic SCEM. We structure it in three dimensions: what, why and where, i.e. the action taken, the environmental impact being addressed with it, and the supply chain or life cycle stage where that impact takes place. We use this framework to conduct a content analysis of corporate responsibility reports of twelve sustainability leaders in six sectors. We quantify and discuss to which extent firms take a supply chain or a firm approach, the attention given to different environmental aspects, and the actions most commonly taken.

### 015-0455: Sustainable Operations and Lean Management: Towards an Integrated Approach

*Valentina Franchini, University of Padova, Italy*

*Ambra Galeazzo, University of Padova, Italy*

*Andrea Furlan, University of Padova, Italy*

*Andrea Vinelli, University of Padova, Italy*

The aim of our research is to study the implications for a company's performance of lean and green practices implementation. In particular, we intend to study if there exists a relationship of complementarity between lean and green practices. In other words, we hypothesize that the operational, environmental and financial results stemming from the joint implementation of lean and green practices outperform the sum of the results of lean and green practices taken in isolation. Our research is based on case studies of two multinational companies, Alfa Laval and ITT-Lowara, which are highly involved in the implementation of lean and green practices, in order to understand how they conjugate lean management with environmental sustainability and if and how the two domains can generate synergies and impact on the performance. Preliminary findings suggest lean and green practices are to be implemented together if one is aimed at maximizing operational and environmental performance.

### 015-0835: Keeping It Green: Balancing the Environmental and Financial Impacts of Equipment Maintenance Practices

*Thomas Sloan, University of Massachusetts Lowell, United States*

*Joseph Sarkis, Clark University, United States*

Using a Markov decision process framework, we develop an equipment maintenance model that looks beyond traditional, monetary performance measures. As the equipment condition deteriorates, the system uses more energy, produces more scrap, and generates greater environmental burdens. Cleaning the equipment reduces these burdens but has environmental and financial consequences as well. Using data from the Toxic Use Reduction Institute (TURI), we estimate the environmental and financial impacts of using different cleaning solvents to perform maintenance. The model is then solved using two different objectives: minimizing financial costs and minimizing the environmental impacts. We explore two sets of questions related to these results: First, how do the maintenance policies derived from the two criteria differ and why? And second, what mechanisms can be used to create better balance between environmental and financial concerns?

### 015-0211: Refurbishing Strategies for Cell Phone Service Providers in the US: Economic and Environmental Assessment

*Vered Doctori Blass, Darden School of Business, University of Virginia, United States*

*Anton Ovchinnikov, Darden School of Business, University of Virginia, United States*

*Gal Raz, Darden School of Business, University of Virginia, United States*

It is commonly assumed that remanufacturing is environmentally beneficial. That, however, is true only when refurbished units replace the need to manufacture new ones, i.e., when remanufactured product cannibalizes new product's demand. At the same time, as our earlier work showed, by optimally pricing remanufactured products the firm can effectively eliminate cannibalization, thus creating a potential tension between economic and environmental performance of remanufacturing activities. In this paper we look at remanufacturing from the perspective of a wireless service provider and through a combination of an analytical model and a behavioral study, analyze the economic and environmental impacts of introducing a remanufactured version of a high-end product into a product line that otherwise consists of new high- and low-end products. We combine the methodologies from operations management and industrial ecology and seek business and policy implications that will help align economic and environmental goals of the firm and the society.

## Saturday, 1:30- 3:00 Sessions

118	Saturday, 1:30- 3:00, Orca	Track: CIM, 8	Chair: Frank Chen
	<b>Session: Inventory Management in Supply Chain Operations</b>		

### 015-0991: Carbon-emission quota and optimal purchases for electricity wholesale market with price and demand uncertainty

*Frank Chen, The Chinese Univ of Hong Kong, Hong Kong*

*Yiwen Su, The Chinese University of Hong Kong, Hong Kong*

*Houmin Yan, The Chinese University of Hong Kong, Hong Kong*

In recent years, electricity has been bought and sold in the wholesale market by numerous market participants such as generators, distributors, and other marketers at prices set by supply and demand equilibrium. Optimal purchasing becomes a challenging task for distributors with price and demand uncertainty. A recently added ingredient in the stew of carbon emission mandate further complicates the process. Government regulations in Renewable Portfolio Standards (RPS) require distributors to purchase a certain portion of their annual energy needs from renewable/cleaner sources. What are the impacts of RPS on the purchase decisions of a distributor? We attempt to address such an issue in this project.

### 015-0097: A Note on Optimal Stock Factor and Base Price for an Assembly Supply Chain

*Mingming Leng, Lingnan University, Hong Kong*

*Mahmut Parlar, McMaster University, Canada*

We investigate a single-period pricing and stocking decision problem faced by an assemble-to-order (ATO) firm which sells a single product to satisfy price-dependent demand in multiplicative or additive form. The ATO firm assembles products only when its customers' orders arrive. We show that there is a unified result regarding the stocking factor for both the multiplicative and the additive demand cases, whereas there is no unified result regarding the base price for the two demand cases. Our result for the base price is different from Petruzzi and Dada (1999) in which, for both stocking factor and safety stock, there are unified results for the two demand cases.

### 015-0120: Designing Service Level Agreements for Inventory Management

*Liping Liang, Lingnan University, China*

*Derek Atkins, University of British Columbia, Canada*

Service level agreements (SLA) are often observed in practice to manage suppliers' performance. Under an SLA, a supplier agrees to meet a pre-specified service level over a review period. We consider one common application of SLAs to inventory management in decentralized supply chains from a principal-agent perspective. We examine some fundamental issues of SLA design.

119	Saturday, 1:30- 3:00, Parksville	Track: EROM, 7	Chair: Muthulingam Suresh
	<b>Session: Management and Operational Performance</b>		

### 015-0184: Managerial Biases and Energy Savings: An Empirical Analysis of the Adoption of Process Improvement Recommendations

*Suresh Muthulingam, The Johnson School at Cornell University, United States*

*Charles Corbett, Anderson School of Management, University of California,, United States*

*Shlomo Benartzi, Anderson School of Management, University of California, United States*

*Bohdan Oppenheim, Frank R. Seaver College of Science and Engineering, United States*

We investigate the adoption and non-adoption of energy efficiency initiatives using a database of over 100,000 recommendations provided to more than 13,000 small and medium sized manufacturing firms. Even though the average payback across all recommendations is just over one year, many of these profitable opportunities are not implemented. We identify four biases in the adoption of these recommendations. First, managers are myopic, as they miss out on many profitable opportunities. Second, managers are more influenced by upfront costs than by net benefits when evaluating such initiatives. Third, adoption of a recommendation depends not only on its characteristics but also on the sequence in which the recommendations are presented. Adoption rates are higher for initiatives appearing early in a list of recommendations. Finally, adoption is not influenced by the number of options provided to decision makers. We highlight decision biases previously unobserved in the Operations Management literature using field data rather than experimental data.

### 015-0336: The COO's Role in Financial Performance

*Cheryl Druehl, George Mason University School of Management, United States*

*Joel Goldhar, Stuart Graduate School of Business, Illinois Institute of Technology, United States*

We examine the link between the COO's role and financial measures of operational performance. We argue that the presence or absence of a 'strong' COO is a major variable in effective strategy implementation and thus the sustained superior performance of an organization: A strong COO fosters functional coordination and integration, furthering operational excellence and innovation. However, discussions with COOs suggest that the COO role may be most appreciated and effective in smaller organizations. Early analysis of a small dataset suggests some support for these hypotheses. Our research offers tentative suggestions for the organizational structure of the 'C-Suite' and for further research.

### 015-0507: Supply Network Structure and Operating Performance

*Rahul Basole, Georgia Institute of Technology, United States*

*Soumen Ghosh, Georgia Institute of Technology, United States*

*Manpreet Hora, Georgia Institute of Technology, United States*

This research provides an empirical investigation of the impact of the supply network structure of firms on their operating performance. We examine and compare this relationship in two industry contexts – the automotive and the consumer electronics/computer industries. Our empirical sample

## Saturday, 1:30- 3:00 Sessions

such as network centrality, density, embeddedness, and relationship strength, influence a firm's operating performance. We discuss both theoretical and practical implications of our findings.

### 015-0050: **Grappling with Supply Chain Disruptions: The Art of Follow-up Strategies**

*Ram Narasimhan, Michigan State University / The Eli Broad Graduate School of Management, United States*

*Myung Kyo Kim, Michigan State University / The Eli Broad Graduate School of Management, United States*

Previous operations management studies were more focused on "proactive" antecedents or importance of operational capabilities against supply chain disruptions, and they did not suggest empirical evidence for them. However, we can still find supply chain disruption cases from world-class manufacturers such as Samsung, Nestle, Sony, and Nokia. Also, most of previous research has narrowly or vaguely defined supply chain disruptions, and this leaves possibilities to misinterpret. In our research, we will define the supply chain disruption as "unexpected and serious defects of products threatening corporate existence." Regarding recovery strategies, previous research outcomes have concentrated on Marketing-centered measures. Based on supply chain disruption cases occurred to Korean firms in 2004, we will show that cases which adopted operational follow-up measures would be recovered from supply chain disruptions better and more quickly comparing to other cases adopting marketing or strategic follow-up measures.

120	Saturday, 1:30- 3:00, Pavilion Ballroom A	Track: PLQ, 7	Chair: Milton Vieira
	<b>Session: Process Improvement Methods - 1</b>		

### 015-0016: **Increasing the Productivity by the Change of Layout and by the Improvement on the Work Stations: A Case Study**

*Milton Vieira Junior, Universidade Nove de Julho, Brazil*

*Everton Fardin, Universidade nove de Julho, Brazil*

*José Salles, Universidade Nove de Julho, Brazil*

*Rosangela Vanalle, Universidade Nove de Julho, Brazil*

Competitiveness on the automotive sector presses suppliers to be more agile on the manufacturing and assembling of parts. Moreover, they are expected to present low costs of production and low prices of the products, quality according to the established by customers, productivity and flexibility, among other requirements. Searching for techniques to reach these requirements, auto part suppliers are working on the layout, an important component of the manufacturing systems, to optimize and improve their results. This paper analyzes the process of layout change that was conducted in an auto part supplier located at Campinas, SP, Brazil, that produces fuel pumps. The change of layout included requirements like the way that milk run occurs, people ergonomics, and products flow, and resulted in a reduction of lead time of production, increase of the production capacity, in the reduction of area occupied, among others significant results.

### 015-0215: **Metaheuristics to Minimize Line Stoppage Time in Mixed-Model Assembly Lines**

*Takayoshi Tamura, Nagoya Institute of Technology, Japan*

*Tej Dhakar, Southern New Hampshire University, United States*

*Katsuhisa Ohno, Aichi Institute of Technology, Japan*

Mixed-model assembly lines are utilized to assemble many product variants on a single line in automobile and other industries. In JIT production system, the autonomation (Jidoka) allows a worker to stop a conveyor line whenever the worker fails to complete assembly operations within a predetermined process time. Given this situation, it becomes important to determine the production sequence, which would minimize the total conveyor stoppage time in the mixed-model assembly line. In this research, we propose an explicit and complete formulation of the production sequencing problem to minimize the total line stoppage time in mixed-model assembly lines. Metaheuristics using Simulated Annealing, Tabu Search and Genetic Algorithm are developed. An evaluation algorithm to determine the total line stoppage time based on the formulation is proposed in order to save computation time compared to using simulation.

### 015-0942: **Design Parameters to Improve the Performance of Mixed-model U-lines**

*Peter Pinto, Bowling Green State University, United States*

*Yunsook Hong, Bowling Green State University, United States*

*John Visich, Bryant University, United States*

*Basheer Khumawala, University of Houston, United States*

In this research, we evaluated the performance of mixed model U-shaped lines by using ProModel simulation software to test two work sequence rules and two layout designs. The work sequencing rule is about how a worker chooses tasks between the front and the back portion of the U-line: on a first-come-first serve based or alternating between the front and the back. The layout of the U-line is about whether to keep the original full U-line layout if some of the workstations are not assigned tasks for both front and back sides. Performance measures evaluated included percentage of theoretical output achieved, percentage of time blocked, average work-in-process, and utilization percentage. Results indicated that the first-come-first-serve rule was superior to the alternate rule, as hypothesized. Interestingly, however, imposed-full U-layout did not improve performance, which was counterintuitive.

121	Saturday, 1:30- 3:00, Pavilion Ballroom B	Track: GENL, 7	Chair: Steve Brown
	<b>Session: POM Strategy</b>		

### 015-0451: **Applying Manufacturing Flow Theory to Project Management**

*Roy Stratton, Nottingham Trent University, United Kingdom*

## Saturday, 1:30- 3:00 Sessions

*Lauri Koskela, Salford University, United Kingdom*

Both lean and Theory of Constraints (TOC) applications are now commonly reporting success in the application of flow concepts to construction management, namely, lean construction and critical chain project management (CCPM). Both approaches are concerned with improving synchronization and flow but the means by which this is achieved are distinctly different. This paper reports on current case-based research aimed at understanding the conceptual similarities and distinctions in extending theory across the operations - project management spectrum. Lean construction successes were found to be allied with Last Planner and CCPM with Goldratt's strategy and tactics tree process. Therefore, these implementation approaches were adopted to provide a consistent methodology in the case study analysis. The paper concludes that the two approaches are largely complementary, with CCPM providing a theoretical framework for the overall planning and control across multiple projects, and last planner providing the means of planning and controlling the site activity.

### 015-0331: Operational Risk: from Finance to Operations Management

*Ross Ritchie, Warwick Business School, United Kingdom*

*Jannis Angelis, Warwick Business School, United Kingdom*

This study outlines operational risk and its relevance to the Operations Management community. It refines the financial definition of operational risks, allowing transparent association with a wider range of organisational considerations such as operating costs, reputation and supply chain relationships. It also provides greater awareness for all consequences of risk, such as economic, social and environmental. This places the focus of Operational Risk as management of pure risk only. To this effect, the study reviews the risk literature, and links it with core OM operational concepts such as Lean, Six Sigma and Performance Management Systems.

### 015-0419: Enablers and Blockages in Developing Operations Strategy - and the Impact Upon Performance

*Steve Brown, Exeter University - Business School, United Kingdom*

Ever since Skinner's seminal contribution in his 1969 HBR article, there has been growing interest in the importance of manufacturing/operations strategy. However, with the emergence of outsourcing and offshoring, there have been questions asked in the literature about the purpose and validity of an organization's operations strategy. This paper provides details of longitudinal case studies that show great distinctions between what Brown (2000; 2009) and Brown and Blackmon (2005) have termed strategic resonance on the one hand; and those that exhibit strategic dissonance on the other. As we shall see, in spite of extremely volatile conditions, operations strategy still has a vital and pivotal role to play. We shall examine enablers and blockages in developing operations strategies and discuss how strategic resonant firms develop strategies - and the impact that this has upon operations performance in a range of parameters, all of which are necessary for current competitive environments.

### 015-0985: Measuring and Understanding Hierarchy as an Architectural Element in Production Sectors

*Jianxi Luo, Massachusetts Institute of Technology, United States*

*Daniel Whitney, Massachusetts Institute of Technology, United States*

*Carliss Baldwin, Harvard Business School, United States*

*Christopher Magee, Massachusetts Institute of Technology, United States*

Classic supply chains display strict hierarchy, whereas firms have linkages going in different directions. Previous theory has assumed the hierarchical relationships among firms and empirical work has focused on single industries or bilateral relationships. Quantitative evidence on the hierarchy in production sectors is lacking. We define and develop the metrics on the degree of hierarchy in industry sectors, and apply them to two sectors in Japan: automotive and electronics. We compiled the networks of firms connected by supply-procurement transactions. Our empirical analysis shows the electronics sector exhibits a much lower hierarchy degree than the automotive sector due to the wide existence of supply cycles. Then, using a network simulation model to relate hierarchy to firm transaction specificity, interview data and existing knowledge on product modularity, we propose a theory to explain how the nature of technologies may influence the structure of supply transactions, which in aggregate determine overall industry hierarchy.

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Saturday, 1:30- 3:00, Pavilion Ballroom C

Track: LM, 7

Chair: Tom Goldsby

Session: Design of Heuristics in Logistics Management

### 015-0608: An Alternative Heuristic to Solve the Shipper Collaboration Problem

*Enrico Ferri, University of Sao Paulo, Brazil*

*Hugo Yoshizaki, University of São Paulo, Brazil*

*Rafael Rosin, University of São Paulo, Brazil*

Collaboration allows companies to operate more efficiently and with a lower carbon footprint. The shipper collaboration problem can be defined as how to identify tours in the set of combined lanes from various shippers that minimize truck repositioning (deadheads), as the sub-set of routes of a single shipper may have lanes that complement routes of another shipper. Thus, combined shippers may offer to carriers a set of tours with regularly executed truckload movements with minimum asset repositioning. It is an important issue, as about 18% of all truck movement in the USA is empty; in Brazil, this number is 37%. This problem can be translated into a particular type of set covering formulation with constrained cycles, the cardinality constrained lane covering problem (CCLCP), which is NP-hard. We propose an alternative heuristic which has performance 1.74% better than literature, and with polynomial times, enabling it to solve much larger instances.

### 015-0827: Powerful Metaheuristic for Huge-scale Vehicle Routing (VRP) and Pickup and Delivery (PDP) Problems with Time Windows

*Pasi Porkka, Aalto University School of Economics, Finland*

*Olli Bräysy, Jyväskylä University, Finland*

*Janne Koskela, Kuopio University, Finland*

*Ari Vepsäläinen, Aalto University School of Economics, Finland*

We present a new and powerful threshold accepting metaheuristic to solve huge-scale routing problems. The method is applied to two well-known

## Saturday, 1:30- 3:00 Sessions

windows. We develop new benchmark problem sets for both problem types and present results for problems up to 40,000 customer points that are twice as large as the largest instances solved so far. In addition, a comparison to previous methods is provided with smaller benchmark problems. The suggested solution method is shown to be powerful and competitive. It can solve problems up to 40,000 points within 5 minutes.

### 015-0473: Does Information Technology Have a Substantial Impact on SCM Efficiency? A Qualitative Study of Information Technology Applications

*Jack Crumbly, Tuskegee University, United States*

*Stephen Swartz, University of North Texas, United States*

*Mark Freeman, Tuskegee University, United States*

Researchers have found inefficiency between supply chain management/logistics partners. One issue connected to this inefficiency can be found within information technology. Information technology (IT) has played a critical role in providing efficiency of the supply chain of manufacturing and service firms. This research will focus on the relationship between IT applications and efficiency in the supply chain.

### 015-0996: A Heuristic Algorithm for the Fixed Charge Problem

*Veena Adlakha, University of Baltimore, United States*

*Krzysztof Kowalski, Department of Transportation, State of Connecticut, United States*

This paper describes some special properties of a fixed charge problem and develops a heuristic algorithm for its solution. The algorithm is based upon the Balinski approximation solution method for a fixed cost transportation problem. In light of the absence of a widely applicable exact method for solving fixed charge problems, the heuristic algorithm presented in this paper should prove useful in dealing with such fundamental nonlinear problems.

123	Saturday, 1:30- 3:00, Pavilion Ballroom D	Track: TECO, 3	Chair: Noel Greis
	<b>Session:</b> Collaborative Technologies in the Supply Chain		

### 015-0168: The Economics of Radio Frequency Identification Devices (RFID)

*David Collier, Florida Gulf Coast University, United States*

*Kurt Hozak, Indiana State University, United States*

Sales of RFID systems are expected to be measured in billions of dollars by 2015. However, the economic justification of RFID systems is suspect. For example, twenty percent of one survey's respondents were not sure they would ever see a return (Bacheldor, 2005). Even the head of EPCglobal US admitted, "Defining an ROI for this technology is hard. If the ROI was as obvious as some would like, everyone would have adopted the technology 40 years ago." (Quinn, 2005)

This paper will identify the advantages and disadvantages of RFID and attempt to quantify them using a general ROA net change model. A numerical example is also presented. Academics and practicing managers will gain insights into how to quantify RFID costs and benefits using a ROA model.

### 015-0489: Value Generation through RFID Implementation: A Data-Driven Model

*Ann Marucheck, University of North Carolina -Chapel Hill, United States*

*Noel Greis, University of North Carolina -Chapel Hill, United States*

*Monica Nogueira, University of North Carolina - Chapel Hill, United States*

Current RFID research has been largely characterized by anecdotal evidence and illustrative case examples. Early RFID adoption studies were mainly focused in retailing/ inventory management; however, there has been a recent explosion of applications in areas as diverse as financial services and sporting events. Reported benefits from these applications extend beyond inventory accuracy to assuring the security of online business transactions and the safety of food. This research represents the first comprehensive study that we are aware of which presents and assesses different value generation models for RFID implementation. We analyze over 4000 cases of RFID implementation reported in the IDTechEx database and both characterize and quantify the scope, scale and benefits of RFID across different industries and global regions. This work is the first step in developing a theory of RFID adoption as a tool for real-time data capture in an enterprise.

### 015-0110: Effectiveness of Innovative Technologies in New Zealand Farming and Supply Chain Management: A Tale of Two Companies

*Ram Roy, Eastern Institute of Technology, New Zealand*

The paper investigates applications of modern technologies (GPS, RFID) in farming and businesses. Two organizations have been selected to study the effectiveness of these technologies on their operations. Some of the KPIs used include acceptance rate, customer satisfaction, idling time, fuel cost, and productivity gain. Extensive literature review has been done to get a profile of global usage of GPS and RFID. Study shows that the organizations are making good progress through these innovative technologies; however, there is scope for improvement in some areas. Some of the benefits of GPS-based devices in farming include productivity gain, cost savings, less stress and greater job enjoyment, and accurate billing. Operational data have been analyzed to identify the key issues, and appropriate recommendations have been suggested. For example, the company can make significant saving in supply chain cost by selecting right GPS deal and setting the idling time limit for different vehicles.

124	Saturday, 1:30- 3:00, Port Alberni	Track: PRF, 2	Chair: Rafael Menda
	<b>Session:</b> Practice-Driven Research		

### 015-0646: An Assessment of the Competitive Landscape and the Operational Capabilities for a Consumer Healthcare Manufacturing Site

## Saturday, 1:30- 3:00 Sessions

**Murat Kristal**, *Schulich School of Business, York University, Canada*

**Rafael Menda**, *Johnson and Johnson, United States*

In this study, we present the results of our collaboration with a site that is part of a large Consumer Healthcare Manufacturing Network. Traditionally known as a slow pace industry with legacy products which are on the market for a long time, recent studies have shown that the Consumer Healthcare market will go through a continuous change over the coming years. We first present how we established the initial contact with the site, and how we laid out the unique challenges that are awaiting the site. We then proceed with how we used the concepts from Operations Strategy research to assess the strategic capabilities that are unique to this site, and how these capabilities can become a strategic source for the overall Manufacturing Network. We conclude with the lessons learned from this exercise for both industry and academia, from the perspective of Operations Strategy research.

### 015-0232: Practice-Driven Research

**Robert Vokurka**, *Texas A&M University - Corpus Christi, United States*

**Rhonda Lummus**, *Indiana University, United States*

The goal of many operations management and supply chain management researchers today is to develop new, or extend existing, operations management theory. Commenting on theory papers in management, Kilduff (Academy of Management Review, 2006) argues that "the route to good theory leads not through gaps in the literature, but through an engagement with problems in the real world that you find personally interesting." This presentation will discuss the importance of practice-driven research, discuss current issues/problems that were identified during practitioner focus groups and from practitioner literature that are potential research topics, and provide opportunities for researchers to pursue theory-writing endeavors through practitioner-focused organizations.

### 015-0021: Service Quality through the Lens of National Culture: Experience from Taiwan's Hospitality Sector

**Ying-Ying Liao**, *University of Kent, United Kingdom*

**Ebrahim Soltani**, *University of Kent, United Kingdom*

**Dan Petrovici**, *University of Kent, United Kingdom*

**Wei-Yuan Wang**, *Shih Chien University, Taiwan, Republic of China*

Much has been written on the dynamics of cultural values and norms and service quality dimensions as well as the resultant implications for the customer satisfaction within the context of Western societies. Absent in this debate has been an examination of the nature and extent of the interconnection between cultural norms and service quality dimensions in the non-Western context. This proposal aims to broaden the debate and examines the dominant Chinese cultural values and their impact on customer's expectations and perceptions towards service quality in the novel context of Taiwan - with a particular focus on the hospitality (e.g., restaurant, hotels) industry.

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Saturday, 1:30- 3:00, Port Hardy

Track: ROM, 3

Chair: Mumin Kurtulus

Session: Retail Operations Management Three

### 015-0866: Incentives to Improve Inventory Availability When Availability is a Function of Order Size

**Almula Camdereli**, *Georgetown University, United States*

**Jayashankar Swaminathan**, *University of North Carolina at Chapel Hill, United States*

Inventory misplacement and stock loss due to shrinkage are major operational inefficiencies in retail stores. In contrast to the existing literature, we study cases where inventory availability depends on the order quantity and a nonlinear proportion of available items becomes unavailable for sale due to misplacement and/or shrinkage. We find that information on demand distribution does not carry any value to suppliers of disorganized retailers where such inefficiencies are relatively high. Further, our results indicate that adverse effects of these inefficiencies will be relatively more for suppliers of low margin and high demand industries. Contrary to previous findings, we show that those buyback and revenue sharing contracts with linear transfer payments fail to align the incentives of parties towards availability improvements when shrinkage is present. However, they do coordinate in pure inventory misplacement systems even though available inventory is nonlinear. We introduce nonlinear contracts to align the incentives.

### 015-0460: Pricing Policy in a Distribution Channel: Negotiation or Posted Pricing

**Chia-wei Kuo**, *National Taiwan University, Taiwan, Republic of China*

**Hyun-soo Ahn**, *University of Michigan, United States*

**Goker Aydin**, *Indiana University, United States*

This paper examines the choice of pricing policy (posted pricing or negotiation) toward end customers in a distribution channel. We find that the retailer prefers negotiation at lower wholesale prices, and posted pricing at higher wholesale prices. We also find that whenever the retailer prefers negotiation, the manufacturer does, too. Therefore, the retailer's discretion over the pricing policy causes friction only when the retailer wants to use posted pricing, while the manufacturer wishes the retailer to use negotiation. We show that such friction arises only when product availability or the cost of negotiation is moderate. In this case, we show that the manufacturer may offer a substantial discount to persuade the retailer to negotiate. Surprisingly, in this region of friction, a decrease in channel capacity or an increase in negotiation costs (both of which are typically considered as worsening the retailer's business environment) translates into higher profit for the retailer.

### 015-0671: On Retail Assortment, Pricing, and Return Policies

**Aydin Alptekinoglu**, *SMU Cox School of Business, United States*

**Alex Grasas**, *Universitat Pompeu Fabra, Spain*

**Elif Akcali**, *University of Florida, United States*

Using a nested-MNL-based consumer choice model, we study a retailer's assortment, pricing and return policy (fraction of price refunded upon return) decisions. Practical circumstances that render prices and refunds exogenous to the problem have structural consequences for optimal

## Saturday, 1:30- 3:00 Sessions

assortment. When all variables are endogenous, the retailer carries some number of most popular products, whereas, when prices and refunds are exogenous, it is optimal for the retailer to carry a mix of the most popular and the most eccentric products if the return policy is sufficiently strict.

### 015-0096: Retail Assortment Planning under Category Captainship

*Mumin Kurtulus, Vanderbilt University, United States*

*Alper Nakkas, Vanderbilt University, United States*

Retail assortment planning can have a tremendous impact on a retailer's bottom line performance. Over the past years, retailers have increasingly relied on their leading manufacturers for recommendations regarding the assortment to be offered to the consumers in a particular category, a practice often referred to as category captainship. Our research investigates the consequences of using category captains for assortment selection decisions. We develop a game theoretic model where multiple manufacturers sell their products to consumers through a single retailer. We compare a model where the retailer selects the assortment in the category with a model where the retailer relies on a category captain for assortment decisions in return of a target category profit. We show that category captainship can, in some circumstances, benefit not only the retailer and the category captain but also the non-captain manufacturers. Our results have implications regarding the implementation of the category captainship practices.

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Saturday, 1:30- 3:00, Port McNeill

Track: OEE, 2

Chair: Manpreet Hora

Session: PANEL Discussion: Product Quality and China

### 015-0706: Product Quality and China: The Case of Product Recalls

*Manpreet Hora, Georgia Institute of Technology, United States*

*Hari Bapuji, University of Manitoba, Canada*

*Aleda Roth, Clemson University, United States*

*Barbara Flynn, Indiana University,, United States*

*Xiande Zhao, Chinese University of Hong Kong, Hong Kong*

This panel brings together cross-disciplinary researchers to discuss issues related to product quality, particularly related to China. The panelists will briefly present their research and cover topics in supply chain management, international business and quality management. The session will include discussion on (a) product recalls and their impact on organizational performance, (b) methodologies such as event studies, experiments, surveys and case studies to study product recalls, (c) types of product defects initiating recalls and (d) emerging areas of research related to product recalls.

## Saturday, 3:30- 5:00 Sessions

127	Saturday, 3:30- 5:00, Finback <b>Session:</b> Supply Chain Management 6	<b>Track:</b> SCM, 19	<b>Chair:</b> Manu Goyal
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### 015-0513: Operational Collaborations Among Competitors

*Harish Krishnan, University of British Columbia, Canada*

*Milind Sohoni, Indian School of Business, India*

Competing firms often enter into “operational alliances,” e.g., competing newspapers in a city sometimes share printing and distribution resources, railroad companies share tracks and other assets, etc. Operational collaborations among competitors carry both benefits and risks. Collaborations can lower costs, which can benefit the firms and customers. But, by changing the cost structure of the competitors, these collaborations can alter competitive dynamics in the industry. We ask the following questions: when should firms enter into operational collaborations with competitors, and how should such collaborations be structured? Any agreements between competitive firms can also raise antitrust scrutiny, and so we consider the welfare implications of agreements that sustain collaboration.

### 015-0769: An Empirical Investigation of Airline Flight Schedule Robustness

*Vinayak Deshpande, Purdue University, United States*

*Mazhar Arikan, Purdue University, United States*

*Milind Sohoni, Indian School of Business, India*

Airline flight delays have come under increased scrutiny lately, with on-time performance at one of its worst levels in 2007. In the first part of this study, we combine flight data published by BTS, with the Newsvendor framework from the Operations literature to examine the impact of the scheduled block time on on-time arrival performance. Next, we analyze the impact of flight block-times and aircraft turn-times on the schedule's robustness based on aircraft routings.

### 015-0282: The Right-of-First-Refusal in Sequential Procurement Auctions

*Manu Goyal, University of Maryland, United States*

*Wedad Elmaghraby, University of Maryland, United States*

*Ali Pilehvar, University of Maryland, United States*

In many procurement auctions, it is common for buyers to grant the “right of first refusal” (ROFR) to a favored supplier. Under ROFR, the favored supplier sees the bids of all other participating suppliers before naming his own. Notwithstanding the many benefits of ROFR, the practice has generally been criticized for raising the procurement cost of the buyer. We verify the conventional wisdom that ROFR indeed increases the buyer's procurement cost in a single auction setting. However, with a looming second auction in the future (with the same participating suppliers), we show that the buyer lowers his procurement cost by granting the ROFR to a supplier. Such an outcome critically hinges on the suppliers strategically managing the information generated via the ROFR in the first auction to optimize the joint outcome of both auctions. Our analysis thus spotlights the role of information and learning in ROFR.

### 015-0339: The Service Supply Chain - A Field for Research

*Chris Voss, London Business School, United Kingdom*

The service supply chain - the chain of supply of services to any organization, manufacturing, or service – is both little understood and, apart from service procurement, little researched. Current research has focused primarily on dyadic rather than extended contexts. Reasons for this include that service operations have focused on B2C, but service supply chains are rooted in B2B; and the traditional focus on manufacturing sector and the existence of widely accepted models is an obstacle to the development of a service supply chain literature (Nie & Kellogg, 1999). This paper sets out to explore the reasons for this neglect and conduct a meta-analysis of current research. It first proposes a set of perspectives on the service supply chain including: service outsourcing, service networks, services science, consolidating and facilitating roles, service bullwhip effect and service design. Finally, based on this a research agenda is developed.

128	Saturday, 3:30- 5:00, Galiano <b>Session:</b> Procurement/Strategic Sourcing 2	<b>Track:</b> SCM, 20	<b>Chair:</b> Damian Beil
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### 015-0935: When Does it Pay to Delay Supplier Qualification? Theory and Experiments

*Elena Katok, Penn State University, United States*

*Zhixi Wan, HEC Paris, France*

*Damian Beil, University of Michigan, United States*

We study a procurement setting in which the buyer seeks a low price but will not allocate the contract to a supplier who has not passed qualification screening. In addition to a qualified incumbent supplier, the buyer has an entrant of unknown qualification. The buyer wishes to run a price-only reverse auction between the incumbent and the entrant, and faces a strategic choice about whether to perform qualification screening before or after the auction. We analytically study the buyer's optimal strategy and the incumbent's optimal bidding strategy under post-auction qualification. We test our analytical results in the laboratory, with human subjects. We find that qualitatively our theoretical predictions hold up quite well, although incumbent suppliers bid somewhat more aggressively than the theory predicts, making buyers more inclined to use post-auction qualification.

### 015-0920: Push or Pull? Auctioning Supply Contracts

*Cuihong Li, University of Connecticut, United States*

*Alan Scheller-Wolf, Carnegie Mellon University, United States*

We consider a buyer, facing uncertain demand, who sources from multiple suppliers via online procurement auctions (open descending price-only

## Saturday, 3:30- 5:00 Sessions

demand. The buyer chooses to offer a push or pull contract, for which the single price and winning supplier are determined via the auction. We compare the push and pull contracts, and establish the relative importance of auction design and contract design in procurement auctions.

### 015-0914: Informing Auction Design by Gathering Intelligence on Suppliers

*Damian Beil, University of Michigan, United States*

*Hyun-soo Ahn, University of Michigan, United States*

*Yan Yin, University of Michigan, United States*

We study whether buyers should undertake costly efforts to learn suppliers' costs directly, versus relying on an auction's downward pricing pressure to reveal this information. This work is inspired by real-world techniques that allow buyers to improve their estimates of suppliers' costs (such as Rapid Plant Assessments). We characterize how the buyer's preference depends on the type of learning, e.g. supplier-specific (factory visit) or industry-wide (off-the-shelf reports), the number of suppliers, and her prior information.

### 015-0943: Outsourcing in Professional Services

*ram ganeshan, college of William and mary, United States*

*Tonya Boone, College of William and Mary, United States*

*Robert Hicks, College of William and Mary, United States*

The research setting is an architectural/engineering firm that routinely outsources many of its projects to sub-contractors. We explore two questions: (1) What is the impact of outsourcing on cost? and (2) Can the firm leverage the knowledge from these outsourced projects?

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Saturday, 3:30- 5:00, Grand Ballroom D

Track: HOM, 15

Chair: Sarah Bourque

Session: Supply Chain Management in Healthcare

### 015-0010: A Process Improvement Case Study of Lean Healthcare

*Asif Salam, University of the Fraser Valley, Canada*

This paper reports a study that applied the concept 'lean' to the analysis of a health care system. This study used lean methodology to identify the problem areas as well as identify value for the patient. The existing process was analyzed based on the layout of the check-up area in the Health Promotion Center of Bangkok Hospital. The process and layout were then redesigned to optimize the lead time of the system. There are 3 main stages in the analysis: data collection, data analysis and data comparison.

### 015-0129: How to Plan Shared Resources in Healthcare?

*Justin Drupsteen, University of Groningen, Netherlands*

*Taco Van Der Vaart, University of Groningen, Netherlands*

*Jacob Wijngaard, University of Groningen, Netherlands*

Many patient groups share the scarce capacity of critical resources (e.g. operating theaters and diagnostic equipment) among each other. Therefore, shared resources are an important factor in the lead time performance of all these patient groups. So far, the healthcare operations literature provides little insight in how to allocate capacity of shared resources and/or how to plan shared resources in such a way that it results in acceptable patient lead time performance. Most literature is focused on a single stage and on the utilization of resources. The aim of this paper is to identify planning approaches that provide a better balance between resource utilization and lead time requirements. In a 3x4 multiple case study (three hospitals, four patient groups), we will investigate the influence of shared resources on the patient's total lead time performance. We analyze the relationships between patient group characteristics, allocation/planning choices regarding shared resources and lead time performance.

### 015-0372: An Integrated Approach for Patient Flow Analysis

*Davood Golmohammadi, UMASS Boston, United States*

*Mike McAdams, Brigham and Women's Hospital, United States*

In this research, we integrate Theory of Constraints (TOC), Lean manufacturing and Re-engineering approaches for a meticulous analysis of patient flow at a local hospital in MA to improve overall customer satisfaction as our main objective. Enhancing facility and staff utilization and system efficiency are the other objectives. Lengthy lead time for patients not only dissatisfies them with the received service, but also increases the cost of operations and creates other associated issues, such as scheduling and time management of specialists. Finally, current and redesigned system are evaluated and compared based on simulation models to analyze validation and effectiveness of improvement.

### 015-0030: A Comparison of Traditional and Open-Access Appointment-Scheduling Policies

*Lawrence Robinson, Cornell University, United States*

*Rachel Chen, University of California at Davis, United States*

This paper compares two types of appointment-scheduling policies for single providers: traditional and open access. Under traditional scheduling, each of a specified number of patients per day is booked well in advance, but may not show up. Under open-access scheduling, a random number of patients call in the morning to make an appointment for that same day. Thus the number of patient arrivals will be random, for different reasons, under both policies. We find that the open-access schedule will significantly outperform the traditional schedule—in terms of a weighted average of patients' waiting time, the doctor's idle time, and the doctor's overtime—except when patient waiting time is held in little regard or when the probability of no-shows is quite small.

### 015-0863: The Business Case for Implementing Electronic Health Records in Primary Care Settings in the U.S.

*Sameer Kumar, University of St. Thomas, Opus College of Business, United States*

With escalating healthcare costs in the U.S., it's easy to understand why healthcare service provider operations such as hospitals and primary care

## Saturday, 3:30- 5:00 Sessions

healthcare service providers profit equation – revenue. There are many things a healthcare service provider can do to influence revenue; one of the most important is implementation of Electronic Health Records. Electronic health record systems hold substantial promise for improving the quality of health care in the U.S. while decreasing costs. Despite such promise, adoption rates for these systems remain quite low, particularly among primary care physicians, with funding often cited as the most significant barrier to their adoption. This study analyzes the costs and benefits of EHR systems and presents a cost-benefit model for making the business case for their implementation in primary care settings.

131	Saturday, 3:30- 5:00, Granville	Track: PRF, 4	Chair: James Gilbert
	<b>Session:</b> How Toyota Lost Its Lean: Lessons on How to Make Lean Sustainable		

**015-1002: How Toyota Lost Its Lean: Lessons on How to Make Lean Sustainable**

**Richard Schonberger**, *Schonberger & Associates, United States*

Toyota's plunge in inventory turns—from 23 to 12 in the past 16 years—is symptomatic of lost leanness and declining attention to process improvement and quality. Judging by similar negative trends at its dominant affiliates and suppliers, Toyota's woes appear to have been visited upon its supply chains as well.

Based on data from global research (the “leanness studies”), Richard Schonberger had begun reporting on Toyota's decline by 2000. Now, in 2010, reasons for Toyota's worsening performance have clarified. Richard will cite several causal factors: a strategic shift from conservative to all-out for global growth; years of industry and general-public adulation, leading to complacency; an apparently strong but actually fragile culture due to decades of insularity in its Toyota-City home base; closed-mindedness with regard to best practices developed elsewhere; loss of customer focus, etc. He explains how to forestall the tendency of lean-based process improvement to fade.

132	Saturday, 3:30- 5:00, Junior Ballroom A	Track: PITM, 8	Chair: Cheryl Druehl
	<b>Session:</b> College of Product Innovation and Technology Management Fellows Lecture		

**015-0739: College of Product Innovation and Technology Management Fellows Lecture**

**Cheryl Druehl**, *George Mason University School of Management, United States*

The 2010 and 2008 PITM Fellows recipients will present a lecture.

133	Saturday, 3:30- 5:00, Junior Ballroom B	Track: OMM, 11	Chair: Chris Tang
	<b>Session:</b> OMM11		

**015-0075: Controlling Moral Hazard Problem in Suppliers' Quality Decisions: Trade Credit vs. Inspections**

**Volodymyr Babich**, *Georgetown University, McDonough School of Business, United States*

**Christopher Tang**, *UCLA, Anderson School of Management, United States*

Frequently, buyers cannot observe the quality of suppliers' production processes. To control suppliers' incentive to “cut corners” on product quality, buyers may inspect the incoming products at a cost. This results in an inspection game with a solution in mixed strategies. Alternatively, a buyer may use trade credit period to allow customers to discover product quality. If defects are found, then the buyer withholds payments to the supplier. This can be an attractive alternative because it provides incentives for suppliers without inspections and inspection costs. However, trade-credit-based policy creates its own inefficiency: by shifting financing costs to the supplier the buyer may increase the total financing cost for the system. We compare equilibrium solutions under inspection and trade credit policies and study conditions when a particular policy is favored by buyers, suppliers, or the channel.

**015-0235: Advance Booking Programs for Managing Supply, Demand, and Price Risks in a Two-Level Supply Chain**

**Soo-Haeng Cho**, *Carnegie Mellon University, United States*

**Christopher Tang**, *UCLA Anderson, United States*

While advance booking programs have been shown to be effective for manufacturers to meet uncertain demand, it is unclear if advance booking will be effective when supply, demand, and market price risks are present in a supply chain. Motivated by an advance booking program for managing these three types of risks arising in a flu vaccine supply chain, we present a two-stage Stackelberg game model to examine the dynamic interactions between the manufacturer and the retailer.

**015-0059: Deposit Reservation Policies in the Presence of Rational Customers and Competition: Is Guarantee Deposit Beneficial?**

**George Georgiadis**, *UCLA Anderson School of Management, United States*

**Christopher Tang**, *UCLA Anderson School of Management, United States*

In the service industry, many firms need to use their fixed capacity to meet uncertain customer demand. Even though firms often encourage customers to make reservations, customers may not show up for their reserved services. To overcome these challenges, firms usually institute two reservation policies: “no deposit” and “guarantee deposit”.

Under the no deposit policy, each customer can make a reservation without paying a deposit. Anticipating that some customers may not show up for their services, the firm may overbook; hence, the service is not guaranteed. On the contrary, under the guarantee deposit policy, the service is guaranteed to each customer who pays a pre-specified deposit when making a reservation. Therefore, the firm will not overbook under the guarantee deposit policy.

In this paper, we present a model that is intended to analyze the trade-off between these two reservation policies by incorporating customers'

## Saturday, 3:30- 5:00 Sessions

rational behavior and the issue of competition.

### 015-0558: Optimal Pricing in Markets With Varying Valuations: Speculators Versus Strategic Consumers

*Christopher Tang, UCLA, United States*

*Wei Shi Lim, National University of Singapore, Singapore*

We examine the optimal pricing decision of a monopolist in a market where there is demand uncertainty and the consumer's valuation varies over time. In Period 1, the seller sets a price and both consumers and speculators make their purchase decisions. In Period 2, the demand, which depends on the sales in Period 1, and the consumer's valuation are realized. Myopic consumers purchase in Period 1 if the price is lower than their valuations at the time of purchase while strategic consumers purchase in Period 1 if the price is lower than their valuation in Period 2 and the expected price in Period 2. The objective of speculators is never to make a profit from the price difference from both periods. We characterize the pricing equilibrium and examine the impact of speculative purchase and strategic behavior on the pricing policies.

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Saturday, 3:30- 5:00, Junior Ballroom C

Track: EROM, 8

Chair: Roth Aleda

Session: Empirical OM Research

### 015-0519: Multiple-Item Perceptual Measures for POM Phenomena: Are They Always Necessary?

*Manus Rungtusanatham, University of Minnesota, United States*

*Christopher Swanton, University of Minnesota, United States*

POM survey researchers typically study a complex POM phenomenon by defining and measuring its underlying dimensions en route to measuring the phenomenon itself. Following the norm, multiple-item perceptual measures are often created to operationalize underlying dimensions, with responses to the multiple-item perceptual measures being subsequently aggregated to compute a composite score about the POM phenomenon. Challenging this norm, we conclude that when the focus of research interest is at the level of the POM phenomenon, it may be sufficient to create and employ single-item perceptual measures to operationalize the underlying dimensions of a POM phenomenon. To support this conclusion, we show the statistical significance of the TQM-Customer Satisfaction relationship and the JIT-Manufacturing Performance relationship twice, once in which the underlying dimensions of TQM are operationalized with multiple-item perceptual measures following the norm, and another in which the underlying dimensions of TQM are operationalized with single-item perceptual measures.

### 015-0481: An Imprecise Data Envelopment Analysis (IDEA) Framework for the Analysis of Retail Banking Strategies

*Pedro Oliveira, School of Economics and Management, Catholic University of Portugal, Portugal*

*Aleda Roth, Clemson University, United States*

*David Rubin, The University of North Carolina at Chapel Hill, United States*

*Wendell Gilland, The University of North Carolina at Chapel Hill, United States*

We address the following question: How can the competitive capabilities of the banking industry be increased through resource-based operations strategy? An Imprecise Data Envelopment Analysis (IDEA) framework is proposed where banks are modeled as input-output systems. Knowledge, technological leadership and market acuity are inputs, and service quality, delivery, flexibility, cost and earnings are outputs. The resulting efficiencies are then analyzed in light of programs emphasized to improve operations. We identify the practices that enabled the most efficient banks to translate their knowledge-based resources into agility. We show that banks that invested in activities aimed to promote intellectual capital tend to be more efficient. Banks that have primarily invested in physical infrastructures and more employees do not present an increase of efficiency. We provide evidence of the importance of knowledge-based assets for agility. One important contribution is the operationalization and application of an IDEA framework.

### 015-0778: An Empirical Investigation of the Role of Supply Chain Absorptive Capacity on Innovation and Performance

*Aleda Roth, Clemson University, United States*

*Murat Kristal, Schulich School of Business, York University, Canada*

*Tracy Johnson, Clemson University, United States*

The paper investigates the effects of supply chain absorptive capacity on production innovation, and in turn business performance. Building upon the organization and strategy literature, we constructed multi-item measurement scales that tap into five dimensions of absorptive capacity, which were adapted to a supply chain management context. Using survey-based data gathered from 174 U.S. supply chain managers, we applied structural equation modeling to assess the influence of supply chain absorptive capacity on business performance and provide empirical insights regarding the mediating role of product innovation capability between absorptive capacity and business performance. Our study provides empirical insights that the construct of absorptive capacity is relevant to supply chain management research and practice.

### 015-0290: Operations-Based Archetypes of Business-to-Business (B2B) Marketspaces

*Eve Rosenzweig, Emory University, United States*

*Aleda Roth, Clemson University, United States*

This study addresses the following question: Are there different archetypes of business-to-business (B2B) marketspaces that are theoretically important and useful from an operations and supply chain management perspective? We hypothesize three emergent B2B archetypes—the e-transaction, modular, and integrator archetypes—based on their inherent operational characteristics from theory and practice. To validate our conceptual typology, we collected data from 50 manufacturers experienced in Internet-enabled commerce with business customers. Our cluster analysis results offer empirical evidence for the existence of the three theoretically-derived emergent B2B archetypes. We go on to compare the resulting clusters using a series of contextual factors, including the degree of electronic, organizational, and cultural proximity among supply chain partners. Our rich description of the types of supply chain relationships afforded by each B2B archetype provides insights for future research and gives managers a view of some strategic options available to leverage their B2B operations.

## Saturday, 3:30- 5:00 Sessions

135	Saturday, 3:30- 5:00, Junior Ballroom D <b>Session:</b> Sustainable Supply Networks	Track: SOHL, 11	Chair: Jagjit Srai
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### 015-0411: The Paradigm of Sustainability in Production Engineering: A Theoretical Perspective

*Karine Carvalho, University of São Paulo, Brazil*

*Reinaldo Costa, University of São Paulo, Brazil*

There is not a consensus on the definition of sustainability. Several authors define it as a complex term because it encompasses three different dimensions: economic, social and environmental. However, the issues and conceptual frameworks to date are not consolidated, making it difficult not only to understand the relationship of these variables and their effects on the organizational development and behavior, but mainly to assess how sustainable development can and should be measured, and to understand it as a systemic concept. Thus, the aim is to build a network to identify the researches in production engineering the focus of which is sustainability. For this, a bibliometric analysis from the ISI Web of Science® database was used. The results showed a tendency towards research topics linked to organizational sustainability, environmental monitoring through Cleaner Production and Life Cycle Assessment.

