

# P O M 2005

Sixteenth Annual Conference of POMS

*"OM Frontiers: Winds of Change"*

CHICAGO

April 29 – May 2, 2005



**PROGRAM**

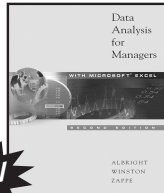
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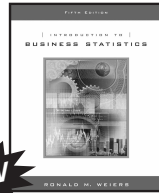
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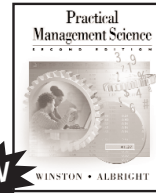
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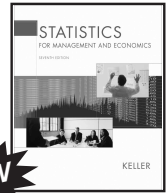
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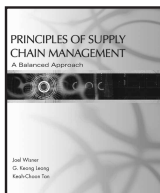
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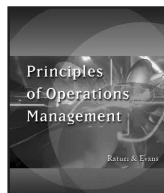


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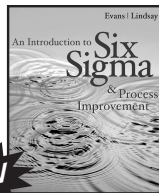
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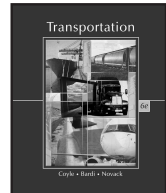


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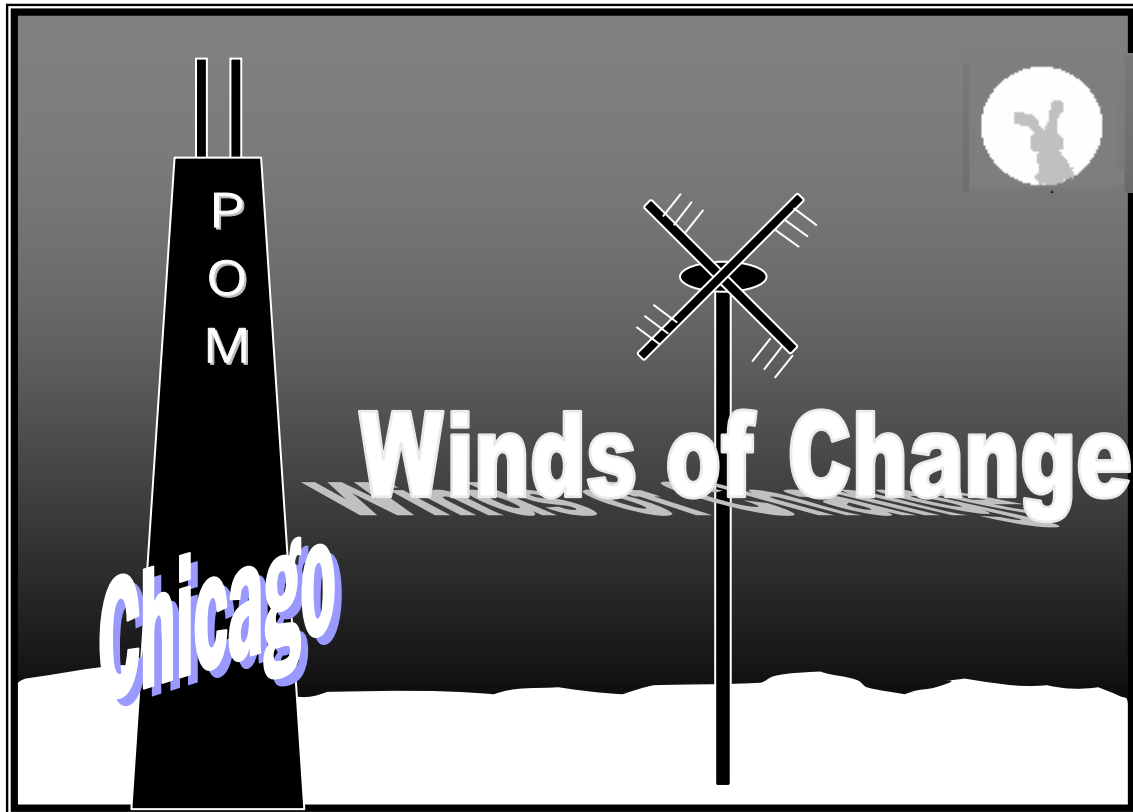
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**Sixteenth Annual Conference of POMS  
April 29 - May 2, 2005, Chicago, IL**

**"OM Frontiers: Winds of Change"**



## **Conference Program**

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<b>Table of Contents</b>	<b>Pages</b>
<b>Messages and acknowledgements</b>	
Greetings from the Mayor	P- 3
Welcome Message from the POM President	P- 4
Welcome Message from the General Chair	P- 5
Welcome Message from the Program Chair	P- 6
Chicago Welcomes POMS	P- 7
<b>POMS</b>	
Society Information	P- 8 : 9
2005 POMS Board Members	P- 10
Membership Dues form	P-11
<b>Schedules and plans</b>	
Timetable	P-12:13
A quick Guide to Parallel sessions & Tutorials	P-14
Daily Planner	P-15
Hotel Floor Plan for Meetings	P-16
Special sessions summary	P-17:18
Plenary sessions	P-19-20
Tutorials	P-21:23
Operations Advantage Group (OAG) conference	P-24:25
Emerging Scholars program	P-26
Doctoral Consortium	P-27
Awards	P-28
<b>Detailed program and Author Index</b>	
Session details, titles, authors, abstracts	1-142
Author index	142-168
<b>Sponsors, Advertisers and Exhibitors</b>	<b>169-172</b>

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OFFICE OF THE MAYOR

CITY OF CHICAGO

April 29, 2005

RICHARD M. DALEY  
MAYOR

GREETINGS

As Mayor and on behalf of the City of Chicago, I extend my warmest greetings to all those attending the Sixteenth Annual Conference of the Production and Operations Management Society (POMS), *OM Frontiers: Winds of Change*.

POMS is a professional organization devoted to addressing the problems, interests and concerns of managers for product and process design, operations and supply chains. This conference provides the opportunity for attendees to gain practical knowledge, innovative ideas and strategy from leading management professionals.

While you are in Chicago, I hope you will take time to discover all that makes our city a great place to live and visit. I know you will like what you find. From our great architecture and our beautiful Lake Michigan shoreline to our exciting nightlife and world-renowned cultural institutions and the new Millennium Park, Chicago offers something for everyone.

May all of you have an enjoyable and memorable conference.

Sincerely,

A handwritten signature in black ink that reads "Richard M. Daley". The signature is stylized and written in a cursive-like font.

Mayor

# POMS: Welcome Message from the President



It gives me a great pleasure to welcome you all to the 16<sup>th</sup> annual POMS conference – *Operations Management Frontiers: Winds of Change*. This theme reflects the importance of changes within which the companies operate. The conference will provide an opportunity to OM professionals, including academicians and practitioners, to focus on issues that are most relevant to business and industry in the changing environment.

The Conference team has worked very hard in putting together an extensive program that is intellectually stimulating and rewarding. The program, clustered in 27 tracks, will focus on cutting edge research; teaching material, software and pedagogy; and the practice of Operations Management. The conference highlights include:

- **Plenary Sessions:** The plenary speakers will share, with conference participants, their experiences about managing in the changing environment. Narendra Mulani, Partner, Supply Chain Practice, Accenture, will speak on *High Performance Supply Chain*; and Marshall Fisher, Professor, Wharton School of the University of Pennsylvania, will focus on learning about *Research Style from Physics, Medicine and Finance*.
- **OAG Session:** The Operational Advantage Group (OAG) has organized a whole day session on Saturday to attract leading practitioners to interact with academicians to forge a society that integrates theory and practice.
- **Awards Luncheon:** The awards luncheon on Monday will recognize the contributions made to the POM field by its members. The awards include: POMS Fellows Awards, Wickham Skinner Awards, and the Excellence in POM Practice (E-POMP) Award.
- **Program for Emerging Scholars of POM:** The goal of this half day program on Monday is to provide junior OM professionals with guidelines for developing excellence in their personal programs of teaching, research, and service in OM. The program reflects POMS' commitment to fostering the development of young academicians.
- **Doctoral Consortium:** The half-day session organized on Saturday aims to provide an excellent opportunity for career development and networking with prominent academicians and practitioners.

This conference, with 564 contributed and invited papers, several workshops and tutorials, is expected to be the largest POMS' conference to date with a strong international participation. This is a remarkable event that demonstrates the strength of the Society and the commitment of its members to advance the theory and practice of Operations Management.

My special thanks to Suresh Chand, Asoo Vakharia, Jim Gilbert, Sushil Gupta, Peter Stonebraker, Raju Balakrishnan, Alka Gupta, and Chelliah Sriskandrajah for planning and organizing this conference.

Gabriel Bitran  
President – POMS  
Nippon Telegraph and Telephone  
Professor of Management Science  
MIT Sloan School of Management

# Welcome Message from the General Chair



On behalf of the POM 2005's organization committee, welcome to Chicago and the 16<sup>th</sup> Annual Conference of the Production and Operations Management Society! The organization committee has worked very hard to make this conference an experience that will provide great value for your time.

The conference theme in 2005 is **Operations Management Frontiers: Winds of Change**. This recognizes the significant changes which are occurring in the environment that companies are operating in. We need to examine what world-class companies do to stay on the frontier in providing value to customers. Consistent with this theme, the invited and contributed papers cover a number of emerging topics such as Reverse Logistics, New Product Development, Secure Supply Chains, RFID Technologies, Strategic Sourcing, myOM-Getting Real with OM in Classrooms, Modular Design, Teaching Innovations, New Frontiers in Service Supply, and Patient Flows, etc. I hope you will all be able to take valuable insights from these sessions.

As the message from POMS President Gabriel Bitran indicates, this conference is expected to be our largest conference to date. This would not have been possible without the tireless efforts of the Program Chair Asoo Vakharia. I am very thankful to Asoo for accepting my invitation to take on this important role and for doing such an outstanding job.

Raju Balakrishnan and Alka Gupta deserve big thanks for their help with the webpage and the database. They were timely and creative in responding whenever there were any difficulties. I am also thankful to the Local Arrangements Chair Peter Stonebraker for creating the list of things to do in Chicago and for working with local industry to arrange our tours. I also thank the members of the sponsorship committee, Chelliah Sriskandarajah, Charles Petersen and Vidyananya Gargeya for their efforts and time. Shrikant Panwalkar and Jian Li deserve thanks for spending hours in putting together the program and meeting the deadlines from the printer. Gabriel Bitran, Sushil Gupta, and Jim Gilbert deserve my particular appreciation for their confidence in my leadership and for giving me this opportunity. My deans Rick Cosier and Bob Plante encouraged me to take this responsibility and provided generous support, my special thanks go to both of them.

Once again, welcome to Chicago and thank you for your participation in the conference. We are here to make your stay enjoyable, so please feel free to contact us if you have any questions/concerns.

Suresh Chand  
General Chair  
Professor of Management  
Krannert School of Management  
Purdue University

# Welcome Message from the Program Chair



Let me add my personal welcome to all of you to the 16<sup>th</sup> annual POMS conference – *Operations Management Frontiers: Winds of Change*. Since both Gabe Bitran and Suresh Chand have already summarized the highlights of this current meeting, I am taking this opportunity to focus on the Program. As the Program was being developed, it reminded me of how each of us have diverse interests but still are interested in coming together to learn more about what we do not know and of course, extend what we do know. This is in my mind, the true worth of being a researcher, teacher, and practitioner in the field of Operations Management.

All the submissions for this meeting have been clustered into twenty-seven different tracks. I have been told that the 561 (209 invited and 352 submitted) abstracts scheduled for this meeting represents the largest total set of submissions for a POMS meeting to date. I would like to start out by acknowledging the support and efforts of the track chairs in putting together this program. The track chairs have been instrumental in helping us put together this entire program by organizing an excellent set of invited sessions and also in helping to cluster the submitted abstracts into a set of focused sessions. These track chairs are: Sanjay Ahire, Haldun Aytug, Kurt Bretthauer, Janice Carrillo, Suresh Chand, Dilip Chhajed, Vinayak Deshpande, Mark Ferguson, Joy Field, Craig Froehle, Steve Gilbert, John Goodale, Surendra Gupta, Vaidy Jayaraman, Anand Paul, Jim Rappold, Pedro Reyes, David Rogers, Nadia Sanders, Glenn Schmidt, Roger Schroeder, Rachna Shah, Ashok Soni, Kathy Stecke, Srinivas Talluri, Rohit Verma, Jozsef Voros, and Don Wardell.

I would also like to acknowledge the help I got from Sushil Gupta, Raju Balakrishnan, and Alka Gupta. They were always there to respond to administrative and other organizational issues in putting together this program. Finally, my thanks to all of you in submitting your work which is really what has made this program come together.

Looking forward to seeing you all – enjoy the conference and let me know if I can do anything else to help.

Asoo J. Vakharia  
Program Chair  
Beall Professor of Supply Chain Management and Chair  
Department of Decision and Information Sciences  
Warrington College of Business Administration  
University of Florida

# Chicago Welcomes POMS

Chicago, “the Windy City”, and sometimes called the “City of Broad Shoulders” for its diversity, is proud to offer an array of diverse entertainment and excitement alternatives for POMS attendees. Conference headquarters, the Intercontinental Chicago Hotel, is located at roughly the mid-point of the “Mag Mile” (Magnificent Mile), one of the nation’s premier shopping districts, and a ten- to fifteen-minute stroll to the Loop, the lakeshore and Navy Pier. Chicago has much to offer for serious fun or funny business.

Restaurants for every taste can be found [in](#) the city . Each of Chicago’s ethnic groups has its own restaurant locale. Chicagoans regularly appreciate excellent ethnic dining in such environments as Greek, Indian, Middle Eastern, Pacific Islands, and others. The several restaurants of Greek Town, for example, offer a wide variety of Greek and Eastern Mediterranean fare. Theatre-goers will enjoy several downtown spots such as Rhapsody, Trattoria #10, the Italian Village, Nick’s Fish Market, and the Berghoff (although reservations, where taken, are strongly recommended). Of course, for just relaxing and enjoying a favorite beverage or snack, the Billy Goat Tavern (immortalized by Chicago Columnist Mike Royko) is a must. The Walnut Room of the flagship Marshall Fields store on State Street, or the Signature Room at the 95<sup>th</sup> floor of the John Hancock Center on the Mag Mile combine a historic perspective of Chicago with shopping districts that are arguably among the finest in the world.

**Exciting things to do:** The Jackie Kennedy: White House Years and Sue (the Tyrannosaurus Rex skeleton) are on exhibit at the Field Museum, and Body Worlds, a highly acclaimed examination of the human physique, is on display at the Museum of Science and Industry. Additionally, the Adler Planetarium and the Shedd Aquarium have daily shows. There are numerous river and lake tour boats which examine the architecture of the city or provide a pleasant evening of dinner and dancing. (Bring a jacket – it’s not for nothing that we are called the “Windy City”). Millennium park has just opened with its Pritzger Pavilion, Crown Fountain, Lurie Gardens, and “Cloud Gate.” It is one of the most spectacular pieces of outdoor architecture and landscaping in Chicago, as well as an impressive concert venue.

Navy Pier has, over the years, been transformed from a shipping and Navy training center and World War II training and deployment facility to a mile-long entertainment complex. It houses the Shakespeare Theater, a fun park, departure points for numerous boat rides, an IMAX theatre, a Children’s Museum, and numerous restaurants. The pier has probably the best concentration of “Chicago memorabilia” of any location in the city.

Chicago theatres offer shows for every taste and preference, including the comedy at Second City, and some forty performing arts centers and theatres. During the conference weekend, *Blue Man Group* will be performing, and tickets are available for *Wicked*, *Kabuki Lady Macbeth* and *Romeo and Juliet*. At the Chicago Symphony Orchestra, Leonard Slatkin will conduct a program of Stravinsky and Rachmaninov. At the Goodman Theatre, two internationally recognized shows include *Ford and Clea under the Western Sky* and *Silk*. And the Steppenwolf Theatre is currently playing *Take Me Out* by Richard Greenberg and *Lost Land* by Stephen Jeffries. Music and Night-life are highlighted by the Chicago Jazz and Blues Scene. The House of Blues and Blues Chicago, as well as the Back Room and Andy’s Jazz Club all have live shows on a nightly basis.

And, of course, baseball. The White Sox will host the Detroit Tigers at U.S. Cellular Field on Friday (28 April) and Saturday (29 April) evenings as well as Sunday (1 May) afternoon. For the record, the Sox and Mark Buehrle are going to be a tough team to beat this year. The playoffs are definitely in their future!!!!

And Chicago offers more. Visit Chicago on the web at <http://www.877chicago.com/default.html> or [http://www.choosechicago.com/see\\_and\\_do.html](http://www.choosechicago.com/see_and_do.html) to make your arrangements for a wonderful stay in our city.

## Local Arrangements Co-Chairs

Pete Stonebraker  
Northeastern Illinois University

Joel Goldhar  
Illinois Institute of technology



**PRODUCTION AND OPERATIONS MANAGEMENT SOCIETY**  
*AN INTERNATIONAL SOCIETY TO EXTEND AND INTEGRATE KNOWLEDGE PERTAINING TO PRODUCTION AND OPERATIONS MANAGEMENT*

**Purpose:** Production and Operations Management Society (POMS) is an international professional organization representing the interests of POM professionals from around the world. The purposes of the Society are:

- to extend and integrate knowledge that contributes to the improved understanding and practice of production and operations management (POM);
- to disseminate information on POM to managers, scientists, educators, students, public and private organizations, national and local governments, and the general public; and
- to promote the improvement of POM and its teaching in public and private manufacturing and service organizations throughout the world.

**Future Vision:** The Production and Operations Management Society (POMS) has become the "Gateway to the POM World". The long term goal and vision for POMS is that it should become the "home" organization for all POM professionals and be recognized as such by other professional organizations, accreditation bodies, university administrators, business and industry leaders, and our own colleagues in business schools. POMS must become the repository of fundamental POM information and the most authoritative source of developments in the POM field.

To achieve this goal, POMS facilitates communication among professors and POM professionals from all over the globe. POMS provides the following multi-dimensional links which create a "virtual department" and provide avenues for sharing ideas that impact teaching, research and practice.

- electronic links which include POMS website ([www.poms.org](http://www.poms.org)) and e-mail to and from the POMS home office ([poms@fiu.edu](mailto:poms@fiu.edu)).
- the printed word which includes Production and Operations Management, an increasingly influential quarterly journal solely devoted to the POM field.
- face-to-face contact at POMS-sponsored conferences both in the United States and in other countries with an opportunity to network with members of POM community from all over the world.

The Society's approach to Production and Operations Management is problem-centered; it does not rely on particular methodologies. We are dedicated to uncovering and understanding the canon of knowledge in POM. We encourage reviews and reinterpretations of past research and the provocative idea that initiates new research. Pedagogy remains core interest of the Society; conference sessions, the website, and bulletins are evidence of this interest. The tangible benefits of the Society include:

- Receipt of the quarterly Production and Operations Management journal
- Access to the electronic version of the Journal on-line.
- Receipt of the POM – Chronicle on-line
- Discounted registration fee at the POMS annual conference.
- Periodic receipt of Job Bulletin, Research Bulletin, and other e-mail announcements.
- Continuing access to the portions of the POMS website that will be locked in the future:
  - Pedagogy area -- links to course websites and syllabi at many schools; links to case collections and international groups; clearinghouse for sabbaticals and leaves around the world.
  - Membership area -- find phone and e-mail addresses of other members easily.

For information contact:

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**Journal:** Production and Operations Management is the official journal of the Society. The inaugural issue of the Journal was published in 1992. Members of POMS receive the Journal as a part of their membership benefits. The criteria for acceptance of manuscript include originality, significant contribution, readability, and organization of the manuscript. The Journal publishes high quality papers on all topics on POM. The Journal recognizes that the knowledge in POM is not restricted to a single discipline and that it covers several areas, including behavioral science, operations research, statistical analysis, decision support systems, information systems, strategic planning, economics, and engineering. The Journal has published several special issues on topics of current interest which include: Total Quality Management, Manufacturing Strategy, Capacity Constrained Planning and Scheduling, Global Operations and Technology Management, Global Supply Chain Management, Internship Projects at MIT Leaders for Manufacturing Program, Teaching POM: Visions, Topics and Pedagogies, and Service Marketing and Service Operations. Several universities cosponsor the journal.

**Annual Conferences:** POMS' annual conferences provide a forum to POM professionals for interaction on topics of importance to the POM field. There are normally two conferences every year – one in U.S.A. and one in another country. The conferences include contributed papers, workshops, plenary sessions, tutorials, and panel discussions. POMS' conferences always have a theme; are smaller but more cohesive and more intimate than many other conferences; and spend considerable time in plenary and semi-plenary sessions that serve to unite us all. The themes of some of the recent conferences include:

- Teaching POM: Visions, Topics, and Pedagogies
- World Best Practice in POM (Australia -1996)
- Reflections: The History of Thought in Operations Management (Santa Fe - 1998)
- (South Africa - 1998)
- Operations Management for Global Economy – Challenges and Prospects (India – 1999)
- POM Facing the New Millennium (Spain – 2000)
- Operations Management in the Internet Era (Brazil – 2001)
- POM in the Service Economy (Savannah – 2003)
- Operations Management 2004: The Expanding Constellation (Cancun, Mexico – 2004).
- (Indianapolis-1996)
- Integrating POM Research and Practice in the 21st Century (Miami - 1997)
- Competitiveness and Wealth Creation – Role of POM
- Creating a New POM Architecture for the 21st Century (Charleston -1999)
- Expanding Boundaries of POM (San Antonio – 2000)
- POM Mastery in the New Millennium (Orlando – 2001)
- POM High Tech (San Francisco – 2002)
- One World? One View of OM? (Italy – 2003)
- OM Frontiers: Winds of Change (Chicago -2005)

The conference in Spain (2000), the 1st World POM Conference, was cosponsored by European Operations Management Association (EurOMA) and Japan Society for Production Management (JSPM). The conference in Italy (2003) was a joint conference with EurOMA. The conference in Cancun, Mexico (2004) was the 2nd World POM conference and was cosponsored by EurOMA and JSPM. POMS conferences are supported by contributions from various sponsors that include universities, book and software publishers, and private businesses and industries.

**Books:** POMS published its first book in Technology and Operations Management Series in 1998. The Book, Global Supply Chain and Technology Management, was edited by Hau L. Lee (Stanford University) and Shu Ming Ng (Hong Kong University of Science and Technology). This book project was financially supported by the School of Business and Management, Hong Kong University of Science and Technology, the Research Grant Council of Hong Kong, and the Stanford Global Supply Chain Management Forum. The second book, Supply Chain Management: Innovations for Education, edited by M. Eric Johnson and David F. Pyke (both from Dartmouth College) was published in June 2000. This book project was financially supported by Dartmouth College.

**Membership:** POMS has about 1000 members from 44 countries. (U.S.A. – 66%, other countries - 34%).

**Web Page:** POMS' web page was developed by a grant from CIBER at Indiana University, Indianapolis, Indiana, U.S.A. POMS' web page provides important links to information about research and teaching in POM, meetings and conferences, POM journals, POM job opportunities, and information about members. ([www.poms.org](http://www.poms.org)).

# Production and Operations Management Society

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## Time Table : April 29 -30, 2005

Time	Event	Location**	
<b>Friday, April 29, 2005</b>			
09:00am - 3:00pm	Board Meeting	King Arthur Court	3S
10:00am - 6:00pm	Registration	Valencia Foyer	LL
08:00am - 6:00pm	Exhibits	Seville Ballroom	1N
01:45pm - 3:15pm	13 Parallel Sessions	See Page P-14	-
03:15pm - 3:45pm	Coffee Break	Exhibit Area	1N
03:45pm - 5:15pm	13 Parallel Sessions	See Page P-14	-
06:30pm - 7:30pm	Cocktail Reception	Seville Ballroom	1N
<b>Saturday, April 30, 2005</b>			
08:00am - 5:00pm	Registration	Valencia Foyer	LL
08:00am - 9:00am	Plenary Session I (Dr. Mulani)	Renaissance Ballroom	5S
09:00am - 9:30am	Coffee Break	Exhibit Area	1N
09:00am - 5:00pm	Exhibits Open	Seville Ballroom	1N
09:30am - 5:00pm	Operational Advantage Group	Exchange	11S
09:30am - 11:00am	13 Parallel Sessions	See Page P-14	-
11:15am - 12:45pm	13 Parallel Sessions	See Page P-14	-
12:45pm - 1:45pm	Lunch on Own		-
01:45pm - 5:00pm	Doctoral Consortium	Trade	11S
01:45pm - 3:15pm	12 parallel sessions	See Page P-14	-
03:15pm - 3:45pm	Coffee Break	Exhibit Area	1N
01:45pm - 3:15pm	<i>Production and Operations Management</i> Meet the Department Editors	Renaissance Ballroom	5S
03:15pm - 5:00pm	Department Editors' Reception	Renaissance Ballroom	5S
03:45pm - 5:15pm	13 Parallel Sessions	See Page P-14	-
05:20pm - 6:00pm	Service College Meeting	Valencia	LL
05:20pm - 6:00pm	Product Innovation and Technology College Meeting	Exchange	11S
05:20pm - 6:00pm	Sustainable Operations College Meeting	Burnham	8S
06:15pm - 7:30pm	President's Reception	Renaissance Ballroom	5S

**\*\* Floor of the location is indicated in the last column**

**3S: floor 3, South      LL : Lobby level**

**All coffee breaks are in the Exhibit area (Seville Ballroom - 1N)**

## Time Table : May 1 - 2, 2005

Time	Event	Location**	
<b>Sunday, May 1, 2005</b>			
08:00am - 5:00pm	Registration	Valencia Foyer	LL
08:30am - 9:30am	Plenary Session II (Prof. Fisher)	Renaissance Ballroom	5S
09:00am - 5:00pm	Exhibits Open	Seville Ballroom	1N
09:30am - 11:00am	13 Parallel Sessions	See Page P-14	-
11:00 am – 11:15 am	Coffee Break	Exhibit Area	1N
11:15am - 12:45pm	13 Parallel Sessions	See Page P-14	-
12:45pm - 1:45pm	Lunch on Own		-
01:45pm - 3:15pm	13 Parallel Sessions	See Page P-14	-
03:15pm - 3:45pm	Coffee Break	Exhibit Area	1N
03:45pm - 5:15pm	13 Parallel Sessions	See Page P-14	-
05:30pm - 6:30pm	POMS General Business Meeting	Exchange	11S
<b>Monday, May 2, 2005</b>			
06:45am - 11:45am	Emerging Scholars Program	Toledo	5S
08:00am - 10:00am	Registration	Valencia Foyer	LL
08:00am - 9:30am	11 Parallel Sessions	See Page P-14	-
09:30am - 10:00am	Coffee Break	Exhibit Area	1N
09:30am - 11:30am	Exhibits Open	Seville Ballroom	1N
10:00am - 11:30am	12 Parallel Sessions	See Page P-14	-
12:00pm - 1:30pm	Closing Ceremony, Awards Luncheon	Grand Ballroom	7S

**\*\* Floor of the location is indicated in the last column**

**3S: floor 3, South      LL : Lobby level**

**All coffee breaks are in the Exhibit area (Seville Ballroom - 1N)**

A Quick Guide to Parallel Sessions and Tutorials														
			Friday , April 29				Saturday , April 30				Sunday , May 1		Monday , May 2	
Room		Floor	1:45-3:15	3:45-5:15	9:30-11:00	11:15-12:45	1:45-3:15	3:45-5:15	9:30-11:00	11:15-12:45	1:45-3:15	3:45-5:15	8:00-9:30	10:00-11:30
	Code		FD	FE	SB	SC	SD	SE	SUB	SUC	SUD	SUE	MA	MB
Adler	5	2N	EIRLM	EIRLM	EIRLM	OPSC	OPSC	OPSC	OPSC	OPSC	OPSC	OPSC	OPSC	CI
Burnham	4	8S	LDCIS	LDCIS	LDCIS	CLSC	CLSC	CLSC	LDCIS	LDCIS	P	P	P	ITISC
Hebron	9	2N	ETOM	QMSS	QMSS	QMSS	QMSS	QMSS	LPS	FM	FM	FM	SCPS	HCO
Holabird	2	8S	SMO	ICSC	ICSC	ICSC	ICSC	ICSC	ICSC	ICSC	SCM	SCM	SCM	SCM
Illinois	7	6S	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	OMI	OMI
Michigan	6	6N	NPTM	NPTM	NPTM	NPTM	□□	NPTM	NPTM	NPTM	liT	NPTM	□□□□	F
Ohio	10	6S	ERP	ERP	ERP	ERP	ERP	ERP	HCO	NPTM	HCO	HCO	HCO	OS
Onyx	11	2N	OS	OS	OS	OS	SOM	OS	OS	OS	OS	OS	OS	OS
St. Clair	8	6S	SOM	SOM	SOM	SOM	SOM	SOM	SOM	SOM	SOM	SOM	SOM	OS
Sullivan	1	8S	SCM	SCM	SCM	SCM	SCM	SCM	SCM	SCM	SCM	SCM	SCM	SCM
Valencia East	12	LL	liT	liT	liT	liT	liT	liT	liT	liT	liT	liT	OS	□□
Valencia West	13	LL	liT	liT	PRM	PRM	OS	TRL	TRL	TRL	TRL	TRL	□□□□	TRL
Wright	3	8S	IM	IM	IM	IM	IM	IM	UJSC	UJSC	EIRLM	ITISC	ITISC	ITISC

**Notes**

Row-wise session codes are FD, FE, etc.  
 Column-wise codes are for rooms.  
 FD5 means Friday's 1:45 pm session in Adler room  
 Floor: 2N means second floor north side.  
 LL means lobby level.

	CI	Continuous Improvement	NPTM	New Product and Technology Management
	CLSC	Closed Loop Supply Chains	OMI	Operations Marketing Interface
	EIRLM	Environmental Issues & Reverse Logistics in Manufacturing	OPSC	Operations Planning, Scheduling and Control
	ERP	ERP	OS	Operations Strategy
	ETOM	Emerging Theories in OM	P	Purchasing
	F	Forecasting	PRM	Pricing and Revenue Management
	FM	Flexible Manufacturing	PSI	Product and Service Innovation
	HCO	Health Care Operations	QMSS	Quality Management and Six Sigma
	ICSC	Information and Contracting in Supply Chains	SCM	Supply Chain Management
	liT	Innovations in Teaching	SCPS	Service Capacity Planning and Scheduling
	IM	Inventory Management	SMO	Stochastic Models in Operations
	ITISC	Impact of Technologies on Integrated SCM Operations	SOM	Service Operations Management
	LDCIS	Logistics, Distribution Channels and Inventory Systems	TRL	Tutorials (details on pages P18 – P20)
	LPS	Lean Production Systems	UJSC	Uncertainty in Integrated Supply Chains

# Daily Planner

<b>Friday</b>	<b>1:45 pm to 3:15 pm</b>	
	<b>3:45 pm to 5:15 pm</b>	
<b>Saturday</b>	<b>8:00 am to 9:00 am</b>	<b>Plenary Session I</b>
	<b>9:30 am to 11:00 am</b>	
	<b>11:15 am to 12:45 pm</b>	
	<b>1:45 pm to 3:15 pm</b>	
	<b>3:45 pm to 5:15 pm</b>	
<b>Sunday</b>	<b>8:30 am to 9:30 am</b>	<b>Plenary Session II</b>
	<b>9:30 am to 11:00 am</b>	
	<b>11:15 am to 12:45 pm</b>	
	<b>1:45 pm to 3:15 pm</b>	
	<b>3:45 pm to 5:15 pm</b>	
<b>Monday</b>	<b>8:00 am to 9:30 am</b>	
	<b>10:00 am to 11:30 am</b>	

# Hotel Floor Plan for Meetings

11<sup>th</sup> Floor

Exchange Room  
Fitness Center  
Administration Offices  
Trade Room

8<sup>th</sup> Floor

Grand Ballroom Balcony

Sullivan Room  
Wright Room  
Holabird Room  
Burnham Room

7<sup>th</sup> Floor

Grand Ballroom

Empire Room

6<sup>th</sup> Floor

Ohio Room  
Michigan Room  
St. Clair Room  
Illinois Room

5<sup>th</sup> Floor

Toledo Room  
Cordova Room  
Spanish Court  
Alhambra Boardroom

Renaissance Ballroom

3<sup>rd</sup> Floor

Camelot Room

Hall of Lions

King Arthur Court

Adler Room

2<sup>nd</sup> Floor

Zest Balcony

Hebron Room

Onyx Room

Hall of Lions

The Living Room

Seville Ballroom

1<sup>st</sup> Floor  
Michigan Ave

Zest Restaurant

Gift Shop

Valencia Rooms

Business Center

Six Continents Bar

Six Continent Salon

## Special Sessions summary

### Plenary (see pages P19:20)

Sat 8:00      Opening Ceremony and Plenary Session 1: Dr. Narendra Mulani, Accenture  
Sun 8:30      Plenary II: Professor Marshall Fisher, Wharton School

### Tutorials (see pages P21:23 for details)

Sat 3:45      SE13: Beyond Lean: Reducing Lead Time (Suri)  
Sun 9:30      SUB13: From Models to Decision Support Systems (Ahuja)  
Sun 11:45     SUC13: Six Sigma (Herb Moskowitz)  
Sun 1:45      SUD13: Costs of Uncoordinated Supply Chains (Munson and Hu)  
Sun 3:45      SUE13: Managing the Lean Supply Chain (Srinivasan)  
Mon 10:00    MB13: Competitive Advantage through Operations (Spear)

### Panels and Workshops (See page P-14 for locations)

Fri 1:45      FD13: Web-Based Simulation to Improve Learning (Wood)  
Fri 1:45      FD9: Emergent Theories for Operations Management (Schroeder and Singhal)  
Fri 3:45      FE7: Focused Chaos – Insight, Intention and Innovation (Stat/IDEO)  
Fri 3:45      FE13: Supply Chain Learning Environment (Palin)  
Sat 9:30      SB7: Teaching Product and Service Innovations – Open Discussion (Verma)  
Sat 9:30      SB8: Panel Discussion: Is Service Operations Missing its Target? (Morgan)  
Sat 9:30      SB10: Innovative Use and Extensions to ERP – Panel (Bendoly)  
Sat 9:30      SB12: Using Technology in OM Classrooms – Workshop (Davis)  
Sat 9:30      SB13: College of Sustainable Operations: An Introduction (Guide)  
Sat 11:15     SC6: Panel on New Product Development (Carrillo)  
Sat 11:15     SC7: Tutorial on Trade Promotion: Innovation in Retail (Collins)  
Sat 11:15     SC10: Panel on Enterprise Systems and Applications: The Future (Soni)  
Sat 11:15     SC12: myOM – Getting Real with OM in the Classroom – Workshop (Russell)  
Sat 11:15     SC13: POMS College of Sustainable Operations – Panel (Guide)  
Sat 1:45      SD10: An ERP Based Operations Curriculum – Panel (Soni)  
Sat 3:45      SE10: RFID Technologies: The Impact on Operations – Panel (Venkataramanan)  
Sat 3:45      SE12: A Supply Chain Perspective of POM Academics - Panel (Ahire)  
Sun 9:30      SUB8: Transferring Manufacturing Knowledge to Service - Panel (Smunt)  
Sun 9:30      SUB11: Operations Strategy in Service Economy – Panel (Goldhar)  
Sun 9:30      SUB12: A New Supply Chain Approach for Tomorrow's professionals (Wagner)  
Sun 1:45      SUD4: Implementing Change Supply Chain: Research Opportunities (Carr)  
Mon 10:00    MB6: Rule Based Forecasting: Using Expert Knowledge (Alya)



# Plenary session I: Narendra Mulani

Saturday, April 30, 2005, 8:00 am to 9:00 am

Renaissance Ballroom

## High Performance Supply Chain



Today, many organizations are embracing an agenda that successfully places the supply chain at the core of their business strategy. Companies such as Dell Computer, Scholastic, Taiwan Semiconductor Manufacturing Company, Wal-Mart, and Zara have used supply chain management to create a distinct competitive advantage that drives profitable growth. These “masters” have developed new operating models across essential supply chain processes--models that dramatically improve their cost position, drive customer service performance, and achieve significant working capital reductions and enhanced asset productivity.

Based on research conducted by Accenture, INSEAD and Stanford and extensive client experience, this session will explore:

- The strategic contribution of supply chain excellence to shareholder value.
- How leading organizations, “masters,” sustain high performance over time by addressing six important characteristics for a world-class supply chain.
- Examples from companies that have transformed their supply chains to become more efficient, responsive and innovative in the face of changing market conditions.

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Narendra Mulani is the partner responsible for Accenture’s North American Supply Chain Management practice and for the global Consumer and Industrial Supply Chain Management practice. He has leadership experience in a variety of roles, including supply chain, marketing and sales force consulting. He has teamed with clients to deliver supply chain solutions in the electronics and consumer goods industries. He has particular expertise in supply chain strategy and execution, supply chain implementations, trade promotion planning, and new product forecasting. Based in Chicago, he can be reached at [narendra.p.mulani@accenture.com](mailto:narendra.p.mulani@accenture.com).

# Plenary session II: Marshall Fisher

Sunday, May 1, 2005, 8:30 am to 9:30 am

Renaissance Ballroom



## What can we Learn about Research Style from Physics, Medicine and Finance?

The field of operations management has accomplished much of which we can be proud, but like all healthy fields, we should constantly strive to do better. One way to improve is to learn from role models. As you can guess from the title of this talk, my favorite role models within academia are physics, medicine and finance, because these fields have spawned 'big', intellectually deep ideas that have significantly impacted the world, e.g. relativity and the Manhattan project, the germ theory of disease and vaccines, and a theory of capital markets that revolutionized Wall Street.

By contrast, the field of operations has had big ideas, like Ford's assembly line, the Toyota production system, TQM and statistical process control, but they have not come from academia. Why? And what can we learn from other fields to change this?

I believe that physics, medicine and finance have prospered because they have a strong empirical tradition that is well integrated with theory and this let's them identify and answer big questions. I'll review how the integration of theoretical and empirical research works in physics, medicine and finance, use this to construct a taxonomy of empirical research and apply the taxonomy to review some 'blossoming flowers' of empirical research in operations management. I'll conclude with some suggestions of how our field might accelerate the pace of operations empirics.

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Marshall L. Fisher is the UPS Professor of Operations and Information Management at the Wharton School of the University of Pennsylvania and co-director of the Fishman-Davidson Center for Service and Operations Management. He earned an SB in electrical engineering and an MBA and PhD in operations research from MIT. After teaching assignments at the University of Chicago and Cornell University, Dr. Fisher joined the faculty of the Wharton School in 1975. His pioneering research in logistics and supply chain coordination has been implemented by many companies and recognized by numerous awards including the Lanchester Prize and the Edelman Prize. Dr. Fisher is a member of the National Academy of Engineering and an INFORMS Fellow. He has been a consultant to many Fortune 500 companies, including Ahold, Air Products and Chemicals, BMG, Campbell Soup, DuPont, Exxon, Frito Lay, General Motors, IBM, Matel, Nokia, Scott Paper and Spiegel, Inc. He is currently engaged in a multi-year study funded by the Sloan Foundation to investigate how retailers can exploit information technology and flexible manufacturing to improve the merchandising of fashion products. Dr. Fisher is a founder and Chairman of 4R Systems, Inc., a company that provides supply chain planning software to retailers of short lifecycle products.

# Tutorials

**Beyond Lean: Reducing Lead Time for Low-Volume and Custom-Engineered Products Using Quick Response Manufacturing (QRM) and POLCA**  
**Saturday April 30, 3:45 pm – 5:15 pm**      **Valencia West**

**Rajan Suri**, University of Wisconsin-Madison

Although Lean Manufacturing techniques can be powerful in certain situations, for companies making low-volume or custom-engineered products, Lean Manufacturing has several drawbacks. Quick Response Manufacturing (QRM) can be a more effective competitive strategy for companies targeting such markets. We provide an overview of QRM strategy which focuses on lead time reduction throughout the enterprise. We explain why Lean strategies of Flow, *Takt* time and Pull don't work well for these markets, and why QRM is more applicable. We describe POLCA, a material control system to be used as part of QRM. We show why a kanban system (used in Lean Manufacturing for material control) is not appropriate for these markets. Instead, POLCA provides an effective method to support both manufacturing and material control for companies serving these markets. The combination of QRM and POLCA provide companies with competitive advantage through their ability to deliver customized products with short lead times.

**From Models to Decision Support Systems**  
**Sunday May 1, 9:30 am – 11:00 am**      **Valencia West**

**Ravi Ahuja**, University of Florida, Gainesville

In their current IE/OR and business school curriculum, students acquire background in modeling, optimization, simulation, database, and programming, but there do not exist courses which teach students how to integrate these technologies learned in different courses to build decision models based information systems, also called *decision support systems* (DSS). A DSS uses the data residing in spreadsheets and/or databases, models it, processes or analyzes it using problem-specific methodologies, and assists the user in the decision-making process through a graphical user interface (GUI). Decision support systems are gaining widespread popularity in industry and knowing how to develop such systems will make our students active participants in the information revolution transforming our society. We are developing several courses that would teach our students how to develop spreadsheet-based or web-enabled decision support systems; in this tutorial we will share the contents of these courses and our experiences in offering these courses. The tutorial will give an overview of DSS and the need for DSS in the practice of operations research and operations management. We will illustrate using simple examples how to develop Excel VBA based and VB.Net based DSS, and demonstrate an extensive set of DSS case studies we have developed arising in forecasting, inventory, finance, location, sports, and medical applications. Finally, we will discuss how to integrate these courses in the existing course curriculums.

# Tutorials .. continued

## **Six Sigma: An Animated Computer Simulation, Case-Based, Active Learning Approach for Improving & Optimizing Processes**

**Sunday, May 1, 11:15 am - 12:45 pm**

**Valencia West**

**Herb Moskowitz**, Purdue University

A key aspect of Six Sigma is DMAIC, which is basically a disciplined approach to problem prevention/solving ... **define, measure, analyze, improve, and control.**

The tutorial presentation will consist of the following:

1. Overview of our learning model which consists of the following components:
  - a. Case studies to motivate and apply Six Sigma principles in various phases of DMAIC.
  - b. A computer animated simulation which serves as the virtual active learning environment for system understanding and improvement.
  - c. Database and analysis software tools (Excel and Minitab) for data collection and statistical analysis.
  - d. Power Point slides of supporting core and reference learning materials.
2. Demonstration of the animated simulation and improvement process in action.
3. Overview and demonstration of a newly developed **automated intelligent manufacturing system (AIMS)** applied to the simulation which employs machine learning and genetic algorithms to model and optimize a simulated or real process.

## **Teaching the Costs of Uncoordinated Supply Chains**

**Sunday, May 1, 1:45 pm – 3:15 pm**

**Valencia West**

**Charles L. Munson**, Washington State University    **Jianli Hu**, Chapman University

The primary theme of supply chain management is that communication and coordination among members of a supply chain enhance its effectiveness, creating financial benefits to be shared by the members. In particular, the mere act of working together (global optimization) instead of separately (independent optimization) can “create money out of thin air,” resulting in a win-win scenario for all parties. In this tutorial, we present various numerical examples, tailored for classroom use either as a self-contained lecture or usable throughout a course, that clearly demonstrate the financial rewards obtainable from coordination. The examples cover areas such as (1) location decisions, (2) centralized warehousing, (3) lot sizing, (4) demand forecasting, (5) pricing, (6) newsvendor environments, and (7) aggregate planning. Sample notes and Excel spreadsheets will be provided to audience members.

# Tutorials .. continued

## **How to Build and Manage the Lean Supply Chain**

**Sunday, May 1, 3:45 pm – 5:15 pm**

**Valencia West**

**Mandyam M. Srinivasan**, University of Tennessee

This tutorial presents the principles and steps that enterprises can jointly undertake to build and manage the lean supply chain. It will discuss how lean thinking and the theory of constraints combine to help flow the product smoothly across the supply chain. One tool we discuss in detail is Rate-Based planning, a lean thinking concept that allows multiple enterprises in a supply chain to plan and schedule production at the same rate. This concept has, however, not been explicated until now. Rate-based planning helps synchronize the production plans and schedules of upstream suppliers with the drumbeat of the downstream customer. The customer's drumbeat is determined by the constraint, which could be either the market or the customer's internal production capacity. The spreadsheet-based tool we present identifies which type of constraint (market or production capacity) is expected to be the bottleneck in the future, and accordingly develops and broadcasts production plans to upstream suppliers. From a theory of constraints perspective, rate-based planning thus integrates the vitally important constraint into the supply chain planning and execution processes.

## **Creating Competitive Advantage through Operations: Teaching Lessons from Toyota, Alcoa, and other High Performing Organizations**

**Monday, May 2, 10:00 am to 11:30 am**

**Valencia West**

**Steve Spear**, Harvard Business School

Though undifferentiated from competitors by strategic factors such as product or service, process technology, and target market, there are companies that maintain dominant positions through the capabilities of their operations, with quality, workplace safety, productivity, *and* flexibility better than others can manage, leading to superior market growth and profitability. The source of these advantages is that these operationally excellent organizations have learned how to manage their complex systems so that doing work and learning to do work better are exceptionally tightly coupled.

This tutorial will introduce material — written and video case studies, simulations, field projects, and readings — used to teach students and managers how companies such as Toyota and Alcoa achieve operations based competitive advantage.

This material has been developed through a decade's worth of studying Toyota to understand the principles that underlie its management system and testing the validity of those findings with industrial companies such and healthcare organizations.

# OAG conference

## SECOND NATIONAL CONFERENCE OF THE OPERATIONAL ADVANTAGE GROUP (OAG)

Saturday, April 30, 9:30 am to 5:00 pm                      Exchange

The OAG all-day conference consists of a business meeting followed by a panel on collaborative research in the morning. After lunch, there is a workshop on the COO role that follows a discussion about OAG issues including the formation of a foundation to oversee the establishment of a global network of business schools (IFAME), the E-POM award for practitioner excellence, and an initiative to increase the effectiveness of POM-student recruitment. The detailed schedule with additional information is given below.

The OAG was formed in 2003 as a POMS activity with the following mission:

To achieve an inclusive organization, that brings together *academics and practitioners*, from many countries, who are devoted to furthering cooperation and interactions between the two groups. OAG members agree to coordinate activities to increase understanding and effectiveness of all aspects of operations management. This goal is in conformance with the original conception of POMS.

The first national meeting of the OAG, held at the Cancun-POMS meeting in May, 2004, was attended by 60 POMS members. The Cancun-OAG meeting was convened to begin discussions about how to integrate the activities of industrial executives with the academic interests of POMS members. The Chicago-OAG meeting resulting from those discussions fields a full schedule of panels, workshops, and discussion themes.

### Outline of the OAG all-day session on Saturday, 30 April, 2005

**8:00 AM – 9:00 AM Plenary Session**

**9:00 AM – 9:30 AM Coffee Break**

**9:30 AM - 10:00 AM**

Welcome to the OAG by Kasra Ferdows, POMS President, followed by an introduction to the OAG organization by Wick Skinner and Marty Starr. The following points will be on the OAG business meeting agenda which continues at 1:30 PM until 2:15 PM. Some of the issues to be discussed, as time allows include: a) optimal size and composition for OAG, b) role of growing ranks of emeritus professors and new career-oriented industry leaders, c) the creation of mutual-benefit networks, d) getting the word out about OAG, e) establishing publication, teaching, and research partnerships, f) student and faculty recruitment and interchanges, g) finding a director for OAG.

**10:00 AM - 12:00 Noon**

Andy Neely's AIM Panel on Collaborative Research: Engaging Practitioners in Management Research. Participants: Professor Andy Neely, Deputy Director AIM Research, Professor of Operations Strategy and Performance at Cranfield School of Management and Visiting Professor of Operations Management at London Business School; Professor Aleda Roth, Professor of Operations, Technology and Innovation Management at University of North Carolina and AIM International Visiting Fellow; Professor Chris Voss, AIM Senior Fellow and Professor of Operations Management at London Business School.

The session will start with an overview of the AIM Initiative from Andy Neely who will then outline work he is carrying out in collaboration with two AIM Senior Fellows, both economists. This work involves studying productivity of organizations and sectors of the UK economy using both company and national data level sets. Chris Voss will talk about his work on experiential services, outlining challenges of dealing with practitioners in large scale experience-based service operations. Aleda Roth will discuss her collaborative survey research with practitioners and the development of research methods. The three presentations exemplify different models of collaborative management research being undertaken by

members of the operations management community. Formal presentations will be followed by open discussion. Participants are invited to share their experiences of collaborative management research.

This panel explores approaches to collaborative management research in operations management that are being undertaken by members of the AIM Community. The goal is to develop world-class collaborative research with practitioners as co-producers of management knowledge.

**12:00 PM - 1:30 PM: Lunch**

**1:30 PM - 2:15 PM**

Continuation of OAG issues:

a) Discussion of the creation of the International Foundation for Advancement of Management Education (IFAME). The IFAME will promote a Global Business Schools Network (GBSN), whose members will provide local access to the best management education that is affordable and relevant. The goal of IFAME is that the M.B.A. programs of its members be ranked among the top five M.B.A. programs in their respective countries within five years of operations. IFAME/GBSN, for its success, requires significant interaction of the business community with academia. – Led by Professor Sushil Gupta (25 minutes)

b) Discussion about how recruitment strategies can be enhanced. - Led by Jennifer Vasseur, Human Resources and Recruiting Manager, Total Quality Logistics, Inc. This company was founded in 1997 and has become a leader in the third-party transportation industry. TQL wishes to explore with OAG how to foster partnerships with local colleges and universities to the benefit of graduates as well as educational institutions. (10 minutes)

c) Discussion concerning the Excellence in POM Practice (E-POMP) Award which has been instituted by the POMS in support of OAG's mission of strengthening the partnership between POM academics and POM practitioners. This award recognizes contributions made to the field of Production and Operations Management by POM practitioners - Led by Professor Sushil Gupta. (10 minutes)

**2:15 PM - 3:15 PM**

Joel Goldhar's COO Workshop - Part 1

The second annual COO (Chief Operating Officers) Workshop will feature short talks by several current and retired COO's, and also academics who have studied the COO position/role. There will be significant time for audience questions and participation. Some key issues include the short and long-term profit impact of the COO; the organizational structures that support COO 'effectiveness,' the recent 'trend' toward disappearance of COO positions.

**3:15 PM – 3: 45 PM Coffee Break**

**3:45 PM – 4: 45 PM**

Joel Goldhar's COO Workshop - Part 2

The afternoon session of the COO Workshop continues the theme of “COOs--The Missing Link in Business.” Observations and anecdotes of firms experiencing (catastrophic or evolutionary) failure will be tied in to the existence of weak (or non-existent) COO functions. Contributions from audience experiences are welcomed. Possible issues include:

1. Is a strong COO necessarily an effective COO?
2. What are the defining interactions between COO, CEO, and the Board of Directors for success?
3. What organizational structures support successful COOs?
4. What research needs to be done to define the role of effective COOs?

**4:45 PM – 5: 15 PM**

Wrap-up for OAG, AIM, and COO – Led by Wick Skinner and Marty Starr

# POMS Emerging Scholars Program: ESP

MON May 2, 2005, 6:45 -11:45 AM

Toledo

The Production and Operations Management Society is committed to fostering the development of young professionals pursuing academic careers in the field of OM, and has thus commissioned this special session of the conference. The program's goal is to provide junior OM professionals with career-building advice in developing excellence in their personal programs of teaching, research, and service in Operations Management.

The program will consist of a set of guided discussions on topics relevant to academic career building in the field of Operations Management. The discussions will cover a broad range of topics such as (but not limited to): excelling in the classroom, new methodologies for research and teaching, book writing, charting and managing a winning research stream, choosing publication outlets, dealing with lazy editors, dealing with impertinent reviewers, doing research in non-PhD granting universities, funded research, professional service – getting involved with what and when, service opportunities in the POMS, consulting, juggling your activities – doing it all, setting priorities, etc.

<b>Facilitators:</b>	06:45 – 07:50	registration, <b>breakfast</b> , introductions, welcome
Jack Kanet, University of Dayton		
Jack Hayya, Penn State University	07:50 – 08:00	pause
Mike Gorman, University of Dayton	08:00 – 09:30	discussion round 1
	09:30 – 10:00	intermission, informal meeting of POMS leadership
<b>Discussion Leaders:</b>	10:00 – 11:30	discussion round 2
Joe Blackburn, Vanderbilt University	11:30 – 11:45	wrap-up
Jim Gilbert, Rollins College		
Mike Magazine, University of Cincinnati		
Jo van Nunen, Erasmus University		
Wick Skinner, Harvard University emeritus		
Marty Starr, Rollins College		

# POMS Doctorial Consortium:

**Saturday April 30 1:30 to 5:00 pm. Trade**  
**Theme: Transitioning from Graduate Student to Professor**

**Introduction:** The Production and Operations Management Society is committed to fostering the development of young professionals pursuing academic careers in the field of operations management, and thus has arranged this special session for current Doctoral students studying OM. In this session, a diverse set of OM faculty will provide insights on how to succeed as a professor, and will discuss such issues as time management, developing short and long range research plans, choosing publication research outlets, preparing teaching plans, excelling in the classroom, etc. Adequate time will be provided for questions from participants.

## **Schedule:**

1:30-1:45 Mixer – getting acquainted.

1:45-2:00 Introduction to Program, Tim Lowe, Tippie College of Business, University of Iowa

### **I. Issues in Research**

2:00 – 2:20 Ann Campbell, Tippie College of Business, University of Iowa

2:20 – 2:40 Kalyan Singhal, Merrick School of Business, University of Baltimore

2:40 – 3:00 Dilip Chhajed, College of Business, University of Illinois

3:00 -3:45 Breakout Session – Assignment: Participants develop research plans.

3:45 – 4:00 Report on Plans

### **II. Issues in Teaching and Service**

4:00 – 4:20 Tim Lowe, Tippie College of Business, University of Iowa

4:20- 4:40 Tim Smunt, Babcock School of Management, Wake Forest University

4:40 – 5:15 Panel Session – Q & A.

# 2005 Wickham Skinner Awards

## Awards Luncheon:

Monday, May 2, noon – 1:30 pm

Grand Ballroom

These awards are intended to encourage POM scholarship and publication, to promote significant research in the field, to reward academics who have achieved unusually high accomplishment early in their careers, and to facilitate the sharing of innovative new ideas about teaching POM, and thereby to establish POMS as the leading professional society in the field of production and operations management.

There are three categories of Wickham Skinner Awards, as follows:

### A. Best Unpublished Paper presented at the Chicago Meeting

The best unpublished paper presented at the Chicago Meeting will receive a prize of \$1,000 and will undergo an expedited review by the *POMS Journal*. The runner-up will receive \$500.

### B. Early-Career Research Accomplishments

The awards include:

1. Public Recognition of the award winner(s) at the POM-2005 Chicago Meeting
2. A plaque
3. A check for \$1000
4. Complimentary POMS membership for the following two years

### C. Teaching Innovation Achievements

The awards include:

1. Public Recognition of the award winner(s) at the POM-2005 Chicago Meeting
2. A plaque
3. A check for \$1,000
4. Complimentary POMS membership for the following two years

# Detailed Program

**FRI/April 29** 1:45 pm- 3:15 pm

Session **FD1: IT & Supply Chains I** (Contributed)

Track: **Supply Chain Management**

Sullivan Room (8th Floor, South)

Chair: **Gurram Gopal**

## 1. How to buy in B2B

**Bo van der Rhee**, University of Utah

**Leslie O Morgan**, University of Utah

Most research on online auctions has focused on B2C and C2C, but the main impact of online auctions can be found in B2B applications, with the reverse auction gaining the most momentum over the last few years. We outline four possible types of reverse auctions, and identify one approach that has so far eluded attention both in literature and in practice. This is the second price sealed bid reverse auction, in which the sellers submit their bids electronically and the winner receives the second lowest bid. We discuss theoretical and managerial benefits of the second price sealed bid approach over the open English reverse auction, the most commonly used online reverse auction. Finally, in our analysis of the four main reverse auction types, we prove that the second price sealed bid reverse auction maximizes profits for the supply chain as a whole.

## 2. Supply Chain Dynamics based on conflicts: A Petri net based Multi agent Framework

**Vipul Jain**, Indian Institute of Technology Delhi

**S G Deshmukh**, Indian Institute of Technology Delhi

**S Wadhwa**, Indian Institute of Technology Delhi

A single supply chain configuration will neither be optimal nor efficient under dynamic conditions, where objectives may conflict. Thus, the issue of dynamic configuration of supply chains needs serious research attention. In this paper, we combine a high level petri net with probabilistic reasoning as probabilistic petri nets to model a Multiagent system (MAS) and detecting together goal and plan conflicts dynamically and concurrently for supply chain networks (SCN's). For agents operating in MAS, situations often arise in which their plans conflict with the plans of other agents. We propose a MAS conflict recognition, analysis and resolution methodology for the optimal and near-to-optimal solutions of SCN's. The model explicitly captures the interactions among enterprises and within departments of an enterprise. The proposed approach models the intricacies associated with the integration of isolated supply chain functions into a global system and the coordination of numerous functions across the SCN's.

## 3. An investigation of the impact of VMI on supply chain performance

**Chungsuk Ryu**, SUNY at Buffalo

**Nallan C Suresh**, SUNY at Buffalo

This study investigates the impact of vendor managed inventory (VMI) systems on supply chain performance under various conditions of decision authority and information sharing. Based on cost-based models and simulation modeling, supply chain performance is evaluated in terms of various cost items and service levels, and compared with traditional buyer managed inventory systems. Both analytical modeling and simulation results confirm that VMI results in less supply chain costs under most conditions than the traditional system. The cost savings due to VMI are due to the dramatic reduction of buyer's costs, but, in most cases, the supplier appears to incur higher expenses. The study seeks to identify the conditions that may remedy the supplier's losses caused by VMI. These results also suggest the contractual elements needed for more equitable benefits for both supplier and buyer.

## 4. The impact of the new IT technologies in the business model transformation

**Luiz C Di Serio**, EAESP/FGV

**Carlos Y Sakuramoto**, EAESP/FGV

**Antonio C Sanchez**, EAESP/FGV

Software industry is one of the most important in the Information technology (IT) segment. In accordance with OECD-2000, this segment represents 20% of the IT market, so that, in values (US\$ 222 billions –

2000) represent a number higher than all hardware sales. Software is linked to information assets and can be distributed, transferred and shared by electronic means, but the Internet and new technologies have been speeding up the transformation in the segment business model and also it could be used to, by Fine's (1999) clockspeed, visualize and foresee the future of the other industrial segments. This article will present, by means of multiple case studies, the impact of the new IT technologies in the segment business model, correlated with Porter's (1985), Fine's (1999), Venkatraman's (1994), Weil's (1998), Hamel (2000) and Prahalad (2004), as well as the impact in the other business sectors.

## **5. Achieving competitive advantage through Global Data Synchronization**

**Gurram Gopal**, Elmhurst College

**Eric McMillan**, Mueller Industries

In this paper we describe the application of Global Data Synchronization using UCCnet by corporations to gain strategic revenue and cost advantages over the competition. Many corporations absorb the cost of "bad data." Bad data are any information mismatches between supply chain partners or between different systems within the same company. Day-to-day processes are hindered by the lack of consistent, valid, and clean data between the company, its customers and its suppliers. This paper presents one solution for this problem through the use of the Global Registry service of UCCnet. This application will help a company in eliminating the source of bad data and thus help it achieve Global Data Synchronization. Here we outline the steps involved in achieving Global Data Synchronization and illustrate it with an actual implementation. Benefits gained through this effort are presented along with the potential pitfalls that might be encountered.

**FRI/Apr 29** 1:45 pm- 3:15 pm

Session **FD2: Stochastic Models** (Contributed)

Track: **Stochastic Models in Operations**

Holabird Room (8th Floor, South)

Chair: **Jian Li**

## **1. Simulation usage in an SME**

**James F O'Kane**, Newcastle Business School, Northumbria University

**Tony Papadoukakis**, Newcastle Business School, Northumbria University

The aim of this study was to show how simulation can contribute and assist in the implementation of TQM and BPR change management philosophies and lead to improvement of the manufacturing efficiency in small and medium enterprises (SMEs). The study was done in conjunction with a SME manufacturer of filters as a case study organization. After the verification and validation of the simulation model of the existing operations, alternative production and control processes scenarios were examined and tested. The findings showed that the use of simulation provides a valuable support to the implementation of the change management philosophies. More specifically, they showed how the SMEs can be guided in the journey of continuous improving and making more efficient parts of their operations by identifying and eliminating inefficiencies, such as in labor and machine utilization and finally achieving TQM targets.

## **2. A Contract Model for a Decentralized Assembly System**

**Xu Xia Zou**, Nanyang Technological University

**Shaligram Pokharel**, Nanyang Technological University

**Rajesh Piplani**, Nanyang Technological University

A decentralized assembly system facing random demand requires coordinating the supply of various components as short supply of one component dictates the final assembly and increases inventory costs. Assemblers generally want a long term relationship with suppliers to avoid such a situation for which multi-period contracts should be designed so that the optimal ordering/delivery decisions can be adjusted in each proceeding period based on supply and demand situation. In this paper, we develop a two-period contract model focusing on a two-echelon decentralized assembly system. We show that the proposed contract model, characterized by wholesale plus buyback prices, is able to realize channel coordination, which is important for gaining overall supply chain efficiency. We also conduct a numerical study to highlight the applicability of the model. It is expected that the proposed model would be suitable for companies seeking proper price and profits adjustment with their long-term partners.

### 3. Scheduling Servers under Demand and Task Time Risk

**Willard T Price**, University of the Pacific

A scheduling challenge is often a queuing challenge. This research examines a traditional decision of branch banking that determines the number of tellers and their assignments to specific days and hours. Branches must also decide whether to invoke "flexible capacity" through multi-skilled employees, supervisors and managers who are assigned to teller operations on a part time or as needed basis. The author was approached by a regional bank manager with a scheduling dilemma. He is using an application that relies on average demand and average task time to schedule tellers. But the output of the application did not always provide the correct allocation of tellers to match actual demand, resulting in some excessive waiting and teller idle time due to the supply-demand mismatch.