### 015-0667: Sustainable Supply Chain Management: A Review of Research and Practice

*Jialun Hu, University of Cambridge, United Kingdom*

*David Kirkwood, University of Cambridge, United Kingdom*

*Yongjiang Shi, University of Cambridge, United Kingdom*

*Jagjit Srai, University of Cambridge, United Kingdom*

There is an ever-growing need for integrating sustainability considerations into supply-chain management research and practice, especially low-carbon but integrating E-E-S (Economic, Environmental and Social) aspects. Perusal of the literature shows that a framework for combining a low-carbon agenda and socially concerned supply chain management is not yet adequately developed from the perspective of secondary stakeholders. A succinct classification to help researchers and practitioners in understanding integrated sustainable supply chain from a wider perspective is therefore needed. A review of the literature on Low-carbon SCM is presented here, primarily taking a life cycle assessment approach. A timeline depicting the evolution of research in this field, indicating relevant papers, is also provided. An integrated perspective bringing together the E-E-S aspects within SCM is presented. This framework sets out major themes of existing research and discusses specific features of sustainable supply chains, the limitations of current approaches and areas for future research.

### 015-0626: Sustainable Service Network Design: A Framework for Integrating Competing Priorities in Through-life Product Service Systems

*Tomás Harrington, University of Cambridge, United Kingdom*

*Jagjit Srai, University of Cambridge, United Kingdom*

Many manufacturing firms have developed a service dimension to their product portfolio. However, the provision of product service solutions has placed an increasingly heavy reliance on networks of multiple partners to deliver services across the whole of the CADMIT (Concept, Assessment, Demonstration, Migration, In-service and Disposal) cycle, from requirement identification to disposal. With these complex service arrangements, there is a growing need for firms to know how best to configure these multi-partner networks for the effective re-cycle, re-use, modification and product-life extension of equipment, sub-systems and components (both internally and with suppliers/partners). This research examines how TLM (Through-life Capability Management) approaches (across the CADMIT cycle) support product service strategic goals. A framework that integrates strategic priorities across the CADMIT cycle to inform service network configuration and design is presented, focusing on the development of a sustainable supply network to enhance operational effectiveness in an environmentally sustainable manner.

### 015-0578: Developing a Configuration Perspective for Sustainable Supply Network Design

*David Kirkwood, University of Cambridge, United Kingdom*

*Jagjit Srai, University of Cambridge, United Kingdom*

The design of global supply networks (SNs) has developed in recent years from traditional lowest landed-cost analysis to the more strategic concept of SN configuration, that selection of particular archetype structures which have specific operational characteristics. These approaches have required the development of supply chain mapping tools that support SN analysis and design. Whilst industrial systems are a driver in raising global quality of life, they are also a major influence on the global environment. MNCs are placing an emphasis on reporting their sustainability performance; however, a framework does not exist for the holistic measurement of environmental impact across the supply network. This paper evaluates quantification methods of supply networks, and presents a holistic sustainability profile of the global supply network of a leading automotive manufacturer, using a combination of supply network configuration mapping tools integrated with an ERWC (energy resource waste carbon) framework.

136	Saturday, 3:30- 5:00, Orca <b>Session:</b> Customer Behavior and Technology in Buyer-Seller Models	Track: CIM, 9	Chair: Apurva Jain
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### 015-0893: Impact of Customer Re-purchase on Capacity and Quality Decisions

*Haiyan Wang, Foster School of Business, University of Washington, United States*

*Yong-Pin Zhou, Foster School of Business, University of Washington, United States*

We study a queueing system where waiting cost is incurred by a group of homogeneous customers. The service provider therefore has an incentive to invest in capacity to satisfy customers and reduce balking. On the other hand, the service provider can invest in the quality of service to increase customers' valuation on the service and the probability that the customer will come back for future service (re-purchase). We study the firm's investment in both service speed and quality. We find that there is a balance between the two that the firm wants to achieve. We also discuss the case with a total investment budget.

## Saturday, 3:30- 5:00 Sessions

### 015-0891: Diffusion of New Technology in a Two-level Supply Chain

*Daeheon Choi, Foster School of Business, University of Washington, United States*

*Apurva Jain, Foster School of Business, University of Washington, United States*

We consider a two-level supply chain with multiple retailers and manufacturers. A firm's adoption of a new technology like RFID depends not only on its own beliefs of the new technology's costs and benefits, but also on the adoption decisions of other firms in the supply chain. We first analyze an individual firm's decision about the timing of new technology adoption. We then aggregate individual firms' decisions to project how new technology diffuses across the supply chain. We analyze the influence of a variety of factors on the diffusion of a new technology like RFID. We also analyze the role of cost sharing in increasing the adoption of RFID.

### 015-0909: Pricing of Tied Digital Contents and Devices

*Ming Fan, Foster School of Business, University of Washington, United States*

*Deb Dey, Foster School of Business, University of Washington, United States*

*Lin Hao, Foster School of Business, University of Washington, United States*

Many companies are offering tied digital contents and devices in the marketplace. For example, Apple sells both iTunes digital media and the iPod; Amazon sells electronic books and the Kindle. In this paper, we study the optimal pricing policy for both digital contents and devices. We also consider the situation that consumers have heterogeneous demands for electronic books. We derive an equilibrium pricing policy for different consumer segments.

### 015-0903: Supply Chain Models with Preferred Retailer Privy to Supplier's Inventory Information

*Hamed Mamani, Foster School of Business, University of Washington, United States*

*Kamran Moinzadeh, Foster School of Business, University of Washington, United States*

*Apurva Jain, Foster School of Business, University of Washington, United States*

We consider a supply chain consisting of a supplier and several retailers. Retailers can place and get their orders delivered, upon availability, at preset intervals of  $T$ , whereas the supplier replenishes his stock every  $kT$  periods. Some of the retailers have preferred status, which provides them with information about the supplier's inventory level. Due to such access to information, preferred retailers can be proactive and inflate their orders when supply gets short. In this research, we study the dynamics of such supply chains as a repeated Stackelberg game where retailers react after the supplier has fixed his strategy. We then evaluate outcome of the resulting game with solution of the centralized problem. Further, we analyze the effect of the existence of such information on the supply chain efficiency.

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Saturday, 3:30- 5:00, Parksville

Track: EROM, 9

Chair: Wagner Stephan M.

Session: Supply Chain Design and Supplier Management

### 015-0298: Benchmarking Supply Chain Designs with Data Envelopment Analysis

*Stephan Wagner, Swiss Federal Institute of Technology Zurich, Switzerland*

*Pan Theo Grosse-Ruyken, Swiss Federal Institute of Technology Zurich, Switzerland*

Benchmarking supply chain designs enables firms to evaluate the potential of their supply chains and become leaders in their industries. By using Data Envelopment Analysis (DEA), this study benchmarks the impact of supply chain designs on Return on Capital Employed (ROCE). Despite many studies on supply chain improvement and optimization, there is little research on integrated finance-supply chain management. To achieve high financial performance, a firm's supply chain design must be a perfect match with the respective customers' requirements for the underlying product, business strategy, and business model. Our study builds on 259 U.S. and European manufacturing firms. Results indicate that there are still many firms that have not found the optimum supply chain design for their products, thus, foregoing significant potential to boost profitability. Only 2% of all investigated firms achieve an optimal efficiency with their supply chains. However, those outperform their counterparts by 3.87 in terms of ROCE.

### 015-0669: Impacts of Coordination with Supplier and Customer on Quality and Flexibility Performance

*Jayanth Jayaram, University of South Carolina, United States*

*Kefeng Xu, University of Texas at San Antonio, United States*

*Mariana Nicolae, University of South Carolina, United States*

Today's goal-oriented supply chain calls for effective coordination to manage the interdependent activities of supply chain partners, in order to achieve superior chain performance. We thus suggest that supplier coordination and customer coordination influence firm performance, operationalized under two dimensions, i.e., quality and flexibility. Moreover, drawing on contingency theory, we theorize that the relationships are contingent upon factors such as firm size and clockspeed. We test our theoretical framework by conducting hierarchical regression analysis on empirical data collected from a large sample of production/operations managers of Chinese manufacturing firms. The results provide strong support for the four direct and positive relationships between each coordination mechanism studied and quality and flexibility performance. They also provide partial support to the contingent roles that firm size and supply clockspeed play in moderating the effects of coordination on quality and flexibility performance. Implications for managers and academics are offered.

### 015-0373: An Empirical Study of Just-in-Sequence Performance in the Automotive Industry

*Stephan Wagner, Swiss Federal Institute of Technology Zurich, Switzerland*

*Victor Silveira-Camargos, Swiss Federal Institute of Technology Zurich, Switzerland*

*Christoph Bode, Swiss Federal Institute of Technology Zurich, Switzerland*

Just-in-sequence (JIS) delivery has become a common logistics concept across several manufacturing industries of customized end products. This sophisticated logistics concept mitigates variety-driven complexity in manufacturing but requires a considerable amount of effort from buying firms and their suppliers to assure a disruption-free production. In this paper, we examine determinants of JIS delivery performance. Based on empirical

## Saturday, 3:30- 5:00 Sessions

and relationship quality may improve performance by diminishing the number of disruptions. Overall, this research represents the first large-scale investigation on JIS and contributes to the OM literature on this important logistics concept.

### 015-0579: Is There Empirical Evidence on Non-linear Relationship Between Lead Time and Resource Utilization in Manufacturing Processes?

*Yvan Nieto, University of Neuchâtel, Switzerland*

*Dominik Gläßer, University of Neuchâtel, Switzerland*

*Gerald Reiner, University of Neuchâtel, Switzerland*

The trade-off between resource utilization and lead time in make-to-order systems is among the most recognized insights gained from queuing theory in production management. However, even if there are not doubts related to axiomatic quantitative research, the exponential relationship between lead time and utilization has not been explicitly investigated based on empirical data in the context of complex manufacturing processes. There are several reasons for this gap, e.g., implicit efforts made by companies to overcome lead time increase in heavy workload situations. In order to pursue the research question empirically, we selected a company that is an international leader in producing polymer solutions used in industries requiring a combination of short lead times and a high level of responsiveness with high demands for quality. We consider 19,000 different products for a period of three years and scrutinize the nature of the relationship between lead time and resource utilization.

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Saturday, 3:30- 5:00, Pavilion Ballroom A

Track: PLQ, 8

Chair: Luiz Alvez

Session: Process Improvement Methods - 2

### 015-0720: Process Improvement, Modeling and Optimization of Voids Related to Solidification in Steel Casting Process Using the Taguchi Approach

*Luiz Alves, Instituto Federal de Educação, Ciência e Tecnologia Sudeste de Minas Gerais, Brazil*

*Fernando Marins, São Paulo State University, Brazil*

*Messias Silva, São Paulo State University (UNESP) and University of São Paulo (USP), Brazil*

In the steel foundry process is susceptible to the occurrence of defects related to solidification, like shrinkages and pores. This paper, developed inside an industrial environment of a steel foundry, purposes a mathematical model capable to predict and minimize the occurrence of shrinkage and pores in carbon steel casting parts. Statistical Design of Experiments using fractional factorial design at the screening step and Taguchi Method for validation and development of the mathematical model were used. The results of experiments showed a considerable difference between the theoretical expected contraction, 5.5%, and the 2% experimentally determined. The variables that most influenced the defect size were: the carbon drop in the steel making process; the Aluminum content of the alloy; the Black Iron Oxide content of the molding sand and the interaction between the pouring temperature and the Carbon drop. The mathematical model showed a good performance in the prediction of defects occurrence.

### 015-0713: Application of Taguchi Method in Process Improvement of Turning of a Superalloy NIMONIC 80A

*Ricardo Penteado, São Paulo State University, Brazil*

*Thiago Hagui, São Paulo State University, Brazil*

*José Faria, São Paulo State University, Brazil*

*Messias Silva, São Paulo State University and São Paulo University, Brazil*

In this article the Taguchi Method was used as a tool to improve a turning of superalloy NIMONIC 80A, using a hard tool metal TNMG 160408-23 C standard H10A and a support, PTGNR K16, in order to optimize the length cutting (Lc). The orthogonal array L8 was used with three factors: cutting speed, feed, depth of cut, operating in two levels and three interactions, setting the value of tool wear in 5mm as the final goal for each experimental condition. The analysis of variance (ANOVA) of the response variable length cutting showed a significant influence of the process of the variables cutting speed and depth of cut, as well as their interactions. The Taguchi Method proved to be very useful in process improvement, because it provides information about the influence of factors on a response variable and requires fewer experiments than traditional methods to improve the process.

### 015-0132: Optimal Sourcing and Subsidy Policy When Suppliers Have Random Yield Loss

*Sammi Tang, University of Miami, United States*

*Hareh Gurnani, University of Miami, United States*

*Diwakar Gupta, University of Minnesota, United States*

We consider a decentralized supply chain with a buyer facing deterministic demand sources from a supplier whose production process has random yield. The supplier can improve supply reliability by investing in better technology. We first study a traditional contract where the buyer's order quantity provides incentive to the supplier to improve supply reliability. Second, we consider a subsidy contract where the buyer shares the supplier's investment cost of reliability improving effort. Given the contract terms, the supplier then decides on the production size and investment level. We characterize the optimal subsidy policy for the buyer and investigate the effectiveness of order inflation and investment subsidy in dealing with suppliers of varying reliability. We also examine the effect of endogenizing the reliability choice on the buyer's ordering behavior and supplier selection policy.

### 015-0569: Determination of the Optimal Initial Process Mean and Cycle Length in a Deteriorating Process Using Physical Programming

*Myung Soo Cha, Kyungsoo University, Korea, Korea, Republic of (South Korea)*

*Chul Hyun Jo, Kyungsoo University, Korea, Korea, Republic of (South Korea)*

*Jung Hoon Lee, Kyungsoo University, Korea, Korea, Republic of (South Korea)*

## Saturday, 3:30- 5:00 Sessions

This paper deals with two mathematical models which determine initial process mean and cycle length in a deteriorating process, using Physical programming. Although the canning problem has been studied by many authors, little attention has been given to the problem considering quality and cost simultaneously. Most of the studies deal with it as a one-objective problem by converting quality to cost. Practically, it is very hard or impossible to convert quality to cost accurately. In this paper, the quality and cost are used as two objectives of Physical programming. Design metrics are the fraction defective and production cost, and decision variables are initial process mean and cycle length. It is assumed that the quality characteristic follows a normal distribution and the deterioration starting point in time follows an exponential distribution. Numerical examples are given.

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Saturday, 3:30- 5:00, Pavilion Ballroom B

Track: DSTR, 4

Chair: Tunc Huseyin

Session: Disaster Management

### 015-0385: A Dynamic Cooperation Model for Interregional Emergency Response

*Yiping Jiang, Institute of Systems Engineering, Southeast University, China*

*Lindu Zhao, Institute of Systems Engineering, Southeast University, China*

Large-scale catastrophic events impose a great challenge to a regional emergency service system; thus, improving the ability to cope with the emergencies has become an urgent issue. Due to the scarcity of emergency resources for a single region, so it is highly necessary to establish emergency response teamwork of multiple emergency organizations through interregional cooperation. In this study, the cooperative teamwork of emergency response is formulated as a multi-stage integer programming model with the objective of minimizing total response time to consider the most timely handle emergencies possible. Then a solution procedure based on genetic algorithm is proposed to solve the presented mathematical model, and a hypothetical scenario is given to illustrate how this proposed model can ultimately be applied into practice.

### 015-0817: Optimizing the Use of Transit System with Information Updates During No-Notice Evacuations

*Huseyin Tunc, Mississippi State University, United States*

*Burak Eksioglu, Mississippi State University, United States*

*Sandra Eksioglu, Mississippi State University, United States*

Evacuation of population during a disaster is necessary in order to minimize casualties and losses. Coordination of activities among resources such as transit vehicles and management of the traffic along the road network are crucial for developing an efficient evacuation plan. Experience with disasters such as hurricanes Katrina and Rita, and the terrorist attacks of September 11, 2001, have demonstrated that public transportation can be crucial for evacuation. This paper presents a mixed integer model for evacuating transit dependent citizens during a no-notice disaster. The paper also introduces a framework for using the proposed mathematical model in real-time. Furthermore, a heuristic algorithm is proposed and it is evaluated in a rolling horizon manner. DYNASMART-P, a dynamic network analysis and evaluation tool, is utilized to evaluate the performance of the evacuation routes.

### 015-0728: Emergency Preparedness Planning

*Soumia Ichoua, Johnson C. Smith University, United States*

We address the problem of pre-positioning emergency supplies prior to a disaster onset. The goal is to ensure a fast and effective response when the disaster strikes. Pre-positioning of emergency supplies aims at determining the number and location of local distribution centers as well as their inventory levels for emergency supplies. These decisions must be made in a highly disruption-prone environment where a timely response is vital and resources are scarce. We present and discuss a scenario-based model that integrates location inventory routing decisions.

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Saturday, 3:30- 5:00, Pavilion Ballroom C

Track: LM, 8

Chair: Henrik Palsson

Session: Sustainability and Logistics Management

### 015-0593: Network Design for the Profitable Tour Problem with Pick-up and Delivery Visits in Express Courier Services

*Friska Ferdinand, Kyungsoong Univ., Korea, Republic of (South Korea)*

*HaeKyung Lee, Kyungsoong univ., Korea, Republic of (South Korea)*

*Eun Mi Yoon, Kyungsoong univ., Korea, Republic of (South Korea)*

*Chul Hyun Jo, Kyungsoong univ., Korea, Republic of (South Korea)*

*Jung Hoon Lee, Kyungsoong univ., Korea, Republic of (South Korea)*

*Chang Seong Ko, Kyungsoong univ., Korea, Republic of (South Korea)*

In the Korean express courier service market, many domestic companies of various sizes have been competing fiercely to extend their own market share. Thus, it is of utmost importance for a company to establish a more efficient logistics system and offer a higher level of customer service to gain a competitive edge. Even if most of the service centers are directly linked to a consolidation terminal in the courier service network, some of them with regional disadvantages are operated in milk run type from/to the consolidation terminal, which is a traditional PDP. This study suggests an approach to designing an express service network for the PDP with the objective of maximizing the incremental profit, which belongs to PTP class. A heuristic algorithm based on GA is developed and tested through an example problem in practice of a courier service company in Korea.

### 015-0780: Induction of Management of the Modal Shift in Multimodal Strategy of Cargo Transport

*Washington Luiz Soares, UNISANTOS, Brazil*

*João Eduardo Tinoco, UNISANTOS, Brazil*

*Getulio Akabane, UNISANTOS - UNIVERSIDADE CATÓLICA DE SANTOS, Brazil*

*Julio Simões, UNISANTOS - UNIVERSIDADE CATÓLICA DE SANTOS, Brazil*

The strategic vision of the management of costs in transport companies is very important for creating new perspectives to deal with suppliers in the

## Saturday, 3:30- 5:00 Sessions

goals which can be controlled with the application of the Balanced Scorecard in administration of services such as railway transport. In this article, the methodology involves a case study about practices of multimodal transport through the use of services of express container trains whose contracts of transport are acquired of rail dealerships which are suppliers of public transport services in Brazil. The control of costs of the case study is observed in rail container transport using the practice of Modal Shift.

### 015-0742: Concept for Assembly Control Based on Synchronised Logistics

*Günther Schuh, WZL, RWTH Aachen, Germany*

*Bastian Franzkoch, WZL, RWTH Aachen, Germany*

*Till Potente, WZL, RWTH Aachen, Germany*

*Cathrin Wesch-Potente, WZL, RWTH Aachen, Germany*

Logistics and assembly in the machine and tool building industry are hardly synchronised in today's industrial environments. Isolated, these functions fail to cope with changing market conditions and internal disturbances. Consequences are missing material and low schedule reliability, which risk the market position in competition. In this article a concept for assembly control based on synchronised logistics is introduced that strives for synchronisation of assembly and logistics in order to enable companies to respond to changing requirements. The approach combines the flexible sequencing of the material supply and the dimensioning of the container size according to the assembly network plan and available material. It has been successfully employed in industry cases, which will be introduced in this paper.

### 015-0961: Aircraft Requirements Servicing for Short Haul Flights

*Jaydeep Balakrishnan, University of Calgary, Canada*

With many airlines in North America not serving hot meals on short and medium haul flights, there is an opportunity to reduce the requirement for a service truck to meet aircraft at the gate to supply food and beverages. This presentation will focus on one such analysis where it was determined that by analyzing the flight schedule, the airline could reduce the number of trucks needed to service aircraft.

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Saturday, 3:30- 5:00, Pavilion Ballroom D

Track: TECO, 4

Chair: Sadia Ali

Session: Technology Adoption, Implementation, and Competitive Advantage

### 015-0008: Smartphones Tune into the Supply Chain

*John Hopkins, Victoria University, Australia*

This paper explores the impact that Smartphones have on the way modern supply chains operate, examining how the mobility they offer can completely alter the way users communicate, do business, interact, plan and most importantly think. A preliminary survey was conducted amongst Australian business users of Smartphones, which aimed to identify the type of user they were, what role and industry they were from, and what impact Smartphones had on their working behaviour. Results from this study gave rise to the theory that Smartphone functionality can be split into three distinct categories – Get, Give, and Share. In order to test this theory further a programme of industry interviews were organised that ventured beyond the opinions of merely the user, by also incorporating representatives from the Australian network carriers, technology providers, and application developers. Results imply the need to add two additional categories to the original theory: Manage and Store.

### 015-0266: Achieving Excellence through Quality Management in Information Technology Projects: A Case of Audit Checks

*Sadia Samar Ali, Associate Professor & Area Chairperson: OM, Institute of Management Studies, India*

As the market is growing more competitive and buyers are now concentrating more on quality products, manufacturing/service providing companies are facing challenges to meet the quality standards. There have been a number of quality standards (PCMM, CMMI, ISO9001, ISO27000, Six Sigma etc). Companies have created quality management systems which direct and control an organization with regards to quality standards. In this paper, study is done on software companies to check the area of improvements based upon Quality Audits reports done for the project which can vary from one audit-per quarter-per project to one audit-per year-per project. Based upon the comparison between different areas like Configuration Management and Control, Service Management, Customer Management, Quantitative Performance Management, Continual Process Improvement, the nonconformities are identified, hypothesized and explained and the research is used to identify the weak areas so that precautionary measures can be taken to deliver quality projects efficiently.

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Saturday, 3:30- 5:00, Port Alberni

Track: SOM, 12

Chair: Hua-Hung Robin

Session: Management of Service Processes

Weng

### 015-0595: Production and Scientific Collaboration in Services-related Publications: An International Social Network Analysis

*Michele Martins, Escola de Administração de Empresas de São Paulo, da Fundação Getúlio Vargas, Brazil*

*Guilherme Martins, Escola de Administração de Empresas de São Paulo, da Fundação Getúlio Vargas, Brazil*

*Angela Sakamoto, Escola de Administração de Empresas de São Paulo, da Fundação Getúlio Vargas, Brazil*

*Joao Mario Csillag, Escola de Administração de Empresas de São Paulo, da Fundação Getúlio Vargas, Brazil*

There has been an emergence of academic publications about services management, and it has been through the publications in services journals that this area has gained some degree of respectability. However, since 1995, service research has started to be produced by the disciplines of marketing, HR and operations (Johnston, 1999). This paper aims to describe the relationships among researchers and institutions from 1995 to 2008. A descriptive and exploratory research was conducted, in which the Social Network Analysis was used to identify the network of collaboration between authors, based in co-authorship. Data were collected in the most relevant journals of Operations (IJOPM, JOM, POM) and Services (SIJ, IJISM, JSR). The results indicate the most prolific authors and institutions in each network, as well as their structural characteristics. A total of 1,734 papers were collected and results indicate that collaboration between researchers increased by 12% in operations and 5% in services journals.

## Saturday, 3:30- 5:00 Sessions

### 015-0726: A new Approach to College Enrollment Management

*Shenghan Xu, University of Idaho, United States*

*Dana Stover, University of Idaho, United States*

The recent difficult economic environment has imposed some challenges on college enrollment management. In this paper, we propose an approach to evaluate the college's capacity and demand pattern and use the news vendor model to decide the optimal admission size. A series of sensitivity analyses is also carried out to show the robustness of the analysis and methodology.

### 015-0296: The Importance of Central, Complementary and Supplementary Services Offered by a University on Students' Retention

*Kleber Nobrega, Potiguar University, Brazil*

*Claudio Marcio Mendonça, Potiguar University, Brazil*

*Domingos Campos, Potiguar University, Brazil*

*Teresa Souza, Potiguar University, Brazil*

Higher education has increased a lot in Brazil. As it consists essentially of service operations, it is necessary to comprehend the impact of the offered services on students' level of satisfaction. This study aimed to investigate the importance of services offered on student retention, based on the perceptions of enrolled students and dropouts. A survey was conducted with 289 enrolled and 19 dropout business students chosen from a private university in Brazil. Results show that the services which more influence retention include central service--teaching, and some complementary services directly related to the central service--director's attending and library. Findings also show that central, complementary and supplementary services have strong correlation for both enrolled students and dropouts. There is balance among the three types of service.

### 015-0799: Planning for Production Services as a Tool for Integration of Professional Accounting

*Shirley Zomerfeld, UFGD, Brazil*

*Sergio Brun, UFGD, Brazil*

*Antonio Carlos Lopes, UFGD, Brazil*

In the context where the accountant is essential to businesses, this study focuses on the professional accounting and its purpose, highlighting the concern about the outcome of the company. The aim of this study is to highlight the goals and purpose of accounting and definitions of Production Services. This research consists of surveys, applied to a random sample. As a result it highlights the lack of discernment between concepts, lack of formal planning and non-coverage of all areas of the company. It is proposed to fully utilize the tools of planning and production control to structure and direct the company.

### 015-0973: Service Recovery: A Comparison Between the US and Taiwan

*Hua-Hung Weng, Yuan Ze University, Taiwan, Republic of China*

This study replicates the service recovery study published by Miller, Craighead, and Karwan in 2000 in Taiwan's environment. After careful translation and back-translation process, a Chinese version survey is established to collect service recovery incidents in Taiwan. Whether the service framework proposed in 2000 is supported by Taiwan's 2010 data is investigated in this study. In addition, chi-squared tests are conducted to evaluate whether the US and Taiwan data are different. In conclusion, suggestions are provided for international companies to adjust their service recovery practices in the US and Taiwan.

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Saturday, 3:30- 5:00, Port Hardy

Track: ROM, 4

Chair: Narendra Agrawal

Session: Retail Operations Management Four

### 015-0368: Growing Green Product Sales Through Price Incentives

*Stephen Smith, Santa Clara University, United States*

Environmentally friendly, or "green" products such as compact fluorescent light bulbs and hybrid cars are often substitutes for standard versions of the product. Some customers are willing to pay a premium for green products, while others are not. Green products may also experience gradual market acceptance through positive network externalities or innovation diffusion effects. This paper considers several types of pricing decisions in this context: (1) How should a retailer price a green product in relation to the standard product in order to maximize profit? (2) If a government agency or electric utility, for example, wishes to increase green product demand, what is the optimal form of the price incentives? (3) How do the resulting price trajectories and green product sales vary over time in the presence of diffusion effects and declining costs?

### 015-0992: Dynamic Assortment Planning

*Rene Caldentey, New York University, United States*

*Felipe Caro, UCLA, United States*

We investigate optimal assortment planning strategies for a retailer with limited shelf space. The retailer can choose among basic and fashion items with low and high risk (and return) respectively. Our motivation is in the apparel industry, and we explicitly model the vogue as a stochastic process that the retailer tries to follow. The objective is to maximize the long-term value of the retail business by dynamically adjusting the menu of products on display.

### 015-0308: Do Upstream Stockouts Matter? An Experiment at Fashion Manufacturer Costis Moros

*Nathan Craig, Harvard Business School, United States*

*Nicole DeHoratius, University of Portland, Zaragoza Logistics Center, United States*

*Ananth Raman, Harvard Business School, United States*

We observe a pilot program at fashion manufacturer Costis Moros that entails improving the availability of certain items while keeping the availability of other items static. We find that the program results in an increase in sales for the pilot items after controlling for alternative hypotheses. We

## Saturday, 3:30- 5:00 Sessions

multi-echelon inventory models that assume stockout costs are incurred only at the lowest echelon.

### 015-0934: The Effect of Waiting Time on Customer Purchasing Behavior

*Marcelo Olivares, Columbia University, United States*

*Yina Lu, ,*

*Andres Musalem, ,*

*Ariel Schilkrut, ,*

This paper studies empirically how customer delays in a supermarket affect customer purchases. We collected data on queue lengths using videocameras and image recognition. These data were matched with point-of-sale data to estimate the effect of expected delays on sales, including purchase incidence, purchase volume and substitution with other categories. We also explore how the empirical findings can be used to improve staffing decisions.

### 015-0698: Retail Inventory Management for Perishable Products Under Substitution

*Stefan Minner, University of Vienna, Austria*

We consider a group of perishable products under non-stationary stochastic demand, random shelflife, and stockout-based customer substitution. We present a method to determine the required inventory levels to fulfill service level constraints. In a numerical experiment, we compare the results obtained for different models of shelflife duration, issuing policies, and customer substitutions models.

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Saturday, 3:30- 5:00, Port McNeill

Track: OEE, 3

Chair: Shanshan Hu

Session: Operations and Supply Chain Management in China: Empirical Studies 2

### 015-0876: A Process Analysis of Global Trade Management: An Inductive Approach

*Warren Hausman, MS&E Department, Stanford University, United States*

*Hau Lee, Graduate School of Business, Stanford University, United States*

*Graham Napier, TradeBeam, Inc., United States*

*Alex Thompson, TradeBeam, Inc., United States*

*Yanchong Zheng, MS&E Department, Stanford University, United States*

We develop a detailed process model of the China-US trade process to study the benefit of implementing advanced information technologies. We collect data on estimated task time reductions for each process step. Estimated profits increase by 28% and 10% for exporters and importers, respectively, under conservative assumptions.

### 015-0089: The Geography of Chinese Inventory

*Richard Lai, The Wharton School, University of Pennsylvania, United States*

*David Robb, Tsinghua University, China*

*Justin Ren, Boston University, United States*

We ask whether, in China, geographic location has explanatory power for firms' inventory turn, and why. We undertake a variance components analysis of firm-level inventory turn, using a panel dataset of 1,531 listed Chinese firms spanning ten years through 2008. We find that city and province effects explain 18.8% and 6.3% of the variation in inventory turn, constituting the most important effects after firm effects (49.1%) and ahead of year and industry effects. To understand why, we use seemingly unrelated regressions to identify how six specific city effects impact inventory turn - by estimating how the effects-turn relationship is mediated by known drivers of inventory turn such as gross margin and lead time. For example, we find that proximity to Beijing is associated with higher inventory turn via lower gross margins.

### 015-0526: Supply Chain Structure, Inventory Turnover, and Financial Performance: Evidence from Manufacturing Companies in China

*Shanshan Hu, Kelley School of Business, Indiana University, United States*

*Qing Ye, School of Economics and Management, Tsinghua University, China*

*Wei Chi, School of Economics and Management, Tsinghua University, China*

*Barbara Flynn, Kelley School of Business, Indiana University, United States*

Using objective data collected by the World Bank, we empirically investigate the relationship between Chinese manufacturers' supply chain structure, raw material and finished goods inventory turnover, and return on sales. Our findings indicate that locational proximity and relationship continuity have a significant impact on inventory performance, which in turn drives profitability. We especially focus on structural characteristics unique to China's business environment. We find that Chinese manufacturing companies have relatively weak operational performance, and better operational performance is associated with newer firms, foreign ownership, and a larger number of foreign customers. Unlike their counterparties in developed countries, Chinese manufacturers' profitability relies more on downstream inventory performance than on upstream inventory performance.

## Sunday, 8:00- 9:30 Sessions

145	Sunday, 8:00- 9:30, Finback <b>Session:</b> Supply Chain Coordination	<b>Track:</b> SCM, 21	<b>Chair:</b> Suresh Sethi
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**015-0283: Antecedents of Trust in Supply Chain Alliances: The Role of the Interdependence Structure**

*Ilaria Giannoccaro, Politecnico di Bari, Italy*

A critical element in achieving supply chain effectiveness is establishing and nurturing trust across organizational boundaries, particularly for relationships such as alliances in a supply chain. Although trust has been extensively analyzed in the literature, there is a paucity of research about the antecedent role of the interdependence structure of the supply chain alliance on trust. Several interdependence structures of the supply chain alliances are then analyzed (random, small-world, local, block diagonal, preferential attachment, centralized, dependent, hierarchical, and diagonal) and compared by using the NK simulation model. The main aim of the analysis is to measure the risk of opportunistic behaviors by supply chain actors in the different interdependence structures so as to show how the latter affects the level of trust. Main results are that the centralized interdependence structure increases the risk of opportunistic behaviors, while the dependent one is associated with the highest level of trust.

**015-0350: Overcoming the Wall of Resistance: A Socio-Structural View of Supply Chain Collaboration**

*Stanley Fawcett, Brigham Young University, United States*

*G. Webb, Brigham Young University, United States*

*Amydee Fawcett, Brigham Young University, United States*

*Gregory Magnan, Seattle University, United States*

Although most companies recognize that SC collaboration can deliver substantial benefits, they struggle to develop this strategic capability. Importantly, the literature is replete with descriptions and evaluations of the barriers to SC collaboration. Three resistors are particularly common: 1) functional organizations create turf conflict, 2) non-aligned goals and incentives lead to conflicting decision-making and counterproductive behavior, and 3) an inability or unwillingness to share information undermines collaborative intent. Despite their prevalence, most companies have yet to learn how to mitigate core resistors. A closer look at the dynamics of the resisting forces is needed to understand why they are so intractable. Such an understanding should lead to the insight needed to transform collaborative intent into a collaborative capability. To this end, we develop an integrated, socio-structural theory that explicates the intransigent nature of the fundamental barriers that have been identified both via the literature and an extensive, rigorous case study methodology.

**015-0886: The Nature of Coordination Contracts for Supply Chain Management**

*Meng Lu, The Chinese University of Hong Kong, Hong Kong*

*Houmin Yan, The Chinese University of Hong Kong, Hong Kong*

*Suresh Sethi, The University of Texas at Dallas, United States*

Supply chain coordination and its associated coordination contracts have been an active research area for supply chain management research. However, aside from its vast body of literature of coordination supply contracts, little has been done in addressing matters of design, evaluation, and implementation for these coordination contracts. In this paper, we define a framework for supply chain contracts and classify a number of well-studied contracts into groups. We demonstrate, with examples, that coordination contracts can be measured by properties of the path-dependency, the sequence of decision-making and the reliance on side payments. Based on precise mathematical definitions, and subsequently-developed structural properties and management insight, we are not only able to measure the goodness of supply contracts but also to reveal the nature of the supply coordination. Our findings open an avenue for design, evaluation and implementation of supply chain coordination contracts.

**015-0036: The Periodic Vehicle Routing Problem with the Joint Replenishment Planning under Supply Chain Environment**

*Chikong Huang, National Yunlin University of Science & Technology, Taiwan, Taiwan, Republic of China*

*Syuan-Hong Liou, National Yunlin University of Science & Technology, Taiwan, Taiwan, Republic of China*

This study tries to integrate the joint replenishment problem and the periodic vehicle routing problem under supply chain environment. A mathematical model is developed to minimize the total operating costs which includes inventory cost, ordering cost, and transportation cost. A heuristic algorithm based on the Tabu search is then constructed to find the best combination of vehicle service types. The model and solution algorithm are verified by numerical examples. Finally, a sensitivity analysis is also conducted by testing different vehicle loading capacities. The policies of joint replenishment are compared and discussed on the basis of cost viewpoint.

146	Sunday, 8:00- 9:30, Galiano <b>Session:</b> Sourcing and Outsourcing	<b>Track:</b> SCM, 22	<b>Chair:</b> Keiko Kusaba
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**015-0880: Logistics Outsourcing and Company Performance in a Dynamic Environment: An Analysis of the Baltic Sea Region**

*Wolfgang Kersten, TUHH Hamburg University of Technology, Germany*

*Lauri Ojala, TSE Turku School of Economics, Finland*

*Meike Schroeder, TUHH Hamburg University of Technology, Germany*

*Tomi Solakivi, TSE Turku School of Economics, Finland*

*Juuso Töyli, TSE Turku School of Economics, Finland*

*Janne Engblom, TSE Turku School of Economics, Finland*

The Baltic Sea Region (BSR) is one of Europe's most dynamic economic regions, representing an attractive market with high purchasing power. It consists of regions in ten countries with around 75 million inhabitants and a commercial trade volume of about one third of Europe's total exports. Logistics operations play a major role in the BSR, but the degree of logistics outsourcing differs a lot within the BSR. The aim of this study is to analyze the outsourcing of logistics operations in the dynamic Baltic Sea region and the possible linkage between logistics outsourcing and

## Sunday, 8:00- 9:30 Sessions

companies' financial performance. The analysis is based on data from 800 companies that took part in our baltic logistics survey in 2006-2007, combined with data from financial reporting. The results help to explain the logistics outsourcing behavior of manufacturing and trading companies, and contribute to a better understanding of potential and realized benefits of logistics outsourcing.

### 015-0080: The Study of Suppliers Selection Based on Flexibility of Supply Chain

*Qi Sun, Shanghai Jiaotong University, China*

*Jian Ji, Shanghai Jiaotong University, China*

The structure optimize problem in supply chain is the selection problem of the number of suppliers. With setting the number of suppliers, it reduces the cost of purchase and supply risk, and at the same time improves the reliability of supply chain. In this paper, we study the number of suppliers. We control two factors which affect the number of suppliers, one is the cost of purchase, and the other is the risk of supply. We then build the model, and analyze the flexibility on supply chain structure. Finally, we find the best number of suppliers.

### 015-0432: Supplier Base Management

*Steven Melnyk, Michigan State University, United States*

*Stan Griffis, Michigan State University, United States*

*Bixby Cooper, Michigan State University, United States*

*John Macdonald, Michigan State University, United States*

SBM is a systematic dynamic approach for strategically managing the whole supply base (current suppliers, potential suppliers and suppliers monitored for future capacity). It focuses on four major activities: (1) the management of current major suppliers; (2) potential suppliers; (3) scouting; and, (4) transition management. This presentation explores the concept, the state of the current literature, new developments, and potential research topics uncovered.

### 015-0444: Consensus in Low-Cost Country Sourcing: Antecedents and Outcomes

*Keiko Kusaba, European Business School, Germany*

*Roger Moser, European Business School, India*

Low-cost country sourcing (LCCS) initiatives are increasing; however, with mixed outcomes. One reason could be differing interests and objectives within the LCCS teams. As research on cross-functional teams and consensus related to sourcing hardly exists, this paper investigates to what extent different LCCS objectives have an influence on consensus in cross-functional LCCS teams, and how the degrees of consensus impact the performance of the specific project. We chose an explorative case study approach to develop a LCCS consensus model, evaluate the identified relationships with quantitative data and derive propositions on the antecedents and outcomes of consensus. Data are collected from multiple respondents within LCCS teams in the automotive sector. Our results show that both LCCS objectives and team consensus, and consensus and LCCS performance, are strongly correlated. The deviation direction from consensus changes depending on the LCCS strategy, while negative deviation from consensus is always associated with better LCCS performance.

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Sunday, 8:00- 9:30, Grand Ballroom A

Track: SCM, 23

Chair: Ahmet Satir

Session: Supply Chain Risk Management 1

### 015-0501: Managing Supply Chain Risk: A Supply-Side Perspective

*Daniel Kern, Friedrich-Alexander-University of Erlangen-Nuremberg, Germany*

*Roger Moser, European Business School, Germany*

*Evi Hartmann, Friedrich-Alexander-University of Erlangen-Nuremberg, Germany*

*Marco Moder, Friedrich-Alexander-University of Erlangen-Nuremberg, Germany*

Supply chain risk management has gained significant attention in the field of operations management. Past research focused on initiatives that made supply chains leaner, resulting in efficient but vulnerable operations. In our study, we develop a model for upstream supply chain risk management. We collected survey data of 162 companies for the empirical analysis. In a path analytic model, we link the risk management activities – risk identification, risk assessment and risk mitigation – to risk performance. Many studies have stressed the importance of an iterative risk management process that is constantly adapted to the changing environment. Therefore, we include the effect of a continuous improvement process on the risk management activities. The data provides support to all our hypotheses confirming risk management's contribution to risk performance. In times of economic crisis, our results provide managers with an even stronger argument to invest in supply chain risk management initiatives.

### 015-0668: A Comparison of Quantitative Methods in Supply Chain Risk Management – Benefits and Drawbacks

*Gandolf Finke, ETH Zurich, Switzerland*

*Alexander Sproedt, ETH Zurich, BWI Center for Enterprise Science, Switzerland*

*Johannes Plehn, ETH Zurich, BWI Center for Enterprise Science, Switzerland*

Supply chain risk management (SCRM) is gaining increasing attention. In practical, industrial application of SCRM, qualitative techniques strongly dominate. To support decision making related to SCRs and to include all available information, the paper argues for the additional use of quantitative methods as a logical continuation of qualitative approaches. However, acceptance of quantitative methods by practitioners is relatively low. This paper aims at exploring possible underlying reasons by analyzing the benefits and drawbacks of quantitative methods, and making suggestions as to how their acceptance in industry might be increased. Besides other methods, the authors focus in particular on different simulation techniques currently available as one way of including quantitative data in SCRM. Furthermore, the different simulation techniques are described, and aspects of implementation such as the different barriers of introduction or underlying assumptions are outlined. The paper ultimately concludes with an overall evaluation of the concept of simulation in SCRM.

## Sunday, 8:00- 9:30 Sessions

**015-0751: A Multi-Method Analysis of Supplier Financial Risk in the Supply Chain**

*Markham Frohlich, Indiana University - Kelley School of Business, United States*

*Mohan Tatikonda, Indiana University - Kelley School of Business, United States*

*Joseph Sarkis, Clark University - Graduate School of Management, United States*

Over the past year, suppliers in many supply chains have been under serious financial pressure, and even today a number of them are still vulnerable to bankruptcy. For example, in one major company in our study out of 1500 critical suppliers, over 80 dropped out of business in 2009, and another 150 are still considered at risk in 2010. This multi-method empirical study analyzed how companies identify and react to failing suppliers. The analysis featured a combination of modeling techniques, case research, and survey methods. A number of factors are identified that help pinpoint suppliers in financial trouble. This study's findings have important implications for managers and serve as a guide to monitoring the financial health of supply chain partners in both good times and bad.

**015-0410: Managing Supply Chain Uncertainty: Emerging Ethical Issues**

*Mark Stevenson, Lancaster University, United Kingdom*

*Linda Hendry, Lancaster University, United Kingdom*

*Eliot Simangunsong, Lancaster University, United Kingdom*

The phenomenon of "supply chain uncertainty" has received considerable attention. Several models have been presented which identify sources of uncertainty or strategies for reducing or coping with uncertainty, but more evidence is needed to further our understanding. A network of twelve food industry companies has been studied using a case study approach, identifying complexities in managing this multi-dimensional phenomenon. In some cases, effective ways of reducing uncertainty were identified, but the practices employed were unethical. For example, one firm colluded with local government to reduce uncertainty surrounding regulatory changes for the focal firm and introduce new product standards that competitors struggled to satisfy. The supply uncertainty experienced by some manufacturing firms was deliberately created by suppliers. For example, some suppliers had coordinated activities with each other to restrict the supply of materials to a customer in order to create a supply shortage and artificially increase the value of their stocks.

**015-0640: Supply Chain Risk Management via Operational and Financial Hedging: A Review**

*Dia Bandaly, Concordia University, Canada*

*Ahmet Satir, Concordia University, Canada*

*Latha Shanker, Concordia University, Canada*

*Yasemin Kahyaoglu, McGill University, Canada*

Companies adopting supply chain strategies are exposed to various sources of risk associated with their supply chain operations. The implementation of operational and financial hedging techniques to manage supply chain risks are studied by many researchers, albeit separately with few exceptions where both techniques are integrated. We conduct a literature review on supply chain risk management (SCRM). Risk management techniques and approaches used across various business disciplines are classified in terms of sources of major supply chain risks and functional areas impacted by the application of the technique / approach. After presenting this big picture for the SCRM, the review then focuses on the work reported in the literature on individual and combined operational and financial hedging along supply chains. Areas for future research in integrating these two hedging areas are also discussed.

148	Sunday, 8:00- 9:30, Grand Ballroom D	Track: HOM, 16	Chair: Thomas Rohleder
	<b>Session:</b> Patient Flow Modeling		

**015-0252: A Generalized Simulation Tool to Model Patient Transportation Systems**

*Danny Segev, Department of Statistics, University of Haifa, Israel*

*Retsef Levi, Sloan School of Management, MIT., United States*

*Peter Dunn, Dept. of Anesthesia, Massachusetts General Hospital, Asst. Prof. Harvard Med Sch, United States*

*Warren Sandberg, Dept of Anesthesia, Massachusetts General Hospital; Assc. Prof. Harvard Med Sch, United States*

During a large OR expansion project, our day-of-surgery admission and patient prep area will relocate from an immediately adjacent operating room suite to a distant location on another floor of a different building. Transporting patients to ORs will cover extra distance and include elevator trips to deliver patients and to recycle transporters. There is a limited number of heavily utilized elevators. We developed a generalized model including elevator steps (explicitly accounting for differing elevator capacities - influenced by patient carriage mode), transporter speed and distance to be covered. We used the model for sensitivity analyses of the number of dedicated elevators, dedicated transporters, transporter speed and the planned process start time on lateness of OR start and cases with serious delays. Two or three dedicated elevators and 10 transporters acceptably reduced lateness and delays; additional elevator capacity yielded little additional benefit, revealing sources of delays due to the admission process.

**015-0253: Failings of Operating Room Efficiency: The Human Factor**

*Avery Tung, Professor of Anesthesia and Critical Care, Univ. of Chicago, United States*

*Thomas Cutter, Professor of Anesthesia and Critical Care, University of Chicago, United States*

*Allan Klock, Professor of Anesthesia and Critical Care, University of Chicago, United States*

*David Glick, Assc. Prof. Dept. of Anesthesia & Critical Care, Univ. of Chicago Hospital, United States*

Efforts to make Operating Room (OR) throughput more efficient all require human cooperation. A number of innovative process changes have been implemented in our medical center to try and improve peri-operative throughput. Their efficacy has been limited, however, due to political and motivational issues. To maximize bed-space availability for tertiary care cases at our institution, alliances were formed to transfer much of our primary care offsite. While beds were made available for more complicated cases, there was tremendous political backlash. Like many hospitals, we have more operations to do than time permits during standard OR block times. To improve efficiency, additional OR block times were created after hours. Unfortunately, there was very little use of the additional block times by any of the surgical services. This was likely the result of

## Sunday, 8:00- 9:30 Sessions

inadequate incentives for surgeons or patients to stay late to populate these evening block times.

### 015-0254: Creating Real-time Transparency in Hospital Processes

**Andreas Seim**, Department of Computer & Info Science, Norwegian University of Science & Tech, Norway

**Andreas Landmark**, Department of Computer and Info Science, Norwegian University of Science & Tech, Norway

**Borge Lillebo**, Department of Neuroscience, Norwegian University of Science and Technology, Norway

**Arild Faxvaag**, Assc. Prof., The Norwegian EHR research centre, Norwegian Univ of Science & Tech, Norway

**Warren Sandberg**, Dept of Anesthesia, Critical Care & Pain Medicine, Massachusetts General Hospita, United States

**Peiter Toussaint**, Assc Prof, Dept of Computer & Info Science, Norwegian Univ of Science & Tech, Norway

The complexity of modern hospitals impedes health actors' situational awareness and their ability to coordinate activities and processes effectively. We hypothesize that providing health actors with an overview of relevant patient trajectories will improve their ability to self-coordinate. We further hypothesize that such overviews can be generated automatically based on real-time detection of events. We here report preliminary results from iterative efforts to develop information technology prototypes to test these hypotheses at two university hospitals in Norway. This includes (1) results from a utility test of an indoor location tracking system for detecting events in patient physical trajectories, (2) secondary use of healthcare data for detecting events that can form the building blocks of process transparency in hospitals, and (3) visualization of patients' physical and medical trajectories.