### 4. Determination of the number of kanbans in stochastic assembly process using a simulation approach

**Pornthep Anussornnitisarn**, Kasetsart University, Thailand

**Wilasinee Rodnim**, Kasetsart University

This article presents a methodology that applied computer simulation with a simple heuristic approach. This procedure determines the appropriate number of kanbans for each workstation in a stochastic flow shop environment that minimize work-in-process while maintaining the throughput level of the flow shop. Kanban is one of the primary tools of the Just-In-Time (JIT) production and ordering systems. Kanban is commonly referred as a simple parts-movement system that depends on cards, boxes or containers etc., to take parts/work pieces from one work station to another. It signals a cycle of replenishment for production and materials. For a Kanban system to operate at its maximum efficiency, it is best to use pre-determined lot sizes for the production of all parts. This allows you to minimize the setup and production costs as much as possible in this type of system.

### 5. Models for Two Order Opportunities in the Newsvendor Problem

**Jian Li**, Krannert School of Management, Purdue University

**Suresh Chand**, Krannert School of Management, Purdue University

**Maqbool Dada**, Krannert School of Management, Purdue University

This paper analyzes three models for the newsvendor problem with a second order opportunity with different flexibilities for the timing and size. In all the models, the first order is placed at the beginning of the season. In Model I, the second order is determined at the beginning of the season for the delivery at given time. In Model II, the second order is determined dynamically at a specified time. In Model III, both the time and quantity for the second order are determined dynamically. Our focus is on providing results to investigate their optimal ordering policies. Model I generalizes the seminal model of Barankin (1961). Model II solves the problem considered by Fisher et al. (2001). Model III establishes for the first time the structure of the optimal policy for ordering time and quantity in a dynamic second order decision problem.

**FRI/Apr 29** 1:45 pm- 3:15 pm  
Session **FD3: Inventory Management I** (Contributed)  
Track: **Inventory Management**

Wright Room (8th Floor, South)

Chair: **James Hill**

### 1. Comparison of heuristics for uncapacitated coordinated dynamic lot sizing problem

**Arunachalam Narayanan**, Texas A&M University, College Station

**Powell Robinson**, Texas A&M University

A company's replenishment policy is a major determinant of its operational efficiency and the ability of the firm to satisfy its customer service objective. Coordinated replenishment problems are common in supply chain management when a family of items shares a joint setup cost. We develop four forward-pass and one two-phase heuristic for this problem and compare their performance with the best existing heuristic (Fogarty and Barringer heuristic with Silver-Kelle procedure (FB-SK)) and an exact approach. We also propose an improvement heuristic based on simulated annealing, which is applied to the two-phase and FB-SK heuristic. We show that the metaheuristic based on two-phase performs better than all the studied heuristics when applied to a wide range of problems varying in the number of items, time periods and

setup cost ratios.

## **2. MULTICRITERIA ABC ANALYSIS AND AHP – A COMBINED APPLICATION**

**Javier Alfonso Asencio Garcia**, Universidad Central de las Villas, Santa Clara, Cuba

**Luis Antonio Delgadillo Gutierrez**, Universidad de Guadalajara

In current situations characterized by an environment of increasing competition, companies must modernize their equipments in order to achieve a continuous improvement of the quality of their products as well as an expressive reduction of operation costs. Therefore, having in mind the scarcity of financial resources, sound decision on where to invest these resources are of a foremost importance. A good inventory analysis should proceed from a diagnosis by the company of the current situation of their technical resources. Multicriteria ABC Analysis was developed in the mid-nineties in order to deal with inventory control problems with more than one classificatory criterion. In this article we show how Saaty's Analytic Hierarchy Process and Multicriteria ABC Analysis can be combined in a real-world situation so as to achieve meaningful numerical results and practical conclusions.

## **3. Optimal Control of Assemble-to-Order Systems**

**MOHSEN ELHAFSI**, UNIVERSITY OF CALIFORNIA-RIVERSIDE

**SAIF BENJAAFAR**, UNIVERSITY OF MINNESOTA

We consider the optimal control of an ATO system with a single end-product and  $n$  customer classes. Demand from each class occurs according to a Poisson process. Components are produced in separate facilities each with exponentially distributed production times. Components can be stocked ahead of demand but incur a holding cost. At any time, the system manager must decide which components to produce and, and which orders from those pending to satisfy. We formulate the problem as a Markov decision process and characterize the structure of the optimal policy. We show that the optimal production policy for each component is a state-dependent base-stock policy, where the base-stock level for each component is non-decreasing in the inventory level of other components. We show that the optimal inventory allocation is a state-dependent multi-level rationing policy where the component rationing level for each class is non-decreasing in the inventory level of other components.

## **4. SUPPLY CHAIN FORECASTING: LUMPY DEMAND AS A MARKOV PROCESS**

**Jack C Hayya**, Pennsylvania State University

**Terry P Harrison**, Pennsylvania State University

**Jeon G Kim**, Pennsylvania State University

**Dean C Chatfield**, VPI and State University

Higher echelons of supply chains are characterized by lumpy demand when negative orders (reverse logistics) are not allowed. Thus, a run of non-negative demands is followed by a run of zero demands, and so on. We analyze this process as an ergodic (means positive recurrent, in that starting in state '0,' the expected time until the lumpy demand process returns to state '0' is finite), irreducible (meaning that the states communicate with each other, i.e., '0' with '0,' '0' with '+,' '+' with '0,' and '+' with '+') Markov process. We use different data sets, for example, Croston's (1972) and Chatfield's (2001) to compare our results with those of the conventional supply chain forecasting techniques, such as simple exponential smoothing (SES) and moving averages (MA), and we come out with a recommendation for the best situational procedure

## **5. The Effect of Lead Time Uncertainty on the Normality Assumption Error**

**Ping Wang**, The Ohio State University

**James A Hill**, The Ohio State University

Under the normality assumption of lead time demand distributions, a reduction of lead time variability is the most effective tool in reducing the reorder point. This normality assumption has been shown to be in error in terms of the misspecification between the actual reorder point and the normally approximated reorder point (Eppen and Martin, 1988). To the best of our knowledge very little research has discussed the impact of lead time uncertainty reduction on the normality assumption error. Based on non-linear programming based heuristics, an optimal lead time uncertainty point is identified, where the normal approximation error is less than 1% when operating below 85% cycle service level. Numerical results show that this optimal point is only dominated by the mean lead time. Given that most managers operate under the normality assumption our results give managers a clear indication as to when to stop reducing

their lead time uncertainty.

**FRI/Apr 29** 1:45 pm- 3:15 pm

Burnham Room (8th Floor, South)

Session **FD4: Logistics Applications I** (Contributed)

Track: **Logistics, Distribution Channels, and Inventory Systems** Chair: **Yuwen Chen**

### **1. A Business Logistics Approach to Design Performance Evaluation Systems**

**Alvaro Gehlen de Leao**, Universidade Federal do Rio Grande do Sul

Since the early 1990s, various authors have been enlarged their considerations about logistics and supply chain management. What can be observed in the existing literature – although its widespread theory about performance measurement and cost management – is a lack of a structured method to proceed a practical implementation of performance evaluation systems using a business logistics approach. This paper intends to present results of a doctoral research developed to design a logistics performance evaluation system, which was built using processes-based management concepts to synchronize logistics measures with corporate strategy, focusing on key performance measures. As a research project outcome, different tools like network modeling, balanced scorecard and activity-based costing were integrated in a system designed for decision-making on logistical management.

### **2. Assessing service satisfaction between a 3PL provider and a vehicle manufacturer using the SERVQUAL technique.**

**Ben Clegg**, Aston Business School

**Faith Flanagan**, Aston Business School

This paper reports on a new study conducted within a leading UK based (and US owned) car manufacturing company looking at the satisfaction between parties within a newly formed third party logistics (3PL) relationship. The study contains a two-way assessment of the relationship (i.e. the vehicle manufacturer's Parts Supply and Logistics Operation's assessment of the 3PL's service and the 3PL's assessment of the vehicle manufacturer's relationship management ability). The study principally used an online SERVQUAL survey, (backed up with an on-line questionnaire, and face to face interviews) for data collection. The paper discusses the background and problems that have arisen in the relationship, the analysis of how each of the parties sees one other in terms of the service provided. Also, the findings and recommendations presented to management are outlined: these include factors such as the need for information sharing, reliability, flexibility, role specificity, trust and effective requirements management.

### **3. Integration of Symbolic Models to Design Performance Evaluation Systems for Business Logistics Management**

**Alvaro Gehlen de Leao**, Pontificia Universidade Catolica do Rio Grande do Sul

Market globalization and the use of new technologies have changed enterprises structure, which obligates them to adopt various approaches to improve its logistics performance. It is noticeable that application of a performance evaluation system for business logistics management, designed through integrated use of symbolic models, allows to define relationships between enterprise strategies and business processes. Therefore, this paper aims to present a conceptual model – using a conceptual basis and a framework for symbolic models integration – to design an integrated model applied to business management. Objectives and goals to evaluate logistics performance are determined by using of business processes benchmarking, employing Balanced Scorecard strategic tools. Implementation of this performance evaluation system, based on Supply Chain Operations Reference model, permits to evaluate business logistics processes influence on main competitive priorities, allowing identification of various alternatives to improve business performance and to develop projects to achieve better business logistics routines.

### **4. Case Study – Synnex: Deliver-to-demand Logistics Expedites Supply Chain in Taiwan**

**Yuwen Chen**, Department of Decision and Information Sciences at the University of Florida

**Ji-Ren Lee**, Department of International Business, National Taiwan University

**Chih-Ning Chu**, Department of Business Administration, Chung Yuan Christian University

Short life cycle and fast price depreciation make high-tech product logistics a challenging job. Synnex, as the largest high-tech product intermediary in Taiwan, developed deliver-to-demand logistics to alleviate

supply chain difficulty. With sophisticated MIS and distribution network, Synnex provides up to three replenishments per day for retailers in Taiwan. Different from Dell's make-to-order, pull demand is achieved to some degree since the retailers keep very low inventory levels by Synnex's expediting delivery service. Simultaneously, Synnex provides prompt repair service directly to consumers. The consumers buy products through retailers, but they can send the product to Synnex's repair shops directly. In 2004, about 50% of Synnex's repair items come directly from consumers. "Synnex behind" slogan has accomplished similar affects like "Intel Inside." Synnex has successfully replicated their business model in China, Hong Kong, Thailand and Australia.

**FRI/Apr 29** 1:45 pm- 3:15 pm

Adler Room (2nd Floor, North)

Session **FD5: Issues in Environmental Sustainability** (Contributed)

Track: **Environmental Issues and Reverse Logistics in**

Chair: **Rajesh Srivastava**

**Manufacturing**

### **1. Implementing Environmental Metrics: A Field Study**

**Frank Montabon**, Iowa State University

**Robert Sroufe**, Boston College

**Steve Melnyk**, Michigan State University

This paper describes a research project into embedded environmental metrics. The primary research questions addressed by this research project are: 1) what metrics-related strategies and tactics can be identified that facilitate the adoption, acceptance, and use of environmental management practices; and 2) how do these strategies and tactics vary according to the specific type of firm, or management level in which the activities are taking place? This project is currently in-process. This paper will describe the theoretical background of the project, the field study methodology being employed and results from the qualitative analysis. The preliminary results of a large scale survey will also be reviewed in order to compare them to the qualitative results.

### **2. SCENARIOS FOR SUSTAINABLE CONSUMPTION**

**BRENO T NUNES**, FEDERAL UNIVERSITY OF RIO GRANDE DO NORTE

**RUBENS E RAMOS**, FEDERAL UNIVERSITY OF RIO GRANDE DO NORTE

**SERGIO MARQUES JR.**, FEDERAL UNIVERSITY OF RIO GRANDE DO NORTE

Our modern lifestyle is often on discussion and criticized because of its consumerism. Sustainable consumption concept has gained strength recently on the environmental issues. This papers aims to discuss current and future scenarios for sustainable consumption and its implications for corporations and world economy. It is a broad discussion on this subject considering its relevance for firm strategy, product and process design and green house effect gases emission, eco-efficiency and eco-effectiveness among other topics. The methodology used on this work was based upon theoretical research on forecasts of well-known institutions, such as the World Bank and the World Resource Institute; books and papers on the issues of environment, strategy and sustainability. The results of this study can help companies, governments, environmental agencies and, also individuals to change or reviews their behavior, strategies and values for the future.

### **3. Adoption of Environmental Management Practices: A Study of Firms in Vermont**

**Marilyn Lucas**, University of Vermont

**Matt Wilson**, University of Vermont

What drives some firms, and not others, to adopt environmental management practices? The state of Vermont has a reputation for being the home of businesses with a socially responsible orientation. Among other things, these businesses strive to develop new and better ways of conducting their economic activities in order to minimize their impact on the environment and to improve their communities. It has become clear that best practices call for the integration of environmental management with on-going operations -- in product design and development, in shop-floor control and in supply chain design (Corbett and Kleindorfer, 2001). Unfortunately, our understanding of the factors that foster these environmental management practices within a firm is still limited, and our intent is, via a series of in-depth case studies of

firms in Vermont, to identify some of these best practices and the factors that drive their successful adoption.

#### **4. Evaluating Reverse Logistics Channels in Healthcare**

**Rajesh Srivastava**, Florida Gulf Coast University

**Elias Kirche**, Florida Gulf Coast University

Recently, many hospitals have started exploring the reuse of Single Use Devices (SUDs) in an effort aimed at reducing costs. It has been shown that many such SUDs can be safely remanufactured and put back in use. However, for a given hospital, not all devices may be cost effective for remanufacturing. This may be due to insufficient volume, or due to other added costs such as the cost of shipping the used products to the remanufacturer. Thus, there are additional costs incurred in the reverse logistics channels, which traditionally have not existed for hospitals. For hospitals, the costs of creating reverse logistics channels could outweigh the advantage of remanufacturing the SUDs. Therefore they have looked at other channels for effecting the reverse logistics. In this study, we examine and compare alternative channels for reverse logistics in this environment.

**FRI/Apr 29** 1:45 pm- 3:15 pm

Michigan Room (6th Floor, South)

Session **FD6: NPD and Manufacturing** (Contributed)

Track: **New Product and Technology Management**

Chair: **B. Joon Park**

#### **1. Interdependencies of development and manufacturing and its effect on the production ramp-up**

**Jan Juerging**, Mannheim University / Industrieseminar

Manufacturers offer more often new products or varieties, which demands changes in the product or its production processes. According to that the number of production ramp-ups a company has to cope with increases. These production ramp-ups face even more problems in the light of decreasing development times, so that more product and process changes are required during and after the ramp-up. A System Dynamics Model is developed that analyses the interdependencies between the development and manufacturing phase. The model will assume a development process following the simultaneous engineering approach and special attention will be paid to the development of required changes during development and ramp-up. The model shows that a shorter time to market results in a slower ramp-up and thus might result in a longer time to volume depending on how early production is involved in the development process and how it is managed.

#### **2. Modularity and Performance**

**Katja M Holttta**, Massachusetts Institute of Technology

Modularity has become a popular topic in new product development for its benefits in terms of flexibility to change, economies in scale and scope, enabling product variety, etc. Modularity, however, has also disadvantages. The decision about modularity involves tradeoffs between business and technical performance. I will show how technical performance limits such as power consumption, volume, and weight drive for more integral products and how a more modular product is preferred when these limits do not exist. I will use computers and telephones as examples. The results provide decision support for modular design.

#### **3. New Economy in Product Development Areas: A Case Study in Brazil**

**Julio Faco**, EAESP-FGV Fundacao Getulio Vargas

**Joao M Csillag**, EAESP-FGV Fundacao Getulio Vargas

The so-called "New Economy" is rapidly becoming an expressive force in countries around the world. Exact definitions of the term differ, but most include the combination of globalization and high technology, where the key outputs and productive assets are primarily information and knowledge, rather than physical. Although most popular attention has focused on the internet-related "dot-coms", but the information-intensive New Economy is actually much broader. It encompasses software development, telecommunications, and much of the media/entertainment industries, as well as internet services among others. This study analyses the relation between some characteristics inherent of the New Economy concept and their impact in Product and Development Areas (P&D). In order to achieve this objective the

study shows a case study of a multinational company with more than a century years old, particularly some aspects concerning the company's activities in Brazil.

#### **4. Managing Manufacturing Flexibility and Product Platform Development for Assembled Products**

**B. Joon Park**, Singapore Management University

**Siqun Wang**, Singapore Management University

Investing in Manufacturing Flexibility—"process flexibility", being able to build different types of products on the same production line at the same time—is an approach adopted by many assembled-product manufacturers as a solution to growing market uncertainty. Flexible assembly lines are designed to eliminate lost production capacity during model changeovers. Manufacturers will be able to operate plants closer to full capacity. Manufacturers, automakers in particular, have recognized having common product architecture as the key enabler for flexible manufacturing. Products are assembled in the same way with shared programme engineering and shared components. Assuming that manufacturing setup cost for two products on the same production line is lower if the two products share the common product architecture, we present a decision support model that comprehensively determines manufacturing setups and product platform development. We propose "robust optimization" as a solution strategy for our model.

**Fri/April 29** 1:45 pm- 3:15 pm

Session **FD7: Supply Chain and Service Innovations** (Contributed)

Track: **Product and Service Innovation**

Illinois Room (6th Floor, South)

Chair: **Thomas Kull**

#### **1. Innovation Network in Brazil: A Case Study in Software Development for Production Scheduling and Control.**

**Rogério Calia**, School of Engineering of São Carlos - University of São Paulo - EESC

**Fábio M Guerrini**, School of Engineering of São Carlos - University of São Paulo - EESC

Some researches state that, in many industries, the locus of innovation is not a single organization but an integrated network of organizations. Moreover, the theory of innovation networks analyses how a network's performance in innovations relates: a) to the competences and strategies of each network member; b) to the type and structure of the relationships inside the network and c) to the process of evolution in the knowledge base that generates the innovation. This case study in Brazil describes the development of a software for production Scheduling and Control with Theory of Constraints algorithms. The research analyses the agents, their relationships and the process of knowledge base improvement for the software development.

#### **2. Service Profiling for Strategic E-Service Design**

**Yun Kyung Cho**, University of Western Ontario

**Larry J Menor**, University of Western Ontario

This research examines the strategic design of e-services through the use of service profiling. Service profiling represents a strategic tool that allows for an assessment of the consistency between critical elements of a service system. The nascent literature in service profiling is largely an extension of the product profiling concept, whereby the match between service offerings and processes is of primary concern. In contrast, our service profiling tool leverages the service strategy triad framework and focuses on the alignment of service concepts, delivery systems, and target markets. Given the situation specific nature of the profiling process, we focus our efforts specifically on e-services. We describe the critical profiling dimensions related to e-service concepts and target markets, and then examine the types of e-service delivery systems that would be typical for each dimension selected. We then provide several illustrations of the utility of our service profiling tool for strategic e-service design.

#### **3. Wanted Combinations of Supplier Attributes for PRD manufacturers**

**Billy T Yu**, Macao Polytechnic Institute

**Peter K Lee**, Macao Polytechnic Institute

**WM W To**, Macao Polytechnic Institute

With the 2003 HKSAR strategy of the Pearl River Delta (PRD) for sustainable and mutually beneficial development for all governments and their people concerned, trade barriers were lowered. With the

increase in the number of potential customers, suppliers better profile themselves accurately. This paper adopted a data-mining approach and utilized a predictive model to help supplier identify the combinations of supplier-attributes that specific type of prospective clients are in quest of. A number of attributes concerning the customers and the suppliers were critically reviewed, like the purchasing capability of the clients, operational performance and the degree of alliance integration.

#### **4. Investigating on-line learning in the last mile of supply chains**

**Thomas J Kull**, Michigan State University

**Kenneth K Boyer**, Michigan State University

As companies strive to extend supply chains to consumers, their ability to provide high quality service depends upon the usability, and learn-ability, of on-line ordering systems. Through use of empirical data, various models are compared which describe how order time, an important performance metric, changes within an on-line grocery environment. Evidence is found supporting power-law learning in a web based environment, as well as implications for web-design influences on learning rates. This research can improve the understanding of how web-sites can improve the efficiency and service of supply chain's last mile. Human computer interface (HCI) generalizations can also be made to similar "walk-up-and-use" systems.

**FRI/Apr 29** 1:45 pm- 3:15 pm

St. Clair Room (6th Floor, South)

Session **FD8: Issues in Service OM I** (Contriuted)

Track: **Service Operations Management**

Chair: **David Collier**

#### **1. A Project Management Approach to Improve Logistics Performance on Industrial Engineering Conferences**

**Alvaro Gehlen de Leao**, Pontificia Universidade Catolica do Rio Grande do Sul

During the last years, project management and supply chain integration turned into a critical matter to improve business logistics performance. In this paper it will be discussed the implementation of a project management approach to improve logistics performance on industrial engineering conferences. It will be reviewed basics on project management and its application in a service industry, particularly on conferences and seminars organization. It will also be discussed various supply chain management topics and its associated tools to evaluate logistics performance. Afterwards, special issues, involving project management techniques and logistical processes management, will be integrated in a particular model to plan and control tasks and events which are included in a conference on industrial engineering. Finally, an application of this model will be presented, describing its use to manage an industrial engineering conference, with over 1500 participants, to be held in Brazil by the end of year 2005.

#### **2. Maintaining robust decision capabilities within critical operations.**

**Simon Veronneau**, HEC Montreal

**Yan Cimon**, HEC Montreal

The purpose of this paper is to suggest a framework towards ensuring robust and effective decision capabilities for organizations involved in critical operations. These operations demand effective decisions in a clutter of structured and unstructured information coming from a variety of channels. We suggest that such a clutter adversely affects decision capabilities and increase the likelihood of crisis occurrences. The challenges to decision-makers and aggregators are fourfold: 1) Human-system interaction; 2) The psychology of decision-making; 3) Issues related to decision support systems; and 4) The queuing and criticality of decisions. We examine the repercussions on organizations. An integrative conceptual model is presented. Academic and managerial implications are discussed.

#### **3. Toward service system agility: real-time capacity adjustment**

**Daesik Hur**, Bowling Green State Univeristy

**Vincent A Mabert**, Indiana Univeristy

**Kurt M Bretthauer**, Indiana Univeristy

Service system agility is defined as ability of a service delivery system to cope with unexpected demand changes and/or supply disruption in a timely and cost-efficient manner. This study suggests real-time

capacity adjustment (RTCA) as an effective tool toward agile service system, and introduces a systematic approach to implement RTCA, based upon authors' research on quick service restaurant industry. First, we identify two major sources of uncertainty that produce capacity-demand imbalance, and discuss how to reduce the needs for real-time capacity adjustment. Second, this paper suggests the measures that can be taken before the day of the service to facilitate real-time capacity adjustment. Specifically, this paper proposes that safety capacity, reserve capacity, cross-training, and overlapping shifts be deployed in preparation for real-time capacity adjustment. Finally, we describe the issues associated with real-time capacity adjustment based upon the findings from field studies and simulation experiments.

#### **4. Measuring Perceived Quality in Shopping Centers: and Empirical Study**

**Cid Goncalves Filho**, Fumec Univesity

**Clodoaldo L Nizza**, Fumec University

**Renata S Guerra**, Fumec University

**Alexandre I Moura**, \*

The shopping center industry is a very representative sector of economy, but there are few studies that measure quality and satisfaction of customers. This research develops a specific scale to measure perceived quality of shopping centers, with a sample of 1141 respondents. Techniques to verify reliability, factorial dimensions of the construct, discriminant and convergent validity were applied at this phase of the study. The research also verifies, using Structural Equation Modeling, the antecedents of satisfaction in shopping centers, demonstrating that

#### **5. Assessment of Retail Store Productivity using Data Envelopment Analysis**

**Gopesh Anand**, Fisher College of Business, The Ohio State University

**David Collier**, Fisher College of Business, The Ohio State University

**Michael Stodnick**, University of North Texas

We use data envelopment analysis to evaluate multifactor productivity of 54 stores belonging to a large well known specialty garment retail chain in the US. Identifying stores that are efficient in converting labor and store area into sales dollars in the first model, we assess where the inefficient stores stand in relation to the efficiency frontier. A second DEA model evaluates these stores on the basis of conversion rate: number of transactions per potential customer entering the store; store area is again included as an input. We then analyze the correlation between efficiency scores of the two models – sales per labor dollar and store area, and transactions per person entering the store and area. A significant correlation provides evidence of a strong relationship between employee productivity and conversion rate supporting the notion that well-trained and motivated employees positively affect conversion rates and provide higher sales.

**FRI/Apr 29** 1:45 pm- 3:15 pm

Session **FD9: Emerging Theories in Operations Management** (Invited)

Track: **Emerging Theories in OM**

Hebron Room (2nd Floor, North)

Chair: **Roger Schroeder**

#### **1. Workshop - Emergent Theories for Operations Management**

**Roger G Schroeder**, University of Minnesota

**Kalyan Singhal**, University of Baltimore

This workshop will explore emerging theories in Operations Management. All empirical research either develops or tests theory and hypotheses are the result of an underlying theory. The science of Operations Management is advanced by the development and use of emergent theories. Several panelists will present emergent theories for Operations Management in a highly interactive format. The panelists are: David Hollingworth (University of North Dakota); M. Johnny Rungtusanatham (Arizona State University); Roger. G. Schroeder (University of Minnesota); Morgan Swink (Michigan State University); Jack Wacker (Arizona State University); and Steve Melnyk (Michigan State University).

**FRI/Apr 29** 1:45 pm- 3:15 pm  
Session **FD10: ERP I (Contributed)**  
Track: **ERP**

Ohio Room (6th Floor, South)  
Chair: **Elliot Bendoly**

### **1. Effect of dominant control system on activation of ERP capabilities**

**Sanjay Kumar**, XLRI Jamshedpur

Paper highlights the effect of 'dominant control system' on the activation of ERP capabilities. Dominant control system influences the perception of information needs of the manager, and these perceived needs influence the ERP capabilities, related to measurement of performance and application of rules, activated during implementation. Methodology: Semi-structured interviews conducted at two companies, with diverse cultural profiles and dominant control systems. Content analysis (using themes), and across method triangulation was used with company documents and in-depth interviews with top level managers. Direct observation of information system related practices used as independent data source. The characteristics of organizations with different dominant organizational control systems identified from literature, were matched with the studied organizations. The degree of activation of ERP capabilities and related effects in the organizations were studied. Information system related practices, hypothesized using established cause effect relationships, were compared with observed practices.

### **2. A Decision Support Tool for Sales Decisions**

**Luiz C Rodrigues**, CEFET-PR

A decision support tool is proposed to tackle the integration of sales and production decisions in a batch process industry. It is shown that this integrated procedure enables reliable sales decisions, concerning order demands and due dates. This is accomplished by means of production planning and scheduling simulations. In the first step production planning is performed, based on the use of Constraint Programming. As a result, time windows are defined for the execution of all planned tasks. The definition of time windows for all tasks poses as an indication that no infeasibility was found during production planning. Scheduling is performed in the second step, based on the use of Mixed Integer Linear Programming. But the only goal of this step is to identify whether a feasible schedule exists or not. Time windows information is used in the proposed scheduling to prune the search.

### **3. A methodology for the analysis and design of the inf. system in industrial companies.**

#### **Application to the textile sector**

**Manuel Expósito**, Polytechnic University of Valencia

**José V Tomás**, Polytechnic University of Valencia

**Josep Capó**, Polytechnic University of Valencia

This paper is aimed at proposing a methodology for the analysis and design of the information system of industrial enterprises. The proposed methodology is based on three main stages. The first stage covers the analysis of functional and informational areas of the enterprise by means of IDEF and DFD techniques. The outcome of this stage is a set of lacks and limitations of the current information system. The second stage comprises an analysis of ERP solutions from three points of view: generic ERPs, sectorial ERPs and adhoc ERPs. The last stage unifies the results obtained in order to provide a proposal of ERP solution for the enterprise. The methodology has been applied to a textile company in order to check its feasibility.

**FRI/Apr 29** 1:45 pm- 3:15 pm  
Session **FD11: Developing operational capabilities/competencies (Contributed)**  
Track: **Operations Strategy**

Onyx Room (2nd Floor, North)  
Chair: **Marcia Silva**

### **1. THE IMPACT OF AN EFFICIENT DISTRIBUTION MODEL TO THE LONGEVITY OF THE FIRM.**

**Hanna K Skytta**, Macquarie Graduate School of Management

**Norma Harrison**, Macquarie Graduate School of Management

With the advent of consumer take-up of mobile handsets reaching saturation point in many markets, the

competition is shifting from simple handset and contract sales towards value-added content. At the same time, a shift from small firms dominating the mobile content industry to larger firms taking over them can be observed. In deed, as the industry life-cycle model suggests, small businesses frequently lose their competitive advantage as the industry matures and large firms start to utilise their economies of scale, specifically in production and distribution. Hence, the question of the most optimal business model becomes central for survival of smaller firms. In this study, we discuss the sustainability of the various distribution models prevalent in mobile content industry, and how an alternative model –syndication– might be more constructive for the longevity of the smaller mobile content businesses in the long run. Our exploration concentrates on mobile gaming industry in particular.

## **2. Management of the Strategical Competence in the Organizations**

**Clandia M Gomes**, São Paulo University

**Maria Aparecida Gouvea**, São Paulo University

**Isak Kruglianskas**, São Paulo University

**Wilson A Costa de Amorin**, São Paulo University

The study tried to estimate the strategic ability of the Organization, identifying the aspects which are subjacent to the understanding of the associates, starting from the application of an intentional model of competence management. Using a multidiversified model of analyses, was identified the principal aspects which illustrate the perception of the associates concerning the strategic competence of the labor union and which affect its satisfaction. The conclusions of the study pointed out that the main changes which explain the perception of the associates in relation with the performance of the labor union are the communication of the plan, the ability of the employees, the competence of the managers and the concerns with the constant improvement. The variations that cause bigger impact in the model and, therefore, exercise bigger influence on the associates satisfaction are the ability of the employees and the communication of the plans to the workers.

## **3. Changes of Competitive Priorities of Chinese Manufacturers from later 1990s: Compared with US and Japanese Manufacturers**

**Ni Wenbin**, Zhengjiang University of Finance & Economics

This paper deals with the changes of competitive priorities of Chinese manufacturers from the later 1990s to present, a period that China economy booms and the country steadily gains its important status in world manufacturing. Based on the data from International Manufacturing Strategy Survey (IMSS), the paper finds some significant changes of manufacturing strategy of Chinese manufacturers. Though price is traditionally the most important competitive priority, it is losing its station to quality, service and delivery. These three will be the new competitive advantages of Chinese manufacturers in the near future. The ability of flexibility takes the backseat as it is not of importance in current competition and is improving its importance slowly. Compared with US and Japanese manufacturers, Chinese manufacturers are taking a strategy like US, implying that Chinese manufacturers can learn more from US than Japanese.

## **4. A Competence Model in an Automobile Company in Brazil**

**Marco A Pereira**<sup>1</sup>, USP - Escola Politécnica

**Marcia T Silva**, USP - Escola Politécnica

Competence is a basic concept which companies all over the world use as one of the pillars of their organizational structures to increase their productivity and optimize their results. This paper analyses the competence by management model from an enterprise that acts in the supplying area in the Brazilian automobile industry. This model is divided in 3 big competences: the organizational competences, their key-processes competences and the individual competences of their employees. We present the basic structure of this model, the explicit relation that exists between the organizational and individual competences and the implicates of this model in specific human resources activities in the company, such as recruiting and selection, training and development, remuneration, career ad succession.

**FRI/Apr 29** 1:45 pm- 3:15 pm

Session **FD12: Diverse Experiences in Teaching OM Courses** (Contributed)

Track: **Innovations in Teaching**

Valencia East (Lobby Level)

Chair: **Ian Stewart**

### **1. The Taco Casita Game: An In-Class Exercise to Introduce Discrete Event Simulation Concepts**

**Paul F Schikora**, Indiana State University

With advancements in desktop computing power, we have seen user-friendly simulation software packages become available. Using graphical interfaces, and hiding much of the simulation science, they allow relatively advanced simulation techniques to be applied by practitioners as part of process improvement projects. This has made it more attractive to teach simulation as a process improvement methodology in undergraduate business curricula, where extensive knowledge of the science of simulation is not necessary. However, we have found it desirable that students still learn the very basic concepts behind these simulation models in order to better understand their development and use. We present a simple classroom game that teaches students the basic discrete-event simulation concepts and processes without requiring them to learn all the underlying math and scientific theory. The game is typically played over two class periods, including post-game discussion.

### **2. 'Cheaper by the Dozen' - The Evolution of Operations as a First-Year Seminar**

**Debra Bishop**, Drake University

Why not introduce students to the ever-changing world of operations management the minute they begin their university years? Twelve fascinating historical figures and stories are brought to life in this intensive writing course. The evolution and impact of operations from Europe to the US to Japan over the past 150 years is considered through readings, videos, writing and considerable discussion. This is not an operations core course but rather students from any discipline may choose this first-year, three-credit course from a list of forty. This presentation will discuss the course content as well as semester-end feedback from students.

### **3. A Team-Based Application of Kolb's Experiential Learning Theory in a Supply Chain Management Course**

**Barbara A Osyk**, The University of Akron

Kolb's Experiential learning theory has been cited as an influential theory in management education. The Experiential Learning Cycle consists of Concrete Experience, Abstract Conceptualization, Reflective Observation, and Active Experimentation. Learners differ in the ways that they acquire and transform knowledge based on their predominant learning style(s). The benefit of teaming up students based on their diverse learning styles is examined through the use of several small case assignments in Principles of Supply Chain Management classes. Students from several different areas are required to take this course. These students have different backgrounds and their prior learning experiences are often quite different. They also have varying expectations related to this course. This paper will discuss my attempt to leverage the varied backgrounds and learning styles of students in an interdisciplinary team-based active-learning environment in order to increase student satisfaction with the course.

### **4. Achieving a Truly Integrated Service Management Educational Experience**

**Ian Stuart**, University of Victoria

Services are a dominant feature in a modern, industrialized economy. As a result, many operations management scholars have repeatedly noted the need to migrate our knowledge accrued from studying manufacturing industries to service contexts. For many educators, this has meant taking traditional OM concepts (e.g. shift scheduling, inventory management) and simply casting them in a service setting. At best, this is simplistic and a short term solution to the educational challenge. At worst, it risks irrelevancy for our field of study. Instead, educators need to think more creatively about how to integrate OM concepts within the broader field of service management and strategy. Using the University of Victoria's MBA Service Management Concentration as a best practice example, this session explores how to overcome the pedagogical and institutional challenges in order to achieve an integrated program delivery in which operations management is a critical and respected component.

**FRI/Apr 29** 1:45 pm-3:15 am

Valencia West (Lobby Level)

Session **FD13: Web-Based Simulations to Improve Learning and Enthusiasm in Operations Courses: Littlefield Technologies & the SCM Game** (Contributed)

Track: **Innovations in Teaching**

Chair: **Samuel Wood**

### **1. Web-Based Simulations to Improve Learning and Enthusiasm in Operations Courses: Littlefield Technologies & the SCM Game**

**Samuel C Wood**, Responsive Learning Technologies

For their development of Littlefield Technologies, Sam Wood and Sunil Kumar received the 2004 POMS Wickham Skinner Award for Teaching Innovation. Littlefield Technologies is a web-based competitive factory simulator. Students and faculty at dozens of institutions have praised the software for improving skills and enthusiasm for managing capacity, lead time, and inventory. The Supply Chain Game is a new web-based competitive supply chain simulator developed with Sunil Chopra and Philipp Afeche at Northwestern University. It is designed to improve skills and build enthusiasm for topics including production and inventory control, forecasting, logistics, and supply network design. The workshop will position attendees to use the games in their own undergraduate and graduate courses. Topics will include pedagogical objectives, typical use in courses, student responses, and the mechanics of running the software. The first half of the workshop will cover Littlefield Technologies and the second half will cover the Supply Chain Game.

**FR/April 29** 3:45 pm- 5:15 pm

Sullivan Room (8th Floor, South)

Session **FE1: IT & Supply Chains II** (Contributed)

Track: **Supply Chain Management**

Chair: **Matteo Savino**

### **1. Information Supply Chain: A Case in the Brazilian Service Sector**

**Julio Faco**, EAESP-FGV Fundação Getúlio Vargas

**Sebastião R Oliveira**, EAESP-FGV Fundação Getúlio Vargas

**Luiz C Di Serio**, EAESP-FGV Fundação Getúlio Vargas

**Marcos A Vasconcellos**, EAESP-FGV Fundação Getúlio Vargas

The growth of the Brazilian economy, in the last 30 years, made that companies and banks tried to enlarge their sales of products and services for consumers around the whole world. However, from that economic growth emerged some problems like as the ignorance of buyers' true identity (in terms of financial information), and the increase of breach of contract risk and fraud in financial credit area. In Brazil, such problems propitiated the appearance of services companies, specialized in collecting information on consumers and companies for this purpose. This article shows the case study of a Brazilian company in the service segment (60% of credit analysis market), that rushed in pioneering enterprises, creating technology and establishing a new value chain. This study aloud the authors to map the supply chain in credit information market, as well as the performance and importance of each link in that chain

### **2. Random Match or Co-evolution of Supply Chain Practices and Information Systems**

**Katariina Kemppainen**, Helsinki School of Economics

**Laukkanen Sanna**, Helsinki School of Economics

**Sami Sarpola**, Helsinki School of Economics

**Ari P.J. Vepsalainen**, Helsinki School of Economics

Numerous studies in the area of supply chain management have explored, on one hand, the adoption of enabling information technologies and, on the other hand, the status of supply chain practices. While research on these two topics is abundant, there is a call for synthesis of these two perspectives. Accordingly, based on a literature review, we introduce a conceptual framework for a unified assessment of both enabling information technologies and supply chain practices ranging from the choice of transportation mode and logistics service provider to collaborative planning and supply contracts. Naturally, the role of a variety of integration and coordination mechanisms is to be evaluated. It is

hypothesized that no single mechanism alone suffices but a combination of mechanisms is required for efficient supply chain management. Finally, empirical evidence is used to illustrate the practical implications of the proposed framework.

### **3. The Impact of ERP on Supply Chain Coordination: A Comparison Study between Chinese and Italian Enterprise**

**Zhixiang Chen**, Zhongshan University

ERP is one of the most important tools supporting supply chain management, but how is the exact effect in practice? what should enterprise consider when use ERP to support supply chain coordination? What is the difference between different country's enterprises in using ERP? This paper gives out the answer through survey in China and Italy. The paper studies the relationships between ERP utilization and supply chain coordination from the function module of ERP, implementation time of ERP, customization degree of ERP. Furthermore, the key limitation of ERP in supporting supply chain coordination is also discussed. Suggests for improving the effect of ERP in supporting supply chain coordination are advanced.

### **4. Enterprise applications for knowledge management. An architecture for the supply chain**

**José V Tomás**, Polytechnic University of Valencia

**Raúl Poler**, Polytechnic University of Valencia

**Josep Capó**, Polytechnic University of Valencia

**Manuel Expósito**, Polytechnic University of Valencia

This paper is aimed at analyzing the existing classifications of enterprise applications for knowledge management in order to provide an integrated view of them. A new classification is proposed from two points of view: the knowledge creation cycle and the knowledge conversion cycle. Finally a knowledge management technical architecture for the supply chain is proposed.

### **5. A model for the Evaluation of Supply Chain Performances in Enterprise Resource Planning Environment**

**Matteo Savino**, Sannium University

**Stefano Apolloni**, University of Naples Federico II

**Francesco Di Domenico**, Sannium University

A careful Supply Chain Management must be able to support the growth of the firm in spite of the environment complexity in which it finds itself. In this context the evaluation of a supply chain is carried out by particular evaluation metrics already present in literature, but not all are in the position of achieving precise results and of being implemented in ERP software. The SCOR (Supply Chain Organization Reference) proposes a subdivision of the business flow in single production processes assigning a certain combination of performances indexes. The aim of our work finds its place in the development of a new method for the SCOR application inside the project "Euro Monete". This project was been assigned to the Italian delivery service, "Poste Italiane", to allow the substitution of the old Italian coin with the new coin, the Euro, and to improve its distribution on the Italian territory.

**FRI/Apr 29** 3:45 pm- 5:15 pm

Session **FE2: Contracting Issues in Supply Chains** (Contributed)

Track: **Information and Contracting in Supply Chains**

Holabird Room (8th Floor, South)

Chair: **Dharamraj Veeramani**

### **1. Analyzing Supply Chain Structures with Cooperative Game Theory**

**Jorn-Henrik Thun**, Mannheim University

In this paper Supply Chains Structures will be analyzed in the light of Cooperative Game Theory. Cooperation can be regarded as constituting element of supply chains. Accordingly, the Shapley-Value can be used as algorithm to allocate the profit among the cooperating partners. But in terms of supply chains the underlying structure is often relevant. The Myerson-Value takes the structure of a game, i.e. the existence of sub-coalitions, into account by formulating a specific allocation rule. By the Myerson-Value the bargaining power of each player within a supply chain structure can be calculated. The Myerson-Value allows a comparison of positions in different supply chain structures concerning the bargaining power. Cooperative game theory can be applied as methodology for Supply Chain Management contributing an

allocation algorithm.

## **2. An Investigation of Innovation Lock-In and Buyer-Supplier Relationship**

**Anand Nair**, Auburn University

**Ram Narasimhan**, Michigan State University

In recent years, several instances of lock-in situations can be observed in collaborative arrangements. These situations are characterized by a high degree of dependence on the part of one of the supply chain partners for the resources and capabilities of the other. The lock-in conditions also define the nature of channel power of a supply chain partner. In this paper, we study such a lock-in situation between a buyer and a supplier, in which the buyer is dependent on the supplier for sourcing an essential product component. The buyer invests in innovation to break free from the lock-in created by the supplier and to establish channel power in the supply chain. A differential game model is used to analyze this situation and to derive the Markovian Nash equilibrium strategies for the buyer's innovation investment intensity and the supplier's production effort rate. We also examine implications for buyer-supplier collaboration.

## **3. Contracting in Multi-Tier Supply Chains in the presence of Information and Knowledge discrepancies**

**Moti Levi**, Penn State University

**Shankar Sundaresan**, Penn State University

The increasing usage of contract manufacturing and outsourcing, coupled with globalization, requires firms to extend their control to second-tier suppliers. Previous literature either focused on inventory or had examined contracting with the first tier only. In this paper we use a principal-agent paradigm to analyze contracts along a three-tier supply chain when both the second and third tier affect the final product's quality. We combine operations/engineering perspective (engineering function - product design) with economic perspective (cost function) to create a model in which there are both knowledge and information effects on contracts and where the nexus of control resides in the supply-chain. Additionally, we explore the tension between knowing the cost function vs. observing effort, an issue that had been neglected in economics or operations. We find that different combinations of knowledge and information sets give rise to different contracts and supply-chain structure.

## **4. Contracting under Asymmetric Production Cost Information**

**Xianghua Gan**, The University of Texas at Dallas

**Metin Cakanyildirim**, The University of Texas at Dallas

**Suresh P Sethi**, The University of Texas at Dallas

We study a supply chain consisting of a supplier and a retailer who faces a newsvendor problem. The supplier knows his production cost, but the retailer knows only the probability distribution of this cost. We model this problem as a game of mechanism design. In this model, the retailer designs a menu of contracts that determines her order quantity and her proportion of the channel profit as a function of the supplier's cost. We derive an optimal contract menu for the retailer. We find that in some cases the supply chain can be coordinated even with asymmetric information.

## **5. Carrier Bidding Strategies for Iterative Auctions for Transportation Services**

**Samik Raychaudhuri**, University of Wisconsin, Madison

**Dharmaraj Veeramani**, University of Wisconsin, Madison

Transportation service procurement auctions are typically characterized by limited number of rounds and low profit margin. In this paper we address the bid determination problem for single-lane and combinatorial bids in the successive rounds of an auction, which maximizes the profit and also ensures winning. A profit factor (PF) is computed at each round using the industry average price for this lane from the historical figures and the winning bids for the past round of this auction.

**FRI/Apr 29** 3:45 pm- 5:15 pm  
Session **FE3: Inventory Management II** (Contributed)  
Track: **Inventory Management**

Wright Room (8th Floor, South)  
Chair: **Alan Stenger**

## **1. A Model for Kit-Management Problem**

**Murat M Koksalan**, Middle East Technical University

**Refik Gullu**, Middle East Technical University

In this paper, we consider the problem of kit management. In this problem, whenever a kit demand occurs, only one item from the kit is used and the rest is returned. The item that will be used from the kit is not known in advance and the whole kit has to stay at the demand site for the whole duration. The motivation of our problem is from the implants used in surgeries but similar problems may arise in repair toolkits as well. We model the problem as determining the base stock level for each item in the toolkit with inventory and stock out considerations.

## **2. Empirical testing of classical inventory management models: evidence from US public companies**

**Serguei Roumiantsev**, Wharton Business School

**Serguei Netessine**, Wharton Business School

We analyze the quarterly-data panel of 722 public US companies to test empirically predictions of classical inventory models (EOQ,  $(r,Q)$ , newsvendor etc). We find that firms do buffer inventory against uncertainty and increased lead times, that higher margins do lead to higher inventory levels and that larger companies have lower relative inventory. We show that the elasticity of inventory with respect to sales is positive and sub-linear but not a square root function as an EOQ model suggests. We use several proxies for demand variability and surprisingly find that variability of unexpected earnings matters more to inventory behavior than variability of sales. We also analyze the breakdown of data into 8 segments including retail, wholesale, oil and gas and machinery and find that asset productivity matters the most in electronics and hardware while margins affect relative inventory the most in retail and machinery.

## **3. MANAGEMENT OF THE EXPLORATION OF EXTERNAL SOURCES FOR INNOVATION**

**Clandia M Gomes**, São Paulo University

**Isak Kruglianskas**, São Paulo University

This paper presents the results of an empirical research performed with the purpose of studying the managerial practices in enterprises regarding the exploration of external sources for innovation. The actual dynamic of businesses under the pressure of globalization and the turbulence caused by the huge amount of innovations in product and process is requiring that the enterprises use intensively external sources to produce innovations for remaining competitive. The present research used the methodology of case study that was carried out through the study of three enterprises. Among the kind of external information sources that had been considered it can be detached the following: universities and research institutions, testing and certification labs, internet and web networks, academic and professional conferences, trade fairs, technical literature (gate-keepers), competitors, suppliers and customers. The results of the research, besides contributing to the advance of the administrative science in this theme, provide relevant subsidies for practitioners.

## **4. On the Use of Fractional Numbers of Customers to Achieve Throughputs in CONWIP Systems**

**Rajan Suri**, University of Wisconsin-Madison

**Rahul Shinde**, University of Wisconsin-Madison

**Mary Vernon**, University of Wisconsin-Madison

CONWIP uses production cards for material control along each manufacturing routing. The design parameter in CONWIP systems is  $N_i$ , the number of cards of product-type  $i$ . It has been assumed that  $N_i$  must be an integer. However, integer choices will usually not achieve the target throughput for each product-type simultaneously. We use Mean Value Analysis with the Schweitzer-Bard approximation (SB-MVA) and nonlinear programming to determine the number of cards needed to achieve the production targets exactly. We also extend SB-MVA to handle the case where  $N_i < 1$ . We obtain solutions which achieve target throughputs exactly, although the values of  $N_i$  may be fractional. We interpret these values to represent the average number of customers of each class in the network. We implement a control algorithm to ensure that the actual (integer) number of customers in the network is manipulated to achieve this target fractional value.

## **5. The Management—or Mis-Management—of Inventories in Industry Today**

**Alan J Stenger**, Penn State University

All of us working in POM today are familiar with the many powerful tools available for managing

inventories. From the Economic Order Quantity, to R. G. Brown's statistical safety stocks, to multi-echelon models—there are numerous techniques that have been well-proven in theory and in practice. Yet it is the experience of this author, and of many other observers, that in many cases these tools are not employed, even in large, sophisticated organizations. And often firms own the software that embodies these tools, yet they still do not use them effectively. This talk explores this issue, posits some reason for the lack of use, and suggests ways POM members and other faculty might help remedy the problem.

**FRI/Apr 29** 3:45 pm- 5:15 pm

Burnham Room (8th Floor, South)

Session **FE4: e-commerce and channels** (Contributed)

Track: **Logistics, Distribution Channels, and Inventory Systems** Chair: **Moritz Fleischmann**

### **1. An Empirical Investigation into the Determinants and Causes of Retail-Out-Stocks**

**Daniel Corsten**, University St. Gallen

**Elisabeth Honka**, Graduate School of Business - University of Chicago

Using new data obtained from 157,000 manually recorded out-of-stocks (OOS) counts at seven different European retail chains in more than 70 stores we show that on average roughly 10% of SKU's in a store are shelf OOS. By analyzing the assigned root causes of OOS we find that 35% can be attributed to store ordering, 30% to delisting by store staff, 11% to inventory inaccuracy and 12% to other causes. Currently, we investigate the influence of store size, average turnover, trading hours, store traffic and competitive environment on the level of store OOS. In addition, we analyze the effects of promotional or new product attributes, category composition, sales velocity as well as cube size, delivery mode on the level of category OOS.

### **2. Sourcing Fulfillment Services in Internet Supply Chains: An Empirical Study of Transaction Costs and Network Strength**

**Elliot Rabinovich**, Arizona State University

**Michael Knemeyer**, The Ohio State University

**Chad Mayer**, Arizona State University

The advent of the Internet has resulted in relationships that have redefined traditional boundaries among firms and have opened new avenues for value creation in the supply chain. In particular, evidence suggests that Internet sellers have established relationships with logistics service providers that allow them to exploit other supply chain parties' logistical resources and skills in order to better fulfill their buyers' orders. We posit that these relationships yield value synergies for Internet sellers through two avenues: (1) a reduction in transaction costs and (2) a formation of stronger networks that bundle many complementary logistics services and offer a broad availability of those services across Internet sellers' customers, vendors, and delivery providers. We rely on transaction cost theory and strategic network theory to articulate and empirically assess these avenues and identify the role that the avenues play in generating value synergies in Internet seller decisions to form such relationships.

### **3. Managing E-Fulfillment Operations in a Multi-Channel Environment**

**Niels Agatz**, Erasmus University Rotterdam

**Moritz Fleischmann**, Erasmus University Rotterdam

**Jo Van Nunen**, Erasmus University Rotterdam

The large number of recent dot.com failures has not meant the end of the e-commerce era. Rather, a growing number of retailers is executing a bricks-and-clicks strategy, combining a network of conventional physical retail stores with a web store. Executing multiple channels offers a way to attract multiple customer segments, serving customers in a way tailored to their specific needs. Balancing the different channels in a way that utilizes their strengths in a complimentary and synergistic manner is both difficult and crucial. Especially, integrating the fulfillment of Internet orders in the traditional retail process poses considerable challenges to operations management. In this contribution, we discuss key trade-offs in the design and operation of such multi-channel distribution structures. In particular, we highlight specific requirements that distinguish e-fulfillment from other distribution channels. We substantiate our findings with insights from a case study at a large grocery retailer.

#### **4. The Role of Trust in Supply Chain Management and Its Performance**

**Mahour Parast**, University of Nebraska-Lincoln

This paper investigates the role of trust in supply chain management from the lenses of total quality management. A conceptual framework for quality management in a supply chain environment has been developed and the effect of trust on supply chain and its performance has been discussed, and key areas for research have been identified.

**FRI/Apr 29** 3:45 pm- 5:15 pm

Adler Room (2nd Floor, North)

Session **FE5: Environmental Potpourri** (Contributed)

Track: **Environmental Issues and Reverse Logistics in Manufacturing**

Chair: **Robert Klassen**

#### **1. Synchronizing Demand and Supply: Managing the Return and Repositioning of Shipping Containers**

**Vaidy Jayaraman**, University of Miami

**Anthony Ross**, Michigan State University

**Alex Rodrigues**, Michigan State University

**Diane Mollenkopf**, Michigan State University

Supply chain management has primarily focused on the forward movement of goods to customers. Yet, many firms are now recognizing the importance and value-creation potential of moving product backwards. Additionally, the prospect of moving packaging materials backwards in a closed loop is gaining attention when firms start addressing value creation opportunities. Reusable containers are assets whose flows and positioning through the supply chain must be as carefully managed as the flow of the product within the containers. However, they add complexity to business operations, as they essentially become additional inventory to be managed and repositioned across the supply chain to ensure optimal flow of materials and goods. The problem appears to be a geographic mismatch between demand and supply of containers.

#### **2. Greening Operations: Component Reuse Policies for Remanufacturing in the Medical Instruments Industry**

**Thomas W Sloan**, University of Massachusetts Lowell

Increasing environmental concerns and regulations have prompted many firms to “green” their operations through remanufacturing. Environmental issues are of particular importance to firms doing business with European organizations, many of which require the adoption of ISO14000 environmental standards. The medical instruments industry presents a unique challenge with respect to remanufacturing because of the extremely high quality and safety standards that must be met (e.g., FDA regulations). This paper reports the results from the first phase of an on-going case study of a medical instruments supplier with operations in both Europe and North America. In an attempt to systematically characterize the tradeoffs involved in remanufacturing, a Markov decision process model is formulated to examine optimal component reuse policies in this tightly regulated environment. The results reveal under what conditions the apparently conflicting objectives of achieving zero defects and increasing component reuse can be met simultaneously.

#### **3. Linking Manufacturing Performance with Environmental Management: The Role of Green Project Partnerships**

**Stephan Vachon**, Clarkson University

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

By interacting with their suppliers and their customers, manufacturing organizations can potentially develop and implement more effective solutions to environmental challenges they are facing. This paper explores the outcome, in terms of operational performance, of green project partnership in the supply chain. Green project partnership, defined here as the degree of interaction between organizations in the supply chain regarding pollution prevention projects, can take place upstream with the suppliers and downstream with the customers. Using the data from a survey of the Canadian and United States

package printing industry, the linkage between green project partnership and five performance indicators was tested. The results indicate that green project partnership with customers was positively linked to quality, flexibility and environmental performance while partnership with suppliers was associated with better delivery performance.

#### **4. Environmental Sustainability: Welfare Economics Extensions and International Practices**

**Germaine H Saad**, Widener University

This paper addresses the main problem of how to achieve continuous economic growth, while preserving environmental sustainability, simultaneously? The contribution thought to help solve this problem is two fold: First; Extension of Welfare Economics concepts are introduced to assure realization of both environmental sustainability, and economic growth, simultaneously. Second: make use of some practices and emerging policies, and identifying lessons to be learned from those practices, as to When and How each can be effectively used in other countries across the globe. Guidelines for implementation will be discussed as well.

**FRI/Apr 29** 3:45 pm- 5:15 pm

Michigan Room (6th Floor, South)

Session **FE6: International Issues in NPD and MOT** (Contributed)

Track: **New Product and Technology Management**

Chair: **Jannis Angelis**

#### **1. ADOPTION OF COST REDUCING TECHNOLOGY UNDER COST OR QUALITY BASED COMPETITION AND STOCHASTIC EVOLUTION OF MARKETS**

**Chester Chambers**, Southern Methodist University

**Panos Kouvelis**, Washington University

**Ping Su**, Washington University

This work considers the adoption of technology that will reduce unit product costs by duopolies sharing a single market. We develop 2 models: one involving quality-based competition, and another which considers competition in output rates. In both settings an evolution of the market is manifested by changes in a market-specific parameter, which experiences shocks described by Geometric Brownian Motion (GBM.) We describe optimal adoption points for both players assuming that they have different initial costs, and that adoption involves a discrete investment that is player-specific. Our results show that under quality-based competition, the higher quality producer is likely to adopt first. By contrast, under Cournot competition the possibility of preemption leads to uncertain sequence of adoption. In the process we show that the inclusion of real options within the analysis of these competitive games yields insights that were under-developed to this point.

#### **2. Managing Technology in China: Views form Enterprises**

**Hong Seng Woo**, Middlesex University

China has been experiencing dramatic growth since the open door policy was instigated in 1978. During this time, the country not only had to embrace technology, but having to do so quickly in order to meet the challenges of the global economy. This paper reports the findings of an exploratory study, based on interviews with executives and senior managers from China on their views of managing technology. The paper introduces a technology management framework to investigate how Chinese organizations manage, and hence, exploit technology for competitive gains. Results show three different major strands to managing technology in Chinese organizations: those that manage technology by first investigating the impact of technology versus the need for the technology; those that manage technology by focusing solely on the needs; and those that manage technology by doing neither.

#### **3. An Empirical Analysis on New Product Development Structure: Comparison between Italian and Japanese Manufacturing Firms**

**Yoshiki Matsui**, Yokohama National University

**Hideaki Kitanaka**, Takushoku University

**Osam Sato**, Tokyo Keizai University

Developing innovative new products is one of the most important challenges for manufacturing companies facing more uncertain and competitive business environments. An intermittent introduction of new

products into market potentially contributes to sales growth and profitability improvement, which lead to solid financial bases for future growth of their businesses. The main purpose of this paper is to comparatively analyze the relationship among practices, process, strategy, capabilities, and performance of new product development activities between Italian and Japanese manufacturing companies. This paper makes it clear what are common effects and what are country-specific effects of new product development activities upon their performance, based on the relevant measurement scales of new product development activities. One of main results is the overwhelming importance of capabilities to detect competitive evolution and customer needs, develop of new product technology, and improve the manufacturing process for new products.

## 5. Product and Service Complexity and High Performing Aerospace Organizations

**Jannis J Angelis**, Templeton College, University of Oxford

**Marc Thompson**, Templeton College, University of Oxford

Offering products or services with high specification and complexity is often used as a competitive business strategy for organizations that cannot compete on cost. This study investigates the relationship between product and service complexity and operational practices supporting such offerings. The results are based on responses from 225 firms across the value chain in the UK aerospace industry, ranging from service providers and systems integrators to components and materials suppliers. The study explores the adoption of knowledge and innovation driven work practices and production processes amongst firms in the aerospace industry in the pursuit of attaining sustainable high complexity products and service offerings. The paper enables managers pursuing high product and service complexity strategies to develop priorities for implementing individual techniques.

**FRI/Apr 29** 3:45 pm- 5:15 pm

Illinois Room (6th Floor, South)

Session **FE7: Focused Chaos: Insights, Intention and Innovation** (Invited)

Track: **Product and Service Innovation**

Chair: **Larry Menor**

## 1. Focused Chaos – Insight, Intention and Innovation

**Tom Stat**, IDEO Chicago

Conventional wisdom dictates that all organizations need to develop some degree of competence in innovation. As most managers and scholars know, creating an effective innovation management process is much easier said than done. Few organizations in recent times have been able to cultivate as successful a culture and process for innovation as IDEO, the Palo Alto-based firm known for its novel, holistic approach to new product and service design and development. This workshop will critically examine IDEO's culture of innovation, one that has impacted how many of today's recognized "exemplar" innovative organizations currently design products or create services and experiences.

**FRI/Apr 29** 3:45 pm- 5:15 pm

St. Clair Room (6th Floor, South)

Session **FE8: Issues in Service OM II** (Contributed)

Track: **Service Operations Management**

Chair: **Ray Coye**

## 1. How to improve competitiveness in telecommunications industry by using lean thinking

**Joao M Csillag**, Escola de Administracao de Empresas de Sao Paulo - FGV

**Helmer W Keppke**, Escola de Administracao de Empresas de Sao Paulo - FGV

This paper presents a framework used to analyze and implement some concepts of lean thinking in a telecommunications service company. Special attention is paid to the importance of the information flow. It is as significant as the flow of goods in traditional lean manufacturing. The specific industry segment analyzed is the corporate communication data services in one of the biggest Brazilian telecommunications company. Quantitative financial savings reached by the use of lean thinking in this company is presented.

## 2. Passing the Time

**Robert J Oxoby**, University of Calgary

**Diane P Bischak**, University of Calgary

How do individuals incorporate the cost of waiting in their decision processes? In laboratory experiments, we analyze the effects of both occupied and unoccupied waiting time on how individuals treat others after a wait. We find no evidence of an effect when individuals are occupied during their wait. However, we find that unoccupied time has interesting effects on individuals' sense of what is "fair" and what they are "owed," with implications for assessment of the true cost of keeping people waiting.

### **3. Workload and amplification in a service system**

**Michael J Armstrong**, Carleton University

Previous research has proposed the use of workload and amplification as performance measures for service systems. In this paper we analyze the behavior of these measures in the context of basic queuing models for service delivery and show how they can be linked with the idea of effective capacity. We then use these models and measures to examine the effect of process variation and quality problems on single stage service systems. Our analysis shows how both variation and rework can contribute to higher workloads, stronger amplification effects, and lower effective capacity. These analytical results suggest that both quality control and quality improvement could be useful in reducing excessive amplification in service systems.

### **4. Psychology of waiting: A server perspective**

**Ray W Coye**, DePaul University

We are becoming increasingly aware that characteristics of service encounters affect the servers themselves. One such factor that has received little attention, however, is the psychology of waiting as experienced by the server. Although we have focused moderate attention on the customer's side of the encounter, we know less about what servers experience when customers must wait. This study uses the critical incident technique to access information from servers regarding their side of the waiting equation. Results point to service failure, inaccurate capacity management, and ineffective customer participation as frequent causes of waiting. Servers report experiencing such responses as stress, anger, frustration, concern over lost customers, and reduced income. Implications for management are discussed.