### 015-0256: Matching Staffing to Demand in a Very Large Academic Multispecialty Anesthesia Department

**Farhad Ghassemi**, Post-Doctoral Fellow and Associate, Sloan School of Management, MIT, United States

**Danny Segev**, Dept. of Statistics, University of Haifa, Israel

**Retsef Levi**, Associate Prof. of Management, Sloan School of Management, MIT, United States

**Wilton Levine**, Dept of Anesthesia & Critical Care, Massachusetts General Hospital, United States

**Peter Dunn**, Dept. of Anesthesia, Massachusetts General Hosp., Asst Prof. Harvard Medical Sch, United States

**Warren Sandberg**, Dept of Anesthesia, Massachusetts General Hosp., Assc Prof. Harvard Medical Sch, United States

The Department of Anesthesia, Critical Care and Pain Medicine at the Massachusetts General Hospital, Boston, faces challenges in staffing over 120 attending anesthesiologists to support the daily surgical and other medical procedures in multiple locations. Additionally, there are many other aspects that constrain the staffing process, such as the specialty of anesthesiologists and their availability throughout the week. This creates a challenging environment with very small level of predictability and a heavy load of repeated overtime.

We introduced the concept of variable-length shifts to better match the staffing levels to the demand. We developed a mathematical programming model that not only quickly finds practically feasible staffing plans, but also enables to test possible future changes (e.g., hiring additional anesthesiologists and nurse anesthetists and, better coverage ratio of anesthesiologists to rooms and anesthesiologists' specialties). The new staffing paradigm mitigates the inherent variability and provides significantly higher predictability.

150	Sunday, 8:00- 9:30, Junior Ballroom A	Track: PITM, 9	Chair: Enno Siemsen
	Session: The Organization of NPD - Networks, Teams, and Incentives		

### 015-0612: Network Structure of Design Engineers and Bottlenecks in White-collar Work

**Bilal Gokpinar**, University College London, United Kingdom

Product development has increasingly become knowledge intensive in the past several decades. In many product development firms, the commonly employed approaches to manage NPD processes including disciplined and fixed procedures, "gated" decision making, following strict design reviews are now taking a back seat, and more flexible, dynamic and information-driven processes are becoming increasingly common. To develop complex products, multi-disciplinary teams work on multi-project environments that include thousands of information-based tasks. So, managing the information flow becomes a unique challenge in these fast-paced NPD environments. In this paper, we provide a network-based framework to study information flow among Design Engineers, and examine performance implications of network structure. We also introduce the concept of "bottleneck" in a white-collar work environment and discuss its significance.

### 015-0911: Collaborative Search

**Fabian Sting**, INSEAD, France

**Jürgen Mihm**, INSEAD, France

**Christoph Loch**, INSEAD, France

Search has become a widely accepted paradigm to describe innovation activities. Formal models of search have incorporated a broad spectrum of different aspects relevant to search, such as cognition or organizational embedding. We contribute to the understanding of search by studying under which circumstances it is beneficial to have several organizational players search collaboratively.

### 015-0714: Managing Partnered Product Development Projects: The Impact of Contract Choice and Partner Integration Levels on Cost and Quality

**Alan MacCormack**, Massachusetts Institute of Technology, United States

**Anant Mishra**, University of St. Thomas, United States

Firms increasingly look outside their organizational boundaries to identify partners that can improve the effectiveness of their product development efforts. The motivation for using partners, however, varies significantly across firms. While some focus purely on lowering costs, others target improvements in product quality. How should these different types of relationship be managed? We report results from an empirical study investigating the impact of contract choice and partner integration levels on performance in product development projects. Our objectives were to understand how contract choices are shaped by a firm's partnering strategy and determine how different contract choices moderate the relationship

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between partner integration levels and project outcomes. Our findings reveal that the optimal choice of contract is a function of a firm's partnering strategy. Furthermore, these choices have a profound impact on the costs and quality benefits that stem from increased levels of partner integration.

### 015-0429: Decentralized Balancing of Complementary Tasks

*Enno Siemsen, University of Minnesota, United States*

This research analyzes how work teams with complementary tasks achieve balance through decentralized decision making if only team outcome can be assessed and rewarded. Analytical results of a principal agent model suggest that without risk aversion, a first best outcome can be achieved, since the balancing constraint overcomes the missing degree of freedom in the incentive contract. Further, balance in equilibrium can both be achieved through helping or effort adjusting, depending on a simple comparison between the productivity loss of helping and the productivity gap at the bottleneck. Finally, optimal incentive systems tend to provide stronger incentives for the bottleneck resource. We conduct a behavioral experiment that therefore explores whether there is a trade-off between effective and fair incentives in teams.

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Sunday, 8:00- 9:30, Junior Ballroom B  
Session: OMM12

Track: OMM, 12

Chair: Xuying Zhao

### 015-0954: Process Integration Between Product Recall and Product Return

*Jerry Wei, University of Notre Dame, United States*

This study attempts to exploit the common components between the process of responding to product recall and the process of handling ordinary product return in a supplier-retailer environment. Although both product recall and return are primarily triggered by quality problems, the natures of these problems are quite different. Product recalls often require a speedy response, and the chief concern is to minimize the loss of "brand value" and loss of consumer goodwill. On the other hand, consumer product returns are regular activities, where the time value of the product and costs of handling must be balanced. We analyze various cost drivers of both systems and suggest a method of coordinating some common segments in the supply chain that helps minimize the total costs.

### 015-0750: A Dynamic Strategy to Optimize Market Entry Timing and Process Improvement Decisions

*Sechan Oh, Stanford University, United States*

*Ozalp Ozer, The University of Texas at Dallas, United States*

Conventionally, manufacturing firms determine the time to introduce a new product to the market long before launching the product. As the rate of technological innovation increases, product life cycles become shorter, and the timing for introducing a new product becomes more important. As a result, firms tend to dynamically determine the market entry timing depending on the competitors' movements and the readiness of their production processes. In this presentation, we consider a manufacturer who dynamically optimizes the timing for introducing a new product and investment decisions for the new production process. We characterize the optimal policy that prescribes when to introduce the new product. We show that compared to conventional static strategies, the dynamic strategy can decently increase the manufacturer's profit while significantly reducing the risk involved in new product introduction decisions. Our study also characterizes the industry conditions under which the dynamic strategy is the most effective.

### 015-0352: Transshipping to the Gray Market: The Impact on a Decentralized Supply Chain

*Jing Shao, University of British Columbia, Canada*

*Harish Krishnan, University of British Columbia, Canada*

*S. McCormick, University of British Columbia, Canada*

Gray markets are unauthorized channels where a product is distributed without the manufacturer's permission. Recent literature has identified the profitability of a gray market for a monopolist. This paper investigates the impact of a gray market on a decentralized supply chain with an upstream manufacturer and downstream retailers. We show that the manufacturer may be strictly better off from a gray market under some conditions. In cases where it could be worse off, it may or may not be able to deter the retailers from transshipping to a gray market.

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Sunday, 8:00- 9:30, Junior Ballroom C  
Session: Strategic Issues in Disaster Management

Track: DSTR, 2

Chair: Willard Thomas Price

### 015-0035: Managing Supply Chains in Times of Crisis: A Review of Literature and Insights

*Malini Natarajathinam, Texas A&M University, United States*

*Ismail Capar, Texas A&M University, United States*

*Arunachalam Narayanan, Texas A&M University, United States*

The purpose of this paper is to review the literature to describe the current practices and research trends in managing supply chains in crisis. This paper also provides directions for future research in supply chain crisis management.

### 015-0633: Unified Guidelines for Resilience

*Ran Bhamra, Loughborough University, United Kingdom*

*Kevin Burnard, Loughborough University, United Kingdom*

Social, economic and environmental disturbances threaten industry infrastructure and the security of the products and services we all depend upon. This paper draws together the numerous approaches to resilience-related research and presents guidelines that would reduce the impact of disruptions. This paper considers streams of research that seek to address the issues of organisational resilience and effective response to disruptions. The fields of supply chain management (Sheffi, Y., 2005), organisational psychology (Powley, E.H., 2009, Barnett, C.K., 2000), ecology (Walker et al, 2002), and strategic management (Hamel, G., & Valikangas, L., 2003) amongst others, are investigated. The paper assesses these

## Sunday, 8:00- 9:30 Sessions

contributions and compares and contrasts approaches in the context of the world's current and pressing issues. This work finds many similarities across the differing research streams. This paper contributes to theory building by establishing a unified set of guidelines with which the impact of infrastructural disruptions could be reduced.

### 015-0905: Prevention Preference: We Won't Let That Happen Again!

*Willard Price, University of the Pacific, United States*

So many disasters, catastrophes, tragedies, failures and accidents occur and soon after we hear someone say, "we can't, won't, shouldn't let that happen again." Yet it is not clear such statements are accurate because we do let the flood occur again, are unwilling or unable to muster the resources to prevent the next terror attack or may not have the knowledge and technology to avoid the next airline crash. One cynical view of disasters is that there is more glory in response and recovery; no heroes come with "first preventers" or votes gained by investing in avoidance. The presentation examines the tradeoff between prevention and recovery, arguing that while the rational act and cheapest behavior is prevention, a variety of explanations keep us from choosing to avoid tragedy. Such events are not truly natural, but instead human disasters, since we are frequently unable to prevent the consequences of continuing failures.

### 015-0964: POM Strategies and Tactics in Disaster Management

*Martin Starr, Rollins College, United States*

*Sushil Gupta, Florida International University, United States*

We present a conceptual paper emphasizing the importance of developing strategies to deal with disasters, whether they are accidental, natural or man-made. The basic idea would be to develop strategies to detect impending cataclysmic events and strategies to prevent them from happening. When disaster strikes, the best tactics bring aid as fast as possible to the scene - for example, using stores like Home Depot to stockpile emergency supplies and grocery supermarkets like Publix to store canned foods. Meanwhile, long-term strategies have to be in place to recover and restore as effectively as possible. Where vulnerabilities exist, it is logical to create long-term strategies and to practice operational tactics for disasters that could occur, like the one in New Orleans in 2005 due to hurricane Katrina and the one currently being faced by Haiti because of the earthquake on January 12, 2010.

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Sunday, 8:00- 9:30, Junior Ballroom D

Track: SOHL, 12

Chair: Edgar Blanco

Session: Insights from Real-World Supply Chain Carbon Footprints

### 015-0212: Measuring and Regulating Carbon Emissions in Transportation

*Jan Fransoo, Eindhoven University of Technology, Netherlands*

Carbon emissions are increasingly being regulated, yet little understanding is available about the proper measurement of these emissions in transportation and the potential impact of regulations on transportation. Using a double case study, we investigate the measurement process of carbon emissions in a European transport network of two primarily bulk shippers. We provide insights into the actual emission and also show the small impact that regulations have on the decision being made to reduce emissions.

### 015-0540: Variability in Product Carbon Labels

*Anthony Craig, Massachusetts Institute of Technology, United States*

*Edgar Blanco, Massachusetts Institute of Technology, United States*

*Yossi Sheffi, Massachusetts Institute of Technology, United States*

Carbon footprints have emerged as a popular measurement of the environmental impact of products and supply chains. Several products now available feature carbon labels that inform the consumer about the product's carbon footprint. Due to the complexities of the labeling process, a single average value is often used on the label for all products sold within a given country. This research explores the variability in a product's carbon footprint that can exist due to differences in the supply chain. We model the distribution network for a single product delivered to more than 300 customer locations in the United States. The carbon footprint of the product is calculated for each customer location, using Life-Cycle Assessment techniques and supply chain modeling software. The results from the model are analyzed to show the variability of the carbon footprint values compared to the average carbon label.

### 015-0676: The Market Value of Supply Chain Flexibility: Theory and Evidence from the Clean Energy Industry

*Jane Davies, Judge Business School, University of Cambridge, United Kingdom*

*Nitin Joglekar, Boston University School of Management, United States*

Competition has shifted increasingly from the individual firm to the supply chain level. As such, effective supply chain management is seen as a way of obtaining competitive advantage for all firms in the supply chain. In this paper we explore how decisions regarding flexibility, integration, assets and technology, which can lead to superior supply chain performance, are reflected in the stock market valuation of each firm. We then calculate the supply chain effect on the value of these firms. We develop constructs to measure each decision and test hypotheses around the synergy between these constructs in the context of 42 supply chains drawn from the solar photovoltaic energy sector. The results indicate that in addition to firm level flexibility factors integration and assets are significantly associated with the valuation of the supply chain. We offer a method for capturing and correcting for this "supply chain effect" at the firm level.

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Sunday, 8:00- 9:30, Orca

Track: CIM, 10

Chair: Xiao Huang

Session: Managing Supply Risk

### 015-0897: Dynamic Decentralized Airline Alliance Revenue Management

*Huaning Cai, University of California, Berkeley, United States*

## Sunday, 8:00- 9:30 Sessions

**Andrew Lim**, *University of California, Berkeley, United States*

Airline alliances involve multiple agents (airlines) sharing common resources (seats). Participating airlines sell itineraries in a decentralized manner dynamically over time to maximize their own objectives, using seats from a common pool. In this paper, we characterize a mechanism by which optimal decentralized pricing coincides with the optimal pricing policy that would be obtained by a single centralized pricing agent. Centralized optimality is obtained by the introduction of contracts which specify the price that selling agents need to pay for seats (resources) that are used. We characterize the optimal contracts, and show how these can be computed without individual airlines having to reveal their demand functions to other airlines. Approximate schemes for computing these contracts will also be discussed.

### 015-0862: Supplier Alliance in Assembly Systems: Competition and Cooperation Under Default Risk

**Xiao Huang**, *McGill University, Canada*

**Tamer Boyaci**, *McGill University, Canada*

**Mehmet Gumus**, *McGill University, Canada*

**Saibal Ray**, *McGill University, Canada*

**Dan Zhang**, *McGill University, Canada*

During the financial crisis and economy recession in recent years, there has been increasing evidence of supplier consolidation and supplier alliance (rather than mergers & acquisitions). However, it has been known in literature that suppliers are reluctant to form alliances in an assembly system, assuming the environment is risk free. By introducing default risk factor into the traditional assembly model, we allow the suppliers to consider the trade-off between joining a greater alliance that is more stable vs. a smaller one that may allocate them with better earnings. Strong Nash Equilibria of the coalition structure are characterized. We also analyze assemblers' incentives to invest in supply risk constructions and how competition may affect the alliance structure.

### 015-0629: Optimal Inventory Policies when Purchase Price and Demand are Stochastic

**Peter Berling**, *Lund University, Sweden*

**Victor Martínez-de-Albéniz**, *IESE Business School, University of Navarra, Spain*

We consider the problem of a firm that faces a stochastic demand (Poisson) and replenish from a market in which prices fluctuate, such as a commodity market. We describe the price evolution as a continuous stochastic process and focus on commonly used processes suggested by the financial literature, such as the Geometric Brownian Motion and the Ornstein-Uhlenbeck process. It is well-known that under variable purchase price, a price-dependent base-stock policy is optimal. Using the single-unit decomposition approach, we explicitly characterize the optimal base-stock level using a series of threshold prices. We show that the base-stock level is first non-decreasing and then non-increasing in the current purchase price. We provide a procedure for calculating the thresholds, which yields closed-form solutions when price follows a GBM and implicit solutions under the O-U price model. Numerical studies show that the optimal policy performs much better than those that ignore future price evolution.

### 015-0855: Cost-effective Handling of Disruptions in Production Management

**Ehsanallah Naseri**, *Concordia University, Canada*

**Onur Kuzgunkaya**, *Concordia University, Canada*

Rescheduling is an essential operating task to efficiently tackle uncertainties and unexpected events frequently encountered in flexible manufacturing systems. The main purpose of this paper is to develop a real time scheduling methodology in order to create new cost-effective schedules capable of quickly responding to disturbances and uncertainties. A Filtered-Beam-Search-heuristic algorithm (FBS) is proposed to generate a pre-specified number of near optimal schedules. Thereafter, a rescheduling cost-based analysis method is suggested to determine the cost impact of changing the existing schedule to each of the alternative schedules generated by the FBS algorithm. For this purpose, a compound cost function which consists of three cost metrics, i.e., job-related, machine-related, and material-related rescheduling costs, is developed. To validate the performance of the proposed algorithm, various test problems are simulated and the reliability of the algorithm is compared to some prominent methods found in the literature.

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Sunday, 8:00- 9:30, Parksville

Track: EROM, 10

Chair: Dauda Muhammad

Session: Inventory Management & Supply Chains

### 015-0015: Inventory Velocity in Canadian Cookie Supply Chains

**Michael Armstrong**, *Brock University, Canada*

**Cassandra Maddaloni**, *Brock University, Canada*

This paper describes a field study of the operational performance of cookie supply chains in Canada. The primary performance measure is the age of the product on the store shelves: that is, the total amount of time the product spent in the distribution system after leaving the manufacturers' production lines. Lower ages indicate that a supply chain has a higher inventory turnover or inventory velocity. The study analyzed the ages of 1,077 boxes of cookies produced by the 2 largest manufacturers that were sampled from 6 major retail chains operating in Canada. The results showed some significant differences in inventory velocities (ages) amongst the retailers, but less so between the manufacturers.

### 015-0306: An Empirical Analysis of the Impact of Fuel Costs on the Level and Distribution of Inventory in the U.S.

**Jian-yu Ke**, *University of Maryland College Park, United States*

**Martin Dresner**, *University of Maryland College Park, United States*

**Yuliang Yao**, *Lehigh University, United States*

Given recent instability in fuel prices, fuel costs have become increasingly important in supply chain decision making. Theory predicts that fuel costs have two effects on inventory. First, due to disparities in fuel prices, firms may locate inventories in states with low fuel costs. Second, when fuel costs become more significant relative to other costs, firms may locate manufacturing plants and distribution centers closer to their markets. Using a

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managerial implications from our findings are also discussed.

### 015-0029: Product Variety and Sales: A Mediation Analysis through Logistics Performance

*Xiang Wan, University of Maryland, United States*

*Martin Dresner, University of Maryland, United States*

*Philip Evers, University of Maryland, United States*

Managing product variety has been analyzed by an extensive body of literature. Two contradictory streams of research are found. The more established stream demonstrates that large product variety provides high value to customers and stimulates sales. The other stream of research argues that increased variety raises the difficulty of logistics management and ultimately reduces customers' satisfaction and sales. This research propose a framework to examine these trade-offs that occur when variety is increased. We specifically investigate product variety's direct and indirect (through logistics performance) impacts on sales. The results indicate that product variety has direct and positive effects on a firm's sales, but a negative impact on logistics performance provided by the firm, which is positively associated with sales. The overall influence of product variety on sales depends on the degree, by which logistics performance affects sales.

156	Sunday, 8:00- 9:30, Pavilion Ballroom A <b>Session:</b> Performance Management Systems	<b>Track:</b> PLQ, 9	<b>Chair:</b> Sascha Fuchs
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### 015-0045: Performance Management SMEs: A Design Method and Information System for Continuous Improvement

*Rafael Lima, University of Sao Paulo - School of Engineering of Sao Carlos, Brazil*

*Luiz Carpinetti, University of Sao Paulo - School of Engineering of Sao Carlos, Brazil*

Performance management is most often addressed in the literature regardless the size of firms. However, several difficulties prevent implementation of performance measurement systems (PMS) in small and medium-sized enterprises (SMEs), especially the time and investments required for this type of project. The objective of this paper is to build on previous research on performance management in SMEs and propose a simple PMS design method tailored for such firms. A software program to assist in the management of performance measures and improvement actions is also described. Both the design method and the software were applied through action research in a Brazilian SME. Despite the time and investment constraints faced during the research, the method and software were found to be effective in the selection and tracking of performance measures. Evidences from the empirical study show that continuous improvement requires not only a software program but also the involvement of people.

### 015-0158: Production Cell Development: Designing an Integrated Performance Measurement System

*Daryl Powell, Norwegian University of Science and Technology, Norway*

*Torbjørn Netland, SINTEF, Norway*

Performance measurement system (PMS) design is complicated by its multi-dimensional nature. A PMS for today's manufacturing environment must focus on monitoring and controlling processes as well as supporting improvement activity. In this paper the analysis and design of a PMS is demonstrated through a case study example. It presents a framework for an integrated performance measurement system for use within the production cells at Volvo Aero Norge, a producer of aero-engine components based in Kongsberg, Norway. The PMS developed here considers two main areas: product performance and operator performance; and integrates these measures with the requirements of the management team.

### 015-0281: Simulation-based Configuration of Value Stream-oriented Production Control

*Sascha Fuchs, WZL, Laboratory for Machine Tools and Production Engineering, RWTH Aachen Univer, Germany*

*Guenther Schuh, WZL, Laboratory for Machine Tools and Production Engineering, RWTH Aachen Univer, Germany*

*Bastian Franzkoch, WZL, Laboratory for Machine Tools and Production Engineering, RWTH Aachen Univer, Germany*

*Till Potente, WZL, Laboratory for Machine Tools and Production Engineering, RWTH Aachen Univer, Germany*

The dilemma of production planning and control is to achieve high process efficiency, low throughput times and good planning confidence in spite of a turbulent environment with short product life cycles, an increasing variety and a growing individualization of demands. Today's solutions in production control are numerous and leave the decision maker with an insolvable amount of choices. Therefore the basic framework for the condition based configuration of production control is a generic simulation model which consists of three layers. They represent the value stream of the production process to be configured, the production control logic fulfilled via different mechanisms (e.g. Kanban, MRP, etc.) and basic information such as operation charts and Master Production Schedule. Via defining control sections within the value stream, a differentiated control strategy can be implemented. The success of this new approach has been demonstrated in industry cases and will be introduced in this paper as well.

157	Sunday, 8:00- 9:30, Pavilion Ballroom B <b>Session:</b> Production Systems	<b>Track:</b> GENL, 9	<b>Chair:</b> Robson de Paula Alves
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### 015-0936: Integrated Maintenance: Feasibility and Effectiveness of Interoperability Between Condition Monitoring and Integrated Management System

*ROBSON ALVES, UNIVERSITY OF SÃO PAULO, Brazil*

*TAMIO SHIMIZU, UNIVERSITY OF SAO PAULO, Brazil*

The subject of study is the model called INTEGRATED MAINTENANCE MANAGEMENT, i.e., the architecture composed by Information Systems applied to the maintenance function, but in an integrated manner. More specifically will be examined the systems dedicated to support technical

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preventive maintenance environment, with a sample, not probabilistic, chosen intentionally. The main objectives of the study are: 1. test and evaluate a model of Integrated Maintenance Management; 2. apply the test to this model; 3. put together, in an organized way and with scientific basis, updated state-of-the-art information about the subject.

### 015-0366: Decision Support System (DSS) for Machine Selection: A Cost Minimization Model

*Mayra Méndez-Piñero, University of Puerto Rico - Mayaguez, Puerto Rico*

*Cesar Malave, Texas A&M University, United States*

A model-driven Decision Support System (DSS), with mathematical modeling considering machines workload balance and total cost minimization, is used to solve the problem of machine selection for multiple parallel, non-identical electronic assembly machines. The major contribution of this model is on the detailed cost components when estimating total cost. Sensitivity analyses were done, varying amount of products, machines, imbalance factor, and coefficient of variation (CV), and the results show that the higher the CV or the number of machines, total cost of all products assembled increased due to the complexity of balancing machines workload for a large number of products.

### 015-0804: Order Acceptance Policies for Production-To-Order Environments with Family-Dependent Due-Date Horizons

*Remco Germs, University of Groningen, Netherlands*

*Nicky Van Foreest, University of Groningen, Netherlands*

We consider a production-to-order environment in which a single machine produces one product family at a time and is subject to significant switch-over times when the product family changes. Orders have strict due dates and the lead times of orders are family dependent. An acceptance and scheduling policy determines whether an arriving order is to be accepted into a production schedule, or rejected upon arrival. The aim of the production system is to find a policy that maximizes the long-run expected reward per arriving order. We use a new combined Markov Dynamic Programming (MDP) and simulation approach to find a near optimal policy that is easy to implement. First, by means of an MDP approach we find an optimal policy which is shown to be difficult to implement. Second, a simulation approach is used to search for a policy that is easy to use in practical situations and nearly optimal.

### 015-0610: Minimizing Mean Tardiness in a Buffer-constrained Dynamic Flowshop - A Comparative Study

*Ahmed El-Bouri, Sultan Qaboos University, Oman*

Cooperative dispatching is a consultative and consensus-seeking methodology for job dispatching in dynamic production systems. This paper evaluates the performance of cooperative dispatching compared to a selection of traditional dispatching rules for minimizing mean tardiness in a buffer-constrained flowshop. Previous research shows that common dispatching rules perform quite poorly when the buffers that hold in-process jobs between machines have very limited capacities. Computational experiments using randomly generated test problems for three different congestion levels and three different due-date tightness levels are carried out for a 5-machine flowshop that operates with very low intermediate buffer capacities. Initial results indicate that cooperative dispatching achieves major improvements in minimizing mean tardiness, compared to the traditional dispatching rule.

159	Sunday, 8:00- 9:30, Pavilion Ballroom D	Track: HBOM, 6	Chair: Peter Lethmate
<b>Session: Consumer and Manager Behavior</b>			

### 015-0140: Complex Decision Making in Decentralized Organizations – an Experimental Study

*Peter Letmathe, University of Siegen, Germany*

*Marc Zielinski, University of Siegen, Germany*

We conducted experiments in which more than 400 students focused on complex decision problems which can be solved with OR methods. The students obtained full information of the problem's input data and the objectives of the underlying problem. Having no access to OR software, each student had to generate "good" production plans for 21 production processes and 3 products. The experiments were repeated four times and different feedback information was given to each of the four subgroups of students after each round. The quality of the decisions is measured through the differences between the optimal solutions and the suggested solutions by the students. Our results show strong learning effects of all groups with a high share of students consistently deviating less than 5 percent from the optimal solution. These results provide evidence that well-designed decentralized planning approaches are better able to respond to short-term planning requirements than less flexible methods.

### 015-0796: Managing Customers' Moods While Waiting: The Use of Scent in Queue Management

*Helene Caudill, St. Edward's University, United States*

*Nancy Ryan, St. Edward's University, United States*

One of the most important research and applied areas of operations management relates to our understanding of waiting lines and learning how to more effectively manage them. Additionally, while research focused on individuals' moods is an integral part of other fields such as marketing, psychology, and social psychology, the field of operations management has not yet embraced this important aspect of human behavior. In particular, how customers' moods are managed during their waits may affect their perceptions of the overall quality of the service received. One atmospheric factor that may affect individuals' moods is scent or olfactory sensations. In a laboratory experiment wait time and scent were manipulated to determine if moods could be enhanced. Results indicate that scent and wait time significantly affect subjects' moods and perceptions of their waiting experiences.

### 015-0109: Recognizing Significant Human-Related Factors Affecting Systems Reliability

## Sunday, 8:00- 9:30 Sessions

**Corey Kiassat**, *University of Toronto, Canada*

**Myrto Konstantinidou**, *NCSR Demokritos, Institute of Nuclear Technology & Radiation Protection, Greece*

System reliability can be affected by many factors, some of which are not machine-related. An important category of these non-traditional factors are human-related (HR) factors, such as expertise, collaboration and motivation. Operational systems consist of machinery as well as human operators and decision makers. Therefore, a risk analysis is incomplete if the probability of human error is not considered.

This paper discusses a method for recognizing human-related factors affecting the system reliability and quantifying their impact. Factors are analyzed for significance and the insignificant ones are eliminated. Most HR factors are qualitative and various Human Reliability Analysis (HRA) techniques are utilized to quantify them. Among the many HRA techniques developed for various applications, this paper uses Cognitive Reliability and Error Analysis Method (CREAM) due to its cognition approach for identifying the factors affecting human reliability. Once quantified, factors are utilized in the Proportional Hazards Model, a well-known reliability prediction model.

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Sunday, 8:00- 9:30, Port Alberni

Track: SOM, 5

Chair: Uday Apte

Session: Dynamic Responsiveness

### 015-0791: Moving Towards a Customer-Focused Approach in Facility Management: Lessons from a Case Study

**Matteo Campanerut**, *University of Udine, Italy*

**Mattia Montagner**, *University of Udine, Italy*

**Alberto De Toni**, *University of Udine, Italy*

In the last decade, the outsourcing market of Facility Management (FM) has significantly grown in the major developed countries. Private companies and governments have seen in the FM contracts a convenient way to gain competitiveness. However, these contracts have often failed in the delivery of excellent services to end-users. The emphasis towards compliance with the contract terms has often led clients and suppliers to a loss of attention to the real needs of end-users.

This paper presents a four-year case study in which the client, a health agency, and its supplier have established a customer-focused approach for FM, developing services from the real needs of end-users. The work highlights how the customer-focused approach has allowed both the client and the supplier to identify concrete opportunities for service improvement and to increase service value. The paper reports the tools, the practices and the skills developed to focus on customer needs.

### 015-0978: Reducing Defects in Outsourced IT Infrastructure Service Delivery Operations

**Abhijit Bose**, *IBM Research, United States*

Many service providers have set up global service delivery centers in low-cost locations to deliver a host of IT services. These centers are staffed with subject-matter experts (SMEs) in various disciplines, such as remote diagnostics and resolution of system and application problems. The SMEs also deploy pre-approved changes to these systems/applications and respond to service requests from the customers. Improving service quality at these centers often requires reducing the number of defects in the operational environment. In this talk, I will describe various aspects of this problem, including origin, taxonomy and distribution of the various types of defects (including defects due to human errors) commonly observed at these centers. Finally, I will present how automated defect classification and root-cause analysis, as part of a quality improvement initiative, can significantly reduce these defects and improve overall reliability and quality of the tasks performed at these centers.

### 015-0344: Security Risks in Service Offshoring/Outsourcing: An Assessment Model Based on the Failure Mode and Effect Analysis

**GUIDO NASSIMBENI**, *UNIVERSITY OF UDINE, Italy*

**MARCO SARTOR**, *UNIVERSITY OF UDINE, Italy*

**DAIANA DUS**, *CASCC, Italy*

Several motivations are increasingly encouraging companies to outsource and/or localize their (IT and business) processes abroad. In doing that, the security risks are among the most relevant.

The wide literature focused on this issue presents some limitations. Firstly, although various authors highlight how different tools/practices seem to be more effective if used jointly, most of the papers still concentrate only on single aspects of the security problem. Secondly, a large part of the studies on data and knowledge protection analyse risks focusing only within the organisational boundaries, without considering the implications of the company external collaborations. Finally, there are only a few works that discuss these security issues in offshoring/outsourcing projects.

This study helps in filling this gap by developing an assessment framework (based on the FMEA methodology) that considers security issues among all the steps of the offshoring/outsourcing process using an holistic (managerial, legal and technical) perspective.

### 015-0658: The Effects of Service Failures on Firms' Performance: A Panel Data Analysis of the American Airline Industry

**Hojung Shin**, *Korea University, Korea, Republic of (South Korea)*

**Sooheon Park**, *Korea University, Korea, Republic of (South Korea)*

In this study, we explore the effects of service failures on firm performance by analyzing the panel data collected from the American Airline Industry by the Department of Transportation and the Bureau of Transportation Statistics. Service failures are measured as ratio scales of arrivals on-time, flight cancellation, mishandled baggages, and over-sales. Using the Panel Correlated Standard Error (PCSE) estimation method, we first investigate the effects of service failures on the number of customer complaints, return on assets (ROA), and return on sales (ROS). We also investigate the mediation effect of customer complaints on the ROA and ROS. The results show that service failures in general have a negative influence on the firms' financial performance, but not always. The lagged effect of customer complaints on firm performance is also found, implying that increasing customer complaints can deteriorate the profitability of the firm in the long run.

## Sunday, 8:00- 9:30 Sessions

161	Sunday, 8:00- 9:30, Port Hardy Session: GOSSM 4	Track: GOSSM, 4	Chair: Yen-Tsang Chen
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### 015-0482: Internationalization Strategy of the Brazilian Coffee Industry: Analysis of Operational Antecedents

*Yen-Tsang Chen, Escola de Administração de Empresas de São Paulo / Fundação Getúlio Vargas, Brazil*

*João Conde, Escola de Administração de Empresas de São Paulo / Fundação Getúlio Vargas, Brazil*

The history of Brazil is highly related to coffee production; it was considered the "Green Gold," and for a long period it has defined the modus vivendi of the Brazilian society. Taking into account the importance of this product, we explored the internationalization strategy of Brazilian coffee from the perspective of the operational antecedents (quality, dependability, flexibility, speed and cost). This study has employed a qualitative research method using multi-case studies and deep interviews with coffee producers in Bahia and São Paulo. This study found that the Brazilian coffee producers lack a consistent internationalization strategy, despite the high level of exportation, and the industry arrangements do not provide enough conditions for coffee producers to implement their own internationalization strategy. To conclude, this study proposes a sustainable internationalization strategy according to the level of the maturity of the producer operation and relating each strategy to its corresponding operational antecedents.

### 015-0484: Focused Networks: Linking Production Networks to Product and Process Characteristics

*Kasra Ferdows, McDonough School of Business, Georgetown University, United States*

*Ann Vereecke, Vlerick Leuven Gent Management School & Ghent University, Belgium*

*Arnoud De Meyer, Judge Business School, Cambridge University, United Kingdom*

Production networks in multinational companies are complex structures. It takes years to put them in place; it is difficult to change them quickly; they may evolve in unintended directions. So, how to assess whether a firm's production network is a strategic asset or liability? There are neither many models for classifying production networks, nor studies that show which model fits which strategy. We propose a model to relate the structure of a firm's production network to characteristics of its products and processes. The model can also be used to decompose a complex network into simpler, focused sub-networks by dividing the firm's products and processes into groups.

Based on case research in five multinationals, we show that the model is a useful tool for tracking the evolution of production networks and for determining whether their transformations fit the changes in the firm's strategy.

### 015-0574: Extracting Managerial Implications by Kano Model from a Cross-Cultural Survey of QWL - Learning from UAE

*Tapan Bagchi, VGSOM/IEM, India*

*Flavy Lasrado, Hamdan Bin Mohamed e-University, Dubai, UAE, United Arab Emirates*

Perceptions of QWL in UAE's cross-cultural Diaspora are investigated. But rather than using the conventional latent factor analysis approach that often causes loss of information, the Kano model of customer satisfaction is invoked to assess the diverse items influencing QWL. Kano analysis finds significant differences in knowledge workers' perception of QWL amongst male/female and between nationals and expatriates. On the other hand, ICT is seen as a basic rather than a delighting or functional element of the workplace. Thus this study demonstrates utility of an actionable path to make interpretation of "latent" organizational development (OD) factors avoidable.

### 015-0606: The Portuguese Railway Locomotive Assembly Industry: An Adaptability Perspective

*Carlos Pinto, CP - Comboios de Portugal EPE, Portugal*

*João Menezes, ISCTE-IUL - Lisbon University Institute, Portugal*

This study aims at analyzing the way firms in the Portuguese locomotive manufacturing industry create value and adjust adaptability within their relationships, from the industrial networks perspective.

The industry has undergone a globalization/concentration process, from which train standardization emerged; despite this, big suppliers (Alstom, Bombardier, Siemens) presently secure their local clients with national customized strategies. Within this framework, and optimizing local supplier network, a new firm/integrator was created in Portugal.

The unit of analysis is the dyadic relationship customer/supplier, in the domains of engineering, production, delivery and maintenance. The research, based on semi-structured interviews, was developed as a case study, addressing a period of three major events as experienced by the different managers involved. The actions/reactions identified are analysed according to different dimensions (value, integration/adaptation, adaptability/flexibility, resource, relational dimensions), each defined by criteria representing different visions of interaction structure. The results contribute to an understanding of how firms interact to adapt to changes in their relationships.

### 015-0312: Unveiling the Effects of Social Power and Procedural Justice on Relational Commitment in a Supply Chain

*Daesik Hur, Yonsei University School of Business, Korea, Republic of (South Korea)*

*Joonhyuk Bok, Yonsei University School of Business, Korea, Republic of (South Korea)*

Firms have enjoyed relational competitive advantage by successfully integrating resources and capabilities of supply chain partners across organizational boundaries. The social exchange theory delineates that supply chain integration requires each party's long-term, normative relationship commitment to each other. Then, what would motivate a supplier firm to develop such positive attitude toward a buyer firm? This study is focused upon social processes embedded in economic exchanges between buyers and suppliers. Underpinned in the theory of social power and organizational justice, this study postulates a buyer's non-mediated power will lead to a supplier firm's normative commitment, whereas reliance on rewards and coercive powers will only result in instrumental commitment from the supplier. Procedural justice is expected to increase suppliers' normative commitment, and to have a contingency effect on the influence of social power. The hypotheses will be tested using data collected in Korean manufacturing industries.

## Sunday, 8:00- 9:30 Sessions

162	Sunday, 8:00- 9:30, Port McNeill	Track: OEE, 4	Chair: Martin Lockström
<b>Session: Integrating Emerging Economies into the Extended Enterprise: Empirical Studies</b>			

### 015-0115: Strategy and Competitiveness of Small and Medium Enterprises (SMEs) in Emergent Countries: Brazilian Cases

*João Amato-Neto, University of São Paulo, Brazil*

*Edmundo Escrivão-Filho, University of São Paulo, Brazil*

*Fábio Guerrini, University of São Paulo, Brazil*

It is important to identify the many problems, in terms of financial, technical-organizational and managerial aspects that small and medium enterprises (SMEs) must overcome in order to become viable and competitive, given the trend of globalization of national and regional economies--especially if these companies act in isolation forms in their respective markets. The aim of this paper is to propose a theoretical analysis of different forms of competitiveness of SMEs operating in different production chains. The real opportunities to develop and increase the innovative capacity of SMEs, in general, are based on real issues, from a new perspective of socio-economic development of regions and nations. Such opportunities are identified especially in the case of the State of São Paulo, Brazil, and this phenomenon may serve as reference for other regions, especially in emerging economies.

### 015-0445: Offshoring Business Process Services and Governance Control Mechanisms in Emerging Markets: An Examination of Service Providers from India

*Vaidy Jayaraman, University of Miami, United States*

*Sriram Narayanan, Michigan State University, United States*

*Yadong Luo, University of Miami, United States*

*Jayashankar Swaminathan, University of North Carolina at Chapel Hill, United States*

As emerging markets increasingly rely on service businesses through outsourcing, we examine the role of governance control mechanisms in improving performance among business process outsourcing (BPO) firms in India. Using data collected from 205 emerging market based BPO service providers in India, we examine the antecedents and consequences of establishing governance control mechanisms in BPO firms. Specifically, we examine how structural (use of contracts with the client), administrative (effective allocation and demarcation of responsibilities within the BPO) and relational (collaboration and information sharing with the client) mechanisms drive the performance of a BPO service provider operating in an emerging market. We also examine how key task-related and client-related antecedents influence the use of different governance control approaches. Our analysis finds that both task connectivity and security significantly impact use of structural and administrative mechanisms, while end customer orientation is significantly associated with the strength of the relational mechanisms.

### 015-0861: Managing Staffing and Control in a Call Center Co-Sourcing Environment

*Amy Ward, USC, United States*

*Mor Armony, NYU, United States*

*Levent Kocaga, USC, United States*

Many firms that prefer to keep their call center operations in-house also use outsourcing to manage time periods of overload. Then, there is an upfront decision on the in-house staffing level that must be made when the call arrival volume is uncertain, and dynamic real-time decisions regarding which calls to outsource, made after the call arrival volume has become known. We propose a policy for staffing and dynamic outsourcing of calls that minimizes costs due to staffing, outsourcing, and customer abandonment.

### 015-0538: Antecedents to Supplier Integration in China: A Quantitative Study

*Martin Lockstrom, China Europe International Business School, China*

*Lei Liu, China Europe International Business School, China*

The aim of this paper is to identify antecedents to supplier integration in China. A deductive approach was deployed by building on a qualitative pre-study and various strands of SCM literature. All in all, six hypotheses were derived and subsequently tested by drawing on an empirical sample collected from 100 purchasing managers at companies located China. The data was then analyzed using structural equation modeling (SEM). The results indicated that supplier integration was positively influenced by supplier capabilities, supplier readiness and buyer leadership effectiveness. Furthermore, cultural distance and internal constraints turned out to have a negative moderating effect on the relationship between buyer leadership effectiveness and supplier readiness, whereas continuous supplier development proved to have a positive impact on supplier capabilities.

## Sunday, 10:00-11:30 Sessions

163	Sunday, 10:00-11:30, Finback <b>Session:</b> Supply Chain Management Models with Strategic Players	<b>Track:</b> SCM, 24	<b>Chair:</b> Tolga Aydinliyim
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### 015-0359: Supply Chain Disruption Management

**Zigeng Liu**, *University of Wisconsin Madison, United States*

**Wallace Hopp**, *University of Michigan,*

**Seyed Irvani**, *Northwestern University,*

Supply chain disruptions can result in both tactical (e.g., loss of short-term sales) and strategic (e.g., loss of long-term market share) consequences. In this talk, we present a model that captures the impact of supply disruptions on competing supply chains. We use our analytic and numerical results to highlight the situations that present the greatest risk and to identify policies for mitigating these risks.

### 015-0357: A Model of Strategic Sourcing under Limited Supply

**Abdullah Dasci**, *York University, Canada*

**Kemal Guler**, *Hewlett Packard Laboratories, United States*

An economic model for a strategic buyer that faces a duopolistic upstream market will be presented. The buyer needs to procure either from two suppliers who act strategically or from a third, non-strategic source. The suppliers are assumed to have limited capacities, which are the main source of strategic interactions among the firms. The problem is analyzed under simple design decisions and the impact of these decisions on firm profits and purchase prices are explored. Initial results under uncertainty and asymmetric information conditions will also be presented.

### 015-0360: Demand Uncertainty and Production Lead Time in a Durable Goods Market

**Xiaobo Zheng**, *University of Rochester, United States*

**Vera Tilson**, *University of Rochester, United States*

Lead time and the resulting demand uncertainty affect production and pricing decisions of durable goods manufacturers. Manufacturers must make production decisions based on economic forecasts of demand. After the production is complete and economic conditions better understood, the manufacturer can adjust pricing to increase its profits. Durable goods manufacturers face additional complication – the cannibalization of sales via the second-hand market. Using a model of a 2-period game between a durable goods manufacturer and heterogeneous consumers, we investigate how the second-hand market and the separation of production and pricing decisions affect the manufacturer's profit and consumer welfare.

### 015-0363: Inventory Information Disclosure in the Presence of Strategic Consumers

**Michael Pangburn**, *University of Oregon, United States*

**Tolga Aydinliyim**, *University of Oregon, United States*

In a two-period model we consider a firm's inventory information disclosure and pricing decisions in the presence of strategic consumers. Our study is motivated by e-tailers who occasionally announce remaining inventory information to their customers. We assume that the market consists of consumers who are heterogeneous in their willingness-to-pay that decreases over time. When making a decision to delay a purchase, each consumer has to assess the trade-off between purchasing at a discounted price and a stock-out at the retailer. We find that, under certain conditions, firms can use inventory information disclosure as an effective tool to increase full-price demand.

164	Sunday, 10:00-11:30, Galiano <b>Session:</b> Supply Chain/Inventory Management	<b>Track:</b> SCM, 25	<b>Chair:</b> Li Chen
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### 015-0490: RFID-Enabled Visibility and Inventory Inaccuracy: Experiments in the Field

**Bill Hardgrave**, *University of Arkansas, United States*

**John Aloysius**, *University of Arkansas, United States*

**Sandeep Goyal**, *University of Arkansas, United States*

RFID technology has the potential to enhance inventory control systems and reduce perpetual inventory (PI) record inaccuracy which is a major hindrance to effective supply chain management. Despite this potential, the literature has no rigorous empirical evidence of the efficacy of RFID, no characterization of product-specific and environmental factors which may promote the efficacy of RFID, and very little quantification of economic impact. In this study, we conduct two controlled field experiments involving a major retailer that: (1) tests the effectiveness of the technology in reducing PI inaccuracy, and (2) investigates the effectiveness of the technology across product categories. We quantify the improvement in PI due to RFID, provide insight into the characteristics of product categories which are the best candidates for tagging, and discuss the potential return on investment to a retailer from using RFID for inventory control.

### 015-0365: A State-space Investigation of Stability, Bullwhip Effect and Total Costs in Supply Chains

**Chong Zhang**, *Southeast University, United States*

**Amy Zeng**, *Worcester Polytechnic Institute, United States*

**Haiyan Wang**, *Southeast University, China*

The main focus of this work is to apply modern control theory, based on state space method, to study the stability/instability of a single-product supply chain, in which an APVIOBPCS order policy is employed. Because product returns are not permitted, the supply chain turns out to be an autonomously switched system according to the retailer's order policy. The stability of the subsystems is analyzed by analytic method and simulation. Then the relationship between stability/instability and bullwhip effect at different values of input parameters is discussed. Finally, the impacts of decision variables on the relationship between stability and total costs in supply chain are examined, and insights for demand forecasting, inventory control, and supply process to optimize the supply chain are identified.

## Sunday, 10:00-11:30 Sessions

### 015-0436: Bullwhip Effect Measurement and its Implications

*Li Chen, Duke University, United States*

*Hau Lee, Stanford University, United States*

The bullwhip effect, or demand information distortion, has been a subject of theoretical and empirical studies in the operations management literature. Empirical studies have shown large magnitudes of the bullwhip effect at the individual product level, but at the macro level, the bullwhip effect may not always exist. In this paper, we examine how time aggregation could affect our observation of the bullwhip effect. We also study similar impacts when data are aggregated across products, and how the existence of correlated demand, seasonality, order batching and finite capacity could affect the measurement of the bullwhip effect. The cost implications of the bullwhip measurement are also discussed as a result of our model-based analysis.

### 015-0533: The 3 C's of Outsourcing Innovation: Cost, Capability and Control

*Cheryl Druehl, George Mason University School of Management, United States*

*Gal Raz, Darden School of Business, United States*

Using a newsvendor setting, we examine a supply chain that sells a product to end consumers. The supply chain consists of a buyer and a supplier, where the supplier must determine whether to implement product improvement (in the form of increased value to consumers) and/or process improvement (in the form of cost reduction) and whether to outsource any (or both) of these activities. Using our model, we investigate the impact of control (who makes decisions), capability (who is better at the activity), and cost (who can perform the activity more economically) on the supply chain performance and the outsourcing decision. We consider 3 cases: no outsourcing, outsource manufacturing, and outsource both design and manufacturing. Using our model, we compare the different cases and examine several tradeoffs, among them the trade-offs between the manufacturing cost and process/ product innovation capability.

165	Sunday, 10:00-11:30, Grand Ballroom A	Track: SCM, 26	Chair: Philipp Hohrath
	Session: Supply Chain Risk Management 2		

### 015-0414: A Proactive and Reactive Supply Chain Risk Management Approach

*Monika Weishaeupl, WU Wien, Austria*

*Werner Jammerneegg, WU Wien, Austria*

Supply chain risk management is an important research area because supply chain disruptions occur frequently and affect their performance. We develop a conceptual framework to analyze and handle supply chain disruptions. It covers three business views: strategic, tactical and operational. The developed approach can be applied for a proactive as well as a reactive, event-driven risk management. Besides, we examine appropriate methods for every stage of our risk management approach by providing a kit of tools and techniques. We illustrate our approach by selected case studies motivated by real world examples.