**FRI/Apr 29** 3:45 pm- 5:15 pm

Session **FE9: Implementation of Six Sigma and ISO 9000** (Contributed)

Track: **Quality Management and Six Sigma**

Hebron Room (2nd Floor, North)

Chair: **THANGASAMY NAMBIRA**

### **1. ISO 9001:2000 and HACCP implementation in a multinational company manufacturing confectionery products**

**THANGASAMY NAMBIIRAJAN**, PONDICHERY UNIVERSITY

The present work was carried out in a multinational company manufacturing confectionery products. The objective of the work was to implement ISO 9001:2000 version and also to obtain HACCP(Hazard analysis and critical control points) Certification. ISO 9001:2000 was implemented across the company:(1)arriving at and adhering to process control parameters in manufacturing and for in process and finished goods,(2)inventory control, (3)service level maintenance, (4)conducting management eviews,(5)calibration of equipments,(6)improving customer services etc. HACCP was implemented to avoid physical, chemical and microbial hazards to improve and maintain product safety for human consumption by better hygienic condition in the shop floor and controlling critical control points. Because of the implementation of Total Quality Management, the company's productivity has improved from 1.8 quintal/manday to 2.25 quintal/manday of confectionery. Quality of products also improved in terms of their hygiene and safety for consumption.

### **2. Assessing the financial impact of 6-Sigma in an automotive company**

**Ben Clegg**, Aston Business School

**Neil Strange**, Aston Business School

This paper reports on an assessment of an ongoing 6-Sigma program conducted within a UK based (US owned) automotive company. It gives an overview of the management of the 6-sigma programme and the

in-house methodology used. The analysis given in the paper pays particular focus to the financial impacts that individual projects have had. Three projects are chosen from the hundreds that have been completed and are discussed in detail, including which specific techniques have been used and how financially successful the projects were. Commentary is also given on the effectiveness of the overall program along with a critique of how the implementation of 6-Sigma could be more effectively managed in the future. This discussion particularly focuses upon issues such as: project selection and scoping, financial evaluation and data availability, organisational awareness, commitment and involvement, middle management support, functional variation, and maintaining momentum during the rollout of a lengthy program.

### **3. The implementation of Six Sigma in manufacturing organizations: motivations and results achieved**

**Rafael M Kessler**, Forjas Taurus

**Antonio D Padula**, UFRGS

The competitive environment forces organizations to strive each time harder to remain on the cutting edge of the productivity frontier. Over the last years Six Sigma has become the strategy of choice for most organizations. Surprisingly, little academic literature is available on this field. This paper describes how six manufacturing organizations located in Brazil have implemented Six Sigma, the convergence between these companies and how they support the statements found on the existing literature. The success factors and barriers to implementation were also evaluated. The research found that adherence to methodology, top management support and alignment with existing strategic initiatives are key to success.

**FRI/Apr 29** 3:45 pm- 5:15 pm  
Session **FE10: ERP II (Contributed)**  
Track: **ERP**

Ohio Room (6th Floor, South)

Chair: **M.A. Venkataraman**

### **1. A Framework of Problem Diagnosis for ERP Implementations**

**Yu-Hui Tao**, National University of Kaohsiung

**Josephine Lee**, National Pingtung University of Science and Technology

**Shu-Chu Liu**, National Pingtung University of Science and Technology

Many surveys showed that over half of ERP implementations failed, which were due mainly to the management and user, and some to technical factors. Consequently, many studies applied retrospective research methods to explore the management and user issues on ERP evaluation, critical success and failure factors, or implementation methods. On the other hand, quickly solving occurring problems during the ERP implementation may turn the potentially "failure" outcome into at least "challenged" if not "successful". Nevertheless, although many practitioners conduct ERP problem-solving, little is found in academic literature about this implicit knowledge. This research proposes a problem-diagnosis framework for ERP implementation by utilizing the software development life cycle as a core to integrate existing information system models, in order to encompass both the academic theories and practical experiences. The justification of this integrated framework, especially its flexibility will be emphasized by its characteristics and from the original design considerations.

### **2. Change in information quality due to ERP implementation using AHP**

**Sanjay Kumar**, XLRI Jamshedpur

**PVSN Murthy**, AIT- XLRI

The paper highlights the change in information quality due to implementation of an ERP system. Information quality was postulated as consisting of dimensions from literature such as timeliness, accuracy, relevance etc. Structured questionnaire instrument was used to measure perceived information quality before and after ERP implementation. Weights of different dimensions of information quality as perceived by managers, were estimated using AHP. Information system (IS) experience was defined as experience with an online information system or a MRP II system, for more than two years. Change in information quality was estimated across companies with and without prior IS experience. Also change across groups of managers with and without prior IS experience within same company was also estimated. Qualitative study of IS related practices was also conducted and concept of 'absorptive capacity'

was used to explain observed results, along with principles related to information management.

### **3. Measuring Perceived Quality and Satisfaction of ERP Systems: an Empirical Study in Software Company**

**Cid Goncalves-Filho**, Universidade FUMEC

**Ramon S Leite**, PUC Minas

**Gustavo Q Souki**, Universidade FUMEC

The main objective of this research is to develop a valid scale to measure perceived quality of ERP (Enterprise Resource Planning) Systems. The research took place in two stages: an exploratory with in-depth interviews and focus groups and a descriptive stage where a survey with 684 valid cases. The study reveals that the scales to measure quality of ERP systems developed are valid and reliable.

Factorial analysis, Cronbach's alpha, discriminant analysis and convergent analysis were some techniques used to test the scale. The research also verifies that users of the system (clients) can be clustered into three different groups according to the degree of satisfaction level.

**FRI/Apr 29** 3:45 pm- 5:15 pm

Onyx Room (2nd Floor, North)

Session **FE11: Management's role in operations strategy** (Contributed)

Track: **Operations Strategy**

Chair: **Lieven Demeester**

### **1. Providing an Entrepreneurial Orientation to a Framework for Manufacturing Flexibility and Firm Performance: A Case Study**

**Jim Jim Hutchison**, George Mason University

**Sidhartha R Das**, George Mason University

We introduce the concept of entrepreneurial orientation or EO into an existing framework relating manufacturing flexibility with firm performance. This framework proposed that four exogenous variables – Strategy, Environmental Factors, Organizational Attributes, and Technology – guide a firm's decisions on choice and adoption of manufacturing flexibility so as to improve its performance. The introduction of a new exogenous variable "EO" helps to further explain the firm's decisions. Next, two types of "fit" within the framework are defined. The first is the fit between the exogenous variables, manufacturing flexibility, and firm performance. The second is the fit denoting the internal consistency within a firm's manufacturing flexibility dimensions. The various relationships in the framework are supported by our case study. Finally we find that the firm's management exhibits three of the five dimensions that constitute EO - autonomy, proactiveness, and risk-taking - in their decision making process.

### **2. Automation strategies - existing theory or ad hoc solutions?**

**Mats Winroth**, School of Engineering, Jönköping University

**Kristina Säfsten**, School of Engineering, Jönköping University

**Johan Stahre**, Chalmers University of Technology

Modern manufacturing systems are often semi-automated, i.e. integrating both manual and automated operations. However, and even if, automation should be realized are often ad hoc decisions and not based on structured decision making. This paper examines three approaches towards automation decisions: top-down, bottom-up, and contingency. Top management initiates a top-down approach about automation of production. On the contrary, when the decision about automation stems from e.g. the operators, a bottom-up approach is applied. We propose a third way, the contingency approach, which links decisions regarding automation to manufacturing strategies and competitive priorities of the company. Making automation decisions is one of several decision areas that emerge as a consequence of choosing a certain type of production system. The paper discusses important factors for the success of different approaches. Different approaches are illustrated with examples from Swedish manufacturing industry.

### **3. The Role of Operations Executives in the Process of Strategy: A Contingency Theory**

**Lieven L Demeester**, INSEAD

**Jovan Grahovac**, A. B. Freeman School of Business

Bounded rationality considerations make it necessary for operations executives to maintain a balance between 'functional deliberation' within the operations function and 'top-level communication' with the chief

executive officer and other functional heads. We argue that functional deliberation is useful primarily in accumulating valuable resources within the operations function. On the other hand, top-level communication improves the cross-functional coherence of resources. We propose a contingency-based approach in which the right balance between the two is based on the external environment and internal conditions that a firm faces. We conclude that higher levels of environmental dynamism, simplicity, and munificence raise the amount of time and energy that operations executives should devote to functional deliberation. Moreover, high levels of remaining development potential and/or relative criticality of the operations function have the same effect.

**FRI/Apr 29** 3:45 pm- 5:15 pm

Valencia East (Lobby Level)

Session **FE12: Innovations in Teaching Lean Operations and Processes** (Contributed)

Track: **Innovations in Teaching**

Chair: **Mary Gander**

### **1. Teaching Supply Chain Coordination with Excel Solver**

**Michael R Godfrey**, University of Wisconsin Oshkosh

**Paul F Schikora**, Indiana State University

The current study will present Excel Solver models for developing a supply chain model to enhance coordination between a manufacturer and a retailer. Specifically, we study the case where the manufacturer produces a commodity-type product for the retailer and the manufacturer needs to persuade the retailer to alter its purchase quantities to minimize overall supply chain costs. Two models are presented. The first model considers the order and carrying costs of both the manufacturer and the retailer. The second model considers the previous costs along with transportation-related costs (shipment costs and in-transit carrying costs) based on freight rates for less-than-truckload and truckload shipments. For both models an optimal purchase quantity discount schedule is presented. The results show that the optimal solution can change significantly when transportation costs are considered explicitly.

### **2. Innovation to Teaching Mathematical Programming to New Production Management**

#### **Practitioners**

**Josefa Mula**, Polytechnic University of Valencia

**Raúl Poler**, Polytechnic University of Valencia

The learning of mathematical programming techniques can result in a long and tedious process for new production management practitioners. It is necessary to combine in a balanced way the theoretical teachings with the modeling of real study cases. In order to make more flexible the theoretical teaching process, multimedia tools of autodidactic learning are provided. A key factor is to evolve from simple models solved through educational programs, such as WinQSB and/or Solver (Microsoft Excel) to more complex models developed with a high level language of mathematical programming as MPL, where the models are solved with diverse commercial solvers (CPLEX, CONOPT, etc.) The objective of this paper is to present an innovative methodology to teach mathematical programming techniques based in: (i) the balance of the theoretical and practical teachings; (ii) the use of multimedia autodidactic tools; and (iii) the formulation and resolution of real study cases through different solvers.

### **3. Teaching Lean Systems: A Multidisciplinary Approach**

**Monica W Tracey**, School of Education and Health Services, Oakland University

**T.J. Wharton**, School of Business Administration, Oakland University

**Bob Van Til**, School of Engineering and Computer Sciences, Oakland University

**Kevin Yamada**, The Pawley Institute, Oakland University

It is widely considered that the use of interdisciplinary team teaching is an effective way to integrate the various decisions about the issues that span an organization's supply chain. Typically this approach involves cross-functional teams within an academic unit of a university (e.g., a business school). This paper presents our efforts in developing and implementing an innovative course in lean systems that is not only interdisciplinary, but utilizes faculty across multiple academic units within a university setting. Drawing on faculty expertise from Oakland University's School of Business Administration, School of Education and Human Services, School of Engineering and Computer Sciences, and Pawley Institute, the course provides students multiple perspectives on the operational issues as well as the leadership issues

necessary to manage a lean supply chain. The benefits and challenges of this cross-school, multidisciplinary approach to teaching are also discussed.

#### **4. Understanding Lean Service through a multimedia teaching case**

**Daisy Escobar**, Instituto de Empresa

**Elena Revilla**, Instituto de Empresa

Lean thinking has proved to be successful in improving firm's performances. As services could benefit from this approach too, there is an increasing interest in Lean Service as a teaching topic in Operations Management. At the Instituto de Empresa we teach the lean operations concepts by using a set of teaching tools such as a simulation based on Lego blocks and multimedia tools developed by our e-learning unit. Although these tools have worked pretty good in a manufacturing context, we have found some limitations in using them to teach lean service, due to the peculiarities of service operations. Thus, we have developed a more specific tool for services, a multimedia case based on the service processes of a major retailer of home furniture. This paper describes its use in teaching Lean Service, emphasizing the main differences with lean manufacturing.

#### **5. Making Product ABC at Acme Manufacturing: A Classroom Lean Simulation Exercise**

**Mary Gander**, Winona State University

Though students (and industry clients) are taught the principles, methods, and tools of Lean manufacturing, it is always a challenge for them to truly grasp the tremendous waste reduction, effectiveness and flexibility that can be achieved through creating one-piece-flow. Hands-on simulations (such as "Building an Airplane" using Lego blocks) are very helpful but only go so far, there is still too large a jump to actual application in a plant. Making Product ABC at Acme Manufacturing is a team exercise that can be done in a classroom setting, taking the learning and applications of other simulation exercises several steps farther, not only giving participants the excitement and gratification of experiencing how much waste they can eliminate from a particular manufacturing process in a very short time, but also preparing them more fully for application on a real plant floor.

**FRI/Apr 29** 3:45 pm- 5:15 pm

Valencia West (Lobby Level)

Session **FE13: Supply Chain Learning Environment: A Tool for Teaching Supply Chain Relationships** (Contributed)

Track: **Innovations in Teaching**

Chair: **Gary Palin**

#### **1. Supply Chain Learning Environment: A Tool for Teaching Supply Chain Relationships**

**Gary Palin**, North Carolina State University

The "Supply Chain Learning Environment" was developed to enable the student to get "hands-on" experience in working in a critical supply chain role in a "virtual company". Current supply chain education through traditional means does not equip students with the vital understanding of the relationships between supply chain participants, the impact of their decisions and also, the importance of negotiating good contracts. The central tenet of Supply Chain Management is the concept of "Total Cost". Most supply chain managers are told that it is more important to ensure that the entire supply chain's value is maximized rather than trying to improve their own firm's profitability alone. However, it is a concept that cannot be taught simply through lectures.

**SAT/Apr 30** 9:30 am-11:00 am

Sullivan Room (8th Floor, South)

Session **SB1: Coordination In Supply Chains** (Contributed)

Track: **Supply Chain Management**

Chair: **Ton de Kok**

#### **1. Decision Rules for Order Promising**

**Hernan Wurgaft**, SUNY Maritime College

A supplier serving a concentrated market consisting of a few large customers must carefully consider the interaction of product availability and order promising decisions. Even when an order is feasible in terms of the requested quantity and delivery date, it may be reasonable not to accept the order to protect the

availability of product for future expected orders. The paper proposes a framework to derive decision rules for order promising in an environment where product price provides a measure of the value of each customer. The framework is based on the usual trade-off between overstocking and understocking costs. The rules also consider the possibility of using more expensive reactive capacity, with different assumptions for the production cost function. The proposed applications are in the chemical industry.

## **2. Push-based Available-to-Promise Allocation Policies**

**Chien-Yu Chen**, George Mason University

**Zhenying Zhao**, University of Maryland

**Michael O Ball**, University of Maryland

In order to support real-time order promising, a company needs to pre-allocate its available resources into different segments of future demand before actual realization. Motivated by revenue management and inventory control studies, we consider different push-based available-to-promise (ATP) allocation policies. Partitioned and nested booking limits are combined with multi-echelon techniques to pre-allocate available resources across sales channels and time periods. Stochastic programming models are developed under discrete demand scenarios and solved with decomposition techniques. We then test and compare the effectiveness of these allocation models in simulation experiments.

## **3. Adaptive Product Offering Conditioning in a Configure-to-Order Manufacturing Environment**

**Markus Ettl**, IBM T.J. Watson Research Center

**Paul Huang**, IBM T.J. Watson Research Center

**Karthik Sourirajan**, Purdue University

**Feng Cheng**, IBM Research

Supply-demand conditioning is a supply chain decision process that monitors imbalances between supply and demand, and recommends corrective actions before an imbalance becomes a threat to customer service. Corrective actions fall into the three categories supply conditioning (working with suppliers to improve flexibility in supply to react to uncertain customer demand); demand conditioning (providing sales plans that can be dynamically changed); and product offering conditioning. We describe an analytical method that finds product offering alternatives to better coordinate supply and sales. The method enables proactive coordination of supply and sales in terms of optimizing profit, and helps companies manage major product transitions. It involves solving a master optimization problem and a sub-problem in an iterative algorithm. The master problem develops an optimal build plan, and the sub-problem utilizes column generation to determine the best new configuration to be added to the existing set to optimize an overall objective.

## **4. Price Determination on the Internet**

**Krishan Dandapani**, Florida International University

**Sushil Gupta**, Florida International University

How does an Institution Price Online Financial Services? Based on theory and competitive environment, we examine the price determination possibilities for a financial institution and contrast it with brick and mortar pricing and explore its implications.

## **5. Coordinating Component Inventory Management and Final Assembly Scheduling in an Assemble-to-Order Environment**

**Ton de Kok**, Technische Universiteit Eindhoven

In recent literature on Assemble-To-Order (ATO) systems the inventory management of components subject to availability constraints has been studied. The key idea behind the approaches considered is that Final Assembly (FAS) can only start when all components are available. In real-world ATO systems final assembly is a complex process consisting a multiple subsequent assembly and testing steps. This implies that some components are more time-critical than others. Such a difference in time criticality is not properly reflected in joint component availability constraints. In this presentation we propose a conceptual approach to coordinate component inventory management and FAS such that customer service objectives with respect to due date reliability are met.

### **1. Flexible Supply Chain Policies with Stocked Products, Backorders, Substitution, and Impatient Customers**

**Bora Kolfal**, Northwestern University

**Seyed Iravani**, Northwestern University

**Mark Van Oyen**, University of Loyola at Chicago

We examine a simple model of a supply chain with fully flexible production of two product types. In a make-to-stock environment with backordering, impatient customers who renege, and the option of product substitution, we explore the optimal and heuristic control of a fully flexible production operation.

### **2. Examination of a Retailer's Fixed Markup Policy under Price-Dependent Demand**

**Michael J Fry**, University of Cincinnati

**Yong Liu**, University of Cincinnati

**Amit Raturi**, University of Cincinnati

We examine the behavior of a manufacturer and a retailer facing price-dependent demand. We investigate their decisions and resulting profits under a traditional price-only contract and under a retailer's fixed markup (RFM) policy. We find that RFM can significantly improve supply chain performance, but that the efficiency and effectiveness of RFM is highly dependent on two factors: (1) the functional form of demand and (2) the relative market power of different players in the supply chain.

### **3. Modeling Methodology for Supply Chain Synthesis and Disruption Analysis**

**Jennifer Blackhurst**, North Carolina State University

**Teresa Wu**, Arizona State University

The concept of supply chain integration is a strategy for managing today's globalized and customer driven supply chains in order to better meet customer demands. Synthesizing individual entities into an integrated supply chain can be a challenging task due to a variety of factors including conflicting objectives and entity constraints. Furthermore, understanding the effects of disruptions occurring in the system is difficult when working toward coordinating supply chain operations. This research introduces a modeling methodology to manage the synthesis of a supply chain by linking hierarchical levels of the system and to model and analyze disruptions in the supply chain. The contribution of this research include: supply chain systems can be modeled hierarchically, the performance of synthesized supply chain system can be evaluated quantitatively, and reachability analysis is used to evaluate system performance, allowing the user to understand the extent of effects of a disruption in an integrated supply chain.

### **4. Information Sharing in Supply Chains: Incentives for Information Distortion**

**Birendra K Mishra**, The University of Texas at Dallas

**Srinivasan Raghunathan**, The University of Texas at Dallas

**Xiaohang Yue**, The University of Wisconsin at Milwaukee

Existing literature on supply chain information sharing assumes that information is shared truthfully. In this study, we analyze the incentives of manufacturers and retailers within a supply chain to distort information when they share it and propose a mechanism that results in truthful information sharing. We consider a make-to-order supply chain consisting of a single manufacturer and a single retailer. The manufacturer and the retailer set prices based on their private forecasts of uncertain demand. We show that the manufacturer and the retailer, respectively, have an incentive to overstate and understate their forecasts while sharing information. The information distortion phenomenon is the direct result of each party exploiting its private information to appropriate the gains from information sharing. We show that the incentives to distort information are eliminated and both parties benefit from information sharing if the manufacturer and the retailer can agree on their relative profit margins.

### **1. An Analytic Approximation of Joint Location/Inventory Decisions**

**Leyla Ozsen**, Purdue University

**Mark S Daskin**, Northwestern University

We introduce an analytical model that integrates location and inventory decisions from which we can obtain closed form solutions. We compare this model to those of a discrete Location-Inventory model. Sensitivity analysis suggests that the benefits of integration increase as inventory costs become a larger fraction of the total cost.

### **2. Collaboration in Automotive After-Sales Supply Chain**

**Peiling Wu**, Manufacturing Systems Research Lab

As early as mid 80s, General Motors Service Parts Operations (GM SPO) conducted an extensive study on its aftermarket customer service level and parts availability off-the-shelf and at dealerships. During early 90s, Saturn Corporation implemented a customer-oriented service supply chain strategy, match the criticality of customers' need for parts, improve parts availability to end customers. The core strategy lies in joint ownership inventory management and collaboration, enabled by information sharing, visibility, and incentive rewards. The on-going research initiatives are motivated from Saturn's success, while extending it beyond to further address a number of practical yet challenging issues such as optimizing retailer inventory pooling and allocation strategies, optimizing incentive programs, and collaborating with upstream suppliers in planning and sales/order forecasting in addition to the partnership with downstream retailers. We discuss the supply chain collaborations in general forms and also share related automotive experiences and vision of CPFR in automotive after-sales applications.

### **3. Forecast Updating and Supplier Coordination for Complementary Component**

**Donald P Warsing**, North Carolina State University

**Douglas J Thomas**, Penn State University

**Xueyi Zhang**, Penn State University

We study a supply chain with an Original Equipment Manufacturer (OEM) that buys subassemblies comprised of two sets of components with different lead times from a contract manufacturer (CM). The OEM must decide (1) whether or not to share an updated demand forecast when the CM places the later order and (2) whether or not to share component overage costs that the CM would otherwise fully bear. For the case where both second-stage demand and its mean in the first stage follow uniform distributions, we obtain closed-form expressions for the CM's order quantities, and we demonstrate that these closed-form solutions accurately approximate the case with bivariate normal demand and forecast information. Using our closed-form expressions, we find that when the OEM does not share overage costs, both parties benefit from forecast sharing; however, when the OEM chooses his best overage sharing agreement, sharing the forecast update can hurt his performance.

### **4. Requirements Planning for Modular Products**

**Anand Paul**, University of Florida

**Asoo Vakharia**, University of Florida

We study inventory planning for the components of a modular product with uncertain demand over an infinite horizon. We focus on a modular product structure containing a single product type that can be assembled from a set of components, where each component has a number of options associated with it. Both aggregate demand and the probabilities associated with option preferences are random. We construct a parsimonious stochastic model and derive some structural insights.

### **5. Multi Criteria Inventory Models for Decentralized Supply Chains**

**Raman Thirumalai**, Marketing Analytics

**A. Ravi Ravindran**, Penn State University

A decentralized serial supply chain is analyzed as a multi criteria problem with multiple decision makers.

We model the supply chain using three companies arranged each with an independent decision maker. Each decision maker's problem is modeled as a multi criteria problem and an interactive method is proposed for solving this problem. Next the supply chain problem is also modeled as a multi criteria problem. We show conditions when the supply chain will operate at efficiency. We prove that in certain cases this problem can result in a dominated solution when each company decides its inventory policy independently. We present a collaborative & interactive algorithm to solve this problem that results in a compromise solution that is supply chain efficient and also efficient for the individual companies.

**SAT/Apr 30** 9:30 am-11:00 am

Burnham Room (8th Floor, South)

Session **SB4: Logistics Applications II** (Contributed)

Track: **Logistics, Distribution Channels, and Inventory Systems** Chair: **Rene de Koster**

### **1. Capacity Planning and Performance Evaluation of Coal Supply Chain Networks**

**CIGDEM GURGUR**, COLORADO SCHOOL OF MINES

We study capacity planning of coal supply chain networks with environmental regulatory issues taken into account to improve coal-related decision making that strokes electric power generation. Coal constitutes a key ingredient of the U.S. economy, and its efficient and cost-effective transportation and distribution have major economic ramifications. We develop a mathematical model using fluid-oriented queuing approach to obtain the performance measures of the supply chain. The analytical model is verified against simulation models of coal supply chain scenarios and validated using industrial data.

### **2. Measuring the Logistics Service Level in the Beverages Industry: the Development of Scales and Impact on Sales**

**Cid Goncalves\_Filho**, FUMEC University

**Washington C Alameida**, Fead Minas

**Gustavo Q Souki**, Fumec University

With the increasing competitiveness and customers demanding better levels of service, logistics management has become an important tool to differentiate industries in the market. Researches conducted by Christopher (1992), Ballou (2001), Bowersox and Closs (2001), emphasizes the importance of the logistics service level perceived by customers to obtain competitive advantage. With the objective of examining empirically the mediation of the level of logistics service perceived by retailers of a beverage industry, a survey was carried out with 132 respondents. A scale to measure the level of logistics service was validated. Techniques as structural equation modeling were used in order to evaluate the impact of service level on the amount of sales done by retailers.

### **3. Private labels and relationship on the marketing channel: a case study in a grocery industry**

**Veronica A de Paula**, Universidade Federal de São Carlos

**Andrea L da Silva**, Universidade Federal de Sao Carlos

In a competitive environment, companies are supposed to search for strategies to differentiate themselves from the competitors. The distribution strategy assures sustainable competitive advantage for the company because it is built during time and involves intangible and long term aspects such as reliance and relationship. As marketing strategy, the company may reach product and label strategies that make it possible to conquer or sustain a competitive position different from the competitors' ones. The private label strategy is an option that relates directly industry and retailing, two very important members of the marketing channel. It is relevant to verify the impact of this decision on the marketing strategy of the company. The aim of this paper is to establish the consequences of the private label strategy for the distribution variable, particularly the impact on the relationship of the industry with the other channel members.

### **4. Pooling Demand Information in a Supply Chain with Unobservable Lost Sales**

**Arnab Bisi**, Purdue University

**David Glenn**, Profit Logic

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

We consider a two-tier supply chain with one supplier and two retailers. Retailers are censored

newsvendors facing parametric demand distributions with unknown parameters. We investigate how the supplier can devise a mechanism in order to influence each retailer to make use of the other retailer's sales data to better forecast and increase channel profits. We compare the performances of the following cases: retailers maximize their profits with or without pooled data, supplier maximizes her profit with or without pooled data, integrated firm maximizes system profit with pooled data.

**SAT/Apr 30** 9:30 am-11:00 am

Adler Room (2nd Floor, North)

Session **SB5: Issues in Product Disassembly** (Invited)

Track: **Environmental Issues and Reverse Logistics in Manufacturing**

Chair: **Surendra Gupta**

### **1. Multi-Criteria Decision Making Approach in Multiple Periods for a Disassembly-To-Order System Under Stochastic Yields**

**Prasit Imtanavanich**, Northeastern University

**Surendra M Gupta**, Northeastern University

In this paper, we consider the disassembly-to-order (DTO) system, where end-of-life (EOL) products are taken back to be disassembled to satisfy demands for components and materials. The main purpose of this research is to determine the optimal number of take-back EOL products for the DTO system while trying to maximize profit and minimize costs involved in the system. In order to achieve the goals, we implement a multi-criteria decision making approach to handle such multiple objectives. Since the operating conditions of take-back EOL products are unknown and always complicate model formulation, heuristic approach which transforms stochastic version of disassembly yields into its deterministic equivalents is included in our work. In this research, we attempt to generate a DTO plan for multiple periods, where the remaining or exceeding resources in the previous period can be used in the following periods. A numerical example is considered to illustrate the approach.

### **2. Disassembly of Sensor-Embedded Products using Disassembly Line with Pull Mechanism**

**Srikanth Vadde**, Northeastern University

**Gun Udomsawat**, Northeastern University

**Sagar Kamarthi**, Northeastern University

**Surendra M Gupta**, Northeastern University

End-Of-Life (EOL) products typically contain reusable materials and components. Disassembly can help increase material and component recovery rate. In selective disassembly of EOL products, a disassembly line can be employed. Due to the uncertainty involving the condition of EOL products, the decision whether to disassemble a product has to be made impromptu which can cause delays in satisfying the demand for components. Sensors if embedded in products can provide information pertaining to product condition which can assist in decision making during product disassembly, thereby boosting product recovery rate, reducing labor cost, increasing line efficiency, and minimizing disassembly time. This paper proposes a model of a disassembly line for sensor-embedded products using a multi-Kanban system. Using studies conducted on two disassembly lines, one that uses sensor-based information and the other not, it is shown that using sensor information can significantly improve the line efficiency.

### **3. Comparison of CSMA/CD and Token Ring Networks' Performances on Computer Disassembly Line**

**Goner Argon**, Northeastern University

**Surendra M Gupta**, Northeastern University

Automation is a very important part of assembly and disassembly lines. A communication network represents the medium and set of rules, which transfers and regulates all the necessary information flow to synchronize the automation and control each product on the line. However, research is lacking that analyzes the effects of different kinds of communication networks on the performance of the line. In this paper, we look at a disassembly line system as a combination of physical processing (performed by machines) and information processing (performed by computer systems), and formulate a model to analyze the system behavior and obtain an optimal or near optimal solution that would maximize the system performance by minimizing the risk of downtime due to network capacity related problems. We

simulated this model for two major types of network protocols (viz., CSMA/CD and Token Ring) used in the manufacturing and de-manufacturing industries. A case study involving

#### **4. Multi-Kanban Mechanism for Automobile Disassembly**

**Gun Udomsawat**, Northeastern University

**Surendra M Gupta**, Northeastern University

Automobile salvage industry is a major conduit for the flow of reusable components to repair industry and recyclable materials to recycling industry. It performs three significant functions, viz., collecting and storing end-of-life cars, dismantling reusable components, and delivering recyclable materials. Primary income typically comes from the sale of replacement parts. Some of these parts are rebuilt and then sold to the market, while the others are directly sold to the market.

In this study, we consider an over-the-counter type of salvage facility, which is normally large in size, and primarily deals with wholesalers, repair shops, insurance companies, and part rebuilders. The facility typically dismantles 20-30 different components, which are cleaned, tested, stored and inventoried. Common problems in this type of facility are overflow of inventories and labor costs that are sunk into parts not sold. We suggest a solution using a disassembly line with pull mechanism. A numerical example is provided.

#### **5. Cost-Benefit Analysis of End-of-Life PCs**

**Satish Nukala**, Northeastern University

**Surendra M Gupta**, Northeastern University

Rapid developments in present day computer technology is rendering personal computers (PCs) life span short, thus increasing the number of PCs to be planned for end-of-life (EOL) processing. In this paper, we develop a cost-benefit model for a disassembler of EOL PCs and a buyer of the disassembled parts of a PC in the second hand market. We carry out a sensitivity analysis of the variables that affect the profit of both the parties, such that, both parties can maximize their mutual profits. We also consider a special case where a disassembler is an OEM and model a specific scenario where the OEM encourages his/her customers to bring back their existing PCs that are relatively new, at the same time, offering brand new PCs at a discounted price, the discount being a variable dependent on the age of the PC the customer is bringing back. A numerical example is considered

**SAT/Apr 30** 9:30 am-11:00 am

Session **SB6: New product Development Issues** (Contributed)

Track: **New Product and Technology Management**

Michigan Room (6th Floor, South)

Chair: **Debashish Mallick**

#### **1. Relationships among collaborative product development practice, intermediate performance measures and firm performance**

**Anant A Mishra**, University of Minnesota

**Rachna Shah**, University of Minnesota

Collaborative Product Development (CPD) is fast emerging as a new paradigm in the product development literature. Coordination within the firm, between various functions (internal coordination) as well as coordination with external groups such as suppliers (supplier coordination) as customers (customer coordination) has been the subject of significant interest in the past decade. However, empirical research so far has not yielded any conclusive insights as to the usefulness of these coordination practices. Moreover, the effect of these practices on firm performance has been rarely investigated. An effort is made here to examine the role of collective pursuance of coordination practices on the intermediate performance measures of 'speed to market' and 'customer satisfaction' and finally the impact on firm performance. Results provide strong evidence of the positive role of collectively pursuing these coordination practices on speed to market and customer satisfaction, whereas the impact on firm performance is only partially supported.