### 015-0456: Supply Chains' Risk Exposure and Configuration

*Wolfgang Kersten, Hamburg University of Technology, Germany*

*Philipp Hohrath, Hamburg University of Technology, Germany*

Recently, awareness for the importance of supply chain risk management in literature and business practice has increased. Empirical studies in the last decade have shown that supply chains are neither affected equally by the same risks nor to the same degree. Literature suggests that among other influencing variables, different configurations of supply chains have a significant influence on supply chains' risk exposure. Inspired by the concept of organizations' configuration known from the strategic management research of Mintzberg and Miller, for example, and based on a comprehensive literature review, we develop a typology of supply chain configurations in this contribution. By means of this typology we recently have started to perform an empirical evaluation in order to verify the mutual influence of the constructs risk exposure and supply chain configuration. The presentation will include some first results of the data gathered so far.

### 015-0381: A Case Study of Supply Chain Performance Based on Dynamic Optimization

*Hong Li, Beijing Jiaotong University, China*

*Yaoqiu Wang, Beijing Jiaotong University, China*

*Changqing Li, Inner Mongolia University of Technology, China*

*Minghua Yu, Inner Mongolia University of Technology, China*

The method of supply chain balanced scorecard is often used for the performance evaluation of supply chains, while it has lots of deficiencies in dynamic optimization management. In this paper, a simulation model is established by the combination of Witness, a simulation tool often used for the simulation of discrete events, and the balanced scorecard. Taking the finance, internal processes, customers and future development of the Inner Mongolia Mengcheng New Energy Limited Co., a supply chain company in China, as performance indicators, and the total inventory costs, average efficiency, average waiting time for orders and terminal sales of the supply chain as objectives, an optimized resources combination scheme is achieved using the annealing algorithm. It shows that the combination of simulation technology with the balanced scorecard approach is feasible and effective for the supply chain performance optimization, which provides a reference for enhancing the performance management.

166	Sunday, 10:00-11:30, Grand Ballroom D	Track: HOM, 17	Chair: Sameer Kumar
	Session: Technology and prevention in healthcare		

### 015-0814: Going Through the Motions: An Empirical Test of Management Involvement in Process Improvement

*Anita Tucker, Harvard Business School, United States*

*Sara Singer, Harvard University, United States*

## Sunday, 10:00-11:30 Sessions

Research has found that improvement efforts fail with insufficient management involvement. Less is known about mechanisms to foster managers' involvement. We addressed this gap with a field experiment suggested by Toyota's problem-solving process. We tested three related process improvement activities: (1) interacting with workers to learn about problems, (2) ensuring that action is taken to address the problems, and (3) communicating about actions taken. Sixty-nine randomly selected hospitals, 20 of which were randomly selected to engage in the three activities for 18-months, participated in the experiment. Survey results showed that identifying problems had a negative impact on organizational climate, while taking action had a positive impact. Results suggest that solving problems as they arise (e.g. Toyota's approach) with intense and substantive actions is more productive than gathering information about large numbers of potential problems to solve (e.g. incident reporting systems).

### 015-0809: The Effect of Universal Healthcare on Hospital Operations: Evidence from Massachusetts

*Diwas Kc, Emory University, United States*

*Sriram Venkataraman, Emory University, United States*

Proponents of nationwide universal healthcare coverage policy posit that quality improvement, cost reduction, and increase in access can be achieved if everyone has access to healthcare insurance. However, relatively scant attention has been paid to the potential impact on the performance of hospitals if universal coverage were to be passed. We explore the effect of the passage of universal healthcare coverage in Massachusetts on the operational performance of hospitals in that state. Specifically, we examine the impact on patient admissions volume, both through the emergency department, and as elective admissions following the passage of the healthcare policy change in Massachusetts and estimate the resulting impact on capacity utilization (of beds, staff, and equipment) and its subsequent impact on the quality of care and service times at hospitals.

### 015-0967: Examining the Nature of the Relationship Between Focus and Performance in Healthcare

*Rachna Shah, Carlson School of Management, University of Minnesota, United States*

*Christopher McDermott, Rensselaer Polytechnic Institute, United States*

*Gregory Stock, University of Colorado at Colorado Springs, United States*

Focus in hospitals is heralded as the next frontier in improving its efficiency and efficacy, yet little empirical research exists. Focus takes several different forms, ranging from stand-alone specialty centers to a hospital that chooses to emphasize a particular specialty in some operational way. While stand-alone facilities are a real phenomenon, the majority of hospitals follow the latter route. We develop multiple measures of focus and operationalize hospital performance along length of stay, cost and mortality dimensions and examine the relationship between focus and performance, using cardiology as the specialty and a secondary dataset of all hospitals that provide cardiac care in New York State. Results from econometric specification of the model show that focus is negatively associated with performance. Specifically, increasing focus results in reduced length of stay, cost and mortality. These findings suggest that focus is important in healthcare and the relationship is independent of the performance measure used.

### 015-0427: Healthcare Quality: The Impact of Operational Excellence Initiatives on Perceptual and Secondary Measures of Patient Outcomes

*John Gardner, The Ohio State University, United States*

*John Gray, The Ohio State University, United States*

*Kenneth Boyer, The Ohio State University, United States*

Significant effort has been exerted during recent years to increase quality care and patient safety in hospitals. Existing research provides some evidence that many quality practices used historically in operations management can also yield real improvements in a healthcare setting. We develop a large, unique database which combines primary measures of quality practices, perceptions of measures of hospital quality, and secondary measures of hospital performance available from the Center for Medicare and Medicaid Services. We examine the effects of established quality practices on performance in a healthcare setting. Insights from the study include evidence regarding the applicability of operations management methods to healthcare, as well as insights regarding the relative emphasis that hospitals, administrators and care providers should place on specific initiatives.

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Sunday, 10:00-11:30, Junior Ballroom A

Track: PITM, 10

Chair: Stylianos Kavadias

Session: Organizational Challenges in New Product Development

### 015-0380: Consequences of Present-Bias: Effort Distortion in an Experiment

*Karthik Ramachandran, Southern Methodist University, United States*

*Vish Krishnan, University of California San Diego, United States*

*Yaozhong Wu, National University of Singapore, Singapore*

Present-biased behavior leads to distortion of effort, with greater effort expended closer to a deadline. We report findings from an experiment on the effects of present-bias on the timing of individual effort in a class project. The experiment offers insights regarding the efficacy of deadlines in managing effort distortion and its consequences.

### 015-0912: Can We Predict the Generation of Bugs? Software Architecture and Quality in Open Source Development

*Manuel Sosa, INSEAD, France*

*Jürgen Mihm, INSEAD, France*

*Tyson Browning, Texas Christian University, United States*

We examine a large longitudinal sample of software architectures and bugs associated with several open source applications developed by Apache. We study the link between software architectural properties and quality. Our results suggest that system cyclicity, a novel architectural property of software applications, is an important determinant of the number of bugs in the system.

## Sunday, 10:00-11:30 Sessions

### 015-0260: Innovation in Top-Down and Bottom-Up Strategy Processes

*Christoph Loch, INSEAD, France*

*Fabian Sting, INSEAD, France*

We study strategy processes at six German manufacturing organizations in mature businesses. We use an organizational search perspective to interpret simultaneous top-down and bottom-up strategy making. While the final decision on important strategic initiatives remains at the top, strategic initiatives are distributed across many actors, at varying hierarchical levels, depending on where expertise is concentrated: product-market positioning and large technological investment initiatives typically come from the top, method initiatives from the middle, and process improvements from the front line. Top management guides and prioritizes but does not make content decisions. Thus, the top-down versus bottom-up balance varies within the same organization according to the problem-solving area. The organizations also use multiple coordination mechanisms to align their actors. Both coordination and top-down decision making represent control. Control must be weighed against the creativity that stems from delegated search.

### 015-0801: The Choice of Incentives for Cross-Functional New Product Development

*Jeremy Hutchison-Krupat, Georgia Institute of Technology, United States*

*Stylianos Kavadias, Georgia Institute of Technology, United States*

New product development (NPD) settings present distinct challenges for the design of performance plans: tasks are collaborative, outcomes are highly uncertain, and NPD employees are granted significant freedom (in the form of decision rights) regarding their collaborative initiatives. Given this context, we evaluate the choice between a performance plan that compensates managers proportional to their functional contribution (functional organizations), and one that compensates them relative to firm profits (project-based organizations). We find that not only are project incentives more appropriate for higher uncertainty initiatives, but they are also preferred when NPD managers are faced with high value alternatives (valuable outside options). This latter finding offers a rationale why different firms (or divisions) offer different types of performance plans, even for initiatives that have the same level of risk.

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Sunday, 10:00-11:30, Junior Ballroom B

Track: OMM, 13

Chair: Liwen Chen

Session: OMM13

### 015-0550: Providing Access to Durable Products to Heterogeneous Consumers - Implications for Operational and Revenue Efficiency

*Haoying Sun, The University of Texas at Austin, United States*

*Stephen Gilbert, The University of Texas at Austin, United States*

*Ramandeep Randhawa, University of Southern California, United States*

We consider a situation in which a durable goods retailer serves consumers who are differentiated according to their usage rate. In this context, we examine the trade-offs between selling the durable and renting it, one use at a time. Selling minimizes transaction costs, but it can also introduce the classic time inconsistency issue. In addition, by giving individual consumers exclusive access to a durable, selling can cause inefficient utilization. On the other hand, by renting durables on a per-use basis, the retailer can ensure that each durable product generates utility at a higher rate. Focusing on these trade-offs, we identify conditions under which the retailer should only sell, only rent, or offer a combination of sales and rentals.

### 015-0243: Name-Your-Own-Price as a Competitive Distribution Channel in the Presence of Posted Prices

*Xiao Huang, McGill University, Canada*

*Greys Sosic, University of Southern California, United States*

We study how competitive suppliers with substitutable, non-replenishable goods may sell their products (1) as regular goods through direct channels at posted prices, and/or (2) as opaque goods through a third-party channel, which allows for the name-your-own-price (NYOP) approach (e.g., Priceline.com). We model the third-party channel as an intermediary firm that collects the difference between the customers' bids and reservation prices set by the suppliers. We study the buying strategy for the customers and the dual-channel pricing strategies for the suppliers. The results suggest that the suppliers may not benefit from the existence of the NYOP channel. In particular, a monopolist would opt out of the NYOP channel and sell at posted prices only, which implies that NYOP is not appropriate for customer discrimination in the regular goods market. Numerical experiments show that suppliers are able to generate higher expected profits in the absence of the NYOP channel.

### 015-0108: High-end Encroachment Patterns of New Products

*Bo van der Rhee, Nyenrode Business University, Netherlands*

*Glen Schmidt, University of Utah, United States*

*Joseph Van Orden, West Point Military Academy, United States*

There are two key ways in which a new product can encroach on an existing market: high-end encroachment, where the new product first sells to the high end of a market and then diffuses down-market, and low-end encroachment (which diffuses up-market). This paper extends the framework for high end encroachment, making three key contributions: 1) we describe three distinct high-end encroachment sub-types; 2) we gain insight into market outcomes under each high-end sub-type through an analytical model; and 3) we offer a detailed numerical example to illustrate how the model might be used to explain actual market outcomes. Our example concerns the sub-type we call new-market high-end encroachment, in which a new product initially sells at a "monopoly" price without affecting the sales of the original product. We offer possible insights into why Apple precipitously dropped the iPhone's price by 1/3 only 68 days after its introduction.

### 015-0219: Private Label Introduction: Does it Benefit the Supply Chain?

*Marc Sachon, IESE Business School, Univ. of Navarra, Spain*

*Victor Martinez de Albeniz, IESE Business School, Univ. of Navarra, Spain*

Private labels, also called store brands or distributor brands, have changed the retail industry during the last three decades. This paper analyzes the

## Sunday, 10:00-11:30 Sessions

prices, as well as on the profits of each firm of the supply chain. While private label introduction helps the retailer reduce manufacturer brand's prices, we find that it does not always improve the total profits of the supply chain. Generally, the supply chain benefits from this introduction only when cross-elasticities are small, i.e., competitive interactions are weak. With our model, we formulate the general conditions under which retailers should consider introducing private labels.

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Sunday, 10:00-11:30, Junior Ballroom C

Track: DSTR, 6

Chair: Charles Munson

Session: Pre-disaster Tactical Planning

### 015-0341: Pre-positioning Humanitarian Relief Supplies

*Ron McLachlin, University of Manitoba, Canada*

*Paul Larson, University of Manitoba, Canada*

This paper addresses the pre-positioning of relief supplies by humanitarian agencies in anticipation of natural disasters. We discuss the use of pre-positioning via postponement strategies - or delayed differentiation - in the context of such relief operations. The paper emphasizes issues of the operating environment following a disaster, which makes implementation difficult, compared to the situation faced by profit-making firms, which normally operate supply chains in relatively stable environments. Examples are provided. This research is part of an overall project that addresses issues of preparedness by humanitarian supply chains for responding to disasters. The research methodology follows a grounded, case-based approach to the systematic analysis of mainly qualitative data, aimed at theory development.

### 015-0487: Staffing Nurses for a Crisis

*Xiaotian Geng, Washington State University, United States*

*Charles Munson, Washington State University, United States*

A local emergency has just erupted, e.g., pandemic, building collapse, earthquake, or terrorism, and the hospital administrator is swamped with tasks. How many extra nurses should be brought in from different sources (in- and out-of-town) to handle the emergency? Knowing that the administrator has little time to write and solve a scheduling optimization model in the midst of a crisis, we seek a simplified mechanism for making these determinations swiftly. Specifically, we apply global sensitivity analysis to a mixed-integer programming workforce scheduling model in order to develop a structural equations representation of the problem that would be available to the administrator ahead of time. During the crisis, the administrator only needs to input some predictions about the amount and type of demand into the equations to obtain nurse resource estimates. With these estimates in hand, the administrator can pick up the phone and begin rounding up an emergency staff immediately.

### 015-0944: Preparedness for Shelter Operations Management Using Discrete Event Simulation

*Pavel Albores, Aston University, United Kingdom*

*Ya-Ling Liu, Aston University, United Kingdom*

*Duncan Shaw, Aston University, United Kingdom*

*Magesh Nagarajan, Aston University, United Kingdom*

In the aftermath of a disaster, one of the most pressing matters is providing shelter and life-saving provisions for people affected by the event. Effectively managing the shelter operation may protect survivors by establishing essential lifelines, as well as minimize the suffering and discomfort of evacuees. Equally important is to most effectively deploy the limited resources available. This paper presents a DES model to analyse different planning scenarios in a network of shelters across a city that has been devastated by a major catastrophic incident. The model includes factors such as shelter allocation for those affected, transportation to shelter, replenishment of resources (e.g. food, water, blankets) from central depots, and length of stay in the shelter. A case study is presented and different policies analysed. This model is part of a suite of models built to prepare for mass evacuations.

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Sunday, 10:00-11:30, Junior Ballroom D

Track: SOHL, 13

Chair: Nitin Joglekar

Session: Emerging Business Models and Operating Performance

### 015-0004: Delayed Differentiation for Multiple Lifecycle Products

*James Abbey, Pennsylvania State University, United States*

*Daniel Guide, Pennsylvania State University, United States*

*Gilvan Souza, Indiana University, United States*

Firms producing multiple lifecycle products (MLP) require effective analytical methods to examine the decision to utilize delayed differentiation. As the number of product variants increases over time through upgrades of a base model via new state-of-the-art modules, firms face a multiple lifecycle product proliferation issue. Thus, the multiple lifecycle strategy requires an evolutionary approach to delayed differentiation whereby the firm evolves their offerings from a single product configuration to n product configurations. This research employs a MIP model to analyze an evolutionary delayed differentiation approach with a distinct push-pull boundary. Both field observations and the experimental results show that the nature of product proliferation and changing demand structures play significant roles in the cost and flexibility of the evolving push-pull boundary. This research stems from an OEM remanufacturing round table and from design innovations by managers and engineers from Xerox's high speed imaging equipment business.

### 015-0509: New Business Models to Enable Clean and Renewable Generation in the Electric Power Industry: A Preliminary Investigation

*Edward Anderson, University of Texas, United States*

*Geoffrey Parker, Tulane University, United States*

The electrical generation and service industry faces significant, transformative change over the coming decades. The introduction of the smart grid,

## Sunday, 10:00-11:30 Sessions

forward. Many researchers are examining aspects of the problem, focusing on power companies' infrastructure portfolios, technological development of smart grids and renewable energy, demand shifting and consumer behavior, pricing structures, and government policy and incentives. Despite these efforts, an open question remains: how will the industry remain profitable as it evolves toward a platform that facilitates the interaction of multiple third-party power providers (e.g. distributed renewable power providers) with multiple end-use consumers? To begin investigating this question, we build a top-down systems model of a typical power company and its "ecosystem," using the system dynamics methodology, and analyze potential firm strategies under different scenarios.

### 015-0716: Environmental Management Practices and Financial Performance: Does Industry Matter?

*Marilyn Lucas, University of Vermont / School of Business Administration, United States*

*Thomas Noordewier, University of Vermont / School of Business Administration, United States*

This paper empirically investigates the relationship between firms' environmental management practices and their financial performance, in an effort to disentangle firm- and industry-level influences. Based upon an analysis of 985 publicly-traded manufacturers, evidence is presented that the effect of a firm's environmental management practices on ROA is moderated by pollution-related characteristics of the industry within which the firm resides (i.e., toxicity of releases and prevention efforts within the industry). To investigate the influence of variables operating at multiple (nested) levels, we employ hierarchical (multilevel) modeling rather than OLS regression. Hierarchical models are designed to handle nested data with correlated errors. The results shed new light on the impact of firm-level green initiatives on financial performance, taking into account industry context.

### 015-0193: A Stochastic Frontier Analysis of the Operating Frontiers in the U.S. Hospitality Industry: Linking Energy Efficiencies to Operating Perform

*Jie Zhang, Boston University, United States*

*Nitin Joglekar, Boston University, United States*

*Rohit Verma, Cornell University, United States*

Early studies have presented opposing views on the performance impact of improving environmental performance. Walley and Whitehead (1994) argued that the cost of improving environmental performance reduces profitability and shareholder value. Porter and van der Linde (1995) argued that improving environmental performance reduces waste and increases productivity, thus improving corporate performance. We empirically study environmental performance by focusing on the energy efficiency aspect. Specifically, we study the link between energy efficiencies and property-level performance using a panel dataset featuring 990 hotel properties from 2001 to 2008, representing a comprehensive coverage of hotels operated by major US chains. We examine the positions and temporal movements of the operating frontiers (Schmenner and Swink 1998) as defined by utility consumption and the value-added per room. We found a significant positive performance impact of energy efficiencies and systematic variations in energy efficiencies across chain segments.

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Sunday, 10:00-11:30, Orca

Track: CIM, 11

Chair: Jing Zhu

Session: Strategic Capacity Management

### 015-0150: Analysis of Performance Evaluation Model through the Balanced Scorecard in a Footwear Industry

*Leonardo Perazza, Universidade do Sagrado Coração, Brazil*

*Paulo Rodrigues, Universidade do Sagrado Coração, Brazil*

In recent decades, significant changes have been noted in the business world, due to the increasing demand of customers, political and economic moments that create a dynamic nonmarket increasingly unstable, contributing to increasing challenges in understanding the demands. The objective was to evaluate the model operations management method BSC, in order to reduce costs and increase productivity and competitiveness. A study was conducted through a semi-open process, with 180 employees at a midsize company in the footwear industry Jaú, collecting information and data from the managers of each area. We conclude that the requirements for improved performance within organizations have made approaches for the management of operations evolve, becoming a broad and network management in the business, contributing to improvements in the condition of growth and sustainability of organizational activity. It is noteworthy, then, the need to use all available resources, minimizing problems and maximizing opportunities.

### 015-0711: The Global Supply Chain Pricing Dynamics

*Claude Machline, EAESP-FGV Escola de Administração de São Paulo da Fundação Getúlio Vargas, Brazil*

Studying the price increases, followed by substantial price decreases, which occurred during the years 2002-2009 in the iron ore-steel-construction supply chain, one can see that the price oscillations follow a pattern similar to the physical ups and downs called the "Bullwhip Forrester Effect." The paper suggests that there is a price system dynamic, parallel to the physical system dynamics. Its causes and consequences for economic crises are focused on in the paper.

### 015-0930: Horizontal Mergers and Supply Chain Performance

*Jing Zhu, McGill University, Canada*

*Tamer Boyaci, McGill University, Canada*

*Saibal Ray, McGill University, Canada*

We address two issues in this paper. First, how does a horizontal merger affect the operating performance of the merging and non-merging firms? Second, what are the differences (in terms of the effect) between an upstream and a downstream merger? Using financial accounting panel data from COMPUSTAT database, we investigate horizontal mergers in manufacturing, wholesale and retail sectors between 1997 and 2006. We find that there is no evidence that mergers significantly improve merging firms' performance, relative to those of non-merging ones for both upstream and downstream industries. We also find that downstream mergers are positively associated with an increase in inventory periods, while upstream mergers are not.

## Sunday, 10:00-11:30 Sessions

### 015-0604: Better Selection or Tougher Management? A Model of Outsourcing Supplier Selection and Management

*Zhijian Cui, INSEAD, France*

*Sameer Hasija, INSEAD, Singapore*

We focus on two important aspects of knowledge process outsourcing: partner selection and relationship management under information asymmetry and uncertainties. In particular, we study a business environment where payoffs depend on the service provider's effort and capabilities. In our model, the service provider exerts a non-observable effort and has private information about her capabilities. The service outsourcer seeks to select provider with "match" capabilities and to manage her optimally. Our key finding is to show the tradeoff between provider's truth telling (better selection) and contracting efficiency (better management) under various payment schemes. We also explore the benefits of issuing an incomplete RFP (request for proposal) compared to the standard complete RFP by the service outsourcer in terms of the provider selection.

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Sunday, 10:00-11:30, Parksville

Track: EROM, 11

Chair: Boyer Ken

Session: Experiments in OM

### 015-0503: A Video-Experimental Analysis of Manager and Customer Perceptions of Service Scripting

*Liana Victorino, University of Victoria, Canada*

*Rohit Verma, Cornell University, United States*

This exploratory study compares managers' perceptions of the use of service scripts within face-to-face service encounters to customers' perceptions. To assess the potential similarities or differences that exist for perceptions of service performance, a video experiment was developed that varies the level of script used by the frontline employee under two service process types (i.e. standardized and customized). In previous work, these video scenarios were shown to a national sample to empirically examine customers' perceptions of scripting. This research extends this work by incorporating the manager's view. This comparative analysis will provide a more comprehensive view to scripting the service encounter. Insights for service design will be provided.

### 015-0813: Bargaining and Channel Coordination

*Elena Katok, Penn State University, United States*

When coordinating contracts, such as tow-part-tariff or quantity discounts, are tested in the laboratory, they perform significantly worse than the standard theory predicts. Specifically, a large proportion of offers are rejected, and earlier studies report that these rejections can be explained, in large part, by social preferences, and specifically by incomplete information about social preferences. We report on laboratory experiments that examine the effect of the bargaining process on contract performance.

### 015-0696: The Influence of Psychological Contract Violation on Supply Chain Decision-making Behaviors

*Stephanie Eckerd, The Ohio State University, United States*

*James Hill, The Ohio State University, United States*

*Kenneth Boyer, The Ohio State University, United States*

Conflict is an inevitable phenomenon in buyer-supplier relationships. In the face of varying types of conflict, individuals may respond differently depending on the level of psychological contract violation experienced. We employ a behavioral experiment to determine how those in boundary-spanning roles respond to conflict in the supply chain, specifically evaluating their economic decisions before and after an occurrence of conflict. We propose that conflict perceived as purposeful renegeing will result in more severe and longer-lasting retaliatory decision-making behavior than when the conflict is attributable to no-fault causes. Furthermore, we predict these changes in behavior can be explained by feelings of psychological contract violation experienced by the decision-maker. Our research contributes to a growing body of literature investigating ways in which economic decisions made by individuals are not necessarily grounded in economic analysis.

### 015-0805: Coordination Mechanisms with Perioperative Services

*Lawrence Fredendall, Clemson University, United States*

*Kevin Taaffe, Clemson University, United States*

*Nathan Huynh, University of South Carolina, United States*

*Sriram Venkataraman, Clemson University, United States*

*Bryan Pearce, Clemson University, United States*

*Narges Hosseini, Clemson University, United States*

*Megan Hyman, University of South Carolina, United States*

This paper examines the perioperative processes of a hospital in order to identify the coordination mechanisms that are the most effective in providing their services. The issues examined are relevant to the societal debate about healthcare. Some argue that costs can be reduced by requiring "one best way" for delivery, while others argue that too-strict standards will destroy healthcare. The paper builds on prior work (Gittell, 2002) that found that both routines and relational coordination are effective when there are uncertainties due to patient health status. Surgical procedures require the coordinated use of a large number of inputs. Hospitals seek to standardize these inputs, but there are many contingencies that may require breaks in the routine. We build on the work of Sitkin, Sutcliffe and Schroeder (1994) who argued that higher levels of uncertainty create distinct organizational requirements, to investigate the effectiveness of both routines and relational mechanisms.

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Sunday, 10:00-11:30, Pavilion Ballroom A

Track: PLQ, 10

Chair: Suzanne DeTreville

Session: Business Process Improvement

### 015-0319: Valuing Volatility in the Lead-Time Reduction Decision

## Sunday, 10:00-11:30 Sessions

**Suzanne de Treville**, *University of Lausanne, Faculty of Business and Economics, Switzerland*

**Lenos Trigeorgis**, *University of Cyprus, Cyprus*

**Norman Schuerhoff**, *University of Lausanne, Faculty of Business and Economics, Switzerland*

**Benjamin Avanzi**, *University of New South Wales, Australia*

Consider a company facing the decision of whether to invest in reducing leadtimes, whether in manufacturing or in the supply chain. Assume that lead times can be reduced through either investment or an increase in manufacturing cost. Volatility in future demand makes lead time reduction more attractive, assuming that the lead time reduction permits postponing the decision about what to produce until less volatile demand information is available. In this paper, we present an approach to explicitly evaluating the volatility of demand information in the decision to invest in lead time reduction.

### 015-0512: Application of Systemic-complex Rules to Production Management

**Rolf Erdmann**, *Federal University of Santa Catarina, Brazil*

**Aline Silveira**, *Federal University of Santa Catarina, Brazil*

Organizations can be interpreted as a set of interrelated parts. From systems theory we know that, as "irritations" or demands occur, which, leads to "clutter", a process of communication between the parts is provoked. This movement will be more intense the bigger the external impulse is and also the bigger the system self organization's capacity. The self organization is a result of the number and the dynamics of the interrelations between the system's parts. According to this logic it is proposed a solutions prospection's instrument in organizations based on the stimulation of the connections between the systemic components. These connections are guided by factors that confer performance: quality, flexibility, quality, cost and rapidity. These systemic components must be interrelated using as links the five objectives of performance. Each one of these performance objectives will be the meeting point to the efforts of improvement.

### 015-0565: An Integrated Model for Maintenance Planning, Process Quality Control and Production Scheduling

**Divya Pandey**, *Indian Institute of Technology Delhi, India, India*

**Makarand Kulkarni**, *Indian Institute of Technology Delhi (IIT Delhi), India*

**Prem Vrat**, *Management Development Institute (MDI), India*

Performance of manufacturing system strongly depends on performance at the shopfloor level. Traditionally, shopfloor level operational policies in the context of maintenance, quality and production-scheduling have been considered and optimized independently. However, these three aspects of operations planning may also have an interaction effect on each other, and hence they need to be considered jointly for improving the manufacturing system performance in a more effective manner. In this paper, an integrated model of maintenance and process quality is first developed. Specifically, its aim is to obtain optimal preventive maintenance interval and control chart parameters that minimize cost per unit time. Subsequently, the optimal preventive maintenance interval obtained is superimposed onto the production-schedule to determine an optimal job-sequence that will minimize penalty-cost incurred due to schedule delay. Finally, an illustrative example is presented to compare the performance of proposed integrated model and the methodology with the performance obtained by using independent models.

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Sunday, 10:00-11:30, Pavilion Ballroom B

Track: GENL, 10

Chair: Qu Quan

Session: Service Systems and Uncertainty Management

### 015-0998: An Empirical Analysis of Waiting Times Using Canadian Joint Replacement Data

**Qu Qian**, *The University of British Columbia, Canada*

**Hong Chen**, *The University of British Columbia, Canada*

**Anming Zhang**, *The University of British Columbia, Canada*

Long medical waiting time is a major policy and managerial concern of Canada's public healthcare system. However, empirical studies of medical waiting times using Canada's evidence are very limited. We contribute to the existing literature by providing an empirical analysis of joint replacement surgery waiting times of nine Canadian provinces. The empirical model is derived from demand and supply equilibrium as well as the basic theory of queuing system. Surgical waiting times are explained by a list of variables that are well documented in the literature. The findings suggest that health policies inducing privately funded health service reduce average waiting time. In addition, patient's distance to hospital positively impacts waiting time and no significant age and sex effects are detected in our model. Our analysis suggests lagging effect of arrival rates on waiting times, which is consistent with the basic theory of queuing systems.

### 015-0475: Forecasting the Effectiveness of a Forecasting System

**Gerald Burch**, *Virginia Commonwealth University, United States*

**Arthur Hill**, *University of Minnesota, United States*

**Weiyong Zhang**, *Virginia Commonwealth University, United States*

In this paper we develop a model for evaluating the economic benefits of a time series forecasting system. The acquisition and implementation of modern forecasting software packages usually costs firms millions of dollars, yet the economic benefits of these sophisticated systems have not been carefully studied. Based on the literature, we argue that the demand pattern of items largely determines the potential economic benefits of a forecasting system, and subsequently develop a model linking the two. We then collected time series data from five organizations and empirically examined the model using regression. Results provided strong support to our proposed model. The model contributes to the forecasting literature and provides useful guidance for practicing managers.

### 015-0125: Strategic Positioning Taxonomy: a Service Integration Proposal

**Dimaria Silva e Meirelles**, *Universidade Presbiteriana Mackenzie, Brazil*

**Claudia Klement**, *Universidade Presbiteriana Mackenzie, Brazil*

The goal of this article is to join the theoretical contributions of operations management and economical theory for the analysis of the services

## Sunday, 10:00-11:30 Sessions

taxonomies are centered in the process perspective and the goal is to develop their contributions for the service strategic analysis. On one hand, it shows the operations vision in relationship to the client contact (COLLIER; MEYER, 1998), the process standardization and the production capacity (SILVESTRO, 1999). On the other hand, it shows the economic vision and it takes into consideration the relationship with the client (GADREY; GALLOUJ; WEINSTEIN, 1995), the grade of standardization and professional capacity (GALLOUJ, 2002), capital intensity and scale of operation (SILVA e MEIRELLES, 2009). As a result, it proposes an integration matrix based on three variables: capital intensity, scale and client's contact.

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Sunday, 10:00-11:30, Pavilion Ballroom C

Track: LM, 10

Chair: GONZALO MEJIA

Session: International Logistical Issues

### 015-0542: Joint Replenishment Lot-sizing Heuristics in Static and Rolling Horizon Planning Systems

*Arunchalam Narayanan, Texas A&M University, United States*

*Powell Robinson, Texas A&M University, United States*

Joint replenishment problems are commonly encountered in purchasing, manufacturing and transportation planning. The literature evaluates various algorithmic approaches for solving the joint replenishment problem in a static environment, but their relative performance in a dynamic rolling horizon system is unknown. This research investigates nine joint replenishment lot-sizing heuristics and policy design variables when implemented in a dynamic rolling schedule environment. The research findings, based on schedule cost and stability, provide managerial insight for selecting the appropriate lot-sizing procedures and policy design variables.

### 015-0171: Designing Dedicated Transportation Subnetworks: Deadheading vs. Lane-Sharing

*Tharanga Rajapakse, University of Texas at Dallas, United States*

*Milind Dawande, University of Texas at Dallas, United States*

*Srinagesh Gavirneni, Cornell University, United States*

*Chelliah Sriskandharajah, University of Texas at Dallas, United States*

A Dedicated Subnetwork (DSN) refers to a subset of lanes with associated loads in a shipper's transportation network, for which a fleet of resources – trucks, drivers, and other equipment – is exclusively assigned to carry out all shipping requirements. The resources assigned to a DSN are not shared for shipping in the rest of the shipper's network. Thus, a DSN is an autonomously operated subnetwork, which could be subcontracted to a third party. In this study, we address the problem of identifying a "good" DSN from the shipper's network with the objective of maximizing the savings realized by subcontracting. In their pure form, the defining conditions of a DSN are often too restrictive to enable the extraction of a sizeable subnetwork. We consider two notions – deadheading and lanesharing – that aid in improving the size of the DSN.

### 015-0546: A Hierarchical Framework for Network Design: An Action Research Study

*Funda Sahin, University of Tennessee, United States*

*Powell Robinson, Texas A&M University, United States*

The literature proposes a variety of models for network design. In order to maintain problem tractability, these models often take a macro perspective while ignoring operational details necessary for implementation. Using action research methods, we collaborate with a manufacturer/distributor of building products to develop a hierarchical framework for network design. The framework consists of four integrated models. At each successive planning level, the geographic scope of the analysis is further restricted, while the granularity of the problem's detail is magnified. This approach maintains problem tractability and reduces data collection at each planning level, while simultaneously enabling a broader range of economic trade-offs to be addressed. Behavioral factors driving the need for a hierarchical approach are discussed.

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Sunday, 10:00-11:30, Pavilion Ballroom D

Track: HBOM, 7

Chair: Enno Siemsen

Session: Behavioral Ops 2

### 015-0199: Individual Differences in Forecasting Behavior

*Brent Moritz, University of Minnesota, United States*

*Mirko Kremer, Penn State University, United States*

*Enno Siemsen, University of Minnesota, United States*

This research uses behavioral experiments to analyze how individuals make forecasts based on time series data. Based on a behavioral model of forecasting using feedback-response learning, we compare performance of individuals. We find that individuals with a stronger ability to cognitively reflect on their judgment are more consistent in their forecasts, and thereby have a better forecasting performance. We also compare the amount of time that it takes for individuals to reach a decision. Contrary to expectation, the time that it takes to reach a decision is inversely related to performance.

### 015-0431: Demand Forecasting Behavior: System Neglect and Change Detection

*Enno Siemsen, University of Minnesota, United States*

*Mirko Kremer, Penn State University, United States*

*Brent Moritz, University of Minnesota, United States*

This research analyzes how individuals make forecasts based on time series data, and what managers can do to improve forecasting performance. Using data from a controlled laboratory experiment, in our first study we find that forecasting behavior can be described well by a feedback-response learning model, and that the feedback-response pattern systematically deviates from normative predictions. Forecasters over-react to errors in

## Sunday, 10:00-11:30 Sessions

significantly improve forecasting performance.

### 015-0448: Operational or Behavioral Preparedness for a Supply Chain Disruption: Is There a Difference?

*Zach Zacharia, Lehigh University, United States*

*John MacDonald, Michigan State University, United States*

Supply chain disruptions have been increasing in frequency and severity as supply chains become longer, have tighter schedules and contain minimal inventory. Companies that prepare for supply chain disruptions do so in two basic ways: (1) operational preparedness, where the focus is on developing specific plans for known disruptions should they occur, and (2) behavioral preparedness, where the focus is on practicing response and recovery actions for different scenarios without identifying a set of specific responses to follow. Our research seeks to ascertain whether there is a difference between the two types of preparedness and the subsequent recovery performance from disruptions. This will be done under conditions of high and low severity disruptions as well as high and low scope disruptions.

### 015-0485: Risk, Fairness, and Rejection in the Two Party Supply Chain: Experimental Results

*Julie Niederhoff, Syracuse University, United States*

Prior supply chain work has shown analytically and experimentally that subjects acting as suppliers and retailers facing a pre-programmed counterpart will not set system optimal contracts or order quantities, and that deviations correspond to individual factors such as risk-aversion and concerns for fairness. Likewise, situational factors like a retailer's strength (framed as his ability to reject a proposed contract or take an outside option) drive supplier behavior. In this study, we explore a two-party experiment in which both the supplier and retailer are known to be human decision makers, to study the interaction of these effects.

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Sunday, 10:00-11:30, Port Alberni

Track: SOM, 6

Chair: Doug Down

Session: Service and Production Systems with Flexibility

### 015-0293: What is Servitization Anyway?

*Emmanouil Alvizos, Warwick Business School, United Kingdom*

*Jannis Angelis, Warwick Business School, United Kingdom*

Servitization is often viewed as the way in which firms provide an integrated bundle of both goods and services or add extra service components to their core offering. A differing notion, however, suggests that servitization is any strategy that changes the way product functionality is delivered. A broader definition is that servitization is the innovation of an organizations capabilities and processes to better create mutual value through a shift from selling products to selling product service systems. We argue that the aforementioned differing notions of servitization represent different concepts that warrant a nuanced rather than aggregate approach to their study. A conceptual approach of servitization is realized through an extensive literature review. Focus is on theoretical as well as empirical evidence and a reconciliatory reframing effort is undertaken.

### 015-0446: A Literature Review on the Servatization Process

*Veridiana Pereira, UNIVERSITY OF SÃO PAULO - PRODUCTION ENGINEERING DEPARTMENT, Brazil*

*Marly Carvalho, UNIVERSITY OF SÃO PAULO - PRODUCTION ENGINEERING DEPARTMENT, Brazil*

*Roberto Rotondaro, UNIVERSITY OF SÃO PAULO - PRODUCTION ENGINEERING DEPARTMENT, Brazil*

The boundaries between manufacturing and service in product industries are falling down around the world (Vandermerwe and Rada, 1988; Neely, 2007). On the other hand, recently service companies are in a process of industrializing their activities, creating the so-called productization of services. In this context the concept of servitization of products arises. The objective of this study is to characterize the process of servitization and identify customers' interaction in this process. To achieve this goal, two review procedures were adopted: a literature review of servitization and a bibliometric study of customer roles in the service field. The bibliometric review is based on citation and co-citation analysis, which are applied to all articles published on the subject and available in the ISI Web of Science database.

### 015-0262: Exploring the Service Paradox: A Longitudinal Analysis

*Ivanka Visnjic, University of Cambridge, United Kingdom*

*Andy Neely, University of Cambridge, United Kingdom*

By 2008, over half of all US manufacturing firms had added services to their existing product offerings (Neely, 2009). Despite large uptake, the results of two large empirical studies that exist to date, Fang et al., 2008 and Neely, 2009, suggest that servitization has different impact on market-based and accounting-based performance measures and can even lead to diminishing returns, a so-called service paradox. In this study, we explore the service paradox. Taking a longitudinal dataset, we seek to connect the declarations of the company's intention to servitize with its subsequent investments in services and with its performance against a variety of performance measures.

### 015-0249: Challenges in Transforming Manufacturers into Integrated Product-Service Providers

*Veronica Martinez, Cranfield School of Management, United Kingdom*

*Björn Claes, Cranfield School of Management, United Kingdom*

The last two decades have seen an increasing interest in servitization strategies. Important advances have been reported in the understanding of this phenomenon. Whilst research has extensively highlighted the design and benefits of integrated goods-service strategies, much less attention has been dedicated to the challenges that companies experience when transforming their "product only" strategies to integrate services. Experience shows that servitization constitutes a major managerial challenge because it alters the core business model of an organization. Adaptation problems can seriously delay the implementation of changes. Recognizing this research gap, this paper addresses the lack of understanding of the servitization-related change processes. Using multiple case studies we empirically identify obstacles in the transformation process towards

## Sunday, 10:00-11:30 Sessions

servitization. We theoretically validate these by mapping them onto the antecedents and tenets proposed by the organizational ecology theories. We conclude by discussing the significance of our findings and highlighting the opportunities for further research.

### 015-0852: Steering Servitization: A Role of Integrated Performance Management Systems

*Ivanka Visnjic, K.U. Leuven, Belgium*

*Bart Van Looy, K. U. Leuven, Belgium*

Despite the growing presence of services in the strategies of manufacturing firm, performance measurement systems are often not designed to reflect the specific nature of service activities. Based on an in-depth case study of a servitized manufacturer, we propose an integrated system for measuring servitization performance, in line with the balanced scorecards concepts. To accurately assess the financial effects of servitization, traditional financial measures are tailored for services and complemented with measures of spillovers of service activities on product performance. Customer performance measures are broadened to capture the effects of services. Business performance is captured by two complementary measures: "service coverage ratio," the share of installed base covered by any type of service, and "service potential share," a ratio of actual achieved service offerings versus the potential, the most elaborate service offering. Finally, the innovation perspective is designed as a composite index of investments in service capabilities and systems.

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Sunday, 10:00-11:30, Port Hardy

Track: GOSSM, 5

Chair: Kempainen Katarina

Session: GOSSM 5

### 015-0639: An Approach to Supply Chain Design Based on Robust Capacity Allocation of Production Locations

*Bernd Scholz-Reiter, BIBA – University of Bremen, Germany*

*Fabian Wirth, Institute of Mathematics, University of Würzburg, Germany*

*Thomas Makuschewitz, BIBA – University of Bremen, Germany*

*Michael Schönlein, Institute of Mathematics, University of Würzburg, Germany*

Global supply chains are complex dynamical systems. Due to nonlinear dependencies between production locations, already a perturbation at one location can change the dynamic behavior of the whole supply chain. As a consequence, the supply of customers may be at risk in time. In this paper, we present an approach to supply chain design that maximizes the robustness of a supply chain with regard to perturbations of the production processes. To this end, we consider the fluid approximation of a dynamic supply chain and assume processor sharing as the production strategy applied at the various locations. The robustness of the supply chain can be measured by the stability radius that reflects the smallest perturbation that destabilizes the network. Based on results concerning the stability radius, we set up an optimization problem for the capacity allocation at each production facility. The capabilities of the approach are demonstrated using a test case.

### 015-0681: Identification and Mitigation of Supply Disruptions as Part of S&OP Process

*Katariina Kempainen, Nokia, Finland*

*Juuso Rantala, Nokia, Finland*

*Sami Sarpola, Nokia, Finland*

Managing supply risks has always been demanding in industries where product lifecycles are short and forecasting accuracy is low. Yet, after the 2009 economic recession, which forced practically all industries to revise their financial targets that drive acceptable inventory and capacity utilization levels, proactive mitigation of supply risks has become even more challenging. This paper discusses the roles of different organizational functions (e.g. sourcing, logistics, R&D, sales and marketing) in supply chain risk management across all planning horizons (short-term, mid-term and long-term), and based on practical examples, proposes how the interfaces should be managed and what tools and methods should be applied for maximizing company profits. The value of the proposed approach is discussed based on implementation experiences in a large global organization

### 015-0684: World Bank's Logistics Performance Index 2010

*Lauri Ojala, Turku School of Economics, Finland*

*Jean-Francois Arvis, The World Bank, United States*

*Monica Mustra, The World Bank, United States*

We present the findings of the 2010 Logistics Performance Index (LPI) by The World Bank. The LPI uses more than 5,000 individual country assessments made by nearly 1,000 international freight forwarders to compare the trade logistics profiles of 155 countries. The 2010 LPI also provides a snapshot of selected performance indicators in nearly 130 countries, including expanded information on the time, cost, and reliability of import and export supply chains, infrastructure quality, performance of core services, and the friendliness of trade clearance procedures. The 2010 LPI encapsulates the firsthand knowledge of movers of international trade, collected amid the economic turmoil of 2009. The importance of efficient logistics for trade and growth is now widely acknowledged. Analysis based on the 2007 LPI or similar information has shown that better logistics performance is strongly associated with trade expansion, export diversification, ability to attract foreign direct investments, and economic growth. In other words, trade logistics matter.

### 015-0685: Transfer Pricing and Offshoring in Global Supply Chains Facing Random Exchange Rates

*Masha Shunko, Tepper School of Business, Carnegie Mellon University, United States*

*Srinagesh Gavirneni, Johnson Graduate School, Cornell University, United States*

*Laurens Debo, Chicago Booth School of Business, United States*

We study how global firms can leverage tax advantages and cost differences between divisions of a global firm through coordinated transfer pricing and offshoring strategies. We derive a trade-off curve between tax and cost differences that can be used to design such strategies and analyze how the strategies are impacted by the exchange rate uncertainty. In a global firm, the implementation of such optimal strategies is often hindered by the following incentive problem. The headquarters is more concerned about the consolidated after tax profits than the local divisions. Local divisions, on

## Sunday, 10:00-11:30 Sessions

the other hand, have a better view on the product cost structure and hence, have a better view on the appropriate sourcing strategies. Hence, there is a value in decentralization of sourcing decisions. We analyze the decentralized global firm and see how it can be coordinated by a combination of linear contracts with the divisions and transfer pricing strategies.

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Sunday, 10:00-11:30, Port McNeill

Track: OEE, 5

Chair: Kejia Chen

Session: Modelling and Optimization of Uncertain Production and Operations Networks in China

### 015-0941: The Application of GA in the Location of a Distribution Center

*Hao Liang, Beijing jiaotong University, China*

*Ru Hong, school of Economics & Management, China*

*Xu Quan, Beijing jiaotong University, China*

With the development of modern logistics systems, distribution centers play an increasingly important role. Facing the planning stage, distribution center location problem is the primary challenge, and it is the most complex problem. On the distribution center location problem, genetic algorithm has received increasing attention in recent years. The innovation of this article is based on specific location issues and redesigns the algorithm encoding. By setting different parameters, the results are compared with different analysis and then we conclude the optimal solution.

### 015-0439: Optimization for Input/Output Routing of Multi-arms Stacker Crane in Automated Warehouse, Based on Tabu Search

*Guiyan Hu, School of Logistics of Beijing Wuzi University, China*

*Zhiping Du, School of Logistics of Beijing Wuzi University, China*

*Weihua Sun, School of Logistics of Beijing Wuzi University, China*

Automated Storage/Retrieval System is the essential component for the efficiency of a logistics centre. The optimal input and output routing problem of stacker cranes with multi-arms in AS/RS was treated. To assign the SC, lots of items must be partitioned into several identical sub-groups. A routing of an SC is defined as an association of storing items of a sub-group into designed cells and retrieving items of a sub-group stored simultaneously. The mean tour time of SC was minimized by dividing into groups, pairing of items and routing of SC at the same time. The computational complexity of the problem including the size of solution space was discussed and an approximation algorithm based on heuristic and tabu search was also proposed. Then, we perform the proposed approximation algorithm by some numerical experiments based on practical conditions, and demonstrate it is efficient in a real automated warehouse.

## Sunday, 1:30- 3:00 Sessions

181	Sunday, 1:30- 3:00, Finback <b>Session:</b> Workshop on Humanitarian Supply Chain Management	<b>Track:</b> SCM, 27	<b>Chair:</b> Steven Alexander Melnyk
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**015-0937: Humanitarian Supply Chain Management - Issues, Challenges, Obstacles and Research Opportunities**

*Steven Melnyk, Michigan State University, United States*  
*W. Whybark, University of North Carolina at Chapel Hill, United States*  
*Edward Davis, University of Virginia, United States*  
*Jamison Day, Louisiana State University, United States*

In recent years humanitarian supply chains have increased in visibility and importance, as evidenced in the USA after Hurricanes Katrina and Ike and now in Haiti. While experience with humanitarian supply chains has increased, the body of knowledge dealing specifically with this type of supply chain (as compared with the demand-driven supply chain) is surprisingly limited. This is especially surprising given that, in many disaster efforts, the supply chain and its performance have been cited by one academic as “the most expensive part of any relief operation, and the part that can mean the difference between a successful or failed operation.” This panel workshop explores the issues, challenges and research opportunities present when studying humanitarian supply chains (which can be viewed as the most extreme form of a responsive supply chain). The goal is to create awareness of this type of supply chain and to increase research into it.

182	Sunday, 1:30- 3:00, Galiano <b>Session:</b> Closed-Loop and Reverse Supply Chains	<b>Track:</b> SCM, 28	<b>Chair:</b> Pietro De Giovanni
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**015-0001: Reverse Logistics Systems of the Empty Packings of Agricultural Pesticides in Brazil**

*Francisco Freires, Federal University of San Francisco Valley, Brazil*  
*Francisco Pinheiro, Federal University of San Francisco Valley, Brazil*

This paper presents an understanding of Reverse Logistics Systems (RLSs) in Brazil for empty packings of pesticide. It describes and analyzes these RLSs, in order to identify the processes of return and recycling and the market viability for recycled products. The work described in this paper studied the connections or relationships with focus on the recycler of 1st level, decomposing the studied RLS into two subsystems or stages: collection and post-collection system.

**015-0704: Optimal Closed Loop Supply Chain Planning Under Market Uncertainty**

*Ana Amaro, ISCAC, Portugal*  
*Ana Barbosa-Póvoa, CEG-IST, Universidade Técnica de Lisboa, Portugal*

The huge competition in global markets has forced businesses and enterprises to invest in their supply chains (SC). Supply chain planning problems are usually subject to uncertainty due to the volatile and demanding worldwide environment. In this paper, an optimal SC managing approach is developed over a multi-period planning problem, where production, transportation, storage and recovery decisions should meet both uncertain and contract driven demands. The uncertainty induced by price changes is modelled through a scenarios approach. In each scenario, uncertainty is considered through the demand to price elasticity coefficient. Different market characteristics that influence SC performance are captured by the elasticity coefficient observed for each product family and market place. Also, the involved economical flows are actualized based on a market rate incorporating the cost of capital. The applicability of the developed formulation is illustrated through the solution of a real industrial pharmaceutical chain.

**015-0872: Coordination Mechanisms for Three-stage Reverse Supply Chains**

*Amy Zeng, Worcester Polytechnic Institute, United States*

Products at the end of life cycles that are thrown away can be harmful to the environment, but could create additional profit as each product or part of the product material can be remanufactured and then resold in the market. In this paper, using the ink cartridge as an example, we present a bilateral mechanism for coordinating a three-stage reverse supply chain that consists of a consumer population, an aggregated retailer, and one manufacturer so that the potential profits generated from the returns for both the retailer and the manufacturer can be maximized. The optimality and sensitivity of the critical coordination parameters are obtained and examined both theoretically and numerically. Insights and recommendations are finally identified for coordinating such three-stage reverse supply chains.

**015-0764: Coop Programs in Closed-loop Supply Chain with Incentives**

*Pietro De Giovanni, ESSEC BS, France*  
*Georges Zaccour, HEC Montreal - Gerad, Canada*

We consider a Closed-loop Supply Chain (CLSC) with a single manufacturer and a single retailer. Under non-coop scenario, the manufacturer invests in green activities to increase the product return rate while the retailer controls the price. Under coop scenario, the retailer supports the manufacturer’s green activities and receives an economic incentive as counterpart that depends on the contract scheme adopted. Reverse revenue sharing contract (RRSC) and returned wholesale price contract (RWPC) are used to coordinate the chain. Our results show that a coop program is successful if the efficiency in remanufacturing is high. While the retailer is always willing to implement a coop program, the manufacturer’s prefers depend on the remanufacturing efficiency. Players’ profits increase in the return rate but they prefer different contracts: while the retailer is always better off when adopting RRSC, the manufacturer is willing to implement RWPC only when the return rate is low.

183	Sunday, 1:30- 3:00, Grand Ballroom A <b>Session:</b> Managing Supply Chain Disruptions	<b>Track:</b> SCM, 29	<b>Chair:</b> Patrappa Chadist
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## Sunday, 1:30- 3:00 Sessions

### 015-0860: Supply Chain Disruption by Avian Flu Pandemic for U.S. Companies – A Case Study

*Sameer Kumar, University of St. Thomas, Opus College of Business, United States*

With global trade increase, supply chain coordination and offshore services, an outbreak of the avian flu could lead to a devastating effect on global food supply, business services and global supply chain. This paper uses a system dynamics modeling approach to examine the impact of the avian flu spread and how an epidemic could affect businesses operations in the United States of two large U.S. companies – Wal-Mart and Dell Computers. Managers would need to understand how this epidemic would affect their workers both at home and in offshore locations. This could impact business services and operations significantly. This study is very important to raise awareness on the impacts of avian flu on businesses, as well as the need for companies to create contingency plans in order to avoid incurring huge losses.

### 015-0953: Supply Chain Resilience: A Preliminary Assessment

*Michael Braunscheidel, Canisius College, United States*

*Nallan Suresh, SUNY Buffalo, United States*

Rice and Caniato (2003) defined supply chain resilience as “the ability to react to unexpected disruption and restore normal supply network operation.” The purpose of this research is to identify components of resilience and operationalize them to create a measurement device for both academic study and practitioner use.

### 015-0825: How Do Global Companies Leverage Response Time to Manage Disruption Risk in the Supply Chain: A Case Study of a UK Pharmaceutical

*Patrapa Chadist, Cass Business School, City University, United Kingdom*

This research aims to evaluate supply chain risk management in a major pharmaceutical company in UK, with particular focus on the importance of time. By using Time-Base Management Framework (Sodhi & Tang, 2008) to argue that if a firm can shorten response time (detect, design and deploy) to disruption by deploying a recovery plan earlier or sooner after an event occurs, the firm can significantly reduce the impact of such events. The company’s response to the H1N1 Flu Pandemic has been selected as a case study on management of response to events with very low probability and potentially disastrous impact. The case study uses the company’s documents, procedures, and company press releases before, during and after the initial detection of H1N1 outbreak. In addition, a qualitative study is performed, composed of recorded interviews and participant-observation meetings with senior supply chain managers/executives.

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Sunday, 1:30- 3:00, Grand Ballroom D

Track: HOM, 18

Chair: Evrim Gunes

Session: Scheduling and Theory of Constraints

### 015-0233: They Said What? Incorporating the Voice of the Patient in Value Stream Mapping

*Keith Willoughby, University of Saskatchewan, Canada*

*Debra Wright, Health Quality Council, Canada*

Value stream mapping helps decision-makers to accurately understand the sequence of activities involved in a process and the extent to which each activity – from the perspective of the customer - adds value to the process. In Saskatchewan, we applied value stream mapping to the processes a breast cancer survivor follows from initial suspicion to treatment. We assembled a group of breast cancer survivors and had them identify the particular activities that added value to their experience and those that could be termed “waste.” In several instances, these survivors did not identify particular activities as non-value added, even though such activities would be purely wasteful from a lean perspective. Our experiences provided us with insights into how individuals may view processes and how we can better frame our communications when undertaking lean initiatives.

### 015-0318: Green Community Pharmaceutical Supply Chain in UK: Reducing and Recycling Pharmaceutical Waste

*Ying Xie, University of Greenwich, United Kingdom*

*Liz Breen, Bradford University, United Kingdom*

The Pharmaceutical Supply Chain (PSC) is a supply chain where pharmaceutical medications are produced, transported and consumed. Disposal of the medication waste is harmful to the environment and costly; therefore, greening the PSC by properly managing the medication waste is investigated. A Cross Boundary Green PSC (XGPSC) approach is proposed to design a green PSC that results in less preventable medication waste and more recycling of inevitable medication waste, and therefore improved environmental, economic and safety performances. This study focuses on the community PSC in UK where patients get medication from local community pharmacies. To green the PSC, every producer of waste is duty bound to ensure the safe handling and disposal of waste. This duty of care spans throughout the chain. This approach is drawn from the contemporary literature and collaborative research, and can be used as a guidance to establish a waste management network in community PSC.

### 015-0239: Selection and Implementation of Innovations in the Healthcare Supply Chain

*Sarah Bourque, HEC Montreal, Canada*

*Marie-Helene Jobin, HEC Montreal, Canada*

*Guy Pare, HEC Montreal, Canada*

Multiple benefits can be gained through healthcare supply chain innovations; however, the expected results are not always realized. Many aspects can go wrong during both innovation selection and implementation, ranging from incorrect requirement assessments to misuse or non-use of an innovation. Innovations often fail because decision makers don’t understand their environment well enough to anticipate the consequence of their actions. This can be explained by the fact that managers often overlook or diminish the importance of conducting actions using multiple frames in their innovation process.

The focus of this research was the creation of such a framework to structure the concept of mindfulness through the use of multiple frames in the innovation process. Following the creation of this multi-perspective framework, various hypotheses are presented.

## Sunday, 1:30- 3:00 Sessions

185	Sunday, 1:30- 3:00, Granville	Track: PITM, 11	Chair: Adegoke Oke
	<b>Session:</b> Supplier Collaboration and Outsourced New Product Development		

### 015-0549: Measuring Innovation and Assessing the Role of Suppliers

*Steven Melnyk, Michigan State University, United States*

*Joseph Sandor, Michigan State University, United States*

*Hugo DeCampos, Michigan State University, United States*

Innovation has become for many firms the new strategic imperative – a way of competing with cost-based competitors. What was observed in a recent study, however, is that there is not one but at least four different innovation strategies that firms can pursue: 1) execution-driven innovation, 2) customer-driven innovation, 3) capabilities-driven innovation and 4) pure research. This research initiative is interested in studying these four types of innovation, with the goal of identifying and describing the contributory role played by the supply base and how innovation is measured from both reactive and predictive dimensions. The research contributes to the extant literature by expanding understanding of how a supply base can complement the unique innovation capabilities and strategies of a given firm. Additionally, while much has been written on metrics of innovation from a reactive standpoint, little research has been done on predictive measures of innovation.

### 015-0555: Improving Outcomes in Outsourced Product Development: A Joint Consultant-Client Perspective

*William Palm, Massachusetts Institute of Technology, United States*

*Daniel Whitney, Massachusetts Institute of Technology, United States*

Although firms increasingly outsource front-end product development activities to production suppliers or design consultants, this practice has received little scholarly attention. The few existing academic studies report high failure rates, but generally present only the client firms' view of the causes. Our first results from in-depth interviews of both clients and consultants give a richer picture of enablers of success and causes of failure. We confirm some previous findings (internal divisions within the client, "poor communication" between parties), identify new ones (inadequate client capabilities, failure to transfer design intent), and combine them into a comprehensive model of outsourced product development that includes negotiating project scope, continuously managing expectations, and carefully re-integrating the design output into the client's operations. Finally, we classify several types of client dependency (need for new ideas, extra capacity, or specific technical expertise) and highlight the particular hazards associated with each.

### 015-0700: Collaborative Product Development (CPD): Exploring Contingencies in Supplier and Customer Involvement

*Debasish Mallick, University of St. Thomas, United States*

*Sohel Ahmad, St. Cloud St. University, United States*

*Changyue Luo, Governors State University, United States*

*Roger Schroeder, University of Minnesota, United States*

Inter-firm collaboration in new product development is becoming one of the major sources of competitive advantage for companies in almost every industrial sector. Using a cross industry survey of 266 new product development projects, we explore the factors affecting the relationship between customer and supplier involvement and new product development performance.

### 015-0899: Linking Supplier Collaboration, Internal Function Integration and Customer Orientation to Product Innovation Performance

*Adegoke Oke, Arizona State University, United States*

*Thomas Choi, Arizona State University, United States*

The individual effects of supplier collaboration, internal functional integration and customer orientation on product innovation performance have been studied in the extant literature. In this paper, we explore and find interesting relationships between the interactive effects of these factors and product innovation performance in a sample of European plants.

186	Sunday, 1:30- 3:00, Junior Ballroom A	Track: PITM, 12	Chair: Jane Davies
	<b>Session:</b> Start-ups and Technology Commercialization		

### 015-0528: Dynamic Learning Strategies for High-Tech Start-Up Ventures

*Jennifer Bailey, Georgia Institute of Technology, United States*

*Cheryl Gaimon, Georgia Institute of Technology, United States*

We introduce a model to examine a dynamic capabilities-based view of the optimal rate of investment in different modes of learning for the high-tech start-up venture. We explore the impact of the different costs, risk penalties and innovation return potential associated with each mode of learning, and investigate whether different learning strategies may be appropriate at different times during the development phase of the venture. Specifically, we explore the risk/return benefits of an exploration-based versus an exploitation-based learning strategy. Selecting the appropriate learning strategy is motivated by pressure from funding partners to maximize innovation value creation and minimize risk penalties under conditions of uncertainty. Through this research, we aim to deepen the understanding of the unique organizational learning challenges faced by the high-tech start-up venture during the development phase of the innovation process.

### 015-0524: Technology Addition and Product Redesign Strategies in a Duopoly

*John Angelis, Rochester Institute of Technology, United States*

*Moren Lévesque, York University, Canada*

Can a firm add a new technology to its product without losing customers to its rival? And if it does add that technology, should product changes be limited to the component level, or should the entire product be redesigned? We develop a game-theoretic framework where the firm accounts for new and current customers' preferences in making its technology-integration

## Sunday, 1:30- 3:00 Sessions

to the ideal average levels of the various customer groups. At a time when emerging firms in many industries are increasingly adding new technologies to their products, our study provides important insights on technology addition and product redesign strategies.

### 015-0762: Sequential Innovation by Start-ups

*Sreekumar Bhaskaran, Southern Methodist University, United States*

*Sinan Erzurumlu, Babson College, United States*

*Karthik Ramachandran, Southern Methodist University, United States*

In this research, we look at how a start-up organization should structure its development process when it faces cash constraints in addition to technology uncertainty. It has the option to launch an ordinary but immediately available product (O), or a higher quality product (H) that might be available in future. While launching O offers the firm a steady stream of immediate profit that eases its cash constraints and reduce chances of bankruptcy, it could also negatively impact the profitability of H if the firm successfully develops it. Implications for resource allocation and product line planning are also considered.

### 015-0614: Drivers for Value Capture and Growth in the Solar Photovoltaic Supply Chain

*Jane Davies, Judge Business School, University of Cambridge, United Kingdom*

*David Kirkwood, Institute for Manufacturing, University of Cambridge, United Kingdom*

The increased focus on climate change and energy security, combined with subsequent government subsidies and incentives, has seen a plethora of firms enter the solar PV sector in the last 5 years. These entrants include new start-ups, but also established firms diversifying from other industry sectors. Along with the incumbents, these firms now face the dual pressures of reducing production costs while increasing the efficiency of solar power by technological innovation. We combine secondary data and case study analysis of 70 solar PV firms to examine the different processes for technology commercialization used by the new ventures, diversifying firms and incumbents. Along with the firm's business model, we show that capacity utilization, resource availability, supply chain position and network configuration have differential effects as drivers of revenue growth and value creation in the solar PV supply chain.

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Sunday, 1:30- 3:00, Junior Ballroom B

Track: OMM, 14

Chair: Patricia Swafford

Session: OMM14

### 015-0424: Strategic Role of Membership Fee on Vertically Differentiated Products Pricing

*Ling Ge, University of Massachusetts at Dartmouth, United States*

*Liwen Chen, The University of Texas at Austin, United States*

We examine how the membership fee charged by big-box retailers such like Costco and Sam's Club will affect the pricing strategy of vertically differentiated products.

### 015-0588: Including the Customer in Goal Alignment Frameworks

*Merieke Stevens, University of Cambridge, Judge Business School, United Kingdom*

*Thomas Staeblein, University of Applied Science Ulm, Germany*

The alignment of objectives and priorities throughout the organization is a well-established feature of enhanced firm performance, just as it has been shown empirically that misalignment of such goals undermines performance. This paper argues that while ex ante research provides powerful frameworks to enhance intra- and inter-firm goal alignment, the customer is mostly missing from these frameworks. We address this gap by revisiting the literature on strategic alignment, and propose a framework that includes customer demand. To test the viability of our model, we conducted an empirical case study at a global automotive manufacturer. At this firm, we examine the cross-functional alignment between Marketing and Operations in the areas of forecasts and resource allocation, and report on the impact of path dependency, spatial integration, and decomposition of strategic goals into synchronized performance indicators. We show how including customer demand in alignment frameworks can enhance overall firm effectiveness and efficiency.

### 015-0795: Coping with the Planning of Rewards Supply in Loyalty Reward Programs – A Mathematical Formulation Model

*Yuheng Cao, Sprott School of Business, Carleton University, Canada*

*Aaron L. Nsakanda, Sprott School of Business, Carleton University, Canada*

*Moustapha Diaby, School of Business Administration, University of Connecticut, United States*

As an innovative marketing program and a new business model, loyalty reward programs (LRPs) are developed to enhance customer retention and target long-term customer profitability. With the proliferation of LRPs in a wide range of industries, the management complexities in these programs have also increased in recent years. In this paper, the problem of planning the supply of rewards, a key management issue in LRP operations, is addressed. We discuss the problem in the context of supply chain management and propose a mathematical model that seeks to maximize the profitability of an LRP firm, subject to satisfying budget and capacity limitations as well as taking into account demand uncertainties and various liability control strategies. A solution procedure based on stochastic programming is developed and its implementation is discussed.

### 015-0694: Allocating Advertising and Quality Spending In the Presence of Word-of-Mouth Effects

*Gurkan Akalin, The University of Texas at Arlington, United States*

*Patricia Swafford, The University of Texas at Arlington, United States*

In today's tight economic times, competition among service-based firms is intense. With this competition and the need to work more effectively with fewer resources, budget allocation decisions have taken on more importance. This research presents a deterministic, multi-period, non-linear model

## Sunday, 1:30- 3:00 Sessions

analysis provides managerial insights for customer service and customer retention. While the level of advertising spending is important, it is also tied to the strength of word-of-mouth effects and firm's level of market share. Results also showed that firms with larger market shares should continue to increase their spending on quality improvement to maintain or increase their customer flow.

188	Sunday, 1:30- 3:00, Junior Ballroom C	Track: GENL, 16	Chair: Sam Wood
	<b>Session:</b> Special Corporate Sponsored Session by Responsive Learning Technologies		

### 015-1004: Play an award-winning online game used to teach Operations Management

**Sam Wood**, *Responsive Learning Technologies, United States*

In 2004 POMS awarded the Wickham Skinner Award for Teaching Innovation for the development of a competitive online simulation-based assignment named Littlefield Technologies. Last year the game was used in introductory operations courses at the undergraduate, graduate, and executive level in hundreds institutions around the world. In this highly interactive session, participants will play an actual game compressed to 45 minutes. The session will also include discussion of how online games can be used effectively. Although not required, attendees are encouraged to bring a laptop to the session.

189	Sunday, 1:30- 3:00, Junior Ballroom D	Track: SOHL, 14	Chair: Robert Klassen
	<b>Session:</b> Sustainability and Firm Performance		

### 015-0279: Role of Environmental Orientation in Green Supply Chain Management

**Erlinda Yunus**, *Southern Illinois University Carbondale, United States*

**Suresh Tadisina**, *Southern Illinois University Carbondale, United States*

Stakeholders are increasingly exerting pressure on firms to move towards becoming more environmentally friendly as the deterioration of the environment due to corporate activities and practices continues. Research has shown the significant impact of external stakeholders on firms' adoption of green supply chain practices; however, the potential influence of a firm's natural environmental orientation (NEO) has not been considered in the supply chain management literature. This paper attempts to examine the relationships between stakeholder pressures, firm's NEO, and green supply chain practices. In addition, the research model includes the impact of stakeholder pressures, firm's NEO, and green supply chain practices on firm performance. Specifically, it is hypothesized that stakeholder pressures and a firm's NEO positively influence the adoption of green supply chain management practices. Moreover, it is argued that a firm's NEO would also reinforce the impact of green supply chain management practices on firm performance.

### 015-0544: The Impact of ISO 14001 Certification on the Financial Performance: With Respect to Stock Price and Corporate Equity Structure

**Donghyun Choi**, *University of Nebraska-Lincoln, United States*

**Yongwhi Noh**, *University of Nebraska-Lincoln, United States*

**Jin Sung Rha**, *University of Nebraska, United States*

The supply chain environment is becoming a source of sustainability and competitiveness for the firm. ISO 14001 is one of the most widely utilized standards in the environmental management system (EMS). EMS causes a certain level of additional cost, while the certification might increase business opportunities through the accomplishment of corporate social responsibility. It affects stakeholders' decision-making in different ways, finally influencing the corporate equity structure through stock price changes. However, there is a paucity of empirical study on the impact of ISO 14001 certification on the stock price and corporate equity structure. The purpose of this study is to investigate how ISO 14001 certification affects the stock price and thereby the corporate equity structure. To do this, we collect the data of the public companies in the American stock market and employ statistical methods to analyze the impact of the certification on the stock market and corporate equity structures.

### 015-0859: The Impact of Social Issues Management on Firm Performance

**Amrou Awaysheh**, *IE Business School, Spain*

**Robert Klassen**, *University of Western Ontario, Canada*

The management of social issues can have a substantial impact on a firm's financial performance. Social issues are quite complex, and managing them requires a wide range of practices that firms can put into place to contribute to the development of human potential or protect people from harm. Examples include establishing workforce policies around safe work practices or diversity, or improving product safety. However, a firm may also be involved in negative practices, such as the use of illegal labor practices or child labor. This paper will present the results from an ongoing event study that examines the positive and negative impact of social issues management on a firm's value.

### 015-0916: An Analysis of the Impact of Financial Incentives for the Adoption of Solar Heating Applications in Canada

**Kalinga Jagoda**, *Mount Royal University, Canada*

**Peter Zizler**, *Mount Royal University, Canada*

Green energy sources such as solar, wind or geothermal play a vital role in reducing our carbon footprints. The major challenges associated with the dissemination of renewable energy technologies are its high initial cost and its heavy reliance on support schemes. The efficient uses of market mechanisms coupled with appropriate support schemes are paramount in achieving the expected outcomes. This paper discusses such an approach applied to the solar energy technologies in the Canadian context. We analyze the cost recovery period of solar panel installations for potential house owners. Moreover, we provide guidelines for policy makers on the optimal amount of government rebates to be outlined for such installations. The results of application of this model to the province of Alberta are presented. The limitations and future research directions on this topic are also discussed.

## Sunday, 1:30- 3:00 Sessions

190	Sunday, 1:30- 3:00, Orca	Track: CIM, 12	Chair: Yanchong Zheng
	<b>Session:</b> Topics in OM: Flexibility in Operations and Behavioral Economics		

### 015-0334: No Rebalancing, Some Transshipment

*Metin Cakanyildirim, University of Texas at Dallas, United States*

*Nagihan Comez, Bilkent University, Turkey*

*Kathryn Stecke, University of Texas at Dallas, United States*

In a two-retailer system, transshipping inventory to a stocked out retailer can eliminate backordering the demand of a new customer that arrives at that retailer. This reasoning makes some transshipments profitable. In other cases, the demands are backordered. Rebalancing is shipping inventory to a stocked out retailer to eliminate an outstanding backorder. We show that "no rebalancing" is necessary in the optimal inventory policy in the presence of "some transshipments."

### 015-0060: Volume Flexibility with Multiple Products and the Tradeoff with Product Flexibility

*Manu Goyal, University of Maryland, United States*

*Serguei Netessine, University of Pennsylvania, United States*

We analyze volume flexibility under endogenous pricing with multiple products. We prove that the value of volume flexibility is a function of demand correlation between products, an outcome which cannot be explained by classical risk-pooling arguments. Our results underscore the value and the necessity of studying volume flexibility with multiple products, and emphasize the contrast with product flexibility.

### 015-0195: Revenue Sharing versus Buyback Contracts: Influence of other Regarding Supplier Preferences

*Karen Donohue, Carlson School of Management, University of Minnesota, United States*

*Tony Cui, Carlson School of Management, University of Minnesota, United States*

*Yinghao Zhang, Carlson School of Management, University of Minnesota, United States*

Prior analytical research shows that buyback and revenue sharing contracts achieve equivalent channel-coordinating solutions when applied in a single supplier-buyer setting. More recently, behavioral research suggests that the two contracts do not always perform equivalently, with both often failing to coordinate the channel. Our goal in this study is to help explain these results by examining how other regarding preferences, such as loss aversion, hyperbolic discounting, and fairness concerns, can influence the supplier's choice of contract parameters and the resulting efficiency of each contract.

### 015-0116: Trust in Forecast Information Sharing

*Ozalp Ozer, School of Management, University of Texas at Dallas, United States*

*Yanchong Zheng, Stanford University, United States*

*Kay-Yut Chen, Hewlett-Packard Laboratories, United States*

Using human-subject experiments with varying capacity cost and market uncertainty, we observe that trust and trustworthiness lead to effective forecast information sharing in a supplier-manufacturer dyad, even in the absence of complex contracts, reputation and punishment. We determine that risk/vulnerability from trusting has a stronger impact than uncertainty on supply chain cooperation. We develop a Trust-Embedded Model to incorporate trust and trustworthiness in the game-theoretic model of forecast communication. The new analytical model outperforms other candidate models and gives accurate predictions about human response to changes in the strategic environment. Further experiments on repeated interactions confirm that reputation concerns reinforce trust and trustworthiness, and that information feedback is essential to this reinforcement. These results enable us to provide effective forecast sharing strategies for varying supply chain environments.

191	Sunday, 1:30- 3:00, Parksville	Track: EROM, 12	Chair: Narayanan Sriram
	<b>Session:</b> Empirical Studies on Innovation		

### 015-0246: The Effect of Product Development Restructuring on Shareholder Value

*Brian Jacobs, Michigan State University, United States*

*Vinod Singhal, Georgia Institute of Technology, United States*

We examine how product development restructuring (PDR) affects shareholder value. Specifically, we collect a sample of PDR announcements to empirically examine two issues. First, we estimate the overall magnitude of the stock market reaction to a diverse set of PDR announcements. Second, we examine how the stock market reaction varies both by type of PDR and by the firm's motivation to undertake it. We also examine what other factors influence the stock market reaction to PDR.

### 015-0288: Team Design, Work Design and Psychological Safety: An Empirical Analysis of R&D Projects

*Aravind Chandrasekaran, The Ohio State University, United States*

*Anant Mishra, University of St. Thomas, United States*

The extant literature on team learning emphasizes psychological safety—a shared belief that the team is safe for interpersonal risk taking—as an important predictor of R&D Project Performance. Yet, empirical research examining the development and performance consequences of psychological safety is rather limited. This study has a two-fold research agenda. First, we examine the role of team design characteristics—namely, Team Autonomy and Transformational Leadership—in affecting the extent of psychological safety in R&D project teams. Next, we examine the role of work design characteristics—Task Interdependency and Degree of Exploration—in affecting performance outcomes in R&D projects. Data for this study are collected using a multilevel research design from 108 R&D projects involving over 250 project leader and project team member informants. Theoretical and practical implications from this research are discussed.

## Sunday, 1:30- 3:00 Sessions

### 015-0719: Team Diversity and Technical Performance of Manufacturing Process Innovation: The Moderating Role of Technology Proveness

*Morgan Swink, Michigan State University, United States*

*Jung Lee, Michigan State University, United States*

We analyze data collected from 171 manufacturing process improvement projects to answer two research questions: What is the impact of team diversity on technical performance of MPI projects? When does the relationship between team diversity and technical performance of MPI projects change? The findings indicate that both functional diversity and work experience diversity in project teams are associated with technical performance achieved. However, these relationships are moderated by the level of technological proveness of the process innovation.

### 015-0939: Interconnected Enterprise: Dynamic Interplay Between Inventory, Advertising, and R&D Investments, and Sales

*Sriram Narayanan, Michigan State University, United States*

*Shrihari Sridhar, Michigan State University, United States*

*Raji Srinivasan, University of Texas at Austin, United States*

We study how firms coordinate investments in inventory, marketing and R&D activities to increase sales using a simultaneous equations approach. We use publicly available data from COMPUSTAT from 1980 through 2008 for a diverse set of industries. Building on past literature on inter-functional coordination and sales response models in marketing and operations management, we show that inventory, advertising and R&D influence each other and also drive sales. Our analysis shows that not allowing for the interactions between various functions may over-estimate advertising elasticity. We study the long terms effects of investments in advertising, inventory and R&D on sales, and on each other. Finally, using a novel method that combines simulating data and DEA, we derive insights on how efficient firms treat each of these investments as compared to the inefficient firms.

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Sunday, 1:30- 3:00, Pavilion Ballroom A

Track: PLQ, 12

Chair: George Norman  
Kenyon

Session: Increasing power in data analysis

### 015-0896: Toward Gage R&R Guidelines that Improve the Power of Statistically Designed Experiments

*Tapan Bagchi, VGSOM/IEM, IIT Kharagpur India, India*

*Rajmani Prasad, IEM, India*

With the present push for Six Sigma, the problem of measurement errors in quality control and assurance is being widely recognized. Suggestions - ranging from naive to theoretically sophisticated - have led to guidelines such as the AIAG MSA procedures for the correct use of gauges to measure physical CTQ characteristics. This work is an attempt to extend that effort - to link the power of ANOVA tests in a DOE framework to the number of treatments employed, number of parts produced in each treatment, and the number of measurements taken on each part. By invoking Biometrika Tables for Statisticians (1972), this work discovers how these quantities may be optimized while conducting DOE to deliver a pre-stated level of detection power.

### 015-0330: Calculating Process Capability Index with Limited Information

*George Kenyon, Lamar University, United States*

*R Sale, Lamar University, United States*

Within the theoretical framework of process capability indexing, the Cpk index is "by far the most prevalent among all the indices in managerial decisions" (Wu, 2009, p500). Many authors also point out that Cpk is essentially a measure of process yield. In this study, we develop an alternate formulation of Cpk which is mathematically equivalent to the traditional formulation but is based more directly on process yield. We then present a new process capability index, Cpy, which is based exclusively on process yield. The purpose of this new formulation is twofold. First it is calculated using only yield, which is more easily available to the manager than data required to calculate existing capability indices. Second it is applicable in many circumstances where the traditional formulation of Cpk is inappropriate, such as when the process distribution is non-normal or when there are multiple steps in a process.

### 015-0017: The Use of Group Technology as a Tool to Organize a Production Kanban

*Milton Vieira Junior, Universidade Nove de Julho, Brazil*

*Felipe Tanner, Imetextil, Brazil*

*José Salles, Universidade Nove de Julho, Brazil*

*Rosangela Vanalle, Universidade Nove de Julho, Brazil*

This paper proposes an optimization method to be applied to traditional Kanban systems using Group Technology (GT) concepts. The Kanban system helps control storage level of goods and WIP, but does not consider the loss of efficiency caused by the high number of setups that occur during the scheduled production. GT is a methodology to find similarities on design or production characteristics to create groups of parts or products aimed to reduce setup time, among others. Joining Kanban and GT was seen as an excellent tool to address deficiencies found on the traditional Kanban procedure. This study was applied to a sandpaper manufacturer that produces with small and medium batch sizes. The results showed that the system Kanban joint to the GT brings advantages, like: greater pursuit rate of machines, reduction of production costs, standardization on the production scheduling and an improvement on the level of attendance to the clients.

### 015-0209: Top Management Support, Human Resource Management, and Quality Results in the Petroleum Industry

*Mahour Parast, University of North Carolina-Pembroke, United States*

The purpose of this presentation is to empirically investigate the effect of top management support for quality and human resource practices on organizational performance (internal and external quality results) in the petroleum industry. The results suggest that top management support is the only significant predictor of external quality results. We did not find a very strong relationship between top management support and employee involvement, an indication of the existence of "management illusion for control." The findings provide some support for convergence theory and

## Sunday, 1:30- 3:00 Sessions

contingency theory in quality management.

193	Sunday, 1:30- 3:00, Pavilion Ballroom B <b>Session:</b> Knowledge and Performance Management	<b>Track:</b> GENL, 11	<b>Chair:</b> Vagner Cavenaghi
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### 015-0474: Implementation of a Knowledge Management Program and its Impact on the Management System: Case Study at an Industrial Company

*Vagner Cavenaghi, São Paulo State University, Brazil*

*João Albino, São Paulo State University, Brazil*

*Paulo Orti, São Paulo State University, Brazil*

*Carla Machado, São Paulo State University, Brazil*

*Marco Torres, São Paulo State University, Brazil*

The business and management environment is influenced by political, organizational, institutional, technological, economic and social phenomena of a global scope. Thus, capturing, registering, organizing and disseminating information and knowledge plays a strategic role in organizations. The objective of this paper is to present a case study of an organization that is developing a Knowledge Management project, analyzing its initiative in order to classify the stage at which the company's knowledge management cycle is at and to relate this cycle to other management instruments it has. The following instruments were used to raise and collect data: individual interviews and bibliographic study. This paper represents an important contribution to the study of knowledge management, demonstrating new technologies that can leverage organizational change and trigger a new understanding of Knowledge Management.

### 015-0476: Knowledge Management Aligned with Performance Indicators: Case Study at a Food Company

*Vagner Cavenaghi, São Paulo State University, Brazil*

*João Albino, São Paulo State University, Brazil*

*Norberto Simonetti, São Paulo State University, Brazil*

*Patricia Gatti, São Paulo State University, Brazil*

*Keity Prado, São Paulo State University, Brazil*

Companies mainly concerned with preserving their organizational intelligence have been implementing several actions in the knowledge management area. However, most do so in an intuitive and empirical manner, without any theoretical foundation. This compromises the final result, if not the success of the program as a whole.

This paper describes one of these initiatives implemented at a large food industry with several units in Latin America.

The case study identified that the program implemented at the company is characterized by the implementation of a practice with little theoretical foundation. It underwent changes according to the program's key performance indicators during its implementation and maintenance phases. This paper is of particular importance due to the following factors: description of an actual fact, confirmation of theories established regarding success factors in knowledge management, and as a subsidy for professionals working at organizations in this area.

### 015-0511: Formulation and Deployment of Strategic Performance Indicators Through DFSS: Action Research on Insurance Sector

*Daniela Marzagão, Escola Politécnica da Universidade de São Paulo, Brazil*

*Marly Carvalho, Escola Politécnica da Universidade de São Paulo, Brazil*

There are many research studies about performance measurement systems, indicating that business performance measurement is a key to strategic planning and management. However, there is a literature gap between the theoretical frameworks and their customization to the specificities of one single organization. This article searches for the steps of formulation and implementation of a performance measurement system, looking for any bottlenecks in this process. The methodological technique was a research action developed in an insurance company. The results point towards the use of well-known methodologies by the organizations. In the company studied in this article, the strategic planning team adopted Design For Six Sigma (DFSS) to formulate, deploy and implement the performance measurement system linked to their strategic planning system. The structure of the proposed system, when compared to the theoretical frameworks, points to good results, allowing the studied organization to customize their performance measurement systems to their business needs.

### 015-0682: Strategic Alignment Antecedents and Consequences for Strategy Implementation

*Vanderli Prieto, University of São Paulo/Presbyterian Mackenzie University, Brazil*

*Marly de Carvalho, University of São Paulo/Production Engineering Dept., Brazil*

This article considers two types of alignment - vertical and horizontal - and explores the relationship between vertical alignment and successful strategy implementation. We argue that failure in strategy implementation can be due to the lack of an integrated vision of the elements that influence this process, mainly the intangible. The study presents a literature review and analysis. The articles were gathered by searching databases (e.g., ISI Web of Science and ABI-Inform), the Internet sites of journals and the annals of national scholarly conferences. As a result, a conceptual framework is proposed, and based on that framework the study links the antecedents identified in the literature to their consequence – the effectiveness in strategy implementation.

194	Sunday, 1:30- 3:00, Pavilion Ballroom C <b>Session:</b> Modern Logistics Issues	<b>Track:</b> LM, 11	<b>Chair:</b> Serhiy Ponomarov
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### 015-0073: Identifying Decision Factors for Logistics Outsourcing in the Brazilian Automotive Industry

*Renata Bandeira, Universidade Federal do Rio Grande do Sul, Brazil*

*Luiz Carlos Mello, Universidade Federal Fluminense, Brazil*

## Sunday, 1:30- 3:00 Sessions

**Antonio Carlos Maçada**, *Universidade Federal do Rio Grande do Sul, Brazil*

Logistics outsourcing is a business practice adopted by a growing number of organizations. The logistics outsourcing process is heavily supported by the literature. Nonetheless, a wrong decision can be a source of corporate problems that may lead to the increase of logistics costs, affecting the company's competitiveness and image. There is a high incidence of unsuccessful cases in outsourcing agreements, mostly due to failures in the decision making process. This fact highlights the complex nature of the logistics outsourcing decision and the lack of understanding, on the part of executives, concerning the variables that affect the decision process. In this context, the present research reports on a study developed in the Brazilian automotive industry on logistics outsourcing according to the perspective of the hiring company. The focus of the thesis consists in identifying the main factors which the organizations of this particular sector should analyze in the decision making process of logistics outsourcing, using qualitative techniques.

### 015-0387: An Approach for the Integration of Production Scheduling and Inter-facility Transportation within Global Supply Chains

**Bernd Scholz-Reiter**, *BIBA – University of Bremen, Germany*

**Christoph Schwindt**, *Institute of Management and Economics, Clausthal University of Technology, Germany*

**Thomas Makuschewitz**, *BIBA – University of Bremen, Germany*

**Enzo Frazzon**, *BIBA – University of Bremen, Germany*

On the operational level, production scheduling and transportation planning are usually carried out by different stakeholders, making locally bounded decisions. The integration of both tasks allows for a better management of disruptions that affect the effectiveness of the production and transportation systems. In this paper we study the integrated production and transportation scheduling problem (PTSP) for supply chains comprising original equipment manufacturer as well as upstream suppliers. Based on a generic framework, the supply chain is structured into a chain of operational planning entities, where for each entity a PTSP arises. The scheduling is performed based on a mathematical programming formulation that takes the current capabilities of the production and transportation systems, as well as the previous schedule, into account. The computational results obtained are the starting point of the development of heuristics.

### 015-0843: Development of Best Practices for the Supply Chain of the Flower Exports in Colombia

**GONZALO MEJIA**, *UNIVERSIDAD DE LOS ANDES, Colombia*

**FIDEL TORRES**, *UNIVERSIDAD DE LOS ANDES, Colombia*

**GABRIELA LEGUIZAMON**, *UNIVERSIDAD DE LOS ANDES, Colombia*

**SEBASTIAN FRANCO**, *UNIVERSIDAD DE LOS ANDES, Colombia*

Flower exports in Colombia represent about \$US 1 billion per year. To remain competitive, the Colombian Government is determined to improve the performance of the supply chain. Such a supply chain begins at the farms where flowers are harvested, and finishes at the wholesalers of the purchasing countries. This work, funded by the Colombian Ministry of Agriculture, focuses on the logistic processes at the farm. The aim was to diagnose and identify inefficiencies and propose viable solutions to the flower growers. The project began with interviews and data collection at over 60 farms in three different regions of the country. Next, a conceptual model of a generic system was developed and then translated and simulated with the ARENA® software. The analysis was performed via an ANOVA experimental design. The recommendations given by the authors are now considered the "best practices" for Colombian flowers in terms of logistics.

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Sunday, 1:30- 3:00, Pavilion Ballroom D

Track: HBOM, 8

Chair: Kay-Yut Chen

Session: Behavioral Ops 3

### 015-0733: Consumer Behavior in the Presence of Refurbished Products - Empirical Foundations and Implications for Remanufacturing Strategies

**Mirko Kremer**, *Penn State University, United States*

**Atalay Atasu**, *Georgia Institute of Technology, United States*

**Koert Van Ittersum**, *Georgia Institute of Technology, United States*

While a growing number of companies now market remanufactured versions of their own products, there remains considerable uncertainty about how to actually position remanufactured products in the market, e.g.: How should they be priced? Do they cannibalize new product sales? Answers to these questions depend critically on actual market response to remanufacturing activities of a firm and its competitors. However, in the growing model-based literature on Closed-Loop Supply Chain Management, assumptions on consumer behavior in the presence of remanufactured products are typically made ad hoc, without proper empirical justification. We study the empirical foundations of market response to remanufacturing activities, with a focus on exploring distinct customer segments. Based on our results, we develop recommendations for the remanufacturing strategy of the firm.

### 015-0515: Contract Complexity and Performance Under Asymmetric Demand Information: An Experimental Evaluation

**Basak Kalkanci**, *Stanford University, United States*

**Kay-Yut Chen**, *HP Labs, United States*

**Feryal Erhun**, *Stanford University, United States*

We investigate why simpler contracts may commonly be preferred in practice despite being theoretically suboptimal, using human subject experiments. We study a single supplier and a single buyer supply chain where the buyer has better information on end-consumer demand. The supplier offers either a quantity discount contract or a price-only contract, which differ in complexity. Results show that, contrary to the theoretical predictions, quantity discounts do not necessarily increase the supplier's profits. A more equitable distribution of profits between the supplier and the buyer than what the theory predicts is observed. Suppliers' choice of contract parameters can be explained well by an experience-weighted attraction learning model. Moreover, suppliers' inertia towards changing their initial decisions as well as their bounded rationality contribute to the relatively close performance of price-only and quantity discount contracts. Our results demonstrate that simpler contracts would be sufficient for a supplier designing contracts under asymmetric demand information.

## Sunday, 1:30- 3:00 Sessions

### 015-0842: Human Information in Work Force Management

*Kay-Yut Chen, Hewlett-Packard Laboratories, United States*  
*Alex Zhang, Hewlett-Packard Laboratories, United States*  
*pano santos, Hewlett-packard Laboratories, United States*  
*Shelen Jain, Hewlett-Packard Laboratories, United States*  
*Ivan Lopez, Hewlett-Packard Laboratories, United States*  
*Afly Louis, Hewlett-Packard, United States*

Effective management of labor in consulting businesses resources requires accurate forecasts of resource demand. We propose new methods to form resource forecasts based on two sources of information. The first is historical data. The second is the planning information from managers who are tasked to deliver consulting projects. This research focuses on predicting resource demand at the aggregate level, instead of a project level, to gain more statistics. The results can be used for labor shaping decisions such as hiring, downsizing and retraining, but not for resource allocations to individual projects. Historical data about past projects are analyzed with the nonparametric bootstrap method to characterize the distribution of resource over different job categories as well as time. A behavior model is being constructed to solicit true beliefs of resource demand given the planning data (and that planning managers may be risk-averse and conservative in their resource projections).

### 015-0845: Modeling and Optimizing of Strategic Work Force Decisions

*Kay-Yut Chen, Hewlett-Packard Laboratories, United States*  
*Alex Zhang, Hewlett-Packard Laboratories, United States*  
*pano santos, Hewlett-packard Laboratories, United States*  
*Shelen Jain, Hewlett-Packard Laboratories, United States*  
*Jerry Shan, Hewlett-Packard Laboratories, United States*  
*Ivan Lopez, Hewlett-Packard Laboratories, United States*  
*Teri Gonzalez, Hewlett-Packard Laboratories, United States*  
*Alfy Louis, Hewlett-Packard, United States*

The field of Behavioral OM has been making strides in integrating behavioral science, and issues into operations management. The work force management of a large consulting business is a perfect setting for such research. On one hand, the size and complexity of the business (many product lines, many skill types of labor, regions, etc.) are perfect for large scale optimization, a main staple of operations research. On the other hand, there are many behavioral issues embedded in the system, from the effect of work force management decisions (for example, what is the effect of increase/decrease hiring to attrition rates, affected by decisions made by individual workers) to the solicitation of preferences of project assignments. In this paper, we will outline an optimization model of labor resources at the business level and discuss the related behavioral issues.

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Sunday, 1:30- 3:00, Port Alberni

Track: SOM, 7

Chair: Rafael Teixeira

Session: Service Operations Strategy

### 015-0709: Servicescape Across Service Settings: Is It Structurally Invariant?

*Alan Cannon, The University of Texas at Arlington, United States*  
*Patti Collett, The University of Maine, United States*

Servicescape, the physical surroundings of a service that include aesthetics, layout and accessibility, and cleanliness, is often assumed to be consistent across environments. As a consequence, important potential contingencies remain underexplored in service operations research. In this research effort, we explore the potential of two such contingencies – the service sector and the service firm's competitive strategy – in evaluating popular servicescape measures with regard to their structural invariance. Our work, based on a multi-firm, multi-sector survey of some 1,300 customers, suggests promising directions for future service operations research.

### 015-0547: Service Quality in the Brazilian Fitness Industry: An Analysis from Diverse Roles Assumed by the Customer

*Yen-Tsang Chen, Escola de Administração de Empresas de São Paulo / Fundação Getúlio Vargas, Brazil*

A customer can play several roles along the service operation chain (buyer, co-producer, auditor or promoter); based on this assumption, this study aims to explore the service quality perception from the diverse roles assumed by the customer at the operation chain. This research was applied to the fitness industry and the SERVQUAL model was used to evaluate service quality provided by the fitness professionals. The data were collected in a survey of customers from several fitness gyms in Brazil. This study shows that the service quality perception seems to vary according to the roles assumed by the customer, and his decision on the service recommendation seems to be related neither to the satisfaction nor to the service quality provided.

The practical implication of this study encourages managers to provide proper services at different stages of the service chain and demonstrate a different quality driver for each role played by the customer.

### 015-0065: Extracting and Analyzing Information from Large Volume of Aircraft Repair Messages

*Mingang Fu, University of Washington, United States*  
*Roberto Lu, The Boeing Company, United States*  
*Richard Storch, University of Washington, United States*  
*Cliff Kirkham, The Boeing Company, United States*

In this paper, we provide a systematic method to examine messages between the service provider and customers to investigate possible delays of aircraft repair services. The messages contain valuable information that can be used for scheduling repair services. We develop a procedure to extract key information from a large volume of repair messages. The extracted information is analyzed with binary variable multiple regressions. We

## Sunday, 1:30- 3:00 Sessions

nature of damages stated in messages.

197	Sunday, 1:30- 3:00, Port Hardy <b>Session:</b> GOSSM 6	Track: GOSSM, 6	Chair: Mallach Raphael
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**015-0701: Path Dependence through Relational Rents in B2B Relationships - China and Germany in Comparison**

*Raphael Mallach, Freie Universität Berlin, Germany*

*Michael Kleinaltenkamp, Freie Universität Berlin, Germany*

This paper is concerned with the question of whether or not relational rents in business-to business (b2b) relationships lead to path dependence. Additionally, the question will be asked if there are any differences in b2b relationships between China and Germany regarding the issue of path dependence through relational rents. The presumed contribution lies in the combination of the theoretical approaches of path dependence, the Relational View and transaction costs economics. The combination of these theories offers a broader view which adds the down side of potential inefficiency to the (transaction) costs reducing and benefits enhancing (e.g. relation-specific governance mechanisms) bright side of relational rents.

**015-0708: The Impact of Sustainability Strategies on Supplier Relationships: An Interorganizational Justice Perspective**

*Julia Wolf, European Business School, Germany*

Climate change, shortages in fossil fuels, serious social discrepancies between developed and less-developed countries, etc., have led to aggravated calls for more sustainable and responsible management practices. Therefore, many companies in the industrialized world integrate sustainability into their mission statement and formulate corresponding sustainability strategies. Global Supply Chain Management (SCM) plays a key role in implementing these strategies because of the function's impact upon emissions and on global supplier relations where social standards might be less developed. Despite the importance of the topic, our understanding of how sustainability strategies translate into global supplier relationship strategies is still limited. By means of qualitative case studies, this research explores how sustainability strategies relate to interorganizational justice in supplier relationships. Findings suggest that interorganizational justice is not clearly linked to corporate sustainability strategies. The perspective enriches sustainability research by identifying areas in alliance management that might be better linked to corporate strategy.

**015-0725: Tariff-oriented Supply Chain Management - Implications of Trade Agreements on Strategic Decisions**

*Johannes Plehn, ETH Zürich, Switzerland*

*Gandolf Finke, ETH Zürich, Switzerland*

*Alexander Sproedt, ETH Zurich, BWI Center for Enterprise Science, Switzerland*

Global trade of finished goods as well as global sourcing of components and raw material are gaining importance. The paper aims to investigate the impact of trade agreements and tariffs on global supply chains and to describe the implications for strategic supply chain management decisions in terms of supplier selection and plant locations. The present system of trade agreements and tariffs among single countries and economic areas is introduced, followed by a qualitative and quantitative assessment of their impact on a global supply chain. Furthermore, the authors illustrate how trade agreements can be used to reduce tariff costs and which implications for the supply chain structure arise. Moreover, the authors highlight potential risks and problems of a tariff-oriented supply chain design. The paper concludes with three scenarios that demonstrate the variability of local content calculations.

**015-0753: Willingness to Pay of Industrial Buyers for Attributes That Constitute Sustainable Products**

*Philipp Goebel, European Business School, Germany*

*Carsten Reuter, European Business School, Germany*

*Richard Pibernik, European Business school, Germany*

*Christina Sichtmann, University of Vienna, Austria*

The assurance of responsible businesses practices along the supply chain of organizations has become a major challenge for organizations. Today, any misconduct within the supply chain may be prolonged to the company closest to the end customer. In order to mitigate the risk of reputational damage, organizations use social and environmental criteria as gatekeepers during supplier selection and evaluation. However, although suppliers might affirm compliance with certain criteria, the buying organization cannot be sure. Third-party certification, for example, might provide increased assurance but induces higher costs for both, suppliers and buyers. We examine the potential conflict of interests for purchasing managers and employ choice-based conjoint analysis for assessing their willingness to pay for various levels of assurance regarding suppliers' compliance with social and environmental criteria. Results indicate that purchasing managers are willing to pay a price premium of up to 5% for higher levels of assurance.