#### **2. An Exploratory Study of Project Decision Making During the Fuzzy Front End**

**Dwight E Smith-Daniels**, Arizona State University

**Vicki L Smith-Daniels**, Arizona State University

The project initiation phase is particularly challenging, since it includes a number of relatively unstructured activities, including team formation and forming, project mission and objective setting, project design and scheduling, and risk planning. Through an experimental study, we examine decision making practices in the

### 3. Dynamic Model Approach to Overlap Product Development Activities

**Jack Su**, University of New Mexico

Develop dynamic models using optimal control theory to capture the trade-offs of overlapping product development activities and provide managerial insights about the optimal pace to invest in such activities in both cost minimization and profit maximization settings.

### 4. A STOCHASTIC PRODUCT VARIETY MANAGEMENT MODEL WITH ONE-WAY DEMAND SUBSTITUTION

**Lifang Wu**, Xavier University

**Renato E de Matta**, University of Iowa

**Timothy Lowe**, University of Iowa

A successful product line requires having the right product in the right place at the right time for the right price. Besides demand uncertainty, the product substitution by customers when their most preferred products run out of stock poses another major challenge which complicates a firm's product variety decision. We formulate a single period, two-stage stochastic programming problem to find the profit maximizing product design, order quantity, and retail pricing decisions when stochastic demand and product substitution are both present. A Benders decomposition method is proposed to solve this two-stage problem.

**SAT/Apr. 30** 9:30 am-11:00 am

Session **SB7: Teaching Product & Service Innovation: An Open Discussion Session (Invited)**

Track: **Product and Service Innovation**

Illinois Room (6th Floor, South)

Chair: **Rohit Verma**

### 1. Teaching Product & Service Innovation – An Open Discussion

**Rohit Verma**, University of Utah

The purpose of this open discussion session is to bring together faculty members from various universities to share ideas about teaching Product & Service Innovation courses. We welcome attendance and active participation of all faculty members who are either teaching (or are interested in teaching) a course on Product & Service Innovation or related topic.

**SAT/Apr 30** 9:30 am-11:00 am

Session **SB8: Panel Discussion: Is Service Operations missing its target? (Invited)**

Track: **Service Operations Management**

St. Clair Room (6th Floor, South)

Chair: **Ivor Morgan**

### 1. Panel Discussion: Ideas & Strategies to Increase the Impact of

**Ivor Morgan**, Babson College

More than 80% of the U.S. economy is purported to be in services. Yet most business schools give a minimal exposure to this 80% or to "Service Operations" in particular. Much of this very large target is being missed. The focus of the panel is on: 1. The underlying reasons for this paradox: faculty, lack of tools, materials shortages, momentum.....? 2. Ideas for gaining greater impact both in business schools and in service management. 3. Strategies for implementing these ideas. Panel members: TBD

**SAT/Apr 30** 9:30 am-11:00 am

Session **SB9: Theoretical Underpinnings of Six Sigma (Contributed)**

Track: **Quality Management and Six Sigma**

Hebron Room (2nd Floor, North)

Chair: **Art Hill**

## **1. An investigation into the Six Sigma approach to performance improvement**

**James W Hamister**, University at Buffalo

**Michael J Braunscheidel**, University at Buffalo

**Nallan C Suresh**, University at Buffalo

**Harold Star**, University at Buffalo

Six Sigma has been defined as a systematic method for strategic process improvement. While Six Sigma has become an important method in practice, gaps remain in understanding the theoretical underpinnings of Six Sigma. The goal of this research is to assess the actual use of Six Sigma, to improve our understanding of specific motivations for adopting Six Sigma, and to assess to what extent these programs achieve desired results. The research protocol consisted of identifying organizations in a variety of industries, and conducting structured interviews with at least three respondents in each company in order to improve response validity. Seven firms agreed to participate in this research. Findings suggest that Six Sigma is used for two separate purposes in practice: variation reduction in current processes, or as a management tool for change. A theoretical model is proposed to explain under what circumstances each approach is chosen.

## **2. Identification of critical principles and practices in a Six Sigma system**

**Xingxing Zu**, Clemson University

**Lawrence D Fredendall**, Clemson University

**Thomas J Douglas**, Clemson University

Many organizations are implementing Six Sigma to improve the quality of their products and services and to boost their bottom-line. While Six Sigma is gaining popularity in industry, there still exist many questions about Six Sigma. One fundamental question is: Whether Six Sigma is a distinctive quality management program or it is just a repackaging of TQM? By analyzing and comparing the principles and practices of TQM and Six Sigma systems, this study identifies a distinctive set of Six Sigma principles and practices which may enhance TQM. The additional principles are: a structured approach, a bottomline benefit focus, and goal setting. And the additional practices in Six Sigma are the use of metrics and Six Sigma structure. Identification of these Six Sigma principles and practices can help to develop a theory of how Six Sigma creates competitive advantages for organizations and assist managers to adjust their existing quality management systems.

## **3. Can we develop theory around Six Sigma? Should we care?**

**Suzanne de Treville**, HEC - University of Lausanne

**Norman M Edelson**, Norm Edelson Manufacturing Improvement Co.

**Anilkumar N Kharkar**, Corning (retired)

Six Sigma organizational practices are believed to have resulted in dramatic reductions in customer-defined defect rates (Linderman et al., 2003). The academic community, however, continues to lack understanding of the constructs and causal relationships underlying Six Sigma (with the exception of Linderman et al., 2003, who examined goal theoretic aspects of Six Sigma), hence is buffeted by anecdotes reported from practice. We evaluate Six Sigma through the lens of theory development (Bacharach, 1989; Osigweh, 1989; Sutton & Staw, 1995; Van de Ven, 1989; Whetten, 1989) to explain why the Six Sigma constructs, assumptions, and causal relationships result in poor theory and concept misformation (Osigweh, 1989). The factors that make Six Sigma inadequate as a theory give insight into the building blocks needed to provide a working theory of process consistency, without which knowledge development in this essential aspect of quality management will remain ad hoc, piecemeal, untestable, and irrefutable.

## **4. A Configurational Study of Six Sigma Program Design**

**Weiyong Zhang**, University of Minnesota

**Arthur V Hill**, University of Minnesota

Six Sigma has been widely accepted by practitioners as an effective means to improve organizational performance. However, very limited research has been done on this important movement. This paper develops a theory of Six Sigma program design. Based on an extensive review of the literature, this paper identifies and contrasts two different views of Six Sigma programs success. The paper then proposes a theory that synthesizes these two views. Important contextual factors and Six Sigma program design

variables are identified through a survey of Six Sigma experts. Finally, the paper proposes several viable Six Sigma program design configurations and their applicable contexts. The theory can serve as a foundation for both future theoretical and empirical research. The theory also offers very practical guidance for practitioners.

**SAT/Apr 30** 9:30 am-11:00 am

Session **SB10: Innovative Use and Extensions to ERP** (Invited)

Track: **ERP**

Ohio Room (6th Floor, South)

Chair: **Elliot Bendoly**

### **1. Innovative Use and Extensions to ERP - A Panel Discussion**

**Elliot Bendoly**, Emory University

The role of this open panel discussion is to provide a window into cutting edge extensions and use of ERP infrastructures. The exchange aims to illuminate the potential of these systems to support both innovative intra- and inter-organizational resource management decisions and thus serve as a launching-pad for strategic advantage. The panelists are: Robert Jacobs (Kelley School of Business, Indiana University); John Ettl (College of Business, Rochester Institute of Technology); Mark Cotteleer (College of Business Administration, Marquette University); and Jeff Stratman (DuPree College of Management, Georgia Institute of Technology).

**SAT/Apr 30** 9:30 am-11:00 am

Session **SB11: Decision making in operations** (Contributed)

Track: **Operations Strategy**

Onyx Room (2nd Floor, North)

Chair: **Jan Fransoo**

### **1. Compatibility of Modular Products in a Vertically Differentiated Industry**

**Farooq Sheikh**, Bloomsburg University

We study a modular product of two modules in a vertically differentiated industry and investigate firm level preference for interface type: proprietary or standard. We consider a one period model of complete information and an industry comprising firms that can either manufacture both the modules or just one module. I find that, in general, preference for proprietary interface is associated with opportunities for rent transfer between firms when the module of one firm provides quality enhancement on an existing product manufactured by another firm or increases sales volume for the latter firm by extending the market into low-end buyers. I find that in a duopoly including firms capable of manufacturing both the modules of the products, standard interface is preferred when firms have consistent quality ranking over individual modules, else proprietary interface is preferred.

### **2. Operational Challenges in the Telecommunications Industry: A Case Study and Research Framework**

**Eric P Jack**, University of Alabama at Birmingham (UAB)

A case study is performed on an inbound telecommunications call center to highlight the detailed context and background of key operational tradeoffs and challenges in the telecommunications industry. Based on a literature review and detailed findings from this case study, managerial insights are discussed that can facilitate key resource management decisions in the call center industry. This research suggests that there are four key resource management decisions that must be addressed in order to effectively manage call center operations. These resource management decisions include the deployment and use of labor, leveraging technology, capacity management, and demand management. Propositions are developed, a research framework is advanced, and future research directions are suggested based on these linkages.

### **3. Improving the Accuracy of Winter's Three Parameter Exponential Smoothing**

**Stephen A DeLurgio**, University of Missouri

**Mongkol Temrangsitornrat**, University of Missouri

Using the 1428 monthly time series of the M3 competition, this research focuses on improving the accuracy of Winter's three parameter exponential smoothing method. Using the experimental design of the M3 competition, the symmetric MAPEs and MAD are measured while constraints are placed on trend

and seasonal smoothing constants. In addition, experimental optimization is used to determine whether statistical significance tests of trend and seasonal components are useful in Winter's method. Preliminary results using constraints of .5 and .8 have been inconclusive; however, overall, average results are negative. Nonetheless, research continues on the effective use of constraints and statistical significance tests in choosing model structure. These improved methods will use some form of additional intelligence in choosing the values of constraints and significance levels; the results of these improved will be presented at the time of presentation.

#### **4. A Normative Framework for New Product Development to Secure Linked Practices**

**Michiya Morita**, Gakushuin University

**Shigemi Ochiai**, Jonquil Consulting Inc.

This study presents a normative framework for new product development to create competitive values based on an real application case of the framework and the High Performance Manufacturing project. The aim of the framework is not only to develop new products, but also to secure a consistent linkage of practices from R&D to selling activities in order to make maximum use of resources of the company. The study shows the real effective integration of activities of the company starts with new product development process.

#### **5. Planners' Action Variety: a field study using the daily planning data at a chemical company**

**Jan C Fransoo**, Technische Universiteit Eindhoven

**Vincent Wiers**, Technische Universiteit Eindhoven

In this paper, the relation between number of actions and action variety is investigated for production planners in a chemical company. The study uses data that is captured by a standard Enterprise Resource Planning system which is used by the planners daily. The research method holds a new combination of approaches in operations management, namely empirical, quantitative and theory-driven. In contrast with a number of behavioral studies on the relation between workload and decision making strategy, it is hypothesized in this paper that there will be a positive relationship between number of actions and action variety. This hypothesis is based on the expectation that planners have enough time to solve a large planning problem, and that planners therefore employ a top-down decision making strategy. The results of the analysis strongly support the hypothesis. It is expected that the methodological setup that is introduced in this paper can be applied to unravel other aspects of the human contribution to production planning.

**SAT/Apr 30** 9:30 am-11:00 am

Session **SB12: Workshop: Use of Technology in the OM Classroom** (Invited)

Track: **Innovations in Teaching**

Valencia East (Lobby Level)

Chair: **Mark Davis**

#### **1. Using Technology in OM Classrooms - A Workshop**

**Mark M Davis**, Bentley College

**Lori S Cook**, DePaul University

**Larry Menor**, University of Western Ontario

**Rohit Verma**, University of Utah

Each year, students in business schools at both the undergraduate and graduate levels are demonstrating higher levels of expertise with computers and computers games. In addition, studies have shown that business school students learn more, and retain what they have learned for a significantly longer time when they actually use/apply concepts in either a real world or computer-supported experience.

Therefore, as faculty, we need to continue to develop/explore the use of technology in the classroom, not only to enhance the students' learning experience, but also so they will retain the knowledge from a course for a much longer period of time. This workshop will present several different types of technology for enhancing the students' learning experience, with the goal of introducing and discussing these technologies to colleagues who share a similar interest and/or who want to learn more about what is currently available for use in the classroom.

**SAT/Apr 30** 9:30 am-11:00 am

Session **SB13: College of Sustainable Operations - An Introduction** (Invited)

Track: **Pricing and Revenue Management**

Valencia West (Lobby Level)

Chair: **Daniel Guide**

### **1. College of Sustainable Operations - An Introduction**

**Daniel Guide**, Pennsylvania State University

The College will provide an introduction to the POMS membership.

**SAT/Apr 30** 11:15 am-12:45 pm

Session **SC1: Pricing Issues in Supply Chains** (Contributed)

Track: **Supply Chain Management**

Sullivan Room (8th Floor, South)

Chair: **Georgia Perakis**

### **1. Modeling the Tradeoff Between Forecast Accuracy and Postponement Capacity**

**Gregory A Graman**, Wright State University

**Nada R Sanders**, Wright State University

Maintaining high finished-goods inventory levels is one way to respond quickly to customer demand for high-variety products. Postponement has been identified as a strategy to reduce these inventories by delaying the product differentiating stage until the latest possible moment. There is a cost to increasing postponement capacity well as a cost to improve forecast accuracy. However, the benefits of postponement decrease as the forecast accuracy increases. We study the tradeoffs associated with spending scarce resources to improve forecast accuracy or to increase postponement capacity. Our paper describes the development of a two-product cost model that is used to enhance managerial understanding the tradeoffs between these two strategies. We test the sensitivity of the model to a range of cost structure factor levels, service levels, demand variability, and inventory holding costs.

### **2. The Private Label Threat: Manufacturer-Retailer Interactions in Product Positioning**

**Hans S Heese**, Kelley School of Business - IU Bloomington

Private labels are of increasing importance in many retail categories. While national brands are designed by the manufacturer and priced by the retailer, the positioning of store brand products is completely under the retailer's control. We consider a model of vertical product differentiation in a game theoretic framework to analyze how retailer-manufacturer interactions in product positioning are affected by a private label introduction. We find that if the retailer is not very efficient in providing consumers with quality, the manufacturer does not need to adjust the national brand quality, but he should offer a wholesale price discount. If the retailer is efficient, the manufacturer should reduce this discount and increase the national brand product quality to mitigate competition. Interestingly, the retailer has incentive to announce the introduction of a store brand to induce the manufacturer's consideration of these plans in determining the national brand product quality and wholesale price.

### **3. Pricing policies for Two-Stage Supply Chain under Channel and National vs. Store Brand Competition**

**Hisashi Kurata**, University of Wisconsin-Milwaukee

**John J Liu**, Hong Kong Polytechnic University

We analyze channel pricing in multiple distribution channels under competition between a national brand (NB) and a store brand (SB), where an NB can be distributed both through a direct channel and through local stores whereas an SB is distributed only through local stores. We explore both cross-brand and cross-channel pricing policies. Formulating the problem as a Nash pricing game, we find: 1) Brand loyalty building is profitable for both an NB and an SB whereas channel management is less important; and 2) Marketing decisions for an NB manufacturer are more restrictive than those for the chain stores. We also assess supply chain coordination finding: 1) Wholesale price change does not coordinate the system; and 2) Appropriate combination of markup and markdown prices can achieve both supply chain coordination and a win-win outcome for each channel.

### **4. Newsvendor Problem with Pricing and Clearance Markets**

**Mustafa Karakul**, York University

**Lap Mui Ann Chan**, Virginia Tech

The classical Newsvendor Problem is a single period inventory control problem of a single perishable product for which the revenue, procurement, holding and shortage costs are linear. Facing stochastic demand, the objective is to find the optimal procurement quantity so as to maximize the expected profit. If the pricing decision is incorporated into the newsvendor problem, it was shown in the literature that the expected profit function loses its concavity property, but has at most two stationary points under mild assumptions on the demand distribution. In this paper, by taking into account the bounds on the price that is inherent from the linear price-demand relationship, we show that the expected profit function is in fact unimodal. This result is then extended to a newsvendor model that incorporates a clearance market as well.

## **5. Ordering and pricing policies of competing retailers under temporary price discounts**

**Kishore K Pochampally**, MIT

**Georgia Perakis**, MIT

A supplier frequently offers temporary price discounts to its retailers, due to factors such as production overruns, competitive price wars, shop retooling requirements, and a required increase in cash flow. Although competition between retailers is common, to the best of our knowledge, the literature on temporary price discounts does not address that issue (competition). In other words, only one retailer is considered and it is assumed that the selling price (and hence the demand) of an item is constant. Moreover, most of the optimization models in the literature on temporary price discounts consider the case where the price discount is offered only at one point in time and conveniently avoid the case where the price discount lasts for a finite time interval. To these ends, this paper investigates what ordering and pricing policies are economical for two competitive retailers when their supplier offers a price discount over a finite interval.

**SAT/Apr 30** 11:15 am-12:45 pm

Session **SC2: Theory and Practice of Supply Chain Management I** (Invited)

Track: **Information and Contracting in Supply Chains**

Holabird Room (8th Floor, South)

Chair: **Amy Zeng**

## **1. Enticing Large Orders before Prices Rise**

**Charles L Munson**, Washington State University

**Jianli Hu**, Chapman University

Although researchers have created lot-sizing models for buyers facing imminent price increases, we have not seen a model that suggests quantity discounts for sellers to offer when they expect price increases in their own inputs, yet this is a common quantity discount driver in practice since big customer orders provide an extra incentive for sellers to purchase large input quantities before the prices increase.

## **2. Performance based Logistics and Military Applications**

**Tim Cathcart**, Enterprise Consultants

**Mario Agripino**, The Naval Undersea Warfare Center

The Departments of Defense (DoD) has adapted commercial supply chain management and logistics operations practices and process through a new policy and strategy called "Performance Based Logistics". Performance Based Logistics optimizes total system availability while minimizing cost and logistics footprint. Sustainment strategies shall include the best use of public and private sector capabilities using new government/industry partnering initiatives. Performance Based Logistics is a strategy for weapon system product support that is designed to optimize system readiness. It meets performance goals for a weapon system through a support structure based on performance agreements with vendors and product support service providers. A case study of PBL application at US Navy will be presented to illustrate the implementation experience.

## **3. Heuristic Search-based Solution and Modeling on Vehicle Routing Problem with Rigid Time-Window**

**Xiangpei Hu**, Dalian University of Technology

**Zheng Wang**, Dalian University of Technology  
**Minfang Huang**, Dalian University of Technology  
**Lijun Sun**, Dalian University of Technology

This paper focuses on the routing problem of non-full loaded vehicle with rigid time windows, and presents an approach based on a heuristic search named “Left Cutting Branch” to generate the scheme for one vehicle’s routing as well as an automatic modeling method. First of all, all of the feasible schemes for one vehicle’s routing are generated by the method of Left Cutting Branch whose essential thought is heuristic search of the state space graph. Secondly, an integer programming model for vehicle routing problem is developed, and the optimal solution found by a solution software package is presented. Finally, a case study on the vehicle routing scheduling for a pork factory in Beijing is presented, showing that this approach is beneficial to vehicle routing problems.

#### **4. A Technology Hub Approach to Achieving Supplier Alliance in Collaborative Manufacturing**

**Amy Z Zeng**, Worcester Polytechnic Institute  
**Samuel H Huang**, University of Cincinnati  
**Kevin Rong**, Worcester Polytechnic Institute

The concept of collaborative manufacturing through strategic partnership has gained popularity in the past few years. The idea is for OEMs to work closely with their suppliers in product and process design. The current partnership model may work well between an OEM and one or two of its large suppliers (e.g., GM and Delphi, and Ford and Visteon), but it is unsuitable for small and medium sized suppliers. Based on the results from a series of case studies, we propose a technology hub approach to achieving supplier alliance that is especially valuable for OEMs to work with their small and medium suppliers. The functionalities, supporting tools, and benefits provided by the technology hub are described in detail.

**SAT/Apr 30** 11:15 am-12:45 pm

Session **SC3: Inventory Management in a Decentralized Supply Chain II** (Invited)

Track: **Inventory Management**

Wright Room (8th Floor, South)

Chair: **Ravi Ravindran**

#### **1. A Framework for Risk Management in Supply Chains**

**Romesh Saigal**, University of Michigan

In the absence of complete markets for a product, a manufacturer can manage the risk of uncertain demand through a supply chain consisting of a supplier and a wholesaler. The optimal quantity the manufacturer must produce can be stated as an optimization problem.

The supply chain is viable when the contracts contain a premium for the risks of the supplier and the wholesaler. In case a complete market exists for the commodity, these risks and the corresponding premium are readily computed. We propose a ‘fair pricing’ model for incomplete markets. It can be shown that if the processes involved follow a geometric Brownian motion, and the agents have a log utility function, the result reduces to the standard Black-Sholes-Merton formula.

A market for the processes for manufacturing a good used is proposed. A model for manufacturing the good that uses processes is proposed. The spot price of the good is

#### **2. Bundled’ Control Charts for the Strategic Monitoring of Delivery Time**

**Earnest Foster**, GM R&D Center

We use a control chart for the strategic monitoring and diagnosing of elapsed time variables for delivery chain systems. Special considerations are made for elapsed time variables used on control charts.

#### **3. A continuous review inventory model with two freight modes**

**Aditya Jain**, University of Rochester

**Harry Groenevelt**, University of Rochester

**Nils Rudi**, University of Rochester

We analyze a continuous review stochastic inventory model, where orders are placed with a make-to-order manufacturer and can be shipped via two alternative freight modes differing in lead time and cost. We derive an optimal policy for deciding how to combine the two freight modes in each cycle. This decision can be delayed until the completion of manufacturing, and the optimal policy utilizes the

information of the demand incurred meanwhile. Further, we characterize the optimal reorder point and the optimal order quantity, when the two freight modes are combined optimally in each cycle. We compare this solution with the optimal solutions to the models with single freight modes, and show that the optimal order quantity is larger than either of the single freight optimal order quantity. We also derive distribution free bounds for cost and optimal order quantity and carry out a numerical investigation of the cost savings over single freight models.

#### **4. An Integrated Optimization Model for Dynamic Supply Chains**

**Tao Yang**, Penn State University

**A. Ravi Ravindran**, Penn State University

An integrated optimization model, “multiple-to-multiple” (MTM) is developed to optimize production, inventory, and transportation simultaneously in supply chains. By following the proposed rules, supply chain activities can be transferred into a MTM network for easy model building and optimization. With a standardized structure, MTM can: Support decision making for supply chain member selection including suppliers, OEMs, retailers, 3PLs, etc. Support optimization and decision making with no limitations on the numbers of products, transportation modes, suppliers, OEMs, etc. Reduce computation complexity by “integrating” and “expanding” details in the network. Handle both micro (within single facility) and macro (among supply chain members) level problems. Support both centralized and decentralized supply chain structures. Facilitate communication among firms by offering standardized data structure. Improve the visibility of material flows in supply chains.

**SAT/Apr 30** 11:15 am-12:45 pm

Session **SC4: Information and Competition in Closed-Loop Supply Chains** (Invited)

Track: **Closed Loop Supply Chains**

Burnham Room (8th Floor, South)

Chair: **Mark Ferguson**

#### **1. Benefits of Pooling Returns Information for Detecting Quality Problems**

**Canan Savaskan**, Northwestern University

**Umut Aytakin**, Northwestern University

Recent product recalls and law suits in the automotive industry have shown that delays in detecting quality problems can not only cost a company more than a \$1 billion dollars in lost profits but also result in law suits and degrading company image. To improve responsiveness in detecting quality problems, recently car companies such as DCX have started investing in the centralization of the warranty product return information at their dealers to pick early warning signals of special quality problems. In this paper we characterize the benefits of centralization of returns information and discuss mechanisms to replicate the efficiency of a centralization system in a decentralized product collection network.

#### **2. The Effect of External Competition on Recovery Strategies**

**Mark Ferguson**, Georgia Institute of Technology

**L. Beril Toktay**, INSEAD

In this paper, we develop models to support a manufacturer's recovery strategy in the face of a competitive threat on the remanufactured product market. We first model the competition between new and remanufactured products. The cost to collect/remanufacture is modeled as an increasing function of the quantity remanufactured, thus capturing a unique aspect of the remanufacturing industry that has not been explored in previous market segmentation research. Our findings provide firms with conditions where the revenue increase from remanufacturing exceeds the detrimental effect of cannibalization. We then characterize the potential profit loss due to external remanufacturing competition and analyze two entry-deterrent strategies: remanufacturing and preemptive collection. We find that a firm may choose to remanufacture or preemptively collect its used products to deter entry, even when the firm would not have chosen to do so under a pure monopoly environment. We characterize conditions under which each strategy is more beneficial.

#### **3. Customer vs. Firm Selection of Sales Contract Parameters in Remanufacturing**

**Baris Yalabik**, University of Illinois Urbana-Champaign

**Nick Petruzzi**, University of Illinois Urbana-Champaign

The success of remanufacturing depends, among other things, on how well a product is designed for remanufacturing, and how long an item is used before it becomes available for remanufacturing. We analyze the optimal behavior of a firm that produces both new and remanufactured items. Besides product design, the firm decides on the sales price for the two types of products. We examine two sales strategies: In the first, each customer decides on how long she keeps the product before making another purchase. In the second, the firm decides on a duration for everyone, as the case might be for a lease contract. We compare the two strategies in terms of their profitability and remanufacturing effectiveness.

#### **4. A BUSINESS PERSPECTIVE ON CLOSED-LOOP SUPPLY CHAINS**

**Daniel Guide**, Pennsylvania State University

**Luk Van Wassenhove**, INSEAD

There are common processes required by a closed-loop supply chain for reverse supply chain activities: product acquisition, reverse logistics, inspection, testing and disposition, remanufacturing, and selling and distribution. However, the management activities and focus in these common processes are not the same among all closed-loop supply chains. We document a number of diverse products that are presently being remanufactured and describe their supply chains. We discuss the crucial differences in the management of each of the different supply chain systems and research needs. A framework for analyzing the profitability of reuse activities is developed, and we show how the management of product returns influences operational requirements. We show that the acquisition of used products may be used as the control lever for the management and profitability of reuse activities. A simple model is presented for determining the optimal prices to stimulate product returns, and determining the corresponding overall profitability.

**SAT/Apr 30** 11:15 am-12:45 pm

Adler Room (2nd Floor, North)

Session **SC5: The OB/OM Interface: Workforce Models in Work Design** (Invited)

Track: **Operations Planning, Scheduling and Control**

Chair: **Kenneth Doerr**

#### **1. Littoral Combat Ship Manpower Requirements**

**Bill Hatch**, Naval Postgraduate School

**Thavee Douangaphaivong**, Naval Postgraduate School

**Greg V Cox**, Naval Postgraduate School

We discuss a two fold staffing problem: staffing for a seaframe, and staffing for mission-packages that operate on the seaframe. Both must be minimally staffed to meet objectives. The latter problem represents a new approach to ship staffing, in which mission teams are not tied to seaframes, but may rotate. Cost and behavioral implications are discussed

#### **2. Behavioral Correlation of Work Rates**

**Tobias Schoenherr**, Indiana University

**Kenneth Schultz**, Cornell University

**David Nembhard**, Pennsylvania State University

In this paper, we examine the question of whether and how co-worker speed affects a worker's performance, using data from an electronics production line. We show that, after accounting for learning, the day of the week, and the time of day, a significant relationship remains. This relationship varies greatly among individuals, with the strongest reaction being to change by 87 percent of the difference between speeds.

#### **3. Design and Control of Single-Worker White-Collar Work Systems**

**Gigi Yuen**, Northwestern University

**Wallace Hopp**, Northwestern University

**Seyed Irvani**, Northwestern University

We study models that capture the characteristics of white-collar work systems, particularly the subjectivity of completion time, using tools of queuing and stochastic control. The optimal work structure and effectiveness of various heuristics are investigated for single and multiple-job-classes system. In contrast to traditional blue-collar work systems, increasing capacity may intensify congestion and reducing

variability may not be desirable.

#### **4. Analysis of a goal-motivated performance metric at a distribution center**

**Kenneth H Doerr**, Naval Postgraduate School

**Kevin R Gue**, Auburn University

We describe a procedure for setting a motivational goal for workers in a distribution center, using bootstrapping to estimate stretch performance goals from historical data. We discuss extensions of goal-setting theory to examine interactions with deadline effects, and investigate the sensitivity of our proposed solution to those interactions.

**SAT/Apr 30** 11:15 am-12:45 pm

Michigan Room (6th Floor, South)

Session **SC6: Panel Discussion on NPD and TM (Invited)**

Track: **New Product and Technology Management**

Chair: **Janice Carrillo**

#### **1. Panel Discussion on New Product Development and Technology Management**

**Janice Carrillo**, University of Florida

The panel will discuss the role of the new POMS College of Product Innovation and Technology Management. In addition, the panel will address publishing opportunities in the NPD and Technology Management areas in the POMS journal. The panelists are: Cheryl Gaimon (Georgia Institute of Technology, DuPree School of Management), and Vish Krishnan (University of Texas- Austin).

**SAT/Apr. 30** 11:15 am-12:45 pm

Illinois Room (6th Floor, South)

Session **SC7: Tutorial on Trade Promotions Management: Innovations in Retailing Operations (Invited)**

Track: **Product and Service Innovation**

Chair: **Gregory Heim**

#### **1. Tutorial on Trade Promotions Management: Innovations in Retailing Operations**

**Hugh J Collins**, Deloitte Consulting LLP

**Chyhe Kim Becker**, Deloitte & Touche LLP

This session will outline the latest trade promotion management (TPM) practices being used between consumer packaged goods (CPG) manufacturers and retailers in today's CPG supply chain. Facing an array of challenges, CPG manufacturers are investing more in trade promotions but not always gaining expected returns. Methods and solutions exist to improve this problem, including efficient, controlled account planning processes and the capability to accurately measure trade spending effectiveness. Innovative TPM technologies such as RFID also promise to provide CPG manufacturers with better data about consumer demand to improve production planning, and data providing verification of retailer execution of promotional service agreements.