198	Sunday, 1:30- 3:00, Port McNeill <b>Session:</b> Interfaces of Operations Management with other disciplines in China	Track: OEE, 6	Chair: Jianghua Wu
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**015-0316: Applying CART to the Prediction of Telecom Customer Lifecycle**

*LU XIU, Xiamen University, P.R.China, China*

*HAN HUA, Xiamen University, P.R.China, China*

Customer life-cycle prediction is the key to achieving long-term customer value. Current methods of customer lifecycle prediction are built on a complete database. Where the transaction volume, number of transactions and other numerical information are missing, those methods do not

## Sunday, 1:30- 3:00 Sessions

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predict the lifecycle of in-net customers. This model is applied for telecom operators in some provinces in China and good accuracy is achieved.

### **015-0313: Effects of Coupon Trading on Consumer Choices and Retailer Profits**

*Meng Su, Peking University, China*

*Yi Lu, Yale University, United States*

*Xiaona Zheng, Peking University, China*

This paper investigates the effects of coupon trading on consumer purchase choices and retailer's profits. Specifically, we develop a model to examine the conditions under which retailers will benefit from the existence of coupon traders. The model analyzes changes in different market segments and retailer's profits under the following three scenarios: (I) no coupon event, (II) coupon event in the absence of coupon traders, and (III) coupon event in the presence of coupon traders. Our findings provide the following implications for retailer's strategies on pricing and coupon policies in the presence of coupon traders. First, coupon trading brings both advantages ("new customer effect") and disadvantages ("sales leakage effect") to the retailer. Second, a retailer can possibly benefit from coupon trading only when the price is sufficiently high. Third, when a retailer varies coupon policy, its profitability in the presence of coupon trading is determined by consumers' hassle costs.

### **015-0616: Pricing and Capacity Allocation in a Production System with Multi-class Demand**

*Jianghua Wu, School of Business, Renmin University of China, China*

*Xin Zhai, Guanghua School of Management, Peking University, China*

We consider a production system with capacity constraint, which faces uncertain and multi-class demand. Each class of demand is substitutable and price-dependent. There exists a cannibalization effect, which means that price difference will affect demand transfer across two classes of demand. We study the optimal decision on capacity allocation and pricing for each class of demand, to maximize system's profit. We also investigate the effect of customers' sensitivity on price difference on the optimal decision and the system's performance.

## Sunday, 3:30- 5:00 Sessions

199	Sunday, 3:30- 5:00, Finback <b>Session:</b> Lean and Agile Supply Chains	<b>Track:</b> SCM, 30	<b>Chair:</b> Santosh Mahapatra
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### 015-0601: Just in Time Supply Chain Practices in Developing Countries: A Case of the Public Healthcare Sector in Botswana

*Kabossa Msimangira, The Open Polytechnic of New Zealand, New Zealand*

The Just in Time (JIT) philosophy and supply chain management (SCM) have been more widely practiced in developed countries than in developing countries. Little is known regarding the JIT practices in public healthcare sector in developing countries, especially in Africa. This paper reports the problems associated with using JIT supply chain technique and highlights JIT supply chain practices in the public healthcare sector in Botswana. Data were collected using a triangulation of methods: interviews, a survey questionnaire, and personal observation. The findings and recommendations to solve some of the key problems are presented.

### 015-0531: An Analysis of Mapping Tools for Lean Supply Chain: A Case Study in Thailand

*Watcharavee Chandraprakaikul, The University of the Thai Chamber of Commerce, Thailand*

*William Lee, Singapore Institute of Manufacturing Technology, Singapore*

A lean supply chain is imperative to compete in today's market. In order to achieve a lean supply chain, the first stage adopted by a number of researchers has been to develop and apply diagnostic tools either within internal or extended supply chains. In general, such tools have proved useful in their original settings, but have often failed to provide a wider applicability. Therefore the purpose of this paper is to discuss the application and challenges faced in constructing a lean supply chain. Different mapping tools will be analysed and evaluated in order to select the most appropriate tool for constructing a lean supply chain. The most appropriate tool will be applied to a case study in order to evaluate how the tool is put into practice. This testing will show a number of shortcomings of the approach.

### 015-0417: Impacts of Lead Times Constraints on Supply Chain Decisions

*Ramzi HAMMAMI, Toulouse Business School, France*

*Yannick Frein, G-SCOP, Grenoble INP, France*

With globalization, production sites have become geographically dispersed. Consequently, the lead times of purchasing, manufacturing and transportation throughout the supply chain (SC) are becoming increasingly long which impacts the customer lead time. In addition to the manipulation of the stock, we seek to understand the impacts of customer lead times constraints on major logistic decisions, such as the location of production sites (should they be close to customers to enhance the customer service or located in low-cost countries to reduce costs?), the choice of manufacturing technologies (should they be more automated to shorten the manufacturing lead time or less automated to use more labor?), the selection of suppliers (a low-cost supplier or a supplier with a short lead time?), etc. In this work, we propose a supply chain design model that includes lead times constraints. We then perform computational experiments in order to answer the above questions.

### 015-0453: Performance of Push, Pull, and Push-Pull Policies Under Demand and Lead Time Uncertainty in a Multi-Stage Supply Chain

*Santosh Mahapatra, Clarkson University, United States*

*Dennis Yu, Clarkson University, United States*

*Farzad Mahmoodi, Clarkson University, United States*

We analyze the performance of push, pull and push-pull operating policies in a three-stage supply chain. The policies differ in terms of their reliance on anticipatory and responsive operations and inventory policies to address uncertainties. We examine how demand uncertainty, lead time uncertainty, forecast errors, planning horizons and inventory control policies impact the fill rate and inventory levels.

200	Sunday, 3:30- 5:00, Galiano <b>Session:</b> Sustainability and Social Responsibility	<b>Track:</b> SCM, 31	<b>Chair:</b> Anu Bask
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### 015-0261: Channel Analysis in a Serial Supply Chain with Product Greening

*Debabrata Ghosh, Indian Institute of Management Bangalore, India*

*Janat Shah, Indian Institute of Management Bangalore, India*

In this paper, we examine a serial supply chain, the players of which initiate product "greening." We consider situations in which either a retailer or a manufacturer initiates the process. Our problem is motivated by recent developments in the supply chains of Wal-Mart and P&G, where each player initiates product greening. We build game theoretic models and show how greening levels are influenced by the decision maker in the supply chain. Using evidence from existing literature, we say that product greening has a positive impact on consumer demand. We show how joint and individual decision-making by the players in selecting the product greening level impacts prices, profitability of the channel members and the entire supply chain. The problem throws interesting results with respect to the above key decision variables.

### 015-0735: Concept for an Integrated Ecological and Economical Evaluation of Textile Industry Supply Chains

*Matthias Vodicka, ETH - Center for Enterprise Science (BWI), Switzerland*

*Stephan Verhasselt, ETH - Center for Enterprise Science (BWI), Switzerland*

*Philipp Bremen, ETH Zurich, BWI Center for Enterprise Science, Switzerland*

The recently emerging Lifestyle of Health and Sustainability (LOHAS) among customers uncovers new differentiation opportunities for the fashion industry. Regarding this, a combined evaluation of ecological and economical performance occurs as a key challenge. Since cost pressure in the textile industry resulted in complex and global supply chains, the selection of economically and ecologically well-performing suppliers is of major importance. However, neither the necessary criteria for an economical and ecological-oriented supplier evaluation nor the related methods

## Sunday, 3:30- 5:00 Sessions

supporting an efficient supplier evaluation process are clearly defined. With the aim to approach this gap, this paper discusses, based on the specific characteristics of textile supply chains, major requirements of evaluation methods for an economical and ecological supplier evaluation process. Moreover, this paper proposes a concept for an integrated approach of economical and ecological-oriented supplier evaluation in textile industries.

### 015-0413: Evaluation Model for Sustainability of Materials Management: Case Mobile Phone Industry

*Anu Bask, Aalto University School of Economics, Finland*

*Markku Kuula, Aalto University School of Economics, Finland*

*Maarika Kulmala, Aalto University School of Economics, Finland*

Corporate social responsibility and SCM have become important research topics during recent years. In this research, one highlighted area is sustainability. Sustainability issues have forced manufacturers to re-evaluate and develop their operations of materials management. Consequently, this study takes a holistic view to SCM management and corporate responsibility in terms of sustainability issues by developing a model for sustainability metrics for evaluating the sustainability of materials management in SCs. The model includes three issues: sustainable product design, sustainable sourcing and SC coordination, and sustainable product end-of-life management. The model is empirically tested to evaluate the level of sustainability of materials management in five mobile handset manufacturing companies operating in the European market. The position of company on each of dimensions determines the level of sustainability of the company's materials management in SCs. By using the model, it is possible to benchmark companies' current state of sustainability within an industry.

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Sunday, 3:30- 5:00, Grand Ballroom A

Track: SCM, 32

Chair: Hyun-cheol Choi

Session: Information Sharing

### 015-0906: The Value of RFID Technology Enabled Information to Manage Perishables

*Michael Ketzenberg, Texas A&M University, United States*

*jaqueline bloemhof, Wageningen University, Netherlands*

We address the value of RFID technology enabled information to manage perishables in the context of a supplier that sells a random lifetime product subject to stochastic demand and lost sales. The product's lifetime is largely determined by the time and temperature history in the supply chain. We compare two information cases to a Base case in which the product's time and temperature history is unknown and therefore its shelf life is uncertain. We formulate these three different cases as Markov decision processes, introduce well-performing heuristics of more practical relevance, and evaluate the value of information through an extensive simulation using representative, real world supply chain parameters.

### 015-0969: Value of Sharing Downstream Supply Chain Information and the Impact of Information Errors

*Hyun-cheol Choi, California State University Fullerton, United States*

*James Blocher, Indiana University, United States*

*Srinagesh Gavirneni, Cornell University, United States*

This paper investigates the benefits of sharing downstream supply chain information and the impact of errors in the shared information. We look at a two-stage serial supply chain where the downstream member, retailer, shares its demand information with the upstream member, supplier. We look at the system-wide total inventory costs when both the retailer and supplier use periodic review order-up-to policies. We analyze the order quantities mathematically to see where the cost differences are from. Then, we use simulations to numerically search for the optimal order-up-to levels for both retailer and supplier over various operational factors, to compare the system inventory costs before and after information sharing and when there are information errors. We found that downstream information sharing is beneficial even when there is a minor degree of errors, but as the error magnitudes become large, the benefits are washed away.

### 015-0598: Preference-based Semantic Models for Supply Chain Partnership Using Ontology

*Hae Kyeong Lee, Kyungshung Univ., Korea, Republic of (South Korea)*

*Tai oun Kim, Kyungshung univ., Korea, Republic of (South Korea)*

In the value chain, a product is composed of component parts. Each part is supplied by the appropriate supply partners. Though common criteria for a partner selection can be such factors as technological capability, quality, price and consistency, etc., importance weight among criteria may vary depending on the characteristics of the part. For example, quality factor may be most important for the core function part compared to other factors. On the other hand, price or cost can be top priority for standardized non-core parts. The purpose of this research is to develop a preference-based semantic model for the supply chain partnership depending on characteristic of parts. The knowledge model can be sharable and reusable among participating vendors in the value chain. To this end, partner selection ontology is constructed, and then, preference-based reasoning model for the selection of appropriate partners is provided according to component characteristics.

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Sunday, 3:30- 5:00, Grand Ballroom D

Track: HOM, 19

Chair: Pablo Santibanez

Session: Cancer Care Operations

### 015-0790: Analysis of Ambulance Diversion Policies Using Simulation

*Adrian Ramirez, School of Computing, Informatics and Decision Sys Engg, Arizona State University, United States*

*John Fowler, Sch of Computing & Decision Sys Engg, Arizona State Univ, United States*

*Teresa Wu, School of Computing, Info. & Decision Syst Engg, Arizona State Univ., United States*

*Esma Gel, School of Computing, Info & Decision Syst Engg, Arizona State Univ., United States*

Ambulance Diversion (AD) is a strategy used by decision makers of Emergency Departments (EDs) to relieve congestion from their facilities.

## Sunday, 3:30- 5:00 Sessions

research uses simulation-based modeling and design of experiments to analyze the impact of diversion policies on the bi-criteria performance of the ED. The policies studied are designed considering the main factors contributing to diversion according to literature, including the number of patients waiting in the ED, the number of patients boarding and the occupancy of the inpatient units.

### 015-0797: Census Smoothing Through Hospital Admission Control

*Jonathan Helm, Department of Industrial and Operations Engineering, Univ. of Michigan, United States*

*Mark Van Oyen, Dept of Ind & Operations Engg, University of Michigan, United States*

The census level in many hospitals is subject to significant and unpredictable fluctuations. Census uncertainty leads to emergency patient blockages, elective cancellations, and patients placed off their preferred unit, among other operational difficulties in the hospital. Studies have shown that a significant driver of census instability is, in fact, inpatient admissions. This talk links inpatient admissions decision making to census variability and patient flow bottlenecks and introduces a decision making paradigm for controlling inpatient admissions to smooth the census and improve the flow of patients through the hospital. The admission control policies presented are based on optimization of stochastic control models, with respect to patient service and hospital cost criteria, and serve to simultaneously reduce hospital cost and improve service to the patient population.

### 015-0810: Understanding Wait Times in the Emergency Department: A Systems Modeling Approach

*Thomas Rohleder, Division of Health Care Policy and Research, Mayo Clinic, United States*

*David Cooke, Haskayne School of Business, University of Calgary, Canada*

*Paul Rogers, Schulich School of Engineering, University of Calgary, Canada*

We present a system model of patient flows in the Calgary Health Region (CHR) for the purpose of improving our understanding of health system dynamics and their impacts on waiting times in hospital emergency departments. The model arose from a qualitative study of the problem of overcrowding in CHR emergency departments, which suggested that emergency department (ED) congestion was in part a manifestation of capacity limitations elsewhere in the health care system. Here we describe our progress in developing a quantitative model that seeks to understand how the broader health care system affects the behaviour of the ED system.

### 015-0858: An Ounce of Prevention: Revenue and Cost Economics of Partnering with Health and Wellness Services

*Sameer Kumar, University of St. Thomas, Opus College of Business, United States*

The purpose of this study is to evaluate whether an outside health and wellness services operation partnering with a business organization can influence and improve the health attitudes and behaviors of its employees and increase productivity, which results in reduced healthcare costs and increased revenues. An in-depth analysis was performed of a company that operates in the health and wellness industry, servicing six clients. Surveys of employees were conducted in three of the company's clients; each client company belongs to a different industry. This study increases awareness of the partnership of health and wellness services operations and business organizations, and the impact that kind of business interaction has on employee attitudes and behaviors. Each company has situational considerations, which will allow for wide applicability across the spectrum of industry types. This paper also details the revenue and cost ramifications of partnering with a health and wellness organization.

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Sunday, 3:30- 5:00, Granville

Track: PITM, 13

Chair: Gulru Ozkan

Session: Managing Knowledge and Complexity in New Product Development

### 015-0727: Knowledge Transfer in New Product Development Projects

*Wenli Xiao, Georgia Institute of Technology, United States*

*Cheryl Gaimon, Georgia Institute of Technology, United States*

*Janice Carrillo, University of Florida, United States*

Two models are introduced (continuous and discrete) that characterize linkages among three stages of knowledge creation for engineering activities in an NPD project: prototyping, pilot line testing, and on-line experimentation. The manager determines the optimal investments in pursuing each activity which drive the levels of prototyping knowledge, pilot line knowledge, and on-line knowledge, respectively. An important feature of our research is that we recognize that by transferring prototyping knowledge to the pilot line testing stage, the manager enhances the creation of knowledge at the pilot-line stage. Similarly, transferring pilot line knowledge enhances the creation of knowledge from on-line experiments. In one model knowledge is continuously transferred between stages; in the other model we determine the discrete time(s) and quantities of knowledge to be transferred. Finally, we provide a deep understanding of the nature of knowledge transfer by analyzing how various parameters drive different solutions for both models.

### 015-0673: The Influence of Portfolio Complexions on Learning

*Mark Jacobs, University of Dayton, United States*

*Morgan Swink, Michigan State University, United States*

Portfolio complexity is logically shown to influence both learn-by-doing and double-loop learning. It is also logically shown to influence learning via the experience curve and learning via variety. Using objective data, measures of portfolio complexity are developed which reveal the role of portfolio complexity in driving learning via experience versus learning via variety.

### 015-0599: Streamlining New Product Development (NPD) in Aerospace Through Knowledge-based Engineering (KBE)

*Angelo Corallo, S.S. ISUFI, University of Salento, Italy*

*Alessandro Margherita, S.S. ISUFI, University of Salento, Italy*

*Giampaolo Pascali, S.S. ISUFI, University of Salento, Italy*

*Giuseppe Turrisi, S.S. ISUFI, University of Salento, Italy*

## Sunday, 3:30- 5:00 Sessions

This paper analyses the potential of knowledge-based engineering (KBE) methods and tools to streamline new product development (NPD) processes. In particular, design activities are investigated as a crucial context for process optimization in the aerospace industry. Based on a four-year collaboration with a leading company, the article shows the development of new processes and software tools which reduced sensibly the time and cost for designing key parts of aircraft engines, with indirect benefits on product quality. The paper can be a proof-of-concept for similar implementations in complex engineering sectors as the study combines discussion of technical aspects of modelling with strategic issues related to design and NPD performance. The process-based analysis and estimate of benefits achieved can help operation managers to better understand the uses and business value of KBE methods in the frame of process innovation and product development initiatives.

### 015-0779: Managing New Product Development Knowledge for Competing Firms: Case of Joint Development

*Gulru Ozkan, Clemson University, United States*

*Cheryl Gaimon, Georgia Institute of Technology, United States*

We introduce a two-period stochastic Stackelberg game on knowledge management (KM) strategies that drive NPD activities of two competing firms. In period one, the leader and the follower determine the amount of knowledge to share (KS) (patents, employee transfers) with each other for joint development of a new product. In period two, firms invest jointly in knowledge development (KD) (problem solving, experimentation, training). They maximize the net revenue from the product they jointly release at the end of the second period, whose value is driven by the knowledge embedded into the new product, minus the cost of KD and the opportunity cost due to KS. Sources of uncertainty considered are customer's valuation of the knowledge embedded in the new product and firms' ability to integrate the knowledge shared into the new product. Through optimal solutions, the impact of firm and market characteristics on KM decisions are analyzed.

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Sunday, 3:30- 5:00, Junior Ballroom A

Track: PITM, 14

Chair: Sinan Erzurumlu

Session: Entrepreneurial Operations

### 015-0062: Optimal Time Allocation Policy for Entrepreneurial Process Improvement

*Onesun Yoo, UCLA Anderson School of Management, United States*

*Charles Corbett, UCLA Anderson School of Management, United States*

*Guillaume Roels, UCLA Anderson School of Management, United States*

For many entrepreneurs, the main bottleneck resource of their company is their time, rather than cash. In this paper, we develop a dynamic time-management framework for entrepreneurial process improvement for contexts where time is more constrained than cash, and provide clear guiding principles for time management. We classify an entrepreneur's daily activities into four categories: fire-fighting, process improvement, revenue enhancement, and revenue generation, and analyze a stylized dynamic time allocation problem for maximizing long-term expected profits. We find that entrepreneurs should first invest time in process improvement until the process reliability reaches a certain threshold, then in revenue enhancement until the revenue rate reaches a certain threshold, and only then spend time generating revenue. Also, entrepreneurs with lower initial revenue rates should invest more time in process improvement and in revenue enhancement, ultimately earning revenue at a higher rate than if they were endowed with a higher initial revenue rate.

### 015-0048: Employees' Break-offs and the Birth of Industrial Clusters

*Moren Levesque, York University, Canada*

*In Hyeock Lee, Western Kentucky University, United States*

*Maria Minniti, Southern Methodist University, United States*

Several industrial clusters originate from employees who break off and locate their new firms close to former employers. The reasons for such a choice are complex and include a variety of costs' considerations. We present a two-player three-stage simultaneous game with interdependent decisions concerning break-offs, deterrent compensations, location, and profit maximizing production outputs. The structure of the game explains under what conditions a break-off is desirable, what location's choice makes it optimal, and why the break-off process may lead to the birth of a cluster. We demonstrate how changes in a firm's marginal production/congestion cost, R&D investment level in a region, and market size, all influence the likelihood of break-offs and their subsequent location decisions. Our results provide a rationale for why, in industries in which technology plays a significant role, an increase in R&D investment in the region may encourage the break-off firm to locate away from the incumbent.

### 015-0853: A New Approach for the Development of Academic Spin-offs

*Leonardo Gomes, University of São Paulo, Brazil*

*Mario Salerno, University of São Paulo, Brazil*

*Vahid Vahdat, University of São Paulo, Brazil*

This article proposes a new approach to the process of development of academic spin-offs. Traditional approaches interpret this process as linear and sequential, consisting of steps and decision points. In this paper, we propose the development of spin-offs as a process of building and mobilization of knowledge, culture, information and resource networks. This new approach allows us to understand how entrepreneurs manage the complexity and unpredictability that are present in the creation of a new business. We use insights from the literature on social networks, the concept of Open Innovation and management of ecosystems and communities, as well as a case study to understand how researchers can convert a technology born in a non-commercial environment - a university - into a new firm.

### 015-0054: Overcoming the Credit Squeeze: Financing and Operational Risks at Clean Technology Startup Firms

*Sinan Erzurumlu, Babson College, United States*

*Nitin Joglekar, Boston University, United States*

*Fehmi Tanrisever, TU/Eindhoven, Netherlands*

At different business development stages a clean technology startup bears various and unique investment and growth opportunities as well as risks.

## Sunday, 3:30- 5:00 Sessions

a framework that conceptualizes the financial and operational risks, benefits and biases of the clean energy startups.

205	Sunday, 3:30- 5:00, Junior Ballroom B Session: OMM15	Track: OMM, 15	Chair: Suresh Sethi
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### 015-0535: Manufacturer's Promotional Support in a Dynamic Retail Duopoly

*Xiuli He, The University of North Carolina at Charlotte, United States*

*Anand Krishnamoorthy, University of Central Florida, United States*

*Ashutosh Prasad, UT Dallas, United States*

*Suresh Sethi, The University of Texas at Dallas, United States*

A nearly explicit feedback Stackelberg equilibrium is obtained in a dynamic distribution channel consisting of a manufacturer and two competing retailers engaged in promoting the manufacturer's product to be sold through one or both of the two retailers. The manufacturer decides on its support for the retailers' advertising activities by announcing cooperative advertising subsidies called "participation rates." The retailers compete for market share by selecting advertising efforts. We formulate the problem as a Stackelberg differential game and find that the manufacturer should offer the cooperative advertising policy to only one retailer, and even then, only when a "participation threshold" is exceeded. We identify the levers that determine the optimal participation rate, and show that retail-level competition induces the manufacturer to offer a higher level of subsidy to the supported retailer and over a wider range of parameters when compared to the results obtained in a one-manufacturer, one-retailer setting.

### 015-0600: Product Quality and Process Innovation Incentives

*Jasper Veldman, University of Twente, Netherlands*

In current OM literature, increasing attention is paid to the alignment of conflicting manufacturing and marketing objectives. In this paper, I model a manufacturing manager's incentive contract as a function of process innovation, product quality and profit. I thereby respond to a lack of understanding in OM research of the role of process innovation incentives and their relationship with other organizational objectives. A three-stage game theoretic model is developed that considers principal-agent pairings in a competitive setting. In the first stage, a firm owner offers his manager an incentive contract. In the second stage, optimal process innovation and product quality levels are chosen. In the third stage, a price is set and the market clears. Analysis of the relevant Nash equilibria reveals that the manufacturing manager's contract is non-negative everywhere, suggesting that incentives can be designed such that conflicting objectives are aligned. Comparative statics exercises and theoretical implications are discussed.

### 015-0680: The Moderating Role of Market Orientation in the Competitive Strategy - Operations Strategy Link in a Developing Economy

*Kwasi Amoako-Gyampah, University of North Carolina at Greensboro, United States*

*Moses Acquah, University of North Carolina at Greensboro, United States*

*Jayanth Jayaram, University of South Carolina, United States*

Operations management researchers have emphasized the importance of operations strategy in the formulation and implementation of a firm's competitive strategy. What has not received much research attention is whether operations strategy's role in the implementation of competitive strategy is enhanced through a market orientation strategy. This study examines the moderating role of market orientation on the relationship between competitive strategy and operations strategy among firms in Ghana. Given that large and small firms differ in terms of their organizational structures, resource availability and deployment, and innovativeness, their operations and competitive strategies may also be different. Thus, we also examine if differences exist between large and small firms. Our results show that market orientation moderates the competitive strategy-operations strategy relationship. Differences exist between large and small firms. The results have implications for firms in developing countries as they seek to become the next source of low-cost operations.

206	Sunday, 3:30- 5:00, Junior Ballroom C Session: Specialization in Healthcare Delivery	Track: HOM, 20	Chair: Liam O'Neill
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### 015-0695: Labor Scheduling in a Healthcare Company Considering the Welfare of its Employees

*JUAN OREJUELA, UNIVERSIDAD DEL VALLE, Colombia*

*DIANA PEÑA, UNIVERSIDAD DEL VALLE, Colombia*

*NEPTALÍ BUSTAMANTE, UNIVERSIDAD DEL VALLE, Colombia*

The Labor Scheduling Problem consists of planning the shifts for the employees, and minimizing costs associated with the workforce. This paper presents a mixed integer linear programming model that minimizes labor costs, satisfies the requirements of demand, establishes adequate working conditions for employees by incorporating constraints that ensure well-being to generate an optimal assignment of physiotherapist shifts in the intensive and intermediate care areas in a Clinic, and maintains an adequate level of service to optimize available capacity usage. For this, we considered that the Labor Scheduling Problem involves various factors such as the company, employees, demand requirements and Legislation, so it is necessary to achieve a balance between these factors. The model was implemented in the AMPL programming language and the computational tool was CPLEX® 11.1.

### 015-0732: Applying Manufacturing Flow Theory to Health and Social Care Management

*Roy Stratton, Nottingham Trent University, United Kingdom*

The concepts of flow and continuous improvement are central to production management theory, and there is growing evidence of their successful application in health and social care. In manufacturing, this development has been led by lean and the theory of constraints (TOC), and there are now similar parallels emerging in health and social care management. However, there is little research evidence that investigates the nature of the

## Sunday, 3:30- 5:00 Sessions

conceptually/theoretically integrated?

### 015-0388: Colorectal Cancer Screening with Resource Constraints

*Evrin Gunes, Koc University, Turkey*

*Derya Kunduzcu, HSBC Bank, Turkey*

*Lerzan Ormeci, Koc University, Turkey*

This work focuses on colorectal screening with colonoscopy and investigates the implications of resource constraints and scheduling policies on health outcomes. Colonoscopy has gained popularity recently as the most accurate test for screening. In addition, it is required for the final diagnosis, before treatment can be started. Using a population dynamics model, we first investigate the implications of increasing compliance rates for screening with a limited colonoscopy capacity. Second, we evaluate alternative scheduling policies. Our results show that if compliance increases without increasing the capacity, benefits from screening will not be fully realized. Moreover, since colorectal cancer progresses slowly, prioritizing the diagnostic procedures over screening procedures is found to be a viable policy.

### 015-0191: Scheduling Physicians in a University Clinic

*Umar Al-Turki, King Fahd University of Petroleum & Minerals, Saudi Arabia*

Efficient scheduling of scarce resources is a common need of health institutions, including clinics serving small communities. This study focuses on increasing the utilization of physicians in a small clinic by rescheduling their working hours to meet the daily demand with minimum waiting times, taking into consideration physicians' preferences. A combination of several optimization techniques are deployed to achieve the intended objective including simulation, mathematical modeling and heuristics. Alternative schedules were generated for the management to select from.

### 015-0493: Resource Management in Emergency Preparedness

*Davood Golmohammadi, UMASS Boston, United States*

*Mohsen Jafari, Rutgers University, United States*

In this paper, the crucial role of resource management during an emergency situation in a hospital environment is addressed and analyzed. We propose a methodology to help the incident managers allocate their available medical and non-medical staff members to the areas of the hospital undergoing emergency evacuation.

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Sunday, 3:30- 5:00, Junior Ballroom D

Track: SOHL, 15

Chair: Ignacio Castillo

Session: Closed-loop Supply Chain Models

### 015-0144: Hybrid Manufacturing/Remanufacturing Model of Cascade Reuse in Closed-loop Supply Chain

*Yasutaka KAINUMA, Tokyo Metropolitan University, Japan*

In this research, we constructed a cascade reuse hybrid manufacturing/remanufacturing model in a closed-loop supply chain with consideration for production and environmental problems. We proposed an optimal ordering policy minimizing manufacturer's total costs when manufacturing two grades of products. The total cost of the manufacturer includes ordering cost of parts, holding cost of products and opportunity loss cost. To minimize the total costs, we formulated the ordering quantities of new and reused parts as a newsvendor problem.

In the data examples, comparing the proposal policy with the policy of the company-A, we confirmed the optimality of the proposal policy. Consequently, if we can know the distribution demand, cost and stock quantity, we showed the optimal ordering policy is more efficient.

### 015-0295: Comprehensive Cost Modeling of Reusable Containers in Food Distribution

*William Sawaya, Texas A&M University, United States*

*Michael Johnson, Texas A&M University, United States*

*Sri Jayanty, Texas A&M University, United States*

As the notion of environmental sustainability moves into the forefront in public policy and in the management of environmental conscious organizations, technological advances in plastics, packaging, cleaning, logistics, and the world economic environment stimulate changes in the relative cost structures of utilizing recyclable, reusable, or disposable container technologies. Developing comprehensive systems of evaluation provides the platform for informed decision making for businesses and government agencies that are making strategic decisions or implementing policy reform affecting the sustainability of delivery systems. This research focuses on calculating the costs associated with process of implementing the complete system to reuse plastic containers for food products including the manufacture, reconditioning, and reverse logistics associated with such efforts in a systematic and extensible format to inform decision makers.

### 015-0402: Reverse Supply Chain Coordination for E-waste Recycling Based-on Option Contract

*Zhiduan Xu, School of Management, Xiamen University, China*

In reverse supply chain of e-waste, collectors and processors play key roles and have connections based on interests. We present a Stackelberg leader (collector) - follower (processor) dynamic game model with profit maximization purpose. When the supply and demand are relatively clear, major risk for processor comes from the uncertainty of price; if the price at which raw material is sold to manufacturer is not enough to compensate for buying, processing and possible land filling e-waste, processor is unable to make profit. So we propose an option contract in which the collector will buy raw material from the processor at a fixed price in the future. This option will guarantee the processor's profitability and increase her effort to order more e-waste from the collector. We show that this contract is Pareto improving in the majority of cases. Our results also indicate that the profit improvement to both parties, and the supply chain is substantial.

### 015-0746: The Optimal Collection Structures in a Closed-Loop Supply Chain with Competition

## Sunday, 3:30- 5:00 Sessions

*Hamidreza Faramarzi, Wilfrid Laurier University, Canada*

*Ignacio Castillo, Wilfrid Laurier University, Canada*

We consider a closed-loop supply chain in which the remanufacturing is done by a separate firm from the manufacturer. As a result, there is a competition between the manufacturer and remanufacturer in addition to the vertical differentiation between the new and remanufactured products. The products are sold through a retailer, and we take into account a third-party to whom the core collection could be subcontracted. We find under what conditions it would be better to subcontract the core collection to the third-party versus to have the collection done by the remanufacturer. In addition, we analyze the impact of competition in the chain on the optimal decisions.

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Sunday, 3:30- 5:00, Orca

Track: CIM, 13

Chair: Nicolle Panzuto

Session: Teaching and Case Studies in Inventory and Capacity Management

### 015-0586: Teaching of Inventory Management in Virtual Worlds

*Ian Graham, University of Edinburgh Business School, United Kingdom*

This paper describes and evaluates the use of a virtual world to teach operations management. The exercise uses a Second Life simulation of a machining factory and the supplier of their forgings. Each student is assigned a specific role and can visit the factory in Second Life, liaise with co-students and use the simulation interface to make the management decisions associated with their role. The structure of the exercise forces students to collaborate to ensure that their decisions are consistent and allows them to explore the use of ERP systems, capacity planning, SPC and Taguchi experiments.

### 015-0037: Call-Off Production, Triggered by the Traditional Kanban Card or by Electronic Kanban: A Case Study at Ericsson

*Stefan Eriksson, University of Gävle, Sweden*

This study analyses a concept for materials supply, called call-off production, used by the telecom company Ericsson, where a case study was performed. Call-off orders are initiated from the production area and submitted directly to an external supplier without any traditional purchase ordering process. In the call-off production concept Ericsson applies two forms of kanban for triggering the replenishment, namely the traditional kanban card and electronic kanban. For both variants, call-off production implies a short lead time, the potential for controlling tied-up capital, few resources, and a high level of delivery service. However, the study indicates that the traditional kanban card could be the more beneficial variant for inventory accuracy. On the other hand, electronic kanban requires less manual handling. To conduct the analysis, a theoretical framework and an analysis model were created as a foundation.

### 015-0032: Analysis of Inventory Management in a Small Business

*Nicolle Panzuto, Universidade do Sagrado Coração, Brazil*

*Paulo Rodrigues, Universidade do Sagrado Coração, Brazil*

The objective of this study was to analyze the production process and supply control in order to identify possible gaps and develop a method for managing supplies. The relevance of this research is on the benefits that can obtain by identifying the problems of supply control. The research method used was the case study, which was grounded on tripod semi-structured interviews, on-site observation, and document analysis. This methodology was very suitable because it can be analyzed and cross checked. The possibility of implementation of the proposal obtained from the theoretical framework, that together with the complementary actions suggested here, offers the opportunity to make the process more productive and profitable. This work allowed one to observe the weaknesses in managing the supply chain and at what points to work should be improved. It allowed to use some scientific models in the company object of study in order to improve supply management.

### 015-0161: Multicriteria Rank Aggregation Methods for ABC Inventory Classification

*Anteneh Ayanso, Brock University, Canada*

*Reena Yoogalingam, Brock University, Canada*

The ABC classification system is the traditional method used to maintain efficient control over the large numbers of items firms carry in inventory. This system uses a single criterion, typically annual dollar usage, to determine groupings of the items. This works in cases where all items are homogeneous and differ in terms of this criterion. In many cases, the items held in inventory are not homogeneous and may differ in terms of other criteria such as lead time and criticality. Many multicriteria methods proposed in the literature are computationally intensive, which may not be effective from an operational standpoint. In this paper, we propose computationally efficient multicriteria rank aggregation methods to develop a multidimensional ranking of items and compare the resulting groupings with existing methods.

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Sunday, 3:30- 5:00, Parksville

Track: EROM, 13

Chair: Bello-Pintado  
Alejandro

Session: Quality Management

### 015-0327: Contribution of Total Productive Maintenance Practices to Quality Performance: Empirical Evidence from Japanese Manufacturing Plants

*ANH PHAN, Yokohama National University, Japan*

*YOSHIKI MATSUI, Yokohama National University, Japan*

In Japan, the implementation of Total Productive Maintenance (TPM) is regarded as building up a continuous improvement culture and system to achieve zero breakdowns, zero accidents, zero defects and zero waste by involving all functions and all workforces. This paper presents the results of an empirical analysis on the contribution of TPM practices to the quality performance of Japanese manufacturing plants. This study uses the survey data collected from 35 manufacturing plants during 2003-2004 in Japan. Regression analysis is used to analyze the relationship between the variables. Results of the analysis demonstrate that TPM practices are intensively used to achieve superior product quality in Japanese plants. Autonomous maintenance, team-based maintenance, and preventive maintenance significantly improve multi-dimensional quality performance. In

## Sunday, 3:30- 5:00 Sessions

addition, we found that effective implementation of TPM highly relates with organizational supports such as cross-functional training for employees and shop-floor information feedback.

### 015-0607: The Use of Quality Practices in Emerging Economies: Determinants and Impact of Performance in Latin America

*Alejandro Bello-Pintado, Universidad Pública de Navarra, Spain*

*Javier Merino, Universidad Pública de Navarra, Spain*

The progressive implementation of the ideas and techniques related to the concept of Quality Management is perhaps the most patent expression of the change and innovation which has taken place in organisations in recent years. The aim of this article is threefold. First, we describe the implementation level of quality management practices in southern Latin America. Second, we analyse the level of adoption of Quality Management (QM) practices in relation to a number of structural, internal and environmental factors. The data used are taken from a wide sample of Argentinean and Uruguayan industrial plants (301). Our results reveal that multinational and technological advancement of firms is positively related to acceptance and practice of QM techniques. The use of these practices allows firms to achieve better manufacturing performance.

### 015-0794: Manufacturing Strategy and Technology Operations Practices: An Empirical Study for Machinery Plants

*Iván Arana, Tecnológico de Monterrey. Campus Estado de México- University of Seville, Mexico*

*Cesár Ortega, UNAH-University of Seville, Spain*

*José Domínguez Machuca, University of Seville, Spain*

*José Pérez, University of Seville, Spain*

We will show results of an ongoing work, which examines links between a manufacturing strategy set of operations practices and a technology set. Their link is being tested by selection/congruency fit, using data from machinery plants from 10 countries. We do not expect to find significant fit between both sets. This is contrary to the selection fit found between practices sets of manufacturing strategy and technology in the auto supplier sector presented here in another paper. Due to industry differences, the machinery sector may present a state of disequilibrium for the manufacturing strategy set of practices, which may have large deviation from the optimum of the technology set to cause variations in performance, which cannot be measured by this method. This doesn't necessarily mean there is no relationship between these practice sets, but in order to test closeness of performance deviations, another fit method would be needed such as interaction.

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Sunday, 3:30- 5:00, Pavilion Ballroom A

Track: PLQ, 13

Chair: David Cantor

Session: Energy and environment

### 015-0055: Integrated Management Systems in Industrial Companies of the São Paulo State – Brazil

*José Oliveira, UNESP - São Paulo State University, Brazil*

*Jeniffer Nadea, UNESP - São Paulo State University, Brazil*

*Otávio Oliveira, UNESP - São Paulo State University, Brazil*

The integrated management systems of quality, environment and safety represent significant competitive advantages for organizations. The aim of this paper is to present, through the case study method, the main characteristics of integrated management systems in five industrial companies of the São Paulo State, Brazil, highlighting its positive aspects and difficulties. The main benefits of this kind of system in the companies studied are: improvement of internal and external customers' satisfaction, company image enhancement, better use of resources, waste reduction, and increase of the internal communication efficiency. The resistance to change is greatest difficulty of these firms.

### 015-0371: Examining Factors that Enhance Employee Willingness to Engage in Environmentally Friendly Practices

*David Cantor, Iowa State, United States*

*Paula Morrow, Iowa State University, United States*

*Frank Montabon, Iowa State University, United States*

The focus of our research is to understand how employees can be encouraged to work on environmental practices at their respective companies. Drawing upon the organizational theory and environmental management literature, we develop a model of factors that contribute to an employee's willingness to engage in environmental initiatives. We empirically test our model using survey data from employees across several organizations. Our research builds upon past environmental management research of Ramus and Steger (2000), Gattiker and Carter (2010), and Sarkis et al. (2010), among others.

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Sunday, 3:30- 5:00, Pavilion Ballroom B

Track: GENL, 12

Chair: Harrison Mark

Session: Current and New Directions in POM

### 015-0576: Project Portfolio Management: Literature Review

*Daniela Marzagão, Escola Politécnica da Universidade de São Paulo, Brazil*

*Ana Paula Lopes, Escola Politécnica da Universidade de São Paulo, Brazil*

*Marly Carvalho, Escola Politécnica da Universidade de São Paulo, Brazil*

Project portfolio management has been gaining importance in project management in recent years. The objective of this study is to describe the present academic research using the method of bibliometric analysis combined with quantitative analysis. The authors are identified in the database ISI Web of Science, 58 articles published in 39 different journals, covering a period of 15 years, published from 1994 to 2009. In this study, the relevant themes on portfolio management were: a discussion of process models of portfolio management, the risk analysis and financial projects, the need for models of decision making based on quantitative and qualitative information, the impact of portfolio management in areas such R&D, product development, information technology and the pharmaceutical industry. The predominant theme is the selection of projects.

## Sunday, 3:30- 5:00 Sessions

### 015-0508: **Portfolio Management: A Quantitative Study of its Implementation and Challenges Found**

*Daniela Marzagão, Escola Politécnica da Universidade de São Paulo, Brazil*

*Marly Carvalho, Escola Politécnica da Universidade de São Paulo, Brazil*

Portfolio Project Management (PPM) is an issue that is evolving over time. This activity links strategic activities with the project development routine. The goal of this work is to identify the current state of PPM in Brazilian companies and the relationship between this state and the issues and challenges found. This relationship was established by using quantitative data of a survey applied to 45 companies. The data was analyzed using partial least squares (PLS) method, allowing the construction of structural equations. The results find that the most companies are actually using PPM tools, but there's still some improvement to be made, such as resources allocation, power-based project selection and quality of information used. These challenges are statistically related to the categorization of the projects, the selection tools used, to feedback from current projects to strategic planning and to the senior management participation in this process.

### 015-0085: **Design of a Two-station Residential Kitchen**

*Mark Harrison, Daniel Webster College, United States*

We report on the design of an unusual two-station (two-cook) residential kitchen. The design analysis considered material flow, layout, equipment, human factors, esthetics, and client tastes; the design goal was to produce a kitchen that worked well for either a single cook or for two cooks working simultaneously. Thinking through the work systems for the kitchen revealed some shortcomings in the traditional "kitchen triangle" approach to residential kitchen layout (specifically, the lack of a garbage / recycling station and the lack of a microwave oven). Subsequent operating experience corroborated the conclusions of the design analysis.

### 015-0844: **Green Supply Chain Management: The State-of-the-art Literature Review on Production, Logistics and Operations Journals**

*Letícia Labegalini, Fundação Getúlio Vargas, Brazil*

*João Csillag, Fundação Getúlio Vargas, Brazil*

*Sylmara Goncalves Dias, Pontifícia Universidade Católica de Sao Paulo, Brazil*

Today, environmental issues challenge companies in the face of the increasing scarcity of resources, consumer awareness, environmental laws and visibility of the environmental impacts caused by the supply chains operations (VACHON, KLASSEN, 2006). Therefore, environmental management in the supply chain has been receiving increasing attention among researchers and managers, through the Green Supply Chain Management. It covers product design, supply and material selection, manufacturing processes, final product delivery to consumers and management of the product at the end of its useful life (SRIVASTAVA, 2007). This paper carried out a desk research on the studies on this theme, based on Srivastava's review (2007), among important national (Brazilian) and international journals in the area of management, logistics and operations. The result is a frame of reference of the theme through time, to show the scarcity of studies and the lack of an integrated view of the theme, and to drive future researches.

### 015-0092: **Exploring Boundaries between Music and Management: Musical Themes and Visions in Operations Management**

*Rita de Cássia Fucci-Amato, University of São Paulo, Brazil*

*Edmundo Escrivão-Filho, University of São Paulo, Brazil*

*João Amato-Neto, University of São Paulo, Brazil*

The aim of this paper is to present some possible approaches of the interface between music and operations management. First, some theoretical questions regarding to the relations between or among areas of knowledge (interdisciplinarity, transdisciplinarity, multidisciplinary etc.) are discussed. Second, some historical examples about music and its influence in many other sciences and in philosophy are presented. Third, the paper focuses on inter-relation between music and OM, pointing out some examples of this theoretical interaction in themes like management of musical groups and institutions, cultural and creative industries and goods, and ergonomics in the work of musical performers. The research was conducted by a bibliographic review in conference proceedings, Ph.D. and Ms.C. thesis, journals, books and other scientific sources in the areas of music and operations management.

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Sunday, 3:30- 5:00, Pavilion Ballroom C

Track: LM, 12

Chair: Don Warsing

Session: Empirical Logistics Research

### 015-0901: **The Role of Logistics Capabilities in Creating Supply Chain Resilience: A Country Comparison**

*Serhiy Ponomarov, University of Tennessee, United States*

*Mary Holcomb, University of Tennessee, United States*

Logistics and supply chain management capabilities, categorized into demand-, supply-, and information management groups, have been shown to lead to improved firm performance and sustainable competitive advantage. Capabilities, however, are often difficult to sustain under conditions of uncertainty. Yet supply chain operations have inbuilt uncertainty and risk, because they involve a multitude of processes and activities that are interrelated and mutually dependent. It is essential that firms understand these inherent vulnerabilities, and more importantly, build capabilities that efficiently and effectively manage them. This research examines the role of logistics capabilities in developing resilient supply chains designed to incorporate event readiness, provide an efficient response to critical events, and be capable of recovering to their original or better state post the disruptive event. A comparative analysis of North American to European Economic Area firms is also presented to demonstrate regional specifics and effectiveness of risk mitigation approaches.

### 015-0514: **Strategic Packaging Innovation – Standardized or Customized Packaging in the Telecom Industry?**

*Fredrik Nilsson, Lund University, Sweden*

*Magnus Fagerlund, Lund University, Sweden*

*Jonas Körner, Lund University, Sweden*

The importance of packaging has increased in several areas - not only in terms of efficient distribution and handling, but also with regards to marketing and bringing a more value-added approach to the product. Furthermore, with the rising concern for the environment, the packaging plays

## Sunday, 3:30- 5:00 Sessions

innovations. Based on case studies, field observations and interviews on markets around the world the paper is able to report that rigorous investigations and understanding is needed for each market or market type and that a customized strategy for packaging is preferable if considerations to logistics, market and environmental issues are being made.

### 015-0259: The Contributions of Logistics to Enhance Energy Efficiency in Freight Traffic

*Doris Humpl, University of Applied Sciences Steyr - Logistikum, Austria*

*Friedrich Starkl, University of Applied Sciences Steyr -Logistikum, Austria*

The paper describes strategies for enhancing energy efficiency in logistics. Modern logistics management is able to increase transport efficiency by means of innovative concepts. Nevertheless short periodic and low-inventory processes are responsible for a fast growth in freight traffic and are the reason for the affinity towards road haulage, which is responsible for the dependency on fossil fuels. Potential measures for enhancing energy efficiency in freight traffic and logistics range from technical approaches to comprehensive regional planning activities. These options will be demonstrated and constraints will be pointed out.

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Sunday, 3:30- 5:00, Pavilion Ballroom D

Track: HBOM, 9

Chair: Karen Donohue

Session: Behavioral Ops 4

### 015-0202: Behavioral Tendencies in Newsvendor Decision Making: Capturing the Chinese Perspective

*Yin Cui, Tsinghua University, China*

*Lucy Chen, National University of Singapore, Singapore*

*Jian Chen, Tsinghua University, China*

*Srinagesh Gavirneni, Cornell University, United States*

The extant behavioral OM literature on Newsvendor decision making has primarily focused on decision makers studying/working in the western hemisphere. China is the manufacturer for the world, its third largest economy, and accounts for a large portion of the global inventories. It is conceivable that the behavioral tendencies prevalent in Chinese decision makers are quite different from those currently recorded. In order to capture the Chinese perspective we conducted the Gavirneni and Isen experiment using Chinese decision makers and tabulated the differences and similarities when compared to their western counterparts. We observed that the Chinese decision makers are analytically superior, less comfortable with lack of information, and better at identifying and utilizing salvage values.

### 015-0213: Responding to the Lehman Wave: Sales Forecasting and Supply Management during the Credit Crisis

*Jan Fransoo, Eindhoven University of Technology, Netherlands*

We analyze the strong dip in the manufacturing industry seen at the end of 2008 and provide evidence from various sources that it was caused by cumulative de-stocking, triggered by the bankruptcy of Lehman Brothers. This de-stocking created a giant dampened wave, the so-called Lehman wave. We model the Lehman Wave using system dynamics and validate the model using data from Royal DSM. We show that aggregate supply chains behave according to well-researched beer game behavior. The model gives a very good prediction of sales development during the credit crisis. We provide insights into how these results can be used to improve sales forecasting and supply chain management during times of severe crises. We also show that the effects of the current financial crisis are far from over and suggest that our methods be used to predict sales during the year 2010.

### 015-0244: The Use of Framing to Improve Inventory Ordering

*Kenneth Schultz, University of Alberta, Canada*

*Joseph Thomas, Cornell University, United States*

*Johnathon Schultz, Cornell University, United States*

*Lawerence Robinson, Cornell, United States*

*John McClain, Cornell, United States*

We investigate the use of "framing" to influence order quantities in inventory decisions. Risk reflection is a human decision bias where questions that are framed to emphasize gain often induce risk-averse behavior, while those emphasizing loss often induce risk-seeking behavior. The Newsvendor inventory decision provides a simple case to test whether this occurs in Operations Management situations. We frame the decision emphasizing first profit and then cost. We get unexpected results. To investigate why, we conduct further experiments to explore the effects of both the question and the situation. In the process we discuss both the relevance of the findings and some of the difficulties inherent in behavioral research in Operations Management and in the application of theory to practice.

### 015-0311: Understanding Supply Chain Replenishment Decisions

*Luis Herrero Riaño, Zaragoza Logistics Center, Spain*

*Rogelio Oliva, Texas A&M University/MIT Zaragoza Program, United States*

*Santiago Kraiselburd, MIT Zaragoza Program / INCAE Business School, Spain*

Despite the growing use of supply chain management information systems to automate companies' inventory replenishment decisions, managers are still responsible for these decisions and often have authority to approve and/or modify the final replenishment decisions. There is evidence that biases, e.g., psychological or incentive-related, affect these replenishment decisions. In this paper, we present the results of a study of a retailer that has an automatic store ordering system but that allows category managers to override the system's decisions. Our data consists of over 300,000 decisions made by 60 managers over a period of several months. A more systematic understanding of how and when these biases affect decision making along with their consequences would benefit companies as they seek to improve their inventory decision making capability.

## Sunday, 3:30- 5:00 Sessions

214	Sunday, 3:30- 5:00, Port Alberni <b>Session:</b> Past Powerpoint: Engaging Students in Operations	<b>Track:</b> SOM, 8	<b>Chair:</b> Carrie Queenan
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**015-0337: A Competence Management and Knowledge-based Routing Framework for Call Center Optimization**

*Thierry Rakotobe-Joel, Ramapo College of New Jersey, United States*

*John Thomas, Ramapo College of New Jersey, United States*

A framework for call center profit optimization, using knowledge management and a self-learning model, is proposed. Simulation experiments of contact center with sorting-scheme based on customer satisfaction and servers tacit/explicit knowledge were used. Customers were first prioritized according to a push system, depending on their service needs and then on their satisfaction levels. Servers were initially assigned to customers according to their level of explicit knowledge, but later on, in a pull system, were allowed to bid on 'premium customers' depending on their experience and self-learned skills. We found out that allowing for servers' self-learning improves the call center performance when 'highly satisfied' customers were given priority processing. Similarly, customer loyalty correlates highly with high-satisfaction levels and directly translates into higher profit for call center operations. We also anticipate that implementing a simple competence management in call center operations will result in lower turnover and increased efficiency in such an environment.

**015-0405: Transient Solution of Call Center Staffing Problem**

*Ahmad Fakheri, Bradley University, United States*

*Farzaneh Fazel, Illinois State University, United States*

Analysis of data from a call center shows that during periods of rapid change in arrival rate, the management generally schedules more employees than their commercial software recommends, yet the service level is often below the target. The software recommendations are based on steady state assumptions, which are not valid during the periods of rapidly changing arrivals, indicating a need for mathematical models that account for the transient nature of the system. The transient behavior of the M/M/s systems is described by a set of differential equations. Difficulty in solving these differential equations has been a major obstacle, resulting in reliance on stationary models for prediction of the behavior of the queuing systems. We have developed a numerical solution technique using finite difference method that efficiently solves the state probability equations for systems of any size, allowing for the determination of performance measures of the actual unsteady problems.

**015-0200: Voting Machine Allocation to Achieve Equity**

*Michael Fry, University of Cincinnati, United States*

*Muer Yang, University of Cincinnati, United States*

*Ted Allen, Ohio State University, United States*

Recent elections in the US have been marred by long queues and accusations of systemic bias to affect election results. We develop methods for allocating direct-recording electronic (DRE) voting machines to precincts in local and national elections. Our goal is to both minimize voter wait times and to assure wait-time equity -- meaning that no subgroups of voters are penalized at the expense of others. Our solution methods combine queueing analysis, simulation and optimization in a service-system setting.

**015-0208: Capacity Planning Model for the Insurance Claims Operation**

*Uday Apte, Naval Postgraduate School, Graduate School of Business and Public Policy, United States*

*Richard Cavaliere, Saint Joseph's University, Department of Mathematics, United States*

We propose a model-based approach for capacity planning in the insurance claims handling process (CHP) - one of the most essential and critical functions of an insurance company. We develop generalized and multi-period models of CHP to capture relationships between claims handling capacity and operating characteristics of the CHP, such as the closing age of claims, closing rate, and the pending claims volume. By incorporating manpower-related equations to account for learning curve effects and staff turnover, we extend the Multi-Period CHP model to a Dynamic Capacity Planning (DCP) model, which can be used to determine the optimal hiring plan for claims reps. We illustrate how the proposed DCP model can be implemented through a numerical example patterned after real-life claims operations. The paper identifies a range of information-intensive services, forming some of the largest and fastest-growing segments of the economy, where the proposed DCP model is applicable.

215	Sunday, 3:30- 5:00, Port Hardy <b>Session:</b> GOSSM 7	<b>Track:</b> GOSSM, 7	<b>Chair:</b> Steffen Kinkel
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**015-0760: Changing Patterns of Production Relocation and Backshoring Activities in the Course of the Economic Crisis**

*Steffen Kinkel, Fraunhofer Institute for Systems and Innovation Research (ISI), Germany*

Relocation of production activities to emerging countries in Asia and Eastern Europe has become more and more important in recent years. However, backshoring activities of once offshored manufacturing capacities are relevant phenomena, too. Particularly cost-driven relocation activities show a tendency to "fail" and are relatively inflexible to changing environmental conditions. We use data from 1,484 German manufacturing companies to analyse changing patterns in firms' production relocation and backshoring behaviour, using structured probit analyses. We find that relocation activities declined significantly, whereas the level of backshoring activities has remained stable. Since the emergence of the economic crisis, particularly companies following a price leadership strategy are engaging in production relocation. Export-intensive companies tend currently towards more backshoring and (re-)concentrating of their production capacities. They valueate the benefits of higher capacity utilization and a superior relation of variable costs to fix costs higher than the option of producing partly at low-wage locations.

**015-0888: Effective Strategies for Improving Supplier Performance in an Outsourcing Environment: Lessons from a Canadian Retail Company**

*Kalinga Jagoda, Mount Royal University, Canada*

## Sunday, 3:30- 5:00 Sessions

**Slylar Anderson**, *Mount Royal University, Canada*

The globalized marketplace presents opportunities for firms to access resources that have not traditionally been available. The current retail clothing landscape has seen a shift in focus on its supply chain management process, and many companies are focusing on sourcing as a strategic tool to maintain their competitive advantage. Managing relationships within a complex supply chain provide challenges in evaluating, reporting and communicating. Designing effective systems to evaluate and report the performance of vendors is critical. Today, companies are focused on developing their own vendor improvement programs to fit their business objectives. These programs assist help to select the best possible tools and evaluation methods to ensure maximum efficiency with lowest operational cost. This paper describes the matrices, tools and methods used by a Canadian retail firm and highlight the approaches deployed to improve the firm's supplier performance and selection. The critical success and failure factors are also highlighted.

### 015-0915: Simulating Virtual Inventory Network of an R/M Integrated Supply Chain Using System Dynamics

**Qiaolun Gu**, *Tianjin University of Technology and Education, China*

An R/M (Remanufacturing/Manufacturing) integrated supply chain includes the forward supply chain and the reverse supply chain. There are many kinds of inventories in an R/M integrated supply chain, such as new-material inventory, new-parts inventory and new-product inventory in forward supply chain, usable-material inventory, usable-parts inventory, remanufactured-product inventory, used-product inventory and second-hand-product inventory in reverse supply chain. All of these inventories in an R/M integrated supply chain form the virtual-inventory-network. Comparing with the inventories in a traditional supply chain, the virtual-inventory-network has shown more and more dynamic complexity. In this paper, we will simulate the virtual inventory network of R/M integrated supply chain using system dynamics considering these inventories' collaboration. Based on the analysis of the structure and the features of the virtual inventory network, we will show how to establish system dynamics models for the virtual inventory network of R/M integrated supply chain, and give some management strategies for the members of R/M integrated supply chain.

### 015-0938: Designing Resilient Supply Networks in Uncertain Product Environments Using Financial Flow Information

**Surya Pathak**, *University of Washington, Bothell, United States*

**Jayanth Jayaram**, *University of South Carolina, United States*

**Charles Ramseyer**, *Univsersty of Washington, United States*

**Robert Leich**, *University of South Carolina, United States*

In recent times, supply networks have been characterized as complex networks with overlapping interconnections spanning multiple industries. Due to this nature, the resiliency of supply networks has become a growing area of interest. Existing literature on supply network resiliency primarily focuses on issues such as risk management, catastrophic failure of the entire network due to disruptions in a small portion of the network, resilience under targeted attacks and robust network design under uncertainty. Limited research exists in the area of supply network resiliency under non-disruptive situations, such as everyday network transactions arising due to sourcing decisions at different portions of the supply networks. We attempt to investigate this research gap and particularly focus on understanding and building a model of supply network resiliency arising from financial flow patterns in a complex supply network in uncertain and new product environments.

### 015-0537: A Strategic Cross-border Operations Framework: Pairing Processes and Channels with Emerging Economies

**Yan Cimon**, *Universite Laval, Canada*

**Simon Veronneau**, *Quinnipiac University, United States*

How do value chains extend to emerging economies? In today's economy, large and small organizations share increasingly international value chains. The purpose of this paper is to examine implications that may be drawn from new value creation patterns, in order to determine how emerging economies get to contribute to high-value portions in these chains. The automobile manufacturing sector in North America provides us with a glaring case in point. First, we examine how strategic operations are affected by coupling firms from both emerging and mature economies. Second, we examine what lessons the North American industry may lead researchers and practitioners to draw from ever increasing complex cross-border environments. Third, we present an agenda to improve sustainable partnerships between these two types of firms, since those from emerging economies play an increasing role in high-value activities. We conclude with managerial, policy, and research implications.

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Sunday, 3:30- 5:00, Port McNeill

Track: OEE, 7

Chair: Shuo Huang

Session: Modelling Inventory and Planning Systems

### 015-0833: Implementation of an Advanced Planning and Scheduling System (APS) in Market-driven Foundries

**Rodolfo Teixeira Jr**, *Unesp, Brazil*

The industrial sector of market-driven foundries is composed of small and mid-sized companies with little or no automation. They work with diversified production, involving several different metal alloy specifications in small tailor-made product lots. The characteristics and restrictions involved in a typical production environment at these industries challenge the formulation of efficient production schedules. This results in low use of resources, high level of in-process inventories and tardiness. This paper has the objective of analyzing the implementation of an advanced planning and scheduling system (APS) through the implementation and operation of an APS system in a foundry industry. Results indicate the use of APS systems as a viable tool to increase the efficiency of production scheduling in these industries.

### 015-0836: Proposal for Implementing an Advanced Planning and Scheduling System (APS) in an Electric Equipment Industry

**Rodolfo Teixeira Jr**, *Unesp, Brazil*

This paper has the objective to propose the implementation of an advanced planning and scheduling (APS) system in an electric equipment industry. This industry is part of an intensely competitive market and manufactures a large number of products through a production-oriented process. It employs a high diversity of raw materials while working with tight deadlines and maintaining quality at low costs. In turn, advanced planning and scheduling systems (APS) seek to increase production environment efficiency. This can be achieved by employing sophisticated mathematical and planning methods allowing the effective use of production resources, and by taking into account resources' finite capacity, thus

## Sunday, 3:30- 5:00 Sessions

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providing an effective alternative for improving industrial productivity. Results from analyzing the implementation and operation of an APS system in an electrical equipment industry verify the system's feasibility for the sector.

### **015-0940: Compensation Mechanisms Design in Inventory Systems with Customer-choice Behavior**

*Jian Chen, Tsinghua University, China*

*Shuo Huang, Tsinghua University, China*

*Nan Zhang, Tsinghua University, China*

We study a compensation mechanism design problem with customer-choice behavior in a continuous-review setting where production and demand arrival processes are both stochastic. When a stock-out occurs, the firm controls backorders based on certain compensation policies. Customers make decisions to maximize their utility. Two compensation mechanisms are designed to control backorders; they are uniform compensation and priority auction. We obtain the optimal stock-out price and order-up-to inventory level under each mechanism, and analyze the properties of the respective optimal policies. We find that: 1) the auction mechanism maintains a lower order-up-to level and results in greater profit than uniform compensation, and 2) auction usually benefits customers with relatively lower or higher impatience factors, but those customers with a medium impatience factor may be rendered worse off under this mechanism. We further show that both compensation mechanisms are suitable for products with a high unit profit and a high holding cost.

## Monday, 7:00- 8:30 Sessions

217	Monday, 7:00- 8:30, Finback <b>Session:</b> Managing Food Supply Chains	Track: SCM, 33	Chair: Zenon Michaelides
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**015-0321: A Comparative Study on Tracking and Traceability System of Meat Supply Chain**

*Shengnan Sun, Institute of Systems Engineering, Southeast University, China*

*Lindu Zhao, Institute of Systems Engineering, Southeast University, China*

Meat is a good source of nutrients, and meat supply chain plays a paramount role in everyday life. Due to recent food crises (e.g. BSE, and hand-foot-and-mouth disease) in the world, food safety and quality control have become a hot topic in mass media, especially the meat products. This paper first relies on extensive literature to describe the tracking and traceability system of meat supply chain used in developed countries from three aspects – supply chain mode, tracking and tracing technology, and management mechanism. Then for the purpose of comparison, the Chinese version of the tracking and traceability system is presented from the same aspects. Finally, improved suggestions for China's meat supply chain management are presented.

**015-0729: Managing Supply Chain Stability in the Grocery Sector**

*roy Stratton, Nottingham Trent University, United Kingdom*

Although the demand for grocery products is inherently stable, the supply chain ordering process commonly imposes instability that has a detrimental effect on service level, shelf life and efficiency. This paper reports on two such case studies, where created demand instability was eliminated with benefits for all parties. The paper explains and quantifies the improvement achieved in attempting to address how and why common management practice encourages such instability.

**015-0877: Development of a Demand-Driven Internet-enabled Planning, Control & Distribution System in the Food Processing Supply Chain Sector**

*Zenon Michaelides, The University of Liverpool, United Kingdom*

*Roula Michaelides, The University of Liverpool, United Kingdom*

The supply of staple foods has become increasingly competitive as a result of the economic downturn due to the collapse of global markets; it has also become unpredictable, as a result of seasonal variations due to extreme weather phenomena associated with global warming. This case study describes the development of a demand-driven Internet-enabled "pull" system, which was used in the perishable foods supply chain for reconciling the logistics supply and demand activities. This research has shown the need for alignment of the physical/information systems and processes in manufacturing and logistics operations to product demand patterns, in order to manage high velocity production associated with the food industry. The objective of this work was therefore to develop efficient methods for management of the logistics function within manufacturing supply chains by reducing overall operating costs through reduced inventory costs, fewer stock-outs, improved customer service levels and reduced delivery rejections due to oversupply.

218	Monday, 7:00- 8:30, Galiano <b>Session:</b> Global Supply Chains	Track: SCM, 34	Chair: Jin Su
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**015-0343: Flexibilities and Marketing: Comparing Brazilian and Chinese Fashion Component Supply Chains**

*Giancarlo Pereira, UNISINOS, Brazil*

*Ilse BIASON, ASSINTECAL, Brazil*

*Miriam Borchardt, UNISINOS, Brazil*

*Miguel Sellitto, UNISINOS, Brazil*

This paper investigates what impact flexibility has on the target market of the Brazilian and Chinese fashion component industry. This multiple case study was based on the hierarchy of flexibilities presented by Stevenson (2007, IJOPM). American and European import agents operating in China and Brazil were selected based on the typology proposed by Abecassis-Moedas (2006, IJOPM). Initially, all managers were interviewed individually to set the dimensions of the study. In the second phase, importers ranked the performance of each country for each selected dimension on a scale from 1 to 10 with the country with the best evaluated performance always receiving a rating of 10. Additionally, each manager interviewed provided a qualitative evaluation of each dimension. Brazilian companies focused on a set of flexibilities' dimensions in order to appeal to the medium added value sector. The Chinese focused on other dimensions to produce a large volume of cheap products.

**015-0495: Innovative Supply Chains for Rural India**

*Ranjan Ghosh, Indian Institute of Management Calcutta, India*

Hundreds of millions of rural people in India are participating in the free market economy for the first time. They have the same needs and the same aspirations as the rest of the Indian society; however, they have lower disposable income. This paper describes how several organizations have exploited the concept of 'fortune at the bottom of the pyramid' and have launched novel schemes to market their products in rural India. One of them is based on an innovative supply chain which eliminates middlemen and transforms a supplier into the dual role of supplier-cum-customer, thereby reducing the cost to the consumer while increasing the return to the supplier. The other is based on partnership with recipients of micro-credit by offering them opportunities for micro-enterprise.

**015-0557: Managing Airport Supply Chain: An Ethiopian Case Study**

*Karuna Jain, Indian Institute of Technology, Bombay, India*

*Mengist Hailemariam, Indian Institute of Technology, Bombay, India*

An airport is one of the most complex facilities which connect several business units to fulfill their roles within the air transport industry. Managing these entire business networks is one of the challenging areas. The characterization of the airport supply chain (SC) is a network of multiple

## Monday, 7:00- 8:30 Sessions

enhancing airport performance. The study involved a combined methodology to data collection, taking Ethiopian Airports Enterprise (EAE) and Addis Ababa Bole International Airport (AABIA) as a case. Data were collected through questionnaires from members of the entire airport SC and structured interviews of key stakeholders. The case study provides practical insight for managing airport SC and how to enhance airport performance.

### 015-0090: "Going Global": Developing Global Supply Network and Manufacturing Culture Study Tour in China

*Jin Su, Indiana University of Pennsylvania, United States*

*Qi Xu, Donghua University, China*

*Vidyaranya Gargeya, The University of North Carolina at Greensboro, United States*

The paper examines the importance of understanding global supply network and manufacturing culture for students to be successful in today's higher education and business world, analyzes cultural challenges in managing global supply networks, and further explores the development of global supply network and manufacturing culture tour in China. The project focuses on providing students with fundamentals of global supply chain management methods with a specific focus on China. It specifically promotes China study tour from which students can utilize their knowledge within a cultural context and complete an analysis of global supply networks and manufacturing culture in China. Finally, the paper provides an example of developing global textile-apparel supply network and manufacturing culture study tour in China, because China has been a leader in global textile and apparel production, distribution, and consumption. Globalization and culture awareness reflected in this study are two important themes of US higher education.

219	Monday, 7:00- 8:30, Grand Ballroom A <b>Session:</b> Session 3	<b>Track:</b> PRF, 3	<b>Chair:</b> Rafael Menda
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### 015-1000: CURRENT REALITIES Panel Discussion: What is Happening to Toyota? Is There Such Thing as Too Lean?

*Rafael Menda, Johnson & Johnson Consumer Products Co., United States*

*Rachna Shah, University of Minnesota, United States*

It is hard to escape recent news about Toyota and its troubles. Popular press has been quick to attribute those troubles to various reasons from "trying to grow and overtake Detroit too fast," to "obsessively focusing on costs," "not testing newly designed parts sufficiently" and "insufficient training of new employees." The comments seem to converge around "abandoning their traditional principles." Do they mean the Lean principles? Do Lean principles not stand the test of fast growth or intensive cost focus? There are a lot of other questions we can ponder which have implications on lean practice and research, with stakeholders in the academia, consultancy and industry. This panel will include members of academia and practitioners, who will explore the causes of Toyota's current difficulties from a Lean Manufacturing point of view. Implications for future research and practice will also be discussed.

221	Monday, 7:00- 8:30, Granville <b>Session:</b> Technology Roadmaps and the Innovation Value Chain	<b>Track:</b> PITM, 15	<b>Chair:</b> Vagner Cavenaghi
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### 015-0652: Proposition of a Dynamic Approach for a Technology Roadmap

*Leonardo Gomes, University of São Paulo, Brazil*

*Mario Salerno, University of São Paulo, Brazil*

Academic spin-offs may face highly changing contexts, under unforeseeable uncertainties, which are related to the inability to articulate in advance all the variables relevant to business performance and complexity. It is difficult to map the number of variables and their functional relationships in dealing with emerging events, ambiguity and non-linearity in the enterprise development process. This paper aims to propose a dynamic approach that seeks to integrate two processes treated separately in the literature: Roadmapping and Technology Roadmap implementation process. To meet this objective, a literature search is carried out, an intervention in an action research perspective and three case studies. This proposed approach uses a paradigm of complexity and complex thinking for roadmapping, presenting a framework appropriate for uncertain and complex environments. Finally, it is expected that the proposed approach can help entrepreneurs that are trying to make academic technology into new business.

### 015-0581: Organization and Management of the Expanded Innovation Value Chain

*Mario Salerno, University of São Paulo, Polytechnic School, Production Engineering Department, Brazil*

*Leonardo Augusto Gomes, University of São Paulo, Polytechnic School, Production Engineering Department, Brazil*

*Simone de Lara Freitas, University of São Paulo, Polytechnic School, Production Engineering Department, Brazil*

*Leo Kroth, University of São Paulo, Polytechnic School, Production Engineering Department, Brazil*

*Vahid Vahdat, University of São Paulo, Polytechnic School, Production Engineering Department, Brazil*

*Adriana Mello, University of São Paulo, Polytechnic School, Production Engineering Department, Brazil*

*Wander Lima, University of São Paulo, Polytechnic School, Production Engineering Department, Brazil*

Based on literature review and ten case studies of innovation projects in Brazil and France, the paper proposes a set of parameters or contingencies that distinguish projects and influence organization and management of innovation in the company. The innovation value chain is treated broadly, neither limited to product development (which is one link in the chain) nor restricted to the company (given practices such as open innovation, co-design etc.) – a network instead. It begins with a discussion of conceptual and practical limitations of current models (as innovation funnel and stage-gates), taking the concept of innovation value chain proposed by Hansen and Birkinshaw (2007) as a starting point. It proposes eight project parameters: product lifecycle, degree of knowledge formalization, kind of market, technological path, total expenditure, kind of product, position in the value chain, product concept. It ends by proposing a new topology of the chain / network.

## Monday, 7:00- 8:30 Sessions

### 015-0591: Strategy Focused Information System Design and Analysis: A Case Study for an Agribusiness Company Sales Force in Brazil

*Vagner Cavenaghi, São Paulo State University, Brazil*

*Hernani Silva, São Paulo State University, Brazil*

*Arnaldo Sima, Sima Consulting, Brazil*

*Reinaldo Sima, Sima Consulting, Brazil*

*Vanderlei Andrade, Sima Consulting, Brazil*

The purpose of this paper is to present an application of SIMA's methodology for information technology strategic management (GETI). The GETI methodology was applied to develop an information system architecture capable of supporting the process of commercial management and to automate an agribusiness company sales force, as well as to promote the optimization of organizational processes that are within the scope of the company sales processes. The first section introduces the context of the work. The second section seeks to understand the evolution of Information Technology Market. The third section brings forth the importance of having an IT management aligned with the business global strategy. The fourth section presents the GETI methodology. The fifth section introduces the case study, describing the steps of GETI application in details. The last section shows the findings, results, and practical implications of using this methodology to support decision making.

### 015-0647: An Approach to the Management of Radical Innovation

*Leonardo Gomes, University of São Paulo, Brazil*

*Adriana Nello, University of São Paulo, Brazil*

*Mario Salerno, University of São Paulo, Brazil*

*Roberto Marx, University of São Paulo, Brazil*

A radical innovation can change the rules of the game, creating new niches, new markets and entire industries. Models of product development in the literature are traditionally more focused on incremental innovations. In this article, we propose a new approach to the management of radical innovations. Using multiple case studies in different companies, with different sizes and technological bases, we propose an approach with three dimensions: operational, managerial and organizational. The operational dimension is a process for developing radical innovations using the logic of stage-gates process, but with different scope and content, a non-linear, recursive, interactive and sequential approach. The managerial dimension consists of a series of supporting processes such as knowledge, technology, uncertainty and complexity management. And finally, the organizational dimension is intended to help create an organization able to cope with events and to operate in an open system, under the paradigm of the so-called "Open Innovation."

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Monday, 7:00- 8:30, Junior Ballroom A

Track: PITM, 16

Chair: Niraj Kumar

Session: Global Product Innovation and Technology Management: India, Brazil, China, and the UK

### 015-0564: The Effect of New Technology on Diffusion: The Case of India

*Karuna Jain, Shailesh J. Mehta School of Management, IITB, India*

*Ruchita Gupta, Shailesh J. Mehta School of Management, IITB, India*

Technological changes in mobile technology have radically changed people's lives by increasing their ability to communicate. Providing enhanced voice capability, high-speed data service, better spectrum management and coverage has resulted in different mobile technology generations in the market. India represents one of the fastest growing economies in mobile communication penetration, with two competing technologies in 2G - the GSM and CDMA. Thus the objective of this paper is to analyze the effect of new technology on the existing technology diffusion process. In this paper, we consider mobile technological change in India. The Epidemic diffusion model depicting the S-curve is selected for the study. This work will help gain a better understanding of the diffusion process of mobile technologies, and the findings can play an important role in developing a diffusion strategy of future technologies like 3G.

### 015-0043: Comparative Analysis between Process Mappings Using IDEF0 and Flow

*Paulo Rodrigues, Universidade do Sagrado coração, Brazil*

This paper describes and analyzes how the flow of the value chain and the mapping of processes are linked, pointing out the main aspects in an industry that operates in stationery products and is headquartered in the region of Bauru, Brazil. Once the company decided to adopt the formal model for mapping of the flow of the value chain in a product, as an indicator of viability and observe the results, it can make observations about the volumes of stocks of raw material and process, as well as the size of production batches and that the frequency of daily production. The analysis between the model and IDEF0 diagram, can observe that the IDEF0 model facilitates the understanding of the processes, allowing standardization which will facilitate decision making by management and direction.

### 015-0584: Building and Security Measures of China's Large Civil Aircraft Industry Independent Innovation Network

*Lv Haijun, Beijing Jiaotong University, China*

*Zhang Lei, Beijing Jiaotong University, China*

In order to build the third Large Civil Aircraft (LCA) industry after Boeing and Airbus, China's Large Civil Aircraft (LCA) project emerges under promotion of the national volition. But how to fundamentally improve the industrial capability of independent innovation has become the main problem of the industrial development. This paper was based on the supply system of Large Civil Aircraft and the current situation of China's Large Civil Aircraft industry. An independent innovation network which includes not only the suppliers and users, but also the universities, external research institutes, financial Institutions and government was built in the study. Then the study illustrated the key nodes and the operation modes of the network. Finally, four security measures were proposed to the network.

### 015-0648: Exploring the Impact of Technological Capability on Inter-firm Collaboration in the UK Aerospace Industry

*Niraj Kumar, University of Bath, United Kingdom*

## Monday, 7:00- 8:30 Sessions

**Mickey Howard**, University of Exeter Business School, United Kingdom

**Sinead Carey**, University of Bath, United Kingdom

**Michael Lewis**, University of Bath, United Kingdom

In an era of increasing global competition and significant re-adjustment of world economy, firms are increasingly looking beyond their boundaries and collaborating with other organisations to maintain their competitiveness. This research aims to explore the impact of a firm's technological capability on effective inter-firm collaboration (IFC) and focuses on Small and Medium size Firms (SMFs) in the UK aerospace industry. SMFs offer a wide variety of entrepreneurial skills in areas such as product development and process improvement, and therefore, large corporations are now beginning to develop formal strategies to work closely with smaller suppliers. Technological capability of SMFs is crucial in developing the end product at lower cost and shorter lead time. Building on a 'bottom-up view' of the management of innovation, this research develops an empirical framework to help better understand the interaction between technological capability and IFC collaboration.

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Monday, 7:00- 8:30, Junior Ballroom B

Track: OMM, 16

Chair: Sadia Samar Ali

Session: OMM16

### 015-0563: Sustaining Excellence of Retailers: A Case of Nestle India Ltd.

**Sadia Samar Ali**, Associate Prof & Area Chair: Operations, Institute of Management Studies,, India

**KHURRAM RIAZ**, ZHCET, India

Globalisation and maximum profit fetching attitude drive many companies to nourish their retailers /distributors. Retailer/distributor satisfaction was the buzzword of the late 1990s; keeping in mind the importance of service as a major marketing tool, the decisions regarding retailers/distributors are enjoying a healthy share in any company's strategic decisions. Such decisions take on further importance because of non-predictability and uncertainty in working environments. In this paper we propose a model based on ACSI to evaluate the satisfaction level of Retailers/Distributors. Data has been collected from three distributors and eighteen retailers from New-Delhi and NCR region Nestle India Limited, which will definitely highlight certain areas for managers to work upon.

### 015-0838: Economic Feasibility in the Distribution Channel: A Case Study in the Logistics of a Wholesale Company

**Washington Luiz Soares**, UNISANTOS - UNIVERSIDADE CATÓLICA DE SANTOS, Brazil

**Adriano Maniçoba**, UNISANTOS - UNIVERSIDADE CATÓLICA DE SANTOS, Brazil

**Getulio Akabane**, UNISANTOS - UNIVERSIDADE CATÓLICA DE SANTOS, Brazil

Wholesale companies have as a main function to serve as intermediaries in transactions between manufacturers and retailers. Two tendencies have been threatening the position of wholesale companies in a distribution channel: vertical integration and the development of retail nets. In this context this research aims to analyze a distribution channel where the retailer concentrates most of their purchases on direct manufacturers to verify the economic viability of the wholesale company as intermediary. The results were analyzed with the use of multivariate regression analysis indicating that parceling out of the products presented economic viability for the wholesale company confirming the importance of such institutions in a distribution channel.

### 015-0970: Towards Developing Effective Pricing Strategy for Land Developers in Southern Alberta

**Gregory Gutowski**, Mount Royal University, Canada

**Kalinga Jagoda**, Mount Royal University, Canada

Oil sand developments has drastically changed Alberta's economic landscape, attracting hundreds of thousands of opportunity seekers with it. This emerging upper-middle class yearns for a luxurious Western Canadian lifestyle that was once only available to few privileged families. This has created a new market for developers who focus on elite properties in the vicinity of booming metropolitan areas. The unique factors influencing this market have not caught enough attention from management scholars. This paper provides a model incorporating factors which attract these exclusive customers and how they affect price setting decisions. Results have shown that the key factors include the closeness to downtown core, view, remoteness, landscaping, and property size. The problems of pricing and cost-recovery, allocation, and targeting are analyzed using data from a Calgary-based land development company.

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Monday, 7:00- 8:30, Junior Ballroom C

Track: GENL, 15

Chair: Jay Heizer

Session: Improving Teaching and Learning with State-of -the-Art WEB Based Software

### 015-1001: Improving Teaching and Learning with State-of -the-Art WEB Based Software

**Barry Render**, Graduate School of Business, Rollins College, United States

**Jay Heizer**, Tezas Lutheran University, United States

Sophisticated state-of-the-art technology now allows us to provide students individualized instruction with immediate feedback. Pearson/Prentice-Hall now has available such an Internet based system referred to as MyOMLab. The system contains homework/exam problems that algorithmically change problem variables. The problems are instantly graded. MyOMLab contains a large database of end of chapter problems with algorithmically generated 1000's of test bank True/False, Multiple-choice, and Short Answer questions that can be assigned for on-line work. For supplemental instruction, the system includes additional help in the form of a similar problem, multiple attempts, online relevant pages from the text, and worked out video tutorials. All are instantly available. This session is designed as an opportunity for examining this technology and exchanging ideas about how it can be best used.

## Monday, 7:00- 8:30 Sessions

225	Monday, 7:00- 8:30, Junior Ballroom D <b>Session:</b> Sustainability and Competitiveness	Track: SOHL, 16	Chair: Ran Bhamra
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### 015-0210: Antecedents of Strategic Agility: The Dynamic Capabilities Perspective

*Divesh Ojha, University of North Texas, United States*

*Sri V. Sridharan, Clemson University, United States*

*R. L. LaForge, Clemson University, United States*

Instituting agility in firms has been identified as a strategy to succeed in highly competitive and uncertain environments. Strategic agility, not just manufacturing agility, is required for sustainable performance in hyper-competitive environments. This paper explores the antecedents of 'strategic agility' using Competence-Capability (CC) framework alongwith the theoretical perspectives of dynamic capability, strength of weak ties and knowledge-based view of competitive advantage to explicate how a firm can set up strategies to build the required competencies to gain 'strategic agility capability'. Using the survey of US manufacturers, we test our hypothesized research model. The results suggest that knowledge-generating competencies are key enablers of the Strategic agility capability.

### 015-0391: Process Knowledge – A Crucial Factor to Reach Sustainable Operations

*Mats Winroth, Chalmers University of Technology, Sweden*

Process knowledge is one of the most important issues for achieving sustainable production. Sustainability does not only include environmental aspects, but also sustainability in terms of human resources, long-term financial profitability, development of well-being in developing countries, etc. The processes in question can be divided in different categories. The value-adding processes are linked to manufacturing, e.g., cutting and assembly, transport (transport), supply chain management, and purchasing. The necessary non-value-adding processes can be transport (sometimes), marketing, retailing, human resources, finance, IT-support, quality and environmental management (the latter can be value adding!). Finally we have processes that are unnecessary and purely waste. All these processes need to be identified in order to be able of controlling them. This paper is a mainly theoretical elaboration on the issue, with the conclusion that if the company does not have good process control, the possibilities to achieve sustainability will decrease.

### 015-0466: Sustainability and Performance Management Systems

*Vagner Cavenaghi, São Paulo State University, Brazil*

*João Albino, São Paulo State University, Brazil*

*Paulo Ortí, São Paulo State University, Brazil*

Literature reveals that the concept of sustainability has diverse foci, such as social, economic, ecological, cultural, political and environmental sustainability, among others. The objective of this paper is to develop an exploratory study of the sustainability concept using an economic approach, and to assess the possibilities of using maturity models as an evaluation resource for organizational performance management systems. The Balanced Scorecard management model was used, comparing internal results to the organizations' evolution in relation to maturity models. The evaluation was conducted with a focus on the intangible assets of human capital and corporate education, in order to observe whether the organization is able to create value through the effective management of its intangible assets. In conclusion, it presents a diagnosis proposal for maturity models in corporate education elaborated by the author and evaluated in a pilot test in the final phases of evaluation and testing.

### 015-0635: The Impact of Sustainability on Manufacturing Competitive Priorities

*Ran Bhamra, Loughborough University, United Kingdom*

This paper re-evaluates manufacturing competitive priorities in the context of sustainability and proposes a new set of sustainable competitive priorities. Sustainability is an imperative (Bruntland, 1987). For the last forty years, manufacturing strategy has stressed the importance of 'trade-off' between manufacturing's fundamental competitive priorities – cost, quality, delivery and flexibility (Skinner, 1969). Now, with the global sustainability imperative, manufacturing has again been challenged. Environmentally conscious manufacturing is an imperative (Sarkis, 1995), so that corporate and manufacturing strategies must now consider sustainability (Webach, 2009). The literature on manufacturing strategy and sustainable and environmentally conscious manufacturing are reviewed and appraised. A new set of critical criteria are developed to illustrate our new 'sustainable' competitive priorities. This paper contributes to the area of manufacturing strategy, specifically the emerging thematic area of sustainable manufacturing, by the development, presentation and critical discussion of manufacturing's new sustainable, competitive priorities.

226	Monday, 7:00- 8:30, Orca <b>Session:</b> Issues in Production and Inventory Control	Track: CIM, 14	Chair: João Almeida
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### 015-0931: Shop Floor Control When Tacit Worker Knowledge is Important

*Patrick Philipoom, University of South Carolina, United States*

*Daniel Steele, University of South Carolina, United States*

We investigate a shop where the workers and supervisors have tacit knowledge of how to operate efficiently and this knowledge is essential for the shop to have the capacity to meet demand. This tacit knowledge includes setup dependencies between products, as well as the knowledge of which worker or machine is best for a particular product. We discuss a real-world shop where this is the case. Management lets the workers and supervisors use their knowledge and judge their performance based on efficiency measures such as standard cost. The question that we explore is how management should control for due date performance in light of the discretion given to the workers and supervisors to sequence jobs on the basis of efficiency. We explore management control of due date performance through the use of order review and release (ORR) and expediting.

### 015-0885: Economic Production Scheduling of a Product at a Facility with Setup Time, Stochastic Demand and Lost Sales

*Thomas Schmitt, University of Washington, United States*

## Monday, 7:00- 8:30 Sessions

**Bruce Faaland**, *University of Washington, United States*

**Mark McKay**, *Trinity Western University, Canada*

We address a problem of scheduling lot sizes for a product at a single machine. Since the production rate exceeds the mean demand rate, the machine is periodically stopped, set up for a time  $S$ , and then restarted. Product demand is Poisson distributed and, if not satisfied, results in lost sales. We derive an optimal solution for a produce-up-to policy that minimizes total cost per unit time, including setup cost, inventory carrying cost, and the cost of lost sales.

### 015-0653: Multi-stage Hybrid Re-entrant Flow Shop Planning with Application to Aluminum Flat Rolled Product

**Debashish Jena**, *Indian Institute of Management, India*

**Rajiv Srivastava**, *Indian Institute of Management, India*

Dynamic demand, higher product variety and the high cost of scrap loss call for a predominantly MTO strategy for aluminum rolled products, as opposed to their steel counterparts, despite similarities in manufacturing process. For the real life case under study, the aluminum manufacturing system can be broadly characterized as hybrid re-entrant flow based multi-stage system. Each stage has its respective processing structure and constraints. In addition, individual stages may have one or a combination of complex features, such as sequence dependence, batching/splitting, re-entrant workflow, bypass/missing operations, and so on. The resultant capacity degradation leads to frequent delayed deliveries and poor order commitment performance. We propose a general precedence based mathematical formulation, which is unique in terms of its multi-stage architecture, task level granularity, re-entrant work flow in metal industry. Besides serving as an advanced planning interface between marketing and production, it provides interesting insights with respect to capacity sensitive planning.

### 015-0454: Product-decision Mix: A Bibliometric Analysis of International Academic Publishing

**Abraão Júnior**, *University of São Paulo, Brazil*

**Reinaldo Costa**, *University of São Paulo, Brazil*

This study addresses the theme “product-decision mix,” which, in a Production and Operations Management perspective, can be understood as the definition of the optimum quantity to be produced for each type of product in a given period, considering these products compete for limited resources. The paper aims to characterize the academic literature on the product-decision mix published in international journals with respect to (i) the countries where the studies originated, (ii) the main channel for publication of papers, (iii) the types of research used, and (iv) the highlights in terms of authors and publications cited. To meet this objective, a literature survey in three academic portals and a bibliometric analysis of the prospected articles are carried out. Finally, it is concluded that product-decision mix academic publications have grown since 1991 and that most of the publications prospected were published in journals directly related to Production and Operations Management research.

227	Monday, 7:00- 8:30, Parksville	Track: EROM, 14	Chair: Tenhiälä Antti
	<b>Session:</b> Safety and Project Management		

### 015-0649: An Assessment of the Impact of Undesirable Outputs on the Productivity of US Motor Carriers

**Rodrigo Britto**, *Robert H. Smith School of Business, University of Maryland, United States*

**Thomas Corsi**, *Robert H. Smith School of Business, University of Maryland, United States*

This research examines the impact of undesirable outputs (i.e; crashes and fatalities) on the productivity of motor carriers during the years 1999-2003. Data Envelopment Analysis (DEA) was used to model both desirable and undesirable outputs. Data were taken from the Motor Carrier Safety Status Measurement System (SafeStat) database and the Motor Carriers Annual Reports dataset. Non-parametric tests were performed to compare the results with those models that only include desirable outputs. Finally, Tobit regression was applied in a second stage to analyze the drivers of efficiency.

### 015-0683: Do Safety Systems Improve Warehouse Safety Performance?

**René De Koster**, *Rotterdam School of Management, Erasmus University, Netherlands*

**Bert Balk**, *Rotterdam School of Management, Erasmus University, Netherlands*

Safety is becoming more and more an issue in warehouses. Effective measures leading to increased occupational health and safety have hardly been researched. Most research focuses on the impact of perceived safety-related leadership of managers and worker safety consciousness on ‘safety climate’ and workers’ safe behavior. We investigate which system-related factors improve warehouse safety performance (as measured by various types of near accidents over a number of years). We distinguish human factors, equipment used, organization, and worker environment. We hypothesize that safety leadership, worker safety consciousness and safety systems all contribute to increase safety performance of the warehouse. Our research focuses on medium and large-size warehouses and is based on a survey among workers (about 20 per facility) and the warehouse or safety managers. First results indicate that in particular equipment factors strongly contribute to safety performance, but the effect of other system factors is rather weak.

### 015-0180: Complexity in Projects - Learning from Unsuccessful, Late and Over-budget Projects

**Ashok Kochhar**, *Aston University, United Kingdom*

There are numerous examples of large scale projects which are unsuccessful, are delivered late or cost far more than was originally estimated. Examples of such projects include the Boeing Dream Liner, Airbus A380, San Francisco – Oakland Bay Bridge, Daimler Chrysler merger, London Millennium Dome, the Athens Olympics, the forthcoming London Olympics, many military projects, and the vast majority of systems/software projects. A common characteristic of such projects is the huge complexity of the project and the large number of parameters which can affect the outcome of the project. Equally there are many examples of large scale projects which are on time and within expected budgets. However, there is a lot that can be learnt from unsuccessful, late and over-budget projects. This presentation will look at the main parameters which contribute to project complexity and affect the project outcomes and their role in project failures.

## Monday, 7:00- 8:30 Sessions

### 015-0571: Task Exceptions and Delivery Performance: Information System Infrastructure as a Moderator under Different Levels of Requisite Integration

*Antti Tenhiälä, Helsinki University of Technology, Finland*

*M. Rungtusanatham, University of Minnesota, United States*

Task exceptions are disruptive events that interrupt the planned execution of production tasks. When left unresolved, task exceptions can escalate into external delivery failures that impact financial performance in a substantially negative manner. To resolve task exceptions efficiently, the information system (IS) implemented to manage planning-related information must be appropriately structured so that it helps decision makers to expediently identify the best alternative to continue the execution of interrupted production tasks. In this paper, we hypothesize that a centralized (decentralized) IS infrastructure is more effective in mitigating the negative effects of task exceptions on delivery performance in production processes characterized by high (low) requisite integration. We find empirical support for the hypotheses in data from 163 production processes from 73 plants located in 18 different countries and belonging to the supply chains of 7 different high-technology machinery manufacturing corporations.

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Monday, 7:00- 8:30, Pavilion Ballroom A

Track: PLQ, 14

Chair: Maneesh Kumar

Session: Six Sigma - 1

### 015-0113: Advanced Sensor Development to Monitor Aircraft Sub-Component Product Life-cycle

*Ali Salour, The Boeing Company, United States*

*Nam Phan, NAVAIR AIR 4.3.3.2, United States*

This paper discusses present challenges in protecting valuable shipments from manufactured locations to the NAVAIR service centers. Technologies include advanced sensors to monitor and record containers in transit to ensure their quality and integrity for safe and timely deliveries to the point of use. This presentation covers off-the-shelf sensor hardware & software systems that monitor vibration, temperature, humidity, and location of mobile assets. In addition, advances in sensors miniaturization and integrated system of systems for situational awareness will be discussed. Other interesting topics will explore the use of Auto ID technologies to record vital manufacturing build process data on aircraft parts for retrieval and acquisition during the service life. This concept will address data analysis schemes for validation, historical records, and prediction of useful part life. NAVAIR 4.3.3.2 Structure Technology group and Boeing Research & Technology team up to describe their joint development in these focus areas.

### 015-0248: Six Sigma Readiness Index for SMEs

*MANEESH KUMAR, EDINBURGH NAPIER UNIVERSITY, United Kingdom*

*JJU ANTONY, UNIVERSITY OF STRATHCLYDE, United Kingdom*

Although benefits of Six Sigma are widely reported in many large organizations, research has shown that its implementation in UK small and medium-sized enterprises (SMEs) is still less evident. This work is based on a longitudinal study of Six Sigma implementation in UK manufacturing SMEs using mixed method approach of survey and case studies. Findings of the study were compiled to develop a Six Sigma Readiness Index (SSRI) for SMEs. The SSRI score is used to identify areas of strengths, weaknesses, and opportunities for improvement in the organization's quality management practices. The purpose of the exercise is to assist SMEs in making right decision in the development of a Six Sigma strategy for achieving and sustaining competitiveness. The cultural readiness and maturity to embark on Six Sigma journey were evaluated and tested within three SMEs. Findings from the readiness exercise were critically analyzed to check the validity of SSRI.

### 015-0522: Identified Benefits of BPM Tools in Brazilian Insurance Companies

*Paulino Francischini, University of Sao Paulo, Brazil*

*Paulo Mello, University of Sao Paulo, Brazil*

The adoption of Business Process Management (BPM) tools has increased significantly in organizations around the world, with promises to reduce cost and improve productivity and quality, and Brazil is no exception. As the insurance market is one of the fastest-growing segments in the country, improvement of their process and operations is mandatory to remain competitive in a globalized market. Based on multiple case studies, this research considers the five biggest insurance companies in Brazil and aims to analyze if the main benefits provided by the use of Business Process Management tools implementation were identified in these organizations. The results were positive and consistent in all insurance companies that were considered in this research.

### 015-0077: Knowledge Management in the Project Sector in the Automobile Industry

*Veridiana Pereira, UNIVERSITY OF SÃO PAULO - PRODUCTION ENGINEERING DEPARTMENT, Brazil*

*Fernando Laurindo, UNIVERSITY OF SÃO PAULO - PRODUCTION ENGINEERING DEPARTMENT, Brazil*

*Marly Carvalho, UNIVERSITY OF SÃO PAULO - PRODUCTION ENGINEERING DEPARTMENT, Brazil*

*Roberto Rotondaro, UNIVERSITY OF SÃO PAULO - PRODUCTION ENGINEERING DEPARTMENT, Brazil*

With the increasing technological advances and high competitiveness in the market nowadays, there is great interest of companies for knowledge management. Managers seek knowledge management help to make human capital - in its broadest sense – central point of analysis. In this context, this study aims to understand the mechanisms of knowledge generation, in the process of technical changes of the project area in a company of the automotive sector. The study showed that the process selected was in advanced stage of mapping and knowledge consolidation, but poor in terms of implantation time control. This gap was solved by creating a report, which begins to be used by the areas involved. This report also aims to facilitate and encourage the use of the historical information on new projects, thereby creating a learning curve.

## Monday, 7:00- 8:30 Sessions

229	Monday, 7:00- 8:30, Pavilion Ballroom B <b>Session:</b> Facility Planning and Network Management	Track: GENL, 13	Chair: Yufeng Zhang
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### 015-0119: Application of Population Density Analysis Based on High-Resolution Remote Sensing Image to the Location of a Large Supermarket

*XIA SHI, Beijing Wuzi Universtiy, China*

*YUE WU, Beijing Wuzi Universtiy, China*

*HAN ZHANG, Beijing Wuzi Universtiy, China*

As consumers, population density is one of the important factors which affect the location of a large supermarket. Currently, the population density data used when locating the large supermarket is mainly attained through population quantity and community area, which were gotten from the property management companies of the communities in the area. In this paper, the population density analysis technology based on a high-resolution remote sensing image is used to estimate the population density, and then the result is used to locate the large supermarket. The result shows that population density analysis technology based on a high-resolution remote sensing image can be effectively used to locate the large supermarket. This method overcomes the traditional methods drawbacks of being time-consuming and effort-consuming, and affords a new and effective method and means to the population density estimate of large supermarket locating.