**SAT/Apr 30** 11:15 am-12:45 pm

St. Clair Room (6th Floor, South)

Session **SC8: Service Outsourcing: to the Customer or Offshore (Invited)**

Track: **Service Operations Management**

Chair: **Mei Xue**

#### **1. The improvement in competition through joint operations: the case of a small retail fast food company pool.**

**Sergio L De Gusmão**, PUCRS - Pontifícia Universidade Católica do Rio Grande do sul

The paper intends to show how a group of small companies in the food sector, basically retail shops in the fast food business, was able to set out a specific pool-based action plan, in order to achieve better performance levels. It is about a set of 8 independent operations (fast food shops), placed around a food court inside a large shopping mall, located in the city of Porto Alegre, in the South of Brazil. As results obtained from the pool-based joint action set out by the companies, it was specially found that this way of operating has enabled substantial management gains in the relationship with suppliers of raw materials,

maintenance services, personnel services, among others, showing that joint action in the management of operations does really contribute for better individual performance on the part of each one of the associated operations.

## **2. Cultural Implications on the Offshoring of Service Work**

**Richard Metters**, Emory University

The offshoring of service work is not simply placing work done in the U.S. into a low-wage foreign country and saving cost. Cultural adaptations both limit and enhance the working environment. Here, a case study of back-office work for an airline is explored. The work was performed in two different cultures: The Dominican Republic and Barbados. One site succeeded, the other failed. In a break from traditional conference presentations, an interactive discussion is planned to explore the differences.

## **3. The Impact of Customer Participation on Competitive Dimensions**

**Janelle Heineke**, Boston University

**Mark M Davis**, Bentley College

Services are inviting customers to participate in the service process in a variety of ways, from directly entering order information at home via websites and at the service site via kiosks, to involvement in the core service process and completion of the payment transactions. At the same time, customers are increasingly purchasing personal services. This paper explores the customer participation in a variety of service settings and its effect on performance along the competitive dimensions of cost, quality, flexibility and delivery and, ultimately, on customer satisfaction with services.

## **4. Service Convenience and Store Performance: An Empirical Analysis of Supermarket Food Stores**

**Xiaowen Huang**, Miami University

**Kingshuk K Sinha**, University of Minnesota

**Yan Dong**, University of Minnesota

Driven by increasingly intense competition, retailers realize that the traditional levers of assortments and price – although still important – are no longer sufficient as bases for competitive differentiation. Innovative retailers are focusing on providing service convenience that facilitates the sale of goods and hence, improving the shopping experience from end-to-end. This study investigates different types of service conveniences and their relationships with store traffic and store sales performance in the supermarket setting. Three service convenience types are identified – access, decision, and transaction convenience. Based on the data collected from 415 conventional supermarket stores, we find that, for a conventional supermarket store, access and transaction convenience have significantly direct impacts on store traffic individually, while decision and transaction convenience have significantly direct effects on store sales performance individually. The results also show the joint effect of a cohesive service convenience strategy will lead to superior store performance for conventional.

## **5. Service Co-production with Information Stickiness: Implications for Service Design**

**Mei Xue**, Boston College

**Joy M Field**, Boston College

In this paper we analyze how the expense for the information transfers between the customer and the service provider in a service delivery process.

**SAT/Apr 30** 11:15 am-12:45 pm  
Session **SC9: Six Sigma Tools** (Contributed)  
Track: **Quality Management and Six Sigma**

Hebron Room (2nd Floor, North)

Chair: **Ashol Kumar**

## **1. An application of Six Sigma tools**

**Keshav N Nandurkar**, K.K. Wagh Institute of Engineering Education & Research

**Anand S Relkar**, K.K. Wagh Institute of Engineering Education & Research

**Mangesh V Bedekar**, K.K. Wagh Institute of Engineering Education & Research

In the era of global competition, six-sigma technique is being increasingly used by manufacturers to improve the quality of products. A study was carried out for a switchgear manufacturing company. The

company received several customer complaints regarding operation of its spring breakers. Analysis of the complaints indicated that failure of mechanical assembly was one of the major causes. It was decided to implement the six-sigma methodology for manufacture of Ratchet wheel, which is a major component of this assembly. A process map was developed in the form of YX diagram. Subsequently, Failure mode and effect analysis (FMEA) and simulation modeling of the mechanism was carried out. The failed pieces of Ratchet wheel were analyzed for chemical composition and microstructure. Several corrective actions were taken which resulted in reduction of customer complaints by ninety percent.

## **2. RFID, Lean Application and Six Sigma – Recent Evidence and Application Model**

**Anthony Narsing**, Macon State College

The use of radio frequency identification (RFID) is not a new concept, its capabilities have increased through rapid development and advancement in technology. RFID removes operational barriers by allowing companies to remotely adapt and configure its existing technologies via radio frequency transmission of data. Organizations, in an effort to remain competitive, streamline costs, and increase operating efficiencies are combining RFID with lean application and Six Sigma. Aligning RFID with Lean application can provide tremendous corporate benefits. When integrated and implemented into an organization's process operations, RFID with Lean application will reduce waste, and decrease inventory levels. Incorporating RFID with Six Sigma will provide operations with real time data where organizations can use this information to reduce defects, process variation and improve quality of products and services. The authors will investigate RFID, Lean Application and Six Sigma, provide recent evidence and propose an application model.

## **3. Application of g-Correlation - The most general Six Sigma tool to discover the correlation between two variables**

**Sarika d tyagi**, Northeastern University

**Sagar Kamarthi**, Northeastern University

In Six Sigma, it is important to discover the relationships or correlations between the variables involved in the problem being examined, at the "Analysis" phase. Determining the strength of relationships between these variables would be helpful for us in deciding the amount of attention each factor need to be given to improve the sigma-level of that process. Normally, Pearson correlation coefficient (normally distributed and linearly related variables) and Spearman correlation coefficient (variables measured on ordinal scale) are used to determine the correlation between a select pair of variables. Similarly, Fechner Correlation coefficient is also used to calculate the correlation between two monotonously related variables. All these correlation coefficients can give correct correlation measures only if the pertinent conditions are met. This paper presents a more general correlation measure referred as "g-Correlation" that has no restrictions on its application. It also discusses some industry drawn examples to demonstrate the application of g-Correlation.

## **4. Six Sigma Action Research in Thailand: A comparative study**

**Preeprem Nonthaleerak**, Lancaster University

**Linda C Hendry**, Lancaster University

Despite wide industrial acclaim, Six Sigma (SS) remains under-researched by academics. A previous literature review and exploratory empirical study identified several preliminary conclusions to be researched further including: Thai cultural issues of seniority and the nature of relationships are perceived to have a high impact on the success of SS projects; data availability is a major concern for non-manufacturing projects; Lean and SS should be integrated into "Lean Six Sigma"; and there is a need to reduce SS project cycle times. To address the latter three issues, an improved DMAIC roadmap on a multimedia platform has been developed. This was implemented using action research in two companies in Thailand, one project in manufacturing and one in sales & services. The study led to improvements to the roadmap. This paper describes the final multimedia model and a proposed tactical strategy to deploy SS successfully in Thai cultural contexts.

## **5. Estimating Product Life - A Case Study**

**Tej S Dhakar**, Southern New Hampshire University

**Ashok Kumar**, Grand Valley State University

Alpha Industries specializes in a certain type of electrical product. The product, when fails, is returned to

Alpha Industries by the customers. The useful life of each unit is determined by matching the return date with the manufacturing date. The data are used to fit a Weibull distribution and estimate the parameters including the average life of the product. The distribution is used to derive many useful results about the product. The paper discusses how all this was done and the issues that were encountered.

**SAT/Apr 30** 11:15 am-12:45 pm

Session **SC10: Enterprise Systems and Applications: The Future** (Invited)

Track: **ERP**

Ohio Room (6th Floor, South)

Chair: **Ashok Soni**

### **1. Enterprise Systems and Applications: The Future - A Panel Discussion**

**Ashok Soni**, Indiana University

This session will provide an overview into the future direction of enterprise systems and related applications. The applications will cover such areas as advanced planning and scheduling systems, customer relationship management systems, supplier relationship systems and the impact of technologies such as RFID. The panelists will be: M.A. Venkataramanan (Kelley School of Business, Indiana University); Amelia Maurizio (SAP AG), Heather Czech (SAP AG); and Elliot Bendoly (Goizueta Business School, Emory University).

**SAT/Apr 30** 11:15 am-12:45 pm

Session **SC11: Performance Implications of Operations Strategy** (Invited)

Track: **Operations Strategy**

Onyx Room (2nd Floor, North)

Chair: **Eve Rosenzweig**

### **1. B2B e-Marketplace Failures**

**Timothy M Laseter**, University of Virginia

**Eve D Rosenzweig**, Emory University

**Aleda V Roth**, University of North Carolina-Chapel Hill

Business to Business (B2B) e-Marketplaces captured the imagination of business people and investors during the late 1990s. Although hundreds of these new entities were launched with great expectations, a substantial number failed in just a few short years. We employ a combination of cluster analysis and logistic regression to examine the failure rates of a sample of nearly one thousand B2B e-Marketplaces in an attempt to discern key attributes that enhance or decrease the odds of survival. Our findings highlight the importance of the ownership structure, the industry characteristics, and the service offering mix.

### **2. Linking Internal Technology Development and the use of AMT with Manufacturing Plant Capabilities**

**Anand Nair**, Auburn University

**Morgan Swink**, Michigan State University

In this paper we distinguish between the internal and external means of technology development in manufacturing plants. While advanced manufacturing technologies (AMT) are typically sourced from external vendors, plants also develop proprietary process technologies in-house. We present internal technology development (ITD) as a construct that captures this internal means of technology development and investigate the individual and interaction effects of ITD and AMT on plant capabilities. Our results indicate that ITD is positively associated with cost efficiency, quality, delivery and process flexibility dimensions, but it is not significantly associated with new product flexibility. The results for the relationship between specific dimension of AMT (process, design and planning AMT) and plant capabilities and between ITD-AMT interaction and plant capabilities suggest context specificity. While, for some technology-manufacturing capabilities link, we find evidence of positive relationship, for others the relationship is insignificant and in some cases even negative.

### **3. Customer Type, Operational Uncertainty, and Process Performance: An Exploratory Study of Financial Services Processes**

**Joy M Field**, Boston College

**Larry P Ritzman**, Boston College

**M. Hossein Safizadeh**, Boston College  
**Charles E Downing**, Northern Illinois University

In this exploratory study using a convenience sample of 108 financial services processes, we examine performance differences in service processes with a varying mix of internal and external customers. We further investigate the effect of operational uncertainty and responses to this uncertainty on process performance and whether the mix of customer types within the process moderates any such effects. In terms of performance, only service quality was significantly higher for processes with external customers. In addition, better performing processes employ higher levels of uncertainty coping but not uncertainty reduction approaches. The mix of customer types within the process appears to have a moderating effect on the association between uncertainty reduction and coping approaches and performance, although these results must be interpreted with caution. We conclude with the managerial implications and limitations of our study.

#### **4. Implementing the Balanced Scorecard: Performance Metric Portfolio Selection using an Operations Strategy Lens**

**Elliot Bendoly**, Emory University  
**Eve D Rosenzweig**, Emory University

**Jeff Stratman**, Georgia Institute of Technology

The widespread adoption of ERP systems and supply chain management principles suggests that managers recognize the importance of evaluating operational decisions holistically. The Balanced Scorecard literature provides a general framework for linking operational metrics to enterprise-wide financial performance. However, this framework is often difficult to implement in practice because the actual portfolio of metrics utilized by a firm is likely to be unique. We extend the balanced scorecard framework by specifying a portfolio of metric types based on the firm's strategic configuration. We present theoretically grounded portfolios of metrics drawn from the literature and from the Supply Chain Council's supply-chain operations reference (SCOR) model and related design-chain and customer-chain models. Our empirical results indicate that three strategic groups—Operational Excellence, Customer Intimacy, and Product Leadership—can be distinguished by a set of operational and strategic performance metrics.

**SAT/Apr 30** 11:15 am-12:45 pm

Valencia East (Lobby Level)

Session **SC12: Workshop: myOM -Getting Real with OM in the Classroom** (Invited)

Track: **Innovations in Teaching**

Chair: **Roberta Russell**

#### **1. myOM - Getting Real with OM in the Classroom - A Workshop**

**Roberta S Russell**, Virginia Tech- VPI&SU

Operations is an vibrant, exciting field. Operations managers work with customers and suppliers, the latest technology, and global partners. They solve problems, transform processes, innovate, and integrate. Operations is more than planning and controlling; it's doing. So how do we make OM vibrant and exciting in the classroom? With careful design, interrupted flow, and active learning. In this interactive workshop, I will shares my experiences with bringing OM to life in the classroom.

**SAT/Apr 30** 11:15 am-12:45 pm

Valencia West (Lobby Level)

Session **SC13: College of Sustainable Operations - An Introduction** (Invited)

Track: **Pricing and Revenue Management**

Chair: **Daniel Guide**

#### **1. POMS College of Sustainable Operations -- A Panel**

**Daniel Guide**, Pennsylvania State University

A distinguished panel from the College will discuss it activities.

## **1. THE INFLUENCE OF TRANSACTION COST ECONOMICS AND THE RESOURCE-BASED VIEW ON THE OUTSOURCING PROCESS**

**Ronan T McIvor**, University of Ulster

The trend towards outsourcing both locally and offshore has been increasing dramatically in many economies. Transaction cost economics and the resource-based view of the firm have made a valuable contribution to the study of outsourcing. However, this paper argues that neither transaction cost economics nor the resource-based view of the firm alone can fully explain the complexities of outsourcing. A critique of these theories as a means of understanding the complexities of outsourcing evaluation is presented. It is argued that integrating certain elements of these theoretical perspectives can inform the study of outsourcing both in theory and practice. A practical framework for outsourcing evaluation is presented which is influenced by a number of elements of these theories and empirical research undertaken. A number of outsourcing case studies are related to the outsourcing framework in order to illustrate both its explanatory and prescriptive nature.

## **2. Incentives for Demand Commitment in a Decentralized Supply Chain**

**Joong Y Son**, Kansas State University

In this paper, we study a coordinated replenishment policy which can be beneficial to all stakeholders while achieving lower system wide inventory in a supply chain with a single seller (a wholesaler) and multiple buyers (retailers). In a supply chain where end customer demands occur only at retailers, unfilled demands due to stockouts at retailers are either backordered or lost. If, however, the stockouts at retailers were mainly due to run-out situations at the wholesaler, then an incentive compatible mechanism would be needed to assign stockout penalties to the appropriate parties involved. We analyze effectiveness of price discount as incentive compatible mechanism for future demand commitment as a result of run-outs at the wholesaler. In particular, we focus on how retailers can be compensated for under this policy and identify settings under which this policy can be beneficial to stakeholders.

## **3. Optimal Group Buying Policies under Demand Substitution**

**Hongsuk Yang**, University of Utah

**Hojung Shin**, University of Notre Dame

Group-Buying occurs when buyers consolidate their demands to increase their purchasing power through volume. We consider a decision problem of two competing retailers, who are willing to form a coalition to take advantage of quantity discounts offered from the manufacturer. A retailer's problem in Group-Buying is driven by tradeoff between two choices. One is to join the coalition and purchase homogenous products at a lower cost, which induces higher substitution in the retail market. Under the Group-Buying policy two retailers may end up with stronger price-competition due to the lack of product differentiation. The other option is to purchase high-cost customized products for the retailer, which may result in lower substitution. Given the manufacturer's quantity discount schedule, we model a retailer's joint decision of pricing-inventory (order quantity) with or without Group-Buying. We derive conditions, in which two competing retailers may collaborate for Group-Buying.

## **4. A Network Economic Model for Supply Chain Versus Supply Chain Competition**

**Ding Zhang**, State University of New York at Oswego

**June Dong**, State University of New York at Oswego

It is no longer a firm versus a firm but a supply chain versus a supply chain in today's competition. We propose a network economic model of heterogeneous supply chains that addresses the following questions. (1) How do supply chains compete against each other? (2) Which supply chain will win the competition? (3) How much of the market share will a winning supply chain obtain? The network model is built upon operation links and interface links, representing, respectively, substantial supply chain operations and coordination functions between the operations. The link performance can be measured against multiple criteria, such as cost, time and quality. The paper presents a variational inequality formulation of the problem. Its solution determines the winning supply chains and their market shares in the equilibrium of supply chain economy. We furnish qualitative properties such as existence and

uniqueness of the equilibrium. Numerical examples are presented for illustrative purpose.

## **5. Overordering and Phantom Demand in Supply Chains**

**Paulo Goncalves**, University of Miami

**John Sterman**, MIT

When demand exceeds supply, customers often hedge against shortages by placing multiple orders with multiple suppliers. The resulting bubble in demand creates instability leading to excess capacity, excess inventory, low capacity utilization, and financial and reputation losses for suppliers and customers. This research contributes to the understanding of phantom demand caused by shortages by developing a formal model of the relationship between a single supplier and multiple retailers. The research combines simulation and game theory to explore equilibrium strategies that arise as a result of a dynamic game. Our analyses suggest that a prisoner's dilemma arises if appropriate incentives are not in place, allowing retailers to reach equilibrium with an aggressive ordering strategy (inflating their orders and later canceling them) even though a conservative ordering strategy (ordering just what they need) is mutually more profitable. The conservative strategy dominates the aggressive one when sufficient incentives are in place.

**SAT/Apr 30** 1:45 pm- 3:15 pm

Holabird Room (8th Floor, South)

Session **SD2: Theory and Practice of Supply Chain Management II** (Invited)

Track: **Information and Contracting in Supply Chains**

Chair: **Amy Zeng**

## **1. Transforming the Public Sector Supply Chain with Private Sector Best Practices**

**Dennis F Mathaisel**, Babson College

**Clare L Comm**, University of Massachusetts

The private sector has experienced successful advances in responsive, dependable, and lower cost supply chain management (SCM) practices. Despite the benefits, the military has not been as quick to respond with such advances. However, the government's recent directives and expenditure of funds to transform several of its maintenance depots indicate that changes are occurring. The intent of this paper is to demonstrate how the military industrial enterprise can learn lessons from private sector best practice companies, such as WalMart, Federal Express, and Caterpillar, which are experts in SCM. In particular, Caterpillar Logistics will be used as a benchmark.

## **2. A Product Differentiation Model for Service Competition: the Role of Customer Efficiency**

**Mei Xue**, Boston College

**Lorin M Hitt**, University of Pennsylvania

**Patrick T Harker**, University of Pennsylvania

In this paper, we develop a vertical product differentiating model for service competition. In particular, in the context of a dynamic oligopoly game, we use the model to investigate the evolution of self-service that has taken place in real world: the entry of self-service to a market traditionally dominated by full service, the transition to mixed service market, and the development of mixed service to a multi-channel one-price service delivery system. We examine the changes needed for the traditional product differentiation model to incorporate the joint-production nature of service, which distinguishes it from manufacturing. The focus of our analysis is the role of customer efficiency, a concept closely related to the service co-production, in the sequence of events of service competition. The major conclusions are empirically tested using a data set from retail banking.

## **3. Pricing Strategy of Supply Chain System Based on Theory of Constraints**

**Lindu Zhao**, Southeast University

Dynamic pricing is crucial to supply chain system survival and development, and is an important foundation for inter-firm co-operation. Based on the complexity of structure and relationship of supply chain system constructed with the products chain, the method of searching for supply chain system constraints is analyzed. From the perspective of the systematic optimization, the theory of constraints (TOC) reveals the existence of system constraints, and it should be a feasible method of dynamic pricing for supply chain system. The paper proposes a dynamic pricing strategy of the supply chain system based on TOC, the price of production that was produced by the enterprise of the constraint's link is regarded as

the pricing criterion, and the pricing strategy considers the structure complexity and relationship complexity of supply chain system. It also analyzes the feasibility of this strategy by a multinational supply chain example in the paper.

#### **4. Designing Efficient Logistical Planning and Control Systems to Support Olympics Games: An Application to the 2008 Beijing**

**Amy Z Zeng**, Worcester Polytechnic Institute

**Son Nguyen**, Worcester Polytechnic Institute

**Wenjie Zhang**, Beijing Jiaotong University

There has been much progress from the 1996 Atlanta Olympics to the 2004 Athens Games in simulation-based logistics management systems for Olympic Games. These systems provide optimal or near optimal solutions to various logistics problems inherent in managing and controlling the Olympics games such as traffic management, vehicle routing and scheduling, capacity planning, material handling, storage and distribution. In this talk, we first describe supply chain and logistics management related issues and their intricacy in the context of Olympic Games, and then review the current literature and findings in simulation-based logistical planning and control systems. Finally, we propose a framework for such a system for the 2008 Beijing Olympic Games.

**SAT/Apr 30** 1:45 pm- 3:15 pm

Session **SD3: Secure Supply-Chain Collaboration (Invited)**

Track: **Inventory Management**

Wright Room (8th Floor, South)

Chair: **Leroy Schwarz**

#### **1. Secure Supply-Chain Collaboration: A New Technology for Supply-Chain Management**

**Leroy B Schwarz**, Purdue University

**Mikhail Atallah**, Purdue University

**Vinayak Deshpande**, Purdue University

This paper will introduce and illustrate the use of secure multi-party computation (SMC), a well-established technique in computer science, to managing supply chains. SSCC protocols enable supply-chain partners to cooperatively achieve desired mutually agreed-upon goals without revealing the private information of any of the parties. This talk will introduce SMC and describe its use in several well-known supply-chain management scenarios.

#### **2. An Introduction to Secure Multi-Party Computation (SMC) for Supply-Chain Management**

**Mikhail Atallah**, Purdue University

This talk will provide a high-level overview of secure multi-party computation (SMC), a decades-old topic of study in computer science. I will provide a brief history, and describe its applicability in facilitating secure supply-chain management; i.e., allowing supply-chain partners to collaborate on decisions without revealing the private information of either party that is essential in making the decisions. In addition to providing examples, the talk will cover issues such as computability versus security trade-offs, inverse optimization, and other security issues that are important from a computer science perspective.

#### **3. A multi-echelon system's simulation model for repairable and consumable items management – A case study**

**Maria Elisa Cunha**, Universidade Autonoma de Lisboa

**Ana Paula B Povo**, Centro de Estudos de Gestão, CEG-IST

**Alvaro A Lopes**, Universidade Lusitana

The inventory management of multi-echelon repairable items structures has been studied largely. However, some restriction still exists on its applications to real case problems. To surpass some of these limitations a simulation model is developed in this work. The model not only admits a multi-echelon structure system but also permits the explicit consideration of a hierarchical parts structure for repairable and consumable items. The generality of the model is proven through its application to the stock management problem of the Portuguese Railway 1900 Locomotives components. Repair may be required due to components breakdowns or potential limit reached. Depending on the locomotives failure repair can be performed at different locations within the multi-echelon structure considered. Repair time depends on

the components availability as well on associated lead times. As final result an adequate inventory policy is obtained. This guarantees a certain level of service accounting for operations occurrence and repairs conditions.

#### **4. Secure Protocols for Supply Chain Collaboration: Capacity Allocation and Collaborative Forecasting**

**Vinayak Deshpande**, Purdue University

**Mikhail Atallah**, Purdue University

**Keith Frikken**, Purdue University

**Leroy B Schwarz**, Purdue University

In this talk, we present specific protocols for two types of supply-chain interactions: Capacity Allocation and Collaborative Forecasting. For the secure capacity allocation model, we show how to allocate capacity to retailers without revealing retailers actual order quantities to the supplier, or the supplier's capacity to the retailers. In secure collaborative forecasting, we develop protocols for constructing a joint forecast without revealing the retailers or suppliers forecast parameters.

**SAT/Apr 30** 1:45 pm- 3:15 pm

Burnham Room (8th Floor, South)

Session **SD4: Information-Centered Issues in Closed-Loop Supply Chains (Invited)**

Track: **Closed Loop Supply Chains**

Chair: **Moritz Fleischmann**

#### **1. Managing Uncertain Used Product Condition in Remanufacturing**

**Michael R Galbreth**, Vanderbilt University

**Joseph D Blackburn**, Vanderbilt University

In remanufacturing, the condition of the used products and their remanufacturing requirements can be highly variable: ranging from new products with no more than cosmetic blemishes to products requiring extensive refurbishment. For a remanufacturer, one of the critical operational decisions is the establishment of sorting criteria – given variable condition, which used products should be remanufactured and which should be scrapped? In this paper, we derive and analyze optimal acquisition policies and sorting criteria in the presence of used product condition uncertainty. These policies are shown to be very robust, and the insights gained are relevant in a wide range of remanufacturing settings. Our results, while motivated by the remanufacturing industry, are applicable to other manufacturing organizations which face uncertain raw material condition.

#### **2. Smart and Sustainable Supply Chains**

**Rob Zuidwijk**, Erasmus University Rotterdam

**Jo van Nunen**, Erasmus University Rotterdam

Topic of the presentation will be the role that Information and Communication Technology can play in supporting companies in realizing new innovative business opportunities in the area of sustainable supply chains. In order to assess the benefits from ICT systematically, we elaborate on sustainable supply chains from three perspectives: processes, customers, and products. We observe that exploiting the possibilities of sustainable supply chains involves handling several uncertainties by providing adequate information. Information on the state of the product, product preferences of the customer, recovery options for a product, and process information can be used to reduce uncertainty. Adoptions of existing methods are proposed to transform data, retrieved from the supply chain by new technologies, into management information in a systematic way. A framework is developed to address uncertainty reduction strategies. Some examples from practice will be provided.

#### **3. Installed-Base Management**

**Moritz Fleischmann**, Erasmus University Rotterdam

**Rob Zuidwijk**, Erasmus University Rotterdam

For many companies, the prevalent approach to product return management has been to treat return flows as an exogenous factor, to which they respond once it occurs. This reactive type of approach misses out on important opportunities. Exploiting a product's full value potential requires a more proactive attitude, which recognizes the usage phase as a part of the overall supply chain. Such an integral, pro-active

approach is known as installed-base management. In this presentation, we discuss issues in installed-base management based on a specific case example. We highlight key drivers, challenges, and opportunities. In particular, we underline the link between product recovery and service management.

**SAT/Apr 30** 1:45 pm- 3:15 pm

Session **SD5: The OB/OM Interface: Work Design and Knowledge Sharing (Invited)**

Track: **Operations Planning, Scheduling and Control**

Adler Room (2nd Floor, North)

Chair: **Kenneth Doerr**

### **1. Impact of Social Network Structure on Innovation: A Hint Model Framework**

**Fang Liu**, Northwestern University

**Wallace Hopp**, Northwestern University/

**Seyed Irvani**, Northwestern University

We propose a framework for representing communication and collaboration in innovative organizations, which is based on flow networks similar to those used to represent production and service systems. We show that in environments where knowledge is one dimensional, the optimal roles of individuals can be sharply characterized in terms of creation (idea generation) and production (idea processing). However, when knowledge is multi-dimensional, individuals can play multiple roles and hence the structure of the most effective network can take on complex forms. By comparing optimized network structures with those that emerge from heuristic human behavior, we characterize the environmental factors that determine whether emergent structures are likely to be effective or not.

### **2. System-Wide Training and Communication, the Impact of Learning on Ordering Decisions in Supply Chains**

**Yan Wu**, Pennsylvania State University

**Elena Katok**, Pennsylvania State University

We investigate the effect of human resource activities on ordering decisions in multi-echelon serial supply chains. Specifically, we use the Beer Distribution Game to examine the impact of training and communication on mitigating the Bullwhip Effect. We demonstrate that bullwhip behavior persists in the laboratory even when experienced participants are involved and an information tracking system is provided, and that traditional "learning by doing" does not help improve individuals' rationality in our experiments. We propose and test two mechanisms to improve behavior: (1) system-wide training which shortens response delays and promotes system knowledge (2) communication through team-meeting that coordinates supply chain members' strategies. We find that having participants discuss team strategy prior to the game alleviates bullwhip behavior. We also find that system-wide training helps reduce order variations when it is combined with the opportunity to communicate. When both interventions are implemented, the best and most stable system is produced

### **3. Employee empowerment: Turning failure into success**

**Desmond J Leach**, University of Sheffield

**Toby D Wall**, University of Sheffield

We present a study of an organization that empowered its employees (i.e., enhanced fault-management responsibility for operators of complex technology) but the expected gains in performance did not materialize. We cover the steps taken to design an intervention to rectify the problem, outcomes (e.g., improved performance amounting to some \$200,000 pa), and an explanation for the effects. To conclude, we briefly discuss current research on the link between work uncertainty and empowerment effects.

### **4. Process Improvements through Operations Design: The Role of Knowledge Sharing**

**Enno Siemsen**, University of North Carolina, Chapel Hill

**Aleda Roth**, University of North Carolina, Chapel Hill

Researchers in operations strategy have highlighted the importance of utilizing employee knowledge for generating competitive advantage through proprietary process improvements. However, there is little research on how to implement such a strategy. We propose that employee knowledge sharing plays a key role in implementing a knowledge-based strategy, and we empirically explore the role of operational design choices - like cross-training and employee utilization - on knowledge sharing behavior.

**SAT/Apr. 30** 1:45 pm- 3:15 pm

Session **SD7: Extended Utility and Other New Developments in Operations Management** (Invited)

Track: **Product and Service Innovation**

Illinois Room (6th Floor, South)

Chair: **Christoph Loch**

### **1. Issues and Challenges in Managing Multi-Firm New Product Development**

**Vish Krishnan**, University of Texas

**S. Bhaskaran**, University of Texas at Austin

The management of new product development that involves multiple firms presents new challenges. New market uncertainties associated with partner opportunism have to be managed alongside conventional performance and timing uncertainties of product development. After motivating this problem with an industrial case-study, we conceptualize and formulate it as the “co-development problem”. We propose, formulate, and analyze two collaboration mechanisms that involve sharing of the development cost and development effort, which we term investment sharing and innovation sharing, respectively. We translate our analytical findings into a managerial framework that maps the domains of appropriateness of different approaches to co-development.

### **2. Tournament Incentives under Unforeseeable Uncertainty**

**Svenja C Sommer**, Purdue University

**Christoph H Loch**, INSEAD

Novel and long-term projects are often plagued by unforeseeable uncertainty, events that cannot possibly be foreseen at the outset. This makes it very difficult to tell beforehand whether a particular project approach or concept will work out. Pursuing multiple parallel concepts (selectionism) has been suggested as one way to manage such projects. We address the question of how the principal (e.g., the firm) can set incentives to maximize the expected payoff from these parallel trials, given that unforeseeable uncertainty exists and that agents (e.g., project managers) are averse to unforeseeable uncertainty.

### **3. Emotions and motivation of professional workers**

**Christoph Loch**, INSEAD

I present empirical evidence that emotional preferences matter in social interactions, and that emotions represent a system governing interactions in groups. I briefly show an application in a model of status competition, and outline possible implications for Operations Management.

### **4. A Model of Preference for Social Reciprocity and Fairness and Supply Chain Performance**

**Christopher Loch**, INSEAD

**Yaozhang Wu**, INSEAD

Supply chain contracting and coordination theory usually assumes that supplier and retailer are self-interested profit maximizers and interact in a one-shot deal. However, empirical research and recent work in economics suggest that the individuals care about reciprocation and fairness in addition to their own profit. We model the supply chain performance in a wholesaler-retailer pair by using social preference theory from Economics, which extends the self-interested rationality assumption of economic agents. We study what equilibrium may arise, which player benefits, and what type of supply chain is selected by competition.