### 015-0394: Building Network Capabilities for Global Operations

*Yufeng Zhang, Birmingham University, United Kingdom*

Network issues are increasingly concerned in operations management domains. But a generic understanding of the essential network capabilities is missing. How to build network capabilities in changing business environments is also poorly understood.

This paper develops a framework to present the essential network capabilities for global operations through 12 in-depth case studies and demonstrates how to build the capabilities with typical cases. Essential network capabilities for global operations were identified. Significant configuration features to deliver the capabilities were captured. Guidance to build networks with specific capability orientations were also suggested based on the case studies.

This paper improves the theoretical understanding of network capabilities for global operations from an engineering perspective. Evidenced by pilot applications, this research can help companies to improve the performance of their global network operations through consistently aligning network capabilities with their business goals in changing environments.

### 015-0609: Ancillary Services' Outsourcing Decision: The Effects of Trade Unions

*Alejandro Bello-Pintado, Universidad Pública de Navarra, Spain*

*Imanol Nuñez, Universidad Pública de Navarra, Spain*

*Javier Merino, Universidad Publica de Navarra, Spain*

This article investigates the effect of trade unions on the outsourcing of several (eleven) ancillary activities. We hypothesize that such impact is contingent on the type of relationship between management and unions. Thus, we expect unions to act against outsourcing only when their goals are not compatible with targets of the management. The empirical analysis draws on WERS data for 938 firms based on the United Kingdom. Results show that some unionization variables are negatively related with the likelihood of outsourcing. This may harm organizational performance, as it reveals that the make or buy decision is not purely informed by efficiency and strategic criteria. However, our results also show that such negative effect of unions is limited to the conflict of interest scenario as it disappears when management and unions collaborate. Further, they also indicate that difficulties in the bargaining process, due to multi-unionism, are the main obstacle to outsourcing.

### 015-0759: Upper Echelons: An Investigation About Operations Executive Profile in Brazil

*André Luís Duarte, Insper Instituto de Ensino e Pesquisa, Brazil*

*Guilherme Martins, Fundação Getúlio Vargas, Brazil*

*Wesley Mendes-da-Silva Mendes-da-Silva, Presbyterian University Mackenzie, Brazil*

*Luiz Carlos DiSerio, Fundação Getúlio Vargas, Brazil*

*Michele Martins, Fundação Getúlio Vargas, Brazil*

This paper aims to analyze the profile of operations executives in Brazilian companies. The theory states that organizational outcomes are partially predicted by managerial background characteristics (Hambrick and Mason, 1984). The study was based on official data from public companies listed in the Brazilian Stock Exchange. It included 503 companies, 4003 executives and 15221 observations during the period 1997-2007. The results showed that the number of top executive positions in Operations Management area didn't increase during the period 1997-2007, remaining close to 13% of top executive positions. This shows that the importance of this area has not increased in terms of number of positions. The study also pointed that 58% of top executives from Operations areas studied Engineering in undergrad courses; only 12% studied Business Administration; 45% of top Operations executives have taken at least one graduate course; almost 18% have MBAs; only 6% have doctoral degrees and 97% are men.

230	Monday, 7:00- 8:30, Pavilion Ballroom C <b>Session:</b> Inventory and Information in Logistics	Track: LM, 13	Chair: Susana Relvas
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### 015-0539: Stockout Management

*Mauro Sampaio, FEI University, Brazil*

Since the early days of modern economics, logistics and retail practitioners have been facing the problem of determining appropriate inventory levels at distribution centers and stores. Errors lead either to excessive and unnecessary investment in stocks, or to stockouts. The specialized literature (Bowersox, Closs and Cooper, 2006) recommends striking a balance between inventory maintenance costs and the cost of stockout. The

## Monday, 7:00- 8:30 Sessions

inventory maintenance cost can be measured (Lambert, 1976), but little is known about the cost of stockout, as the relationship between it and potential sales lost remains unknown (Zinn and Liu, 2001). This research provides direction to managers for selecting action to reduce the stockout based on the retail environment.

### 015-0826: Barriers to Implementing ABC in Emerging Economies: Lessons from the Mexican Logistics Sector

*Halia Valladares, Mount Royal University, Canada*

*Kalinga Jagoda, Mount Royal University, Canada*

*Begoña Prieto, Universidad de Burgos, Spain*

The current economic downturn forced companies to retool their business strategies. In particular, effective management of logistic costs in service-oriented companies has become an important part of this process. Activity Based Costing (ABC) can serve as a supportive tool for logistic managers in establishing the relationship between an activity and the resources required to perform such activity. The literature provides limited insights when it comes to ABC implementation in emerging economies. This paper presents the findings of an empirical study conducted to investigate the problems and limitations of ABC implementation by logistics companies in Mexico. The results show that the main problem is the lack of knowledge of managers on ABC. In addition, the high cost of consulting services and the difficulty of collecting information on cost drivers proved to be critical. Implications to the policy makers and research limitations are also highlighted.

### 015-0687: Oil Products Distribution Systems: Multiproduct Pipeline Scheduling for Effective Inventory Management

*Susana Relvas, Instituto Superior Técnico, Portugal*

*Ana Barbosa-Povoa, Instituto Superior Técnico, Portugal*

*Henrique Matos, Instituto Superior Técnico, Portugal*

The oil business is facing a competitive and harsh era: margins are low and other energy alternatives start to have a growing importance. Logistics can play an important role in optimizing operations and minimizing costs, if proper and integrated methods are used. Multiproduct pipeline systems represent one of the most complex equipments to manage in the oil supply chain, where it is essential to integrate transportation operations with inventory management policies at distribution centers. This work addresses such problem by analyzing a real world case study at a Portuguese company considering a distribution system formed by a multiproduct pipeline and a set of storage tanks. An operations management tool is developed, which is built on an optimization model. Operations management policies are explored, and the obtained optimized results are compared to real world procedures, illustrating the importance of using integrated operations management tools to solve real problems.

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Monday, 7:00- 8:30, Pavilion Ballroom D

Track: HBOM, 10

Chair: Pauline Found

Session: Organizations 3

### 015-0013: An Integrative Thinking Approach to Organizational Learning

*Pauline Found, Cardiff University Lean Enterprise Research Centre, United Kingdom*

*Robert Kearney, GKN Aerospace, United Kingdom*

This paper investigates the problem of what affects the learning process. The nature of learning is defined as a "Mess", where many factors interrelate. Integrative thinking is chosen as the method to investigate this Mess. The literature of organizational learning and the learning organization is reviewed, as well as the differing definitions of what constitutes learning. The concepts of system thinking and system dynamics are then used to determine causality between factors that affect learning. The paper reports the findings of recent research which concludes that the senior managers have the most effect on employee learning, until peer pressure outweighs this. This is governed by a formula that can be applied to determine the relationship.

### 015-0027: A Systematic Approach to Change Considering Corporate Culture

*Robert Schmitt, WZL RWTH Aachen University, Germany*

*Alexandra Ottong, Fraunhofer-Institute for Production Technology IPT, Germany*

Successful change-projects are characterized by the use of the right methods at the right time. Therefore, Fraunhofer IPT developed a toolbox, meeting following demands: little effort to conduct methods, comprehensiveness, consecutive build-up, flexible and dynamic approach concerning reflection and changing conditions plus consideration of soft factors. The theoretical background is based on communicational and motivational aspects as well as organizational phenomena like micro politics and corporate culture. The success of a change-project must be assessable for management and all participants. To recommend the most appropriate methods for single projects, company specific conditions, the change-type and the prevailing corporate culture should be considered. Additionally, a study conducted by IPT shows significant correlations. The individual change-types influence the effect of individual culture characteristics, which may be supportive or inhibitory. The toolbox provides flexible methodological support and integrates corporate culture. The aim is to safeguard the quality of change-projects on different corporate cultures.

### 015-0686: Emotional Capability, Organizational Learning and Mass Customization

*Anant Deshpande, SUNY Empire State College, United States*

Mass customization (MC) as a source of competitive advantage has generated a lot of interest. A gap, however, exists in terms of exploring factors enabling the successful implementation of mass customization. The current study identifies organizational learning capabilities, such as knowledge transfer and openness & experimentation, as factors directly impacting the implementation of MC capability. A firm's Emotional Capability has been known to influence learning and overall employee and organizational outcomes. However, studies in Operations Management (OM) literature, and more specifically MC literature, have not integrated the concept of Emotional Capability in their framework. The study is unique in that it explores the linkages between Emotional Capability, organizational learning capability dimensions, mass customization capability and its consequences. Based on a comprehensive literature review, a theoretical framework and propositions are derived. The description for possible findings and implications of the study for managers is presented.

## Monday, 7:00- 8:30 Sessions

### 015-0679: Rethinking the Need for Multiple Paradigms in Operations Management Research

*Priyal Singh, XLRI, India*

With service operations gaining importance, there is a need to explore beyond the positivist thinking that has dominated operations management research. Human behavior that is an integral part of any service offering has been gaining importance in other areas of management, and there has been an effort to include it by researching through various paradigms. This paper argues for the need of research from an interpretivist paradigm, viewing reality as a result of social construction and thereby including human behavior in operations management research. The paper also discusses some limitations with the approach, and how positivism and interpretivism can be collectively used to further operations management research.

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Monday, 7:00- 8:30, Port Hardy

Track: GOSSM, 8

Chair: Ram Bala

Session: GOSSM 8

### 015-0960: Postponement for Better Information Under Competition

*Aditya Jain, Indian School of Business, India*

*Milind Sohoni, Indian School of Business, India*

*Sridhar Seshadri, McCombs School of Business, University of Texas at Austin, United States*

We consider the competitive decision making of three firms: Two competing retailers placing orders with a common supplier under uncertain market demand. Each retailer can either order early to gain access to lower wholesale price, or order late, when more information is available regarding the market. In this model, we show that postponement is driven not only by operational benefits resulting from better information, but also strategic considerations that depend on disclosure of information among the players.

### 015-0977: Distributed Development and Product Line Decision Making

*Ram Bala, Indian School of Business, India*

*Vish Krishnan, UC San Diego, United States*

*Wenge Zhu, Cal Poly Pomona, United States*

Distributed product development, in which a firm's new product development operations are carried out in more than one geographic location, is becoming increasingly prevalent in a number of industries. While the monetary rationale for distributed development has received significant attention, some of the deeper implications of such development are just beginning to be understood. Motivated by our field work at software and electronic firms, we ask the following question: How does the decision to distribute product development work across geographic locations impact the firm's product offering and market coverage decisions? We formulate a model to understand the linkages between the various drivers of distributed development, such as capacity constraints and cost differences, and its market implications, such as customer response to remotely developed products.

### 015-0324: Collaboration Mechanism and Processing Based on Multi-agents in Regional Logistics System

*Lingyun Zhou, Beijing Jiaotong University, China*

*Dong Mu, Beijing Jiaotong University, China*

The regional logistics system is a complex dynamical system composed of many agents, and the collaboration operation based on multi-agents of regional logistics system is playing an important role in the regional economy development and supply chain management. According to the operation process of regional logistics, the agent concept and attribute in regional logistics system are analyzed, and the types and functions of multi-agents in regional logistics system are discussed. Moreover, the coordination mechanism based on multi-agents in regional logistics system is put forward, and the collaborating processes based on multi-agents are aboratively designed to optimize the logistics operation. Furthermore, a behavior model based on multi-agents in regional logistics system is built to cooperate the complex business and logistics activities and enhance the efficiency of regional logistics operation.

### 015-0369: The Effect of National Culture on OM

*Richard Metters, Emory University, United States*

*Xiande Zhou, Chinese University of Hong Kong, China*

*Elliott Bendoly, Emory University, United States*

*Bin Jiang, DePaul University, United States*

*Scott Young, DePaul University, United States*

The OM literature is combined with work from Anthropology and Women's Studies to provide a wide view of the effects of various Asian cultures on OM. The basic premise is that OM decisions may need to take culture into account: some OM practices are altered or precluded by culture, while others are more effective in some cultures than others. Numerous examples are provided involving quality management, shift scheduling, revenue management, facility location, layout, supply chain strategies, and other areas.

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Monday, 7:00- 8:30, Port McNeill

Track: OEE, 8

Chair: Dong Mu

Session: Perspectives and New Research Methods in Green Logistics and Supply Chain Management

### 015-0024: Biodiesel in Brazil: Policies, Resources and Trends

*Francisco Freires, Federal University of San Francisco Valley, Brazil*

*Thomas Gonçalo, Federal University of San Francisco Valley, Brazil*

The main focus of this paper is to describe the current situation of biodiesel in the Brazilian context. Within this objective it is also given an overview

## Monday, 7:00- 8:30 Sessions

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After that, a technical description related to production capacity and availability of feedstocks in Brazil is presented. Concluding this paper, the main trend for Brazilian biodiesel is discussed.

### **015-0257: Study on Economic Measurement and Control of Coal Supply Chain's Carbon Emissions**

*Qingguo Jiang, School of Economics and Management of Beijing Jiaotong University, China*

*Dong Mu, School of Economics and Management of Beijing Jiaotong University, China*

*Chao Wang, School of Economics and Management of Beijing Jiaotong University, China*

*Yuehwen Yih, School of Industry Engineering of Purdue University, United States*

In the next 20 years, coal still is a major energy source to insure the continuous increasing of the Chinese economy and also a main source of CO<sub>2</sub> emissions. Research on the economic relations among the coal supply chain's carbon emissions, cost and benefit generated by the activities coupled with carbon emissions has an important significance for controlling coal supply chain's carbon emissions from an economic standpoint. We present a typical structural model of coal supply chain, and analyze the relations among carbon emissions, cost and benefit of this structural model. Then we construct a carbon emissions economic measurement (CEEM) model of coal supply chain. An example of a large coal mine is given to verify the feasibility and reliability of the CEEM model under the conditions of non-carbon emissions restraint and carbon emissions restraint. Our research shows that controlling the coal supply chain's carbon emissions from an economic point can achieve good results.

### **015-0245: Self-organizing Evolution Mechanism of Regional Logistics System Based on Biology Community Theory**

*Dong Mu, BEIJING JIAOTONG UNIVERSITY, China*

The regional logistics industry is a typical self-organizing system. According to characteristics of regional logistics industry, the connotation of regional logistics synergetic evolution is analyzed, and on the basis of the comparability between biology community and regional industry community, the forming and developing phases of regional logistics system in different periods are deduced with the niche theory of biology community, the self-organizing evolution simulation equations of regional logistics system are built based on the principles of order parameters in regional logistics system. Moreover, the order parameter in region logistics systems which dominates the development and evolution orientation of the whole region logistics systems is analyzed, and the synergetic development mechanism of are regional logistics system are put forward in order to effectively adjusting the regional logistics industry structure and accelerating the synergetic, efficient and regular evolution of regional logistics system.

## Monday, 10:45-12:15 Sessions

238	Monday, 10:45-12:15, Grand Ballroom D <b>Session:</b> Simulation, Queueing, and Risk in Healthcare	<b>Track:</b> HOM, 22	<b>Chair:</b> Sam Xu
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### 015-0923: Health Services: Waiting is Not Inevitable

*Willard Price, University of the Pacific, United States*

Most patients expect waiting, maybe a substantial wait, to be prevalent in health service delivery. Apparently, providers design service systems with little concern about waiting, likely assuming they do not have any choice. Interestingly, health insurance companies have standards for waiting but may not enforce such standards. This research presents a queuing model addressing random arrivals, queue design, service randomness and methods to observe/predict system performance. This theory describes the paradox of wait, flexible capacity and system optimality. Practical examples are included with research on the defensibility of reducing wait.

### 015-0904: Near Decomposability of Healthcare Systems: Implications for Healthcare Simulation

*Samuel Xu, Haskayne School of Business, University of Calgary, Canada*

In this paper, the author argues that healthcare systems can be regarded as nearly decomposable systems with hierarchy. The short-run behavior of each subsystem is approximately independent of that of other subsystems. In the long run, the behavior of any one of the subsystems depends only in an aggregative way on the behavior of other subsystems. The author further demonstrates the near decomposability of a healthcare system viewed from a patient's perspective, and describes the implications for the design and coordination of different healthcare simulation projects. The author also introduces a generic patient flow model, which can be used as a common structural description for all the subsystem. The possible use of this generic model in healthcare simulation projects is also discussed.

### 015-0678: Meta-modeling of An Emergency Department DES Model: A Neural Networks Approach

*Samuel Xu, Haskayne School of Business, University of Calgary, Canada*

In this paper, the author explores the possible use of neural networks to model the generalized response of input changes in a discrete even simulation (DES) model without the need to rerun the model. The DES model was built to diagnose causes of patient delays in the emergency department (ED) at Foothills Medical Center (FMC) in Calgary, Alberta, Canada. The outputs of the DES model are used to train neural networks. Performance comparison is conducted among the trained neural networks, the traditional multivariate regression models, and the DES model itself. The initial result is very encouraging. In the paper, the author also discusses different training strategies for neural networks, and the potential applications of the trained neural networks.

### 015-0304: Lean Management in Healthcare

*Sanjeev Bordoloi, University of St Thomas, United States*

*David Fischer, TRIA Orthopaedic Center, U.S.A.*

U.S. hospitals are beginning to embrace Lean and Six Sigma to cut costs and boost productivity. Lean management focuses on removing waste from processes, while delivering added value to customers. Six Sigma attempts to reduce variations in processes, products and services. Although healthcare differs from manufacturing in several ways, there are also surprising similarities that make it possible to extend concepts from Toyota to healthcare management. In healthcare, lean thinking begins with identifying value-added and non-value-added items in each process in its journey toward lean operations. In order for lean principles to take root, healthcare leaders must first create an organizational culture that is conducive to lean thinking. This paper looks into the healthcare industry and identifies ways in which lean and six-sigma principles can be used to reduce wastes and improve productivity.

239	Monday, 10:45-12:15, Granville <b>Session:</b> Competitiveness and Performance	<b>Track:</b> PITM, 17	<b>Chair:</b> Cláudia Gomes
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### 015-0492: What Generates Competitiveness in Organizations?

*Janaina Piana, Universidade Federal de Santa Catarina, Brazil*

*Rolf Erdmann, Universidade Federal de Santa Catarina, Brazil*

The global dimension of the competition demands that the companies are managed under perspectives that take into consideration the relations between the different areas of the organization. As such, it is necessary to observe which are the competitive priorities that affect the constituent areas of an organizational system and that they raise the competitiveness level. This work, by means of documentary research, objectified a survey regarding the main competitive priorities. The results was summarized in 107 generating factors of competitiveness. These had been classified in 14 groups: Lean Production, Benchmarking, Relationship with Customers, Technology, Integration, Ecological Responsibility, Information, Flexibility, Cost, Quality, Innovation, Trustworthiness, Training and Rapidity. Interrelations between these factors were also analyzed. From these results comes an objective to feed the development of a tool of organizational diagnosis that has taken into consideration the complex relations of a production system.

### 015-0434: Analysis of the Relationship Between Innovative Performance and Company Size

*Clandia Gomes, Santa Maria Federal University, Brazil*

*Isak Kruglianskas, Santa Maria Federal University, Brazil*

*Flavia Scherer, Santa Maria Federal University, Brazil*

*Lucia Rejane Madruga, Santa Maria Federal University, Brazil*

The present study sought to evaluate the influence of company size on the management of external sources of technological information. We conducted an empirical survey of innovative Brazilian companies in the industrial sector. Analysis of management and performance characteristics found significant differences between large companies and smaller organizations, particularly regarding management structure, technology access opportunities, external sources of technology information, and performance indicators. Our analyses highlight cooperation and external relationships

## Monday, 10:45-12:15 Sessions

as ways to maximize innovative activity, regardless of company size.

### 015-0785: Technology and Precocious Internationalization in Brazilian Companies

*Andresa Francischini, Mackenzie University, Brazil*

*Renato Garcia, University of Sao Paulo, Brazil*

*João Furtado, University of Sao Paulo, Brazil*

This study analyses the internationalization process of companies dedicated to the production of higher technological density goods that present different motivations for internationalization besides commercial advantages. In economic scenery marked by the intensification of competition, companies started to consider internationalization as a strategy for broadening their competitive advantages and expanding. Based on case studies, the research considered three Brazilian companies that became internationalized precociously, that is, shortly after the beginning of their activities. They recognize technology as the main element for the growth and expansion of their activities and invest continuously in development and research activities. This fact has contributed to the application for patents and global product development, which can be adapted according to the necessities of their national and international clients. It has been concluded that the precocious internationalization of the studied companies has been the result of continuous investments in technology.

### 015-0063: Technology Posture, R&D, and Innovation

*Sidhartha Das, George Mason University, United States*

*Maheshkumar Joshi, George Mason University, United States*

This study focuses on innovation in technology services firms (TSOs). We argue that for TSOs, two factors are critical for providing innovation in its products and services. The first factor is the degree of a TSO's R&D efforts, and the second factor is a TSO's technology posture. Next, the study proposes a model where product innovation leads to firm performance, and technology posture and R&D intensity are antecedents of product innovation. Using data obtained from TSOs in the Mid-Atlantic region, we examine a set of research hypotheses. Analysis of data indicates that both technology posture and R&D intensity are positively related with product/service innovation, and product/service innovation is positively related with firm performance.

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Monday, 10:45-12:15, Junior Ballroom A

Track: PITM, 18

Chair: Verónica Villena

Session: Topics in Product Innovation and Technology Management

### 015-0703: Management Tools for Family Farming

*Marie-Anne Lozano, Universidade Federal de Santa Catarina, Brazil*

*Nelson Mello, Universidade Federal de Santa Catarina, Brazil*

*Rolf Erdmann, Universidade Federal de Santa Catarina, Brazil*

Understanding the essential characteristics of family farming is a fundamental way to manage it more efficiently and effectively, maximizing resources and also ensuring its sustainability in the marketplace. Thus, it is proposed to create a management tool appropriate to the population of these units through the use of a diagnosis of performance practices from the perspective of complexity theory, also identifying their potential for improvement and generation of ideas. The aim is to identify good practices in managing the universe of family farms, creating a management tool that can be applied to them, and through the results obtained, set up improvement projects to consider the uniqueness. The use of this instrument will allow a glimpse of possible gaps not covered by the management conventionally adopted, promoting not only the management of these units, but also the research on the topic.

### 015-0856: Changing Climates: Development and Deployment of Eco-Friendly Technologies in the Canadian Oil Sand Industry

*Adam Bloomer, Mount Royal University, Canada*

*Jeffrie Landry, Mount Royal University, Canada*

*Kalinga Jagoda, Mount Royal University, Canada*

The consumer demand for eco-friendly technologies has caused firms to re-evaluate their business strategies. The current production methods of the Canadian oil sands industry have attracted a considerable amount of negative attention. The carbon dioxide emissions from extraction, production and refining of Canadian bitumen are the single largest contributor to greenhouse gas emissions growth in Canada. The development of sustainable extraction, production and refining technology is essential to the survival of the Canadian oil sands. This paper proposes an integrated model for development and diffusion of environment-friendly technologies. It demonstrates the relationships and interactions among the institutions, players, which collectively and individually contribute to the development, diffusion and commercialization of eco-friendly technologies. The model is then illustrated using a case study, and the facilitating and inhibiting factors are highlighted.

### 015-0948: In Pursuit of Implementation Patterns of Portfolio Management: An Action Research Study

*Roque Rabechini, UNINOVE, Brazil*

*Marly Carvalho, University of São Paulo, Brazil*

*Jose Modica, Transpetro, Brazil*

*Edison Braun, Transpetro, Brazil*

The high competitiveness in the oil market and the high speed at which changes occur in the world have made the big companies of that sector keep extensive engineering project portfolios requiring a highly effective management and balancing techniques in order not to be beaten by their competitors. This paper focuses on the project selection and prioritization stages of portfolio management. In this sense, a branch office of the biggest logistic company in South America, a company which belongs to the Brazilian oil system and which implements portfolio management, was investigated. The implementation of a methodology to prioritize criteria, using the Analytic Hierarchy Process, is analyzed through action research-based approach. The dynamics of implementation with a preliminary sensitivity analysis, the choice of the technique for the analysis using multiple criteria, the development of an auxiliary tool and the results of the prioritization of the portfolio were investigated.

## Monday, 10:45-12:15 Sessions

### 015-0745: Supplier Integration into New Product Development: When Modular Design Policies Do and Do Not Work

*Fabrizio Salvador, IE Business School, Spain*

*Verónica Villena, IE Business School, Spain*

Many studies have found that supplier integration (SI) has a beneficial impact on NPD performance, but a number of studies failed to find empirical evidence of the positive impact of SI on NPD performance, and some even found this effect to be negative. In this paper, we argue that negative implications of SI on the cost and performance of the design product can be mitigated through the buyer modular design competence, defined as its ability to design product platforms that emphasize component commonality and combinability. We test our hypotheses using a secondary data source consisting of an international sample of 217 NPD projects. Hierarchical regression analyses provide support for the proposed hypotheses. We finally discuss the implications of our arguments for the literature on concurrent product-process-supply chain design, for the literature on the impact of modularity on buyer-supplier relationships, and for the literature on NPD.

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Monday, 10:45-12:15, Junior Ballroom B

Track: OMM, 17

Chair: Bart MacCarthy

Session: OMM17

### 015-0868: Approximations for Virtual-Build-to-Order (VBTO) Fulfillment Metrics

*Bart MacCarthy, University of Nottingham, United Kingdom*

*Tamer Ovtmen, University of Nottingham, United Kingdom*

There is a desire in many sectors to increase flexibility in order fulfillment to meet the needs of different customers. Sectors with high variety and customization are particularly challenging. Some order fulfillment systems allow customers to be satisfied in one of three ways - from stock, by building a specific product to order (BTO) or by allocating a product already in the planning pipeline to a customer. Such systems, sometimes called Virtual-Build-to-Order systems, behave differently from conventional systems where the planning pipeline is closed. Here we consider the estimation of stock, pipeline and BTO fulfillment metrics for systems of different scale in terms of pipeline length, initial stock in the system and different variety levels. Approximation schemes are compared with an exact simulation and their accuracy is discussed for different combinations of system parameters. The relevance of the work for different sectors and future research directions are noted.

### 015-0819: After Crisis Brazilian Beef Companies Internationalization Strategies

*Luis Henrique Pereira, FGV-EAESP, Brazil*

*Adriane Queiroz, UFMS, Brazil*

The beef industry in Brazil has been shaken since October 2008, when the crisis struck the world. In 2009, the production of beef decreased 9% and although experts comment that in 2010 the industry will be back on track, some skepticism still exists. The aim of this study is to understand what will be the internationalization strategies of the Brazilian Beef Industry companies to adapt and innovate in this challenging scenario. The main concern is to understand how Brazilian beef companies can take the chance to provide a more valuable offer to an increasingly demanding consumer and a fiercer competition.

A qualitative research has been carried out with the use of case studies. Three of the most important Brazilian beef companies were selected. Preliminary findings show many changes in the market, and mergers and acquisitions may be the trend from now on.

### 015-0908: Optimizing Natural Gas Flows Including Balancing

*Kai Becker, London School of Economics and Political Science, United Kingdom*

Gas distribution companies face the problem of how to use a comparably constant, inflexible supply of gas to satisfy demands that are characterized by high volatility. For doing so, they can enter into contracts for buying gas that allow for a certain degree of flexibility, employ storages to bridge the gap between periods of lower and higher demands, and make use of the tolerance of the pipeline system with respect to the pressure of the gas transported (balancing). The paper addresses the case of a gas distribution company in France and presents an optimization tool, based on several linked mathematical programming models, that calculates the optimal flows in the network. The tool has been used for pricing, strategic analyses of the gas market, and the daily process of managing gas flows.

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Monday, 10:45-12:15, Junior Ballroom D

Track: SOHL, 17

Chair: Peter Tatham

Session: Disaster Relief and Humanitarian Logistics

### 015-0018: Local Capacity Building: A Logistics Perspective in Disaster Relief

*Ala Pazirandeh, Lund Technical University, Sweden*

With disasters growing in number, and the main impact being on developing countries, building local capacities becomes an important issue. Considering logistics taking up more than three fourth of relief operations, the purpose of this paper is to connect local capacity building (LCB) to the logistics realm in disaster relief.

An exploratory review of literature followed by a document study on capacity building cases based the frame of reference, which was further used to develop a conceptual framework for LCB projects. Findings depicted a set of keywords as the glue behind LCB concept, which were extended to develop the conceptual framework of the paper.

This paper, presents a definition for LCB, and its connection with humanitarian logistics. The suggested conceptual framework sets achievable milestones to reach sustainable capacity, leading to mitigation in the relief response phase logistics costs, and reducing the perceived disaster risk by the people.

### 015-0554: A Model for Designing Effective Humanitarian Relief Supply Chains – A Case Study in Thailand

## Monday, 10:45-12:15 Sessions

**Watcharavee Chandraprakaikul**, *The University of the Thai Chamber of Commerce, Thailand*

Hundreds of millions of people are affected by disasters each year. There is considerable evidence that the number of worldwide natural and man-made disasters is increasing, but there is still relatively little published work aimed at improving the understanding of the nature of logistics and supply chain management for humanitarian aid. Therefore, the aim of this paper is to identify elements of good practice in conventional business supply chains and apply them to the humanitarian aid supply chain, making use of published practice-based literature and web sites associated with humanitarian aid. A model for designing effective supply chains for humanitarian aid is developed. Then it is applied to a case study in Thailand to prove whether it is applicable in practice and to provide a guideline for the case study organisation to develop an effective humanitarian relief supply chain.

### 015-0972: Supply Chain Preparedness for Crisis and Disaster Events: A Proactive Partnership Perspective

**Christopher Torrance**, *Jackson State University, United States*

**Jack Crumbly**, *Tuskegee University, United States*

Logistics and supply chain management is critical to the continuity of society's daily operations after the occurrence of a disaster. Because of the widespread impact of a number of recent disaster events, there is a growing need for multiple entities to communicate and collaborate in order to provide effective action and relief. The researchers will investigate this relationship by using the proactive partnership perspective suggested by Richey (2009). Exploring theories based in resource based view (RBV), communication theory, and collaboration, we will examine state emergency management agencies and their relationship with commercial entities dealing with logistics and supply chain management in crisis situations. The researchers would like to determine if a relationship of communication and collaboration exists and is moderated by resources.

### 015-0179: What Skills and Attributes Are Needed by Humanitarian Logisticians - a Perspective Drawn from International Disaster Relief Agencies

**Peter Tatham**, *Cranfield University, United Kingdom*

**Gyongyi Kovacs**, *The HUMLOG Institute, Finland*

**Paul Larson**, *University of Manitoba, Canada*

Prior research has developed and tested a theoretical framework that links the skills and attributes of individual logisticians to logistic performance in the humanitarian, military and commercial fields. Using this framework, this paper analyses the job advertisements for humanitarian logisticians working in the "last mile" in order to assess the extent to which the framework reflect the reality of the requirements of hiring organizations. The paper demonstrates that, although there is broad agreement between the attributes deemed to be important from a theoretical perspective and those sought by practitioners, a number of unanticipated additional roles were exposed that are considered to be part of the humanitarian logisticians' job specification. The implication of the research is that those engaged in education and training of humanitarian logisticians may need to expand their curriculum in order to reflect the demands of hiring organizations more accurately.

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Monday, 10:45-12:15, Orca

Track: CIM, 15

Chair: Koichi Nakade

Session: Managing Flexibility in Inventory Systems

### 015-0401: Value of the Third Chain: Effect of Partial Production Postponement on Process Flexibility

**Geoffrey Bryan Chua**, *Nanyang Technological University, Singapore*

Two approaches that can deal with the challenges of uncertainty and complexity in production networks are process flexibility and production postponement. While full flexibility with full postponement provides the highest benefits, the literature shows that full postponement with partial flexibility can approximate these benefits at a fraction of the cost. In this paper, we show that full flexibility with partial postponement can also achieve this. Moreover, we examine the impact when both flexibility and postponement are partial. We discover that flexibility loss of 2-chain is no longer negligible (as high as 30% for small systems) under partial postponement. However, we find that by adding a third chain, the flexibility loss can be restored. For very large systems, we extend the existing analytical method to demonstrate the asymptotic value of the third chain. Finally, we study the flexibility-postponement tradeoff and find that a 3-chain at 70% postponement incurs minimal optimality loss.

### 015-0074: Finished-Goods Inventory Study under Capacitated Postponement in Semiconductor Manufacturing

**Dong Tang**, *Intel Corporation, United States*

Semiconductor manufacturers practicing delayed differentiation or postponement usually suffer from constrained finishing capacities and therefore still keep finished-goods inventories. This paper studies base-stock inventory models with and without demand forecasting and provides a computationally efficient method to set optimal inventory targets for finished products under capacitated postponement. Computations show inventory-saving benefit quickly vanishes after capacity reaches a certain level. The value of forecasted advance-demand information to postponement is justified, but can easily be overstated. When capacity limitation becomes severe, intuitions often guide producers to build to forecast more than finishing lead time ahead. Results in this work indicate that these intuitions may be invalid under capacitated postponement, reveal that forecasted advance-demand information is valuable only when the variance of demand forecast errors is less than that of demands, and show that the optimal forecast lead time can be obtained in the same way as if capacity is unlimited.

### 015-0231: Managing Inventories at the Decoupling Point

**Onur Kilic**, *University of Groningen, Netherlands*

**Dirk van Donk**, *University of Groningen, Netherlands*

The food processing industries usually produce a variety of end products with various recipes and packaging types. In general, two production stages can be distinguished. A common standard intermediate is produced in the first stage and is then processed into customer-specific end products in the second stage. The first stage operates in a batch production mode and is characterized by large setups and consequently long processing runs whereas the second stage possesses customer-specific processing times. Decoupling plays a central role in coping with demand uncertainty in such production environments. The decoupling principle is modeled by a make-to-stock approach for the first and a make-to-order approach for the second stage. We analyze the production and inventory costs and customer waiting times of the resulting inventory system. Our

## Monday, 10:45-12:15 Sessions

study is one of the first that quantitatively analyzes the functioning of the well-known Decoupling Point concept.

### 015-0267: On Ordering Policies in a Manufacturer-Retailer Model with Advance Demand Information and Production Lead Time

*Koichi Nakade, Nagoya Institute of Technology, Japan*

*Takeru Fukumoto, Nagoya Institute of Technology, Japan*

We consider a manufacturer-retailer model with advance demand information. The retailer orders finished products under base stock policy to the manufacturer with deterministic order lead time to minimize his total average holding and blocking cost. The manufacturer decides the number of products with retailer's order information to minimize his total average holding and additional overtime cost, where there is the deterministic production lead time for this order. Two cases are considered: the demand lead time is less than or equal to retailer's order lead time, and its reverse. In the former case, the retailer has positive safety stocks and the number of product order of manufacturer is also of modified base stock type, whereas in the latter case the retailer always has no stock, and better performance is obtained if advance demand information is available to the manufacturer.

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Monday, 10:45-12:15, Parksville

Track: EROM, 15

Chair: Liu Gensheng

Session: Qualitative Research

### 015-0643: On the Role of Objects and Observation in Engaged Qualitative Research

*Martin Spring, Lancaster University Management School, United Kingdom*

*Juliana Bonomi Santos, Lancaster University Management School, United Kingdom*

In OM case study research, methodological practices have been adopted in order to provide assurances of research quality. As well as a concern with research design, these often emphasise data collection and analysis methods revolving around the recording, transcription and subsequent analysis of data from interviews, sometimes using data analysis software. Such analyses are then 'triangulated' by the use of 'observations and documentary evidence', but the nature of this is often vague. In contrast, this paper argues that the role of observations and the cognition, by researchers and research subjects alike, of objects such as products, machines, diagrams and software programs, is seriously under-played. This seems a particularly important opportunity for OM, a discipline centrally concerned with making and using 'things'. Using specific examples from recent research experiences, we propose a more insightful approach to more fully 'qualitative' qualitative research.

### 015-0462: Core and Overlapping Knowledge, Integration, and Process Performance: An Empirical Study of the Buyer-Product Engineer Dyad

*David Hall, Clemson University, United States*

*Scott Ellis, Clemson University, United States*

Despite the prominence that knowledge management theory holds within extant studies of operations and supply chain management, the role of knowledge within the concurrent execution of linked sourcing and new product development projects has received little attention. Using primary data collected from direct material buyers and matched product engineers, we examine the causal linkages amongst knowledge, cross-functional integration, and process performance. Our conceptualization of knowledge incorporates both core knowledge and overlap knowledge; using a second-order construct, we operationalize these aspects of knowledge in terms of supplier, supply market, and technical knowledge. The results indicate that knowledge is significantly and positively associated with cross-functional integration. Further, we find that cross-functional integration significantly affects the success of both the direct materials sourcing and the new product development processes. These findings underscore the importance of core and overlap knowledge within cross-functional approaches to business process management.

### 015-0196: Understanding the Relationship Between E-business Systems Adoption and Organizational Agility

*Soud Almahamid, Al Hussein Bin Talal University, Jordan*

*Taher Kalaldehy, Middel East University For Graduate Studies, Jordan*

This study aims to examine the relationship between e-business systems adoption and organizational agility. A cross-sectional survey questionnaire method of data collection was adopted. The population of this research consists of all 21 chemical and pharmaceutical companies that are listed in the Amman Stock exchange. The results are expected to indicate that E-business systems adoption to have a positive impact on agile capabilities. This research is not free of the limitations of the cross-sectional studies. By focusing on understanding the relationship between e-business systems adoption and organizational agility, this study will reveal the effectiveness of e-business systems in coping with environmental uncertainty. It represents the first attempt to link the e-business system adoption and organizational agility. Finally, this work has never been done before in the Chemical and Pharmaceutical companies in Jordan or in the Middle East region.

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Monday, 10:45-12:15, Pavilion Ballroom A

Track: PLQ, 15

Chair: Franco Paulo

Session: Six Sigma - 2

### 015-0738: The Key Success Factors in Choosing and Conducting a Lean Six Sigma Project

*Paulo Franco, São Paulo State University, Brazil*

*Messias Silva, São Paulo State University (UNESP) and University of São Paulo (USP), Brazil*

In this paper was showed that, regardless of the prevailing culture, people, stage of technology, or the management model of the organization, the critical factors to provide sustainable gains for business is a small set of management actions, where the majority (> 80%) is managerially controllable (controllable management) and that the most important points to successfully conduct the Lean Six Sigma project are: Business Strategy focus; Business Impact (Financial and / or Qualitative); Metric(s) Key Performance Indicator(s); Goal (reduce, improve), Deadline (4 to 6 months); Contribution to Business Results; Project Charter (well defined and completed early); Team; Management Approval; Discipline; Champion & Management support; Champion follow up; Inspiration and dedication; Project Closure (Control Plan and / or Standard Operation, seriously).

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### 015-0968: Six Sigma: Case Studies

*James Hamister, Wright State University, United States*

*Michael Braunscheidel, Canisius College, United States*

Several case studies regarding the implementation of and motivation for Six Sigma initiatives are compared to information from academic and practitioner literature. Similarities and differences are highlighted among the selected sources. Based on these case studies, Six Sigma initiatives are implemented in a variety of ways and are not prescriptive in nature.

### 015-0345: Application of the Six Sigma Methodology in Customer Complaints Management

*Carlos Riesenberger, Bosh, Portugal*

*Sergio Sousa, University of Minho, Portugal*

An investigation was made to identify the variables influencing the customer complaint treatment process throughout a case study in the automotive industry. Customer satisfaction is vital for an organisation, but it is a complex process; therefore, solutions are not obvious. This investigation cared about the quickness and quality of the investigations made to reply to the customer complaints, using the 8D method. By selecting the Six Sigma methodology, an organized structure for problem analysis and problem solving was followed. Throughout the DMAIC cycle the problem was defined, the variables influencing the process were measured, the causes for the process failure were analyzed, improvements were planned and made and the variables were controlled until a defined six sigma level and a solid level of customer satisfaction were reached. An improved customer complaints management system resulted in a faster reactivity to complaints, representing savings of thousands whenever a complaint appears.

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Monday, 10:45-12:15, Pavilion Ballroom B

Track: GENL, 14

Chair: Aida Fajardo Montiel

Session: Regional Industrial Clusters and Governance

### 015-0702: A Case Study on the Governance Role in a Metal-Mechanic Cluster: Challenges and Prospects

*Karla Oliveira, São Paulo State University, Brazil*

*Otávio Oi, São Paulo State University, Brazil*

The industrial clusters formation phenomenon has been considerably intensified in Brazil. For this reason, this paper aims to identify, describe and analyze the management solutions developed by the governance of a major metal-mechanic cluster in the state of Sao Paulo, Brazil, as well as its challenges and perspectives. From the case study method, the following positive initiatives were observed: conceptualization and implementation of one of the most important metal-mechanic sector fairs and development of a project to encourage joint activities such as collective purchasing, sharing experience, creation of a quality certification and joint development of a system to improve product quality. The main difficulty found in the cluster management is the low involvement of the company's director, creating a retarding issue to potential results.

### 015-0715: How Much Does Firm Agglomeration Matter for Firm Growth?

*Elvio Porto, Mackenzie, Brazil*

*Luiz Brito, FGV-EAESP, Brazil*

Firm co-location in specific regions, creating local agglomerations or industrial clusters, has been considered a relevant phenomenon, potentially contributing to firm and regions competitiveness. Economic geography and the existence of positive externalities are the key theoretical justifications for this effect. The empirical test of this effect and the estimation of its magnitude is, however, still a challenge. This paper analyzed the growth of more than 16,000 Brazilian firms during the period of 1996 to 2005 using a multilevel model with cross-classification. A positive, statistically significant, but small effect of agglomeration was identified, giving support to the theoretical argument but indicating that other effects may be more relevant. Results further suggest that the relationship may have an inverted U-form. Growth variance was also decomposed, suggesting that agglomerations of similar industrial activities account for more variance than the simple agglomeration of diverse industrial activities, suggesting more relevance for the positive externalities explanation.

### 015-0044: Proposal of a Model of Maturity Levels in Management of Industrial Clusters

*Rafael Lima, University of São Paulo - School of Engineering of Sao Carlos, Brazil*

*Luiz Carpinetti, University of Sao Paulo - School of Engineering of Sao Carlos, Brazil*

*Edwin Galdamez, University of Maringa, Brazil*

Literature has emphasized the importance of industrial clusters in the development of regions and nations. Therefore, it becomes relevant to study forms of governance to improve local managerial capabilities. This paper aims at proposing a performance management model for governance agencies in industrial clusters and also a method to assess their maturity level. Hence, a literature review is made on performance management in industrial clusters and the forms of governance that may arise in such regions. Then the performance management model and the method for maturity level assessment are introduced. Two case studies in Brazilian industrial clusters were carried out to test both the management model and maturity levels. In both cases there were local associations acting as a governance agency that was in charge of stimulating and managing joint actions. The results demonstrate the appropriateness of the maturity levels in the assessment of industrial clusters.

### 015-0749: Identification of Regional Impacts from the Introduction of Production of Oil and Gas in the Deep-sea Oil Reserves in Santos, Brazil

*Edison Monteiro, UNIP, Brazil*

*Evandro Guerreiro, UNIP, Brazil*

*Ivan Campos, Unip, Brazil*

*Antonio Albuquerque, Unip, Brazil*

This article describes how to perform a sustainability and governance evaluation of the new cycle of investment in exploration and production of oil and gas in the deep-sea oil reserves, and its impact on the whole supply chain of the sector, based on the definition of specific sustainability metrics or indicators. A case study at the productive arrangement that is emerging at Santos City of the State of São Paulo in southeastern Brazil is

## Monday, 10:45-12:15 Sessions

development.

### 015-0839: A Framework for Transparency

*Børge Lillebo, Norwegian University of Science and Technology, Institute of Neuroscience, Norway*

*Andreas Økland, SINTEF Technology and Society, Norway*

*Eva Amdahl, SINTEF Technology and Society, Norway*

*Andreas Seim, Norwegian University of Science and Technology, Department of Computer and Infor, Norway*

Effective and timely information and knowledge sharing in modern complex organizations is pivotal to their competitiveness. Challenges in such sharing often become particularly visible in the cooperation between organizations and organizational units. We outline a framework for understanding transparency, drawing on 1) literature on information and knowledge sharing in operations management and knowledge management, and 2) a case from a highly complex environment - health care - and one from a highly competitive environment - the leisure boat industry. Both organizations are characterized by craft work. We further discuss how coordination could be better supported by schedules, routines, roles, and sharing of knowledge and information. Particularly, we focus on how well suited such tools, methods, and mechanisms are for increasing transparency. Finally we suggest how transparency may be enhanced by novel use of information and communication technology.

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Monday, 10:45-12:15, Port Alberni

Track: SOM, 10

Chair: Andy Neely

Session: Servitization

### 015-0774: Co-production and Service Disruption in the Business Telecommunication Industry: A Numerical Taxonomy of B2B Buyer Network Structure Complex

*Rafael Teixeira, Clemson University, United States*

*Aleda Roth, Clemson University, United States*

This research addresses the issue of complexity in service supply chains. We characterize service complexity terms of the nature of the services (standard versus customized) and geographic characteristics. Using a sample of 227 B2B buyers in the largest Brazilian telecommunications company, we develop a numerical taxonomy of B2B buyer network structure using cluster analyses. We show that service complexity is multi-dimensional, as represented by the cluster types; some types are more prone to supply disruptions and the average down time varies considerably. This paper contributes to the service strategy literature by exploring the dimensions of service complexity in the context of network structures, and offers ways that B2B service firms may mitigate against risk.

### 015-0659: Operations Strategy in B2B Services: Case Study Evidence

*Martin Spring, Lancaster University Management School, United Kingdom*

This paper is concerned with the development of operations strategy (OS) thinking and practice to reflect the increasingly inter-organizational, technology-intensive and service-based nature of B2B operations and supply. A framework developed from theoretical synthesis is briefly presented. This draws on technology strategy, evolutionary economics, modularity theory and service strategy, as well as OS. Then, results from case studies in various sectors, including aerospace, software and publishing, are presented. In particular, these draw attention to the design of what is termed the 'offering' – the various ways of combining product and service elements – and the dynamic inter-dependencies between this aspect of the proposed framework and the other two, namely, technology and the architecture of the inter-organizational network. The paper concludes by outlining a proposed OS development method based on these empirical studies.

### 015-0928: Competitive Alignment of the Tourism Network

*Angela Flecha, Federal University of Ouro Preto, Brazil*

*José Paulo Fusco, São Paulo State University, Brazil*

*Américo Bernardes, Federal University of Ouro Preto, Brazil*

The basic assumption is that the transactions between economic actors should occur in an equilibrated environment. Cohesion of the network and the convergence of the interests of its participants require the achievement of a balanced relationship and the settlement of governance principles. In this paper, we present the results of the mapping of a touristic network in the Ouro Preto, the best preserved baroque city in Brazil. We mapped the flux of tourists between places and the influence of this movement on the formation of the sector competitive bases. The substrate for this analysis is that provided by the theory of Business Networks and Supply Chain Management (SCM), which is also revised. We show that the actors' level of significance can be obtained from the tourists choice criteria to create their pathways. This movement can reinforce existent networks.

### 015-0560: Service Productivity and Stakeholder Theory

*Ruth Taylor, Curtin University, Australia*

*Amrik Sohal, Monash University, Australia*

Globally there is significant growth in service industries across developed and emerging economies; however, various studies have indicated that service sector productivity is less than that of manufacturing. Acknowledging that previous research has primarily focused on manufacturing productivity, this paper seeks to investigate service productivity. With simultaneity of production and consumption in services, the potential for influence from a range of stakeholders needs to be given consideration when exploring service productivity. Using stakeholder theory as a framework, we investigate service productivity in the hotel industry. Face-to-face interviews were conducted with managers in 13 different hotels. Results show that simultaneity, intra-stakeholder heterogeneity, and variability of stakeholder dependency impact on service productivity, creating a non-linear, dynamic service productivity environment. A model of service productivity has been developed and is currently being validated through quantitative research. Results of our research have implications for emerging economies in terms of service productivity strategy and sustainability.

## Monday, 10:45-12:15 Sessions

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