**SAT/Apr 30** 1:45 pm- 3:15 pm

Session **SD8: Managing Health Care Process Improvement** (Invited)

Track: **Service Operations Management**

St. Clair Room (6th Floor, South)

Chair: **Nicole DeHoratius**

### **1. An Exploratory Study of Project Management Practices**

**Daniel R Heiser**, DePaul University

**Gerry Aase**, Northern Illinois University

**Lori S Cook**, DePaul University

**Charles Petersen**, Northern Illinois University

Effective and efficient project management is important for organizations to implement strategy, improve operations, and design new products. This study examines the following research questions: a) what are the most important factors for successful project management, b) what are the most common causes of project failure, and c) what will be the greatest challenges and/or opportunities over the next decade? Results from a survey of 244 North American project managers will be presented.

## **2. Market Impact of Technology-Based Service Innovations in Healthcare Industry**

**Rohit Verma**, University of Utah

N/A

## **3. Technology-Driven Hospital Process Improvement**

**Craig Froehle**, University of Cincinnati

**Mark Halsted**, Cincinnati Children's Hospital Medical Center

**Neil Johnson**, Cincinnati Children's Hospital Medical Center

Medicine in the US is being pressured to simultaneously improve both the quality and cost-effectiveness of patient care. In order to accomplish these goals, much like many manufacturing industries a few decades ago, healthcare is looking to combine process improvement with advanced technology. We examine a scenario where the Radiology department of a world-class children's hospital implements what it believes to be a more efficient workflow enabled by a new medical IT system. We form several targeted hypotheses and then test them empirically using data collected in a classical observe-effect-observe design. The data used to test the hypotheses include operational and process data gleaned from various hospital databases as well as perceptual data obtained from primary patient and employee surveys. The findings provide insights into where and why various improvements were achieved and how the realized improvements compare with the changes originally hypothesized.

## **4. Doing more versus doing less in a portfolio of improvement projects: The effect of focus on project completion rate**

**Ingrid Nembhard**, Harvard University

**Anita Tucker**, University of Pennsylvania

In this paper, we present data from 23 neonatal intensive care units (NICUs) that collaboratively developed 93 guidelines for improving care in one of seven areas (i.e. infection, pain control, etc.). We examine project completion rate -- the extent to which NICUs implemented the projects they had intended within the two-year period. Specifically, we test whether focus, undertaking fewer changes or limiting changes to a targeted area, resulted in higher completion rates, controlling for organizational factors such as hospital supportiveness and human resources. We find that: (1) focusing on fewer improvement areas increases project completion rate; (2) doing more projects within improvement areas defined by low extant knowledge (usually organizational areas) improves completion rate, and (3) the number of projects within improvement areas defined by high extant knowledge (usually technical areas) has no effect on completion rate. We therefore conclude that there are synergy benefits to conducting more

## **5. Medication Error in Drug Dispensing**

**Jennifer Hitler**, University of Chicago

**Nicole DeHoratius**, University of Chicago

Health care professionals and researchers strive to reduce adverse drug events. To date they have focused on reducing medication errors in two phases of the medication supply chain: prescribing and administering. However, errors made during the middle phase, dispensing, can also contribute to poor process quality and thereby adverse drug events. We provide a typology for existing studies on medication errors and highlight where additional research is needed to better understand the role of technology within the medication "supply chain". By drawing on existing operations management and organizational learning research, we hypothesize that automated drug dispensing systems are more likely to accompany a reduction in medication errors when such technology coexists with certain organizational practices (e.g. standardized processes, shared accountability for quality improvement, rapid feedback by upstream parties regarding the presence of errors in the system, and root cause problem solving to correct such errors).

### 1. An Integrative Approach to Learning-Based Continuous Quality Improvement

**Thierry Rakotobe-Joel**, Ramapo College of New Jersey

An integrative approach to CQI, based on the learning theory, is proposed. The concept of 'learning' is an important, yet missing, link in the contemporary quality management technique as firms must also take into account past experiences and learned processes as they undergo the CQI process. While some see a negative correlation between routine and quality, the proposed framework attempt to develop a framework that build upon routines and learning as necessary compatible elements of quality process. The model shows that as workers are settling into routines, quality might suffer; however, a strong knowledge management can change routines into a mechanism that work favorably toward lasting CQI. A simulation-based experiment was used to develop the framework.

### 2. THE MODERATING EFFECT OF SLACK RESOURCES ON THE RELATION BETWEEN QM AND ORGANIZATIONAL LEARNING

**Andrés J Navarro-Paule**, University of Granada (Spain)

**Javier Llorens-Montes**, University of Granada (Spain)

**Victor J García-Morales**, University of Granada (Spain)

**Luis M Molina-Fernández**, University of Granada (Spain)

**Antonia Ruiz-Moreno**, University of Granada (Spain)

As business environments increase in dynamism and complexity, firms lose the ability to incrementally adapt and maintain existing competitive advantages. In this context, organizational learning and Quality Management (QM) have emerged as two fundamental resources for responding to the environment and obtaining long term competitive advantage. Slack resources may also give the firm leeway to manage changes that improve the firm's response to environmental changes. In this paper we provide strong theoretical foundations of the relationship the relationship between organizational learning, QM and slack. We support that the bundling of resources is the key to developing and maintaining sustainable competitive advantage. In this sense firms must learn to re-bundle internal competencies and resources in order to achieve competitive advantages. This paper examines how firms employ slack resources to enhance the relationship between quality management (QM) and organizational learning to obtain sustainable competitive advantages.

### 3. A research project - performance measurement of a crisis region of Hungary adapting a method of organization evaluation

**István Szintay**, University of Miskolc, Institute of Management Science

**Mariann Somosi Veres**, University of Miskolc, Institute of Management Science

**Orsolya Hogya**, University of Miskolc, Institute of Management Science

We examined a representative sample of the producing and service companies of a crisis region in Hungary's transition economy in a period of 2001-2004 using primer (tests, statistical data, interview) and secondary (EFQM model) evaluation methods. The main fields of the research were: the reorganization of companies in the mirror of excellence, main characteristics of the companies in the region as a basis of change management, corporate governance, and the forms of technology and knowledge transfer.

### 4. Measurement of the Quality of Service in Electronic Commerce on the Internet

**Cid Goncalves-Filho**, FUMEC University

**Marilea V Goulart**, Fead Minas

**Gustavo Q Souki**, Universidade Fumec

The expansion of the services sector has directed the attention of companies towards quality as an important factor of competitive advantage. Parasuraman, Zeithaml and Malhotra (2000) created a multi-items scale called "e-SERVQUAL" (ESQ) in order to evaluate service quality as perceived by consumers, specifically on the INTERNET. This research, carried out in June 2004, had the aim of evaluating the quality of service perceived at electronic business websites. With a sample of 350

respondents, the research tested the reliability and validity of the scale, using structural equation modelling. This study provides to the retail industry, a important managerial tool, to evaluate customer's perception of quality.

**SAT/Apr 30** 1:45 pm- 3:15 pm

Session **SD10: An ERP-Based Operations Curriculum (Invited)**

Track: **ERP**

Ohio Room (6th Floor, South)

Chair: **Vince Mabert**

### **1. An ERP-Based Operations Curriculum - A Panel Discussion**

**Ashok Soni**, Indiana University

This session will present an overview of an ERP-based undergraduate curriculum in Operations Management. Topics covered will include forecasting, project management, production planning, MRP, and quality control. The panelists are: Vince Mabert (Kelley School of Business, Indiana University); Doug Blocher (Kelley School of Business, Indiana University); and M.A. Venkataramanan (Kelley School of Business, Indiana University).

**SAT/Apr 30** 1:45 pm- 3:15 pm

Session **SD11: Emerging Topics in Service Operations Management (Invited)**

Track: **Service Operations Management**

Onyx Room (2nd Floor, North)

Chair: **Gregory Heim**

### **1. Self-Service Strategy: Linking Operations and Marketing**

**Mei Xue**, Boston College

**Patrick T Harker**, University of Pennsylvania

The strong growth of the so-called "self-service economy" emphasizes the increasing popularity of self-service in service designs. Utilizing the co-production nature of service that distinguishes it from manufacturing, self-service seems to offer the ultimate solution for providing cost-effective and efficient services to consumers. However, research about the managerial implications and consequences of increasing self-service level have been largely limited to exploratory studies and lacked a general framework for analytical analysis. In this paper, we propose a general framework for modeling service co-production and analyzing the "self-service strategies", the strategies focusing on using self-service to substitute employee service in service delivery. We then use the proposed model to analyze the self-service strategies of a service provider for customer segmentation, retention and acquisition and product positioning.

### **2. Sourcing of Logistics Services in Internet Supply Chains: An Empirical Study of Transaction Costs and Network Strength**

**Elliot Rabinovich**, Arizona State University

**A. Michael Knemeyer**, Ohio State University

**Chad M Mayer**, Arizona State University

The advent of the Internet resulted in relationships that redefined traditional boundaries among firms and opened new avenues for value creation in the supply chain. In particular, evidence suggests that Internet sellers have established relationships with logistics service providers allowing them to utilize other supply chain parties' logistical resources and skills in order to better fulfill their buyers' orders. We posit that these relationships are formed on the basis of the development of value synergies for Internet sellers. These value synergies, in turn, are contingent upon two factors: (1) low transaction costs and (2) the formation of strong networks that bundle many complementary logistics services and offer a broad availability of those services across Internet sellers' customers, vendors, and delivery providers. We rely on transaction cost theory and strategic network theory to articulate and empirically assess these factors and identify their role in Internet seller decisions to form such relationships.

### **3. Measuring the Effectiveness of E-Commerce Website Design**

**Jungpil Hahn**, Purdue University

**Robert J Kauffman**, University of Minnesota

The assessment of the effectiveness of e-commerce websites is of critical importance to online retailers. We model online shopping as a self-service production process in which customers are making use of various functionalities provided by the e-commerce website in order to complete a purchase transaction. This view enables us to formulate a novel perspective on website performance – the ability to transform inputs (i.e., use of website functionalities) into outputs (i.e., completed purchase transactions). We use data envelopment analysis (DEA) as the methodological vehicle for measuring online customers' efficiencies in utilizing an e-tailer's website. The analysis of the distribution of the customers' efficiency scores provides an overall assessment of the effectiveness of the e-tailer's website. Using clickstream and transaction data from an online retailer of groceries, we empirically validate the proposed metrics by associating customers' efficiency scores with customer value.

#### **4. Understanding the Application of SST in Transaction-Based e-Service**

**Xin Ding**, University of Utah

**Rohit Verma**, University of Utah

**Zafar Iqbal**, Depaul University

**Gerhard Plaschka**, Depaul University

The application of self-service technology (SST) in transaction-based e-service creates a challenge for firms: What combination of features should they offer to satisfy needs from different customer segments? Based on Iqbal, Verma, and Baran (2003)'s study, this article stresses the above question by highlighting similarities and differences in consumer preferences between self-service and professional service segments for a transaction-based e-service. This study employs a web-based discrete choice experiment, in which 1,319 consumers were offered different account alternatives, including features for self-service and professional assistance, price per transaction, and promotion offers. The results demonstrate that overall, consumer preferences for features of transaction-based e-services differ between self-service and professional service consumers. Moreover, with the variation in the strength of self-reliance, interesting trends regarding the relative importance for features are observed. The authors believe that these results have both managerial and research implications for design and operations strategy formulation for transaction-based e-services.

#### **5. Process Drivers of E-Service Quality: Analysis of Data from an Online Rating Site**

**Gregory R Heim**, Boston College

**Joy M Field**, Boston College

Managers of e-service operations are increasingly challenged to ensure high quality in their electronic services. Many researchers have studied how perceptions of individual e-service quality dimensions relate to perceptions of overall e-service quality. Few have studied which service features are associated with individual e-service quality dimensions. In this study, we turn toward operational practices, examining relationships between e-service process attributes and e-service quality. We identify drivers of e-service quality that managers can use as levers to improve their operations. The study employs a cross-sectional regression analysis of publicly available data collected from an online rating site. The entire study sample consists of over 1000 online retailers from several retailing segments. The results identify operational drivers associated with customer ratings of e-service quality, and provide guidance for future research on drivers of e-service quality.

**SAT/Apr 30** 1:45 pm- 3:15 pm

Session **SD12: New Perspectives on Teaching Core OM Courses** (Invited)

Track: **Innovations in Teaching**

Valencia East (Lobby Level)

Chair: **Barbara Osyk**

#### **1. Leveraging the Survey Course in Operations Management to Promote OM Majors**

**Sanjay L Ahire**, University of Dayton

Operations Management (OM) does not have the same recognition among undergraduate students as do Accounting, Finance, Marketing, or even MIS. The survey course in OM (mostly at the 300 level) is often the first and last chance to attract students (almost always already committed to other majors) to OM careers. I will present an approach to teaching this course that forcefully establishes the value-proposition

of OM as a standalone major and as a valuable complement to other careers. I will highlight my successes in building student confidence and competence in OM through this first real exposure to the field.

## **2. A New Case Study Approach to Linked Survey Courses in Operations, Marketing, and Finance**

**Peter G Wagner**, University of Dayton

**Rebecca Yates-Wells**, University of Dayton

**Leslie S Douglas**, University of Dayton

We describe new case study approaches being used in the School of Business Administration at the University of Dayton that focus on integrating material in junior level introductory courses in finance, operations, and marketing. We present ways in which selected and original case studies are used in integrated sections to give students greater opportunities to think across disciplines and compare their experiences with those students in traditional stand-alone courses.

## **3. Teaching of introductory Operations course in a large lecture format: a panel discussion**

**Tim McClurg**, University of Wisconsin

**Renato DeMatta**, University of Iowa

The large lecture format is a reality at

many of the larger colleges and universities across the country, and there is always room for improvement. The session will focus on three primary areas of discussion: curriculum development, class organization, and class management. Specific topics might include TA selection, writing in large classes, use of technology, and motivating students.

## **4. An application of the Collective Causal Mapping methodology to develop a framework for teaching operations management**

**Julie M Hays**, University of St. Thomas

**Arthur V Hill**, University of Minnesota

**Annibal J Scavarda**, Fundação Getúlio Vargas Business School

**Tatiana Bouzdine-Chameeva**, Bordeaux Business School

**Susan Meyer Goldstein**, Curtis L. Carlson School of Management, University of Minnesota

The field of operations management has evolved and changed since its inception. From its beginnings as scientific management with significant emphasis on quantitative tools to the present, the list and sequence of topic areas has evolved as our understanding of the problems faced in operations has evolved. In this paper, we survey academics and practitioners with varying amounts of experience located world wide and apply the Collective Causal Mapping methodology. We use the findings of this research to develop a model of what these experts believe should be taught in an introductory operations management course, as well as how those topics should be logically grouped within the course.

**SAT/Apr 30** 1:45 pm- 3:15 pm

Session **SD13: OPERATIONS MANAGEMENT: EVOLUTION IS THE CONSTANT** (Invited)

Track: **Operations Strategy**

Valencia West (Lobby Level)

Chair: **Linda Sprague**

## **1. What's the Fastest Changing Field in the business Lexicon?**

**Martin K Starr**, Rollins College

P/OM is the answer. Production and operations management has galloped through two major intellectual discoveries and one gigantic technological invention. All were created by academic-type efforts in industry and government. (Who said that university contributions pale in comparison to those of industry?)

University-based academics worked side-by-side with industry and government-based theoreticians. The theories they were developing were driven by urgent industrial and governmental opportunities and needs. One area where progress was not being made was business education. Entrenched traditional beliefs led to Ford and Carnegie Foundation reports that appeared with unprecedented simultaneity, which stated that the U.S.A. was falling behind (Sputnik) and needed to revamp its business curricula. That redesign is still going on and shows no signs of decelerating. Traditional management approaches are being replaced by new capabilities. Out: Planning; In: product design, process flexibility, and business intelligence. Adam

Smith (1776) might have been surprised.

## **2. Archeological Benchmarking: The Service Profit Chain *circa* 1876**

**Karen A. Brown**, University of Washington

**Nancy L Hyer**, Vanderbilt University

The Fred Harvey Company operated a highly successful string of restaurants and hotels along the Atchison, Topeka and Santa Fe Railroad line, starting in 1876, reaching its peak around 1912, and continuing until about 1950. Fred Harvey was a visionary businessman who understood many of the key concepts that guide the most successful service operations today. This presentation will describe the operating system Harvey used for delivering 15 million meals per year in 65 restaurants extending over a span reaching from Chicago to San Francisco. The underpinnings of Harvey's system foretold of concepts considered new today, particularly the service profit chain (Heskett, et al., 1994) and its reliance on a clear operations strategy supported by well-trained, loyal employees and a congruent system of measurement.

## **3. What Do We Know?**

**Linda G. Sprague**, China Europe International Business School (CEIBS)

From the 19<sup>th</sup> and 20<sup>th</sup> century works of Frederick Taylor and many of his contemporaries, through the 1920's works of Henry Ford, to the 1950's contributions of Jay Forrester, there are surprisingly consistent themes about what works in operations. Any number of operational fads can be deconstructed to some fundamental concepts which appear regularly. While technology has dramatically enhanced our analytic capabilities and our ability to handle larger and larger systems, a number of basics remain. This presentation proposes a short list of what we really know and Operations Management and/or the management of operations.

**SAT/Apr 30** 3:45 pm- 5:15 pm

Session **SE1: Economics of SCM II** (Contributed)

Track: **Supply Chain Management**

Sullivan Room (8th Floor, South)

Chair: **Panos Kouvelis**

## **1. Identifying The Supply Network Topologies**

**Surya D Pathak**, Vanderbilt University

**David M Dilts**, Vanderbilt University

Since long, supply networks have been either looked on as diads and triads of firms or as a strict hierarchy (hourglass structure). Our recent research on Complex Adaptive Supply networks has shown other wise. In this paper we identify 5 fundamental 2 dimensional network topologies for classifying supply networks. We present representative industry examples for each classification. We also discuss the strategic ramifications of having such knowledge of supply network topology from a managers/decision maker's perspective, especially on issues such as power diffusion in the network, supplier selection, and stability of supply network systems. Finally, we discuss the issue of how such knowledge can benefit firms in a market when supply networks compete against each other.

## **2. Switching Costs, Dynamic Uncertainty, and Buyer-Seller Relationships**

**Nagesh N Murthy**, University of Oregon

**Milind Shrikhande**, Georgia State University

**Ajay Subramanian**, Georgia State University

We analyze strategic relationships between buyers and sellers in markets with switching costs and dynamic uncertainty by investigating the scenario wherein a representative buyer trades with two foreign sellers located in the same foreign country. We show that, under exchange rate uncertainty, switching costs may lead to switching equilibria where both sellers co-exist in the market with the buyer, or no-switching equilibria where either seller captures the market. Low levels of exchange rate uncertainty facilitate competition by allowing the sellers to co-exist in the market with the buyer. However, if the level of uncertainty is beyond a threshold, the only viable equilibria are those where one of the sellers captures the market. Further, depending on the level of exchange rate uncertainty and the sellers' variable costs, switching costs may either raise or lower the level of prices in long-term contracts between the buyer and the sellers.

### 3. Breaking the Winner's Curse

**Bin Jiang**, DePaul University

This research uses the option theory to study the winner's curse control in outsourcing. By investigating the two popular flexible pricing approaches, market-based pricing and benefit sharing, this research has mathematically proved some important findings which have not previously been identified in the literature, such as, the marketbased pricing approach can break the winner's curse more effectively as long as the vendor is facing a strong market; when the market is weak, the vendor would like to undertake the benefit sharing contract, and so on.

### 4. Process Focused Approaches to Demand Chain Network Design

**Vishwanath G Hegde**, California State University Hayward

**Kaushik Sengupta**, Hofstra University

Demand chain network design has been primarily analyzed from logistics and inventory management perspectives. This approach does not incorporate a number of issues that are involved in the OEM and customer interfaces during the product life cycle. In this research we examine the demand chain from a process perspective. This approach includes business processes that exist in customer interfaces such as product creation, fulfillment, after-sales service and returns management. We discuss why different companies seem to manage the interfaces differently. Based on the case studies chosen from various product markets, we propose a framework for demand chain design.

### 5. On the Study of Operations Flexibility in a Supply Chain with Transshipment

**Dennis Z Yu**, Washington University in St. Louis

**Sammi Y Tang**, Washington University in St. Louis

**Haojun Shen**, Washington University in St. Louis

**Julie Niederhoff**, Washington University in St. Louis

**Panos Kouvelis**, Washington University in St. Louis

Transshipment is an effective way in supply chain management to increase operations flexibility in an established supply chain. In their seminal paper on network flexibility Jordan and Grave (1995) argue that a great deal of increase in profit can be obtained by merely adding adequate level of flexibility. However, adding flexibility in the real world could be extremely expensive or even not achievable. The newsvendor network model provides us with a modeling framework to optimize retailers' order quantities at any flexibility level. We study a stylized two-stage supply chain including one supplier and three retailers by using the newsvendor network model to formulate and solve the problem. We investigate six typical levels of operations flexibility and calculate the expected profits under optimized order quantities, mean demand stock levels, and newsvendor solutions. A comprehensive numerical study has been done to demonstrate the actual benefits of optimization and operations flexibility.

**SAT/Apr 30** 3:45 pm- 5:15 pm

Session **SE2: Supply Chains in eBusiness** (Invited)

Track: **Information and Contracting in Supply Chains**

Holabird Room (8th Floor, South)

Chair: **Kyle Cattani**

### 1. An e-enabled Approach Facilitated in the Outsourced Supply Chain

**Sarah Y Zhang**, the University of Liverpool Management School

Outsourcing has become a trend in manufacturing, which also extends the whole supply chain length and operation management coverage scale. A key factor in the chain is to ensure the real-time information transferred accurately and order processed timely. This paper reviews e-enabling technology support and its application in the remote supply chain improvement. In this paper, the e-support supply chain development is briefly blueprinted in line with the presently reachable e-business support. Emerging e-enabled relationships achieves to support multiple simultaneous business models and communication media to realise the full benefits of the business. A case study in aerospace industry is introduced in order to demonstrate the theoretical approach of supply chain control development, describing an Internet-based remote system which is regarded as a strategically integrated package to rationalise the manufacturer's supply chain with the upstream and downstream collaborative partners.

## 2. Supply Chain Inventory Competition and Coordination in e-Business

**Wei-yu Kevin Chiang**, University of Maryland

A game-theoretical model is developed to investigate the competitive and cooperative stocking behavior in a two-echelon supply chain in which a supplier uses both its wholly owned online channel and an independent retailer to distribute its products to customers with heterogeneous channel preference. The customers may dynamically substitute between the two sales channels. We analyze the channel inefficiencies induced by inventory competition and propose coordination contracts for the supply chain.

## 3. Will Your Investments In The Supply Chain Help Your Competitor?

**Cheryl Druehl**, University of Maryland

**Sivakumar Viswanathan**, University of Maryland

Consider 2 firms which use the same supplier. Investments by one firm in the supplier, such as business process design and the associated infrastructure, may benefit the other firm. For example, consider two firms such as Cisco and Nortel. Both use suppliers such as Solectron to manufacture their products. By increasing Solectron's knowledge – in terms of the market, manufacturing processes, and use of e-business methods, Cisco increases the chances that its competitor Nortel will benefit. We discuss conditions under which this occurs.

## 4. Boiling Frogs: Pricing Strategies for a Manufacturer Adding a Direct Channel that Competes with the Traditional Channel

**Kyle Cattani**, University of North Carolina at Chapel Hill

**Wendell Gilland**, University of North Carolina at Chapel Hill

**H. Sebastian Heese**, Indiana University

**Jayashankar Swaminathan**, University of North Carolina at Chapel Hill

We analyze a scenario where a manufacturer with a traditional channel partner (i.e., a retailer) opens up a direct Internet channel that is in competition with the traditional channel partner. We first consider that the manufacturer, who chooses wholesale prices as a Stackelberg leader, commits to match the retailer's price in the new direct channel in order to mitigate the channel conflict. We consider the implications of the equal-pricing constraint through a numerical experiment that indicates that the equal-pricing strategy is appropriate as long as the Internet channel is significantly less convenient than the traditional channel. If the Internet channel is of comparable convenience to the traditional channel, then the manufacturer has tremendous incentive to abandon the equal-pricing policy – at great peril to the traditional retailer.

**SAT/Apr 30** 3:45 pm- 5:15 pm

Session **SE3: Enhancements in Inventory Management (Invited)**

Track: **Inventory Management**

Wright Room (8th Floor, South)

Chair: **Bogdan Bichescu**

## 1. A Two-Stage Newsvendor Problem with a Service Constraint

**Qi Feng**, The University of Texas at Dallas

**Suresh Sethi**, The University of Texas at Dallas

**Alain Bensoussan**, The University of Texas at Dallas

We extend the classical newsvendor problem by introducing a service constraint and a demand forecast update. The newsvendor orders an initial amount and has the possibility to adjust the initial order after she observes a demand updating signal. She also commits to a target service level before any forecast update is available. The resulting problem does not permit a dynamic programming formulation. We use the method of Lagrange multipliers to solve the problem, and we derive an analytical expression for the optimal ordering decisions. Various properties of the optimal policy are discussed, and numerical results are presented to provide further insights into the newsvendor's behavior.

## 2. A Study on a Solution Algorithm of a Resource Allocation Problem for EOQ Model with Price Breaks

**Shin'ichi Yoshikawa**, Faculty of Management, Nagoya Keizai University

The EOQ model is obtained as a trade-off between the ordering cost and the inventory preservation cost. Until now, the formulation of resource allocation problem in the inventory control has been carried out in

the field of DP. However, there are some difficult points concerning scale and space in DP. Therefore, we propose an efficient solution algorithm using mathematical programming. When we order  $m$  kinds of goods, there is a problem of how to allocate the  $m$  kinds of goods to minimize the total inventory cost. In our proposed model, the purchasing cost per unit is discounted at the price break point  $q_i$ , so the cost function becomes non-continuous at  $q_i$ . But it is partially non-continuous function, so by paying attention to it, we can introduce more effective solution algorithm than that of DP. Our algorithm can reduce to  $O(n)$  from  $O(2n)$  for computational complexity.

### 3. Partially Observable Inventory Systems: The Case of Information Delays

**Metin Cakanyildirim**, University of Texas at Dallas

**Suresh Seth**, University of Texas at Dallas

**Alain Bensoussan**, University of Texas at Dallas

In large organizations, it takes a while to process demand data, and pass the results to the Inventory Manager (IM). Sales representatives often promise deliveries to customers without the IM's permission. We call this (demand) information delay and study the structure of the optimal ordering policies with fixed/random delays.

### 4. A Dynamic Programming Approach to Solving an Inventory Problem with Returns

**Rahul Upreti**, University of Alabama

**Charles P Schmidt**, University of Alabama

We consider a situation where some of the sold units of a product may return in future periods with a probability distribution. Returned units are just like new units in terms of salability. As some of the issued units may never return, new units have to be acquired from time to time. In this presentation an ordering policy of these new units is determined using Dynamic Programming for a finite time horizon so as to minimize the total ordering and expected carrying and backordering costs.

### 5. Supply Chain Performance under General (Q,r) inventory policies

**Bogdan Bichescu**, University of Cincinnati

**Michael J Fry**, University of Cincinnati

We analyze centralized and decentralized supply chains that function according to general (Q, r) policies which allow the decision-making responsibilities to be split between supply chain agents, i.e. a retailer and a supplier. We explore several channel power distribution scenarios, including vendor-managed inventory, and we outline their effects on supply chain performance.

**SAT/Apr 30** 3:45 pm- 5:15 pm

Session **SE4: Topics in closed-loop supply chains** (Invited)

Track: **Closed Loop Supply Chains**

Burnham Room (8th Floor, South)

Chair: **Gilvan Souza**

### 1. Supply Chain Coordination for False Failure Returns

**Gilvan C Souza**, University of Maryland

**Mark Ferguson**, Georgia Institute of Technology

**V. Daniel Guide, Jr**, Penn State University

False failure returns are products that are returned by consumers to retailers with no defects. The cost of a false failure return includes the processing actions of testing, refurbishing, and repackaging, the value loss due to processing delays, and the loss in revenue because the product is sold at a discounted price. This cost is significant, and incurred primarily by the manufacturer. Reducing false failure returns, however, requires effort primarily by the retailer, for example informing consumers about the product that best fits their needs. We propose a target rebate contract that pays the retailer a specific dollar amount per each unit of false failure returns below a target. This target rebate provides an incentive to the retailer to increase her effort, thus decreasing the number of false failures and (potentially) increasing net sales. We show that this contract is Pareto-improving in the majority of cases.

### 2. The Value of Information in Reverse Logistics

**Michael E Ketzenberg**, Colorado State University

**Erwin van der Laan**, Erasmus University Rotterdam

**Ruud H Teunter**, Erasmus University Rotterdam

We explore the value of information in the context of a remanufacturer that faces uncertainty with respect to demand, product return, and product recovery (yield loss). We assume a single period model in which the operational decision of interest is the quantity of new product to order. Our objective is to evaluate the absolute and relative value of the different types of information that such a firm may choose to invest in order to reduce the uncertainty it experiences in matching supply with demand. We develop and test a theoretical model that is predictive of 1) the value of each type of information, 2) the conditions that give rise to the value for each type of information, and 3) the relative value for each type of information.

### **3. Source Configurations in Process Industry Reuse**

**Monique L French**, University of Colorado at Colorado Springs

**Rebecca Duray**, University of Colorado at Colorado Springs

This study considers re-use in process industries from the producer's perspective. A cluster analysis approach is used to classify process industry re-use based on sources of product returns. Using responses from 141 manufacturing facilities, findings indicate that the source configurations differ based on re-use choice.

### **4. Dynamic network design model with reverse flows**

**Maria Isabel Salema**, Centro de Matemática e Aplicações, FCT

**Ana Paula Barbosa-Povoa**, Centro de Estudos de Gestão, IST

**Augusto Novais**, Departamento de Modelação e Simulação, INETI

Much attention is currently given to the study of supply chains. Most studies are, however, only concerned with forward chains, rendering reverse chains a field insufficiently covered. Thus, few models addressing either the design of reverse networks or the simultaneous design of forward and reverse networks have been presented. We propose a MILP model for the design and planning of an integrated forward and reverse chain. While minimizing cost, the network structure is defined simultaneously with production and storage planning. Dynamic aspects are accounted for using a two-time scale fully interconnected structure: a macro time for network design and a micro time for planning. Demand and return uncertainty are studied through a scenario approach. Two types of results are obtained: a common structure to all scenarios, and distribution, production and storage policies, which are scenario dependent. A case study is solved. The model generality is corroborated with good performance results.

**SAT/Apr 30** 3:45 pm- 5:15 pm

Adler Room (2nd Floor, North)

Session **SE5: Scheduling & Logistics – From the Shop Floor to the Extended Enterprise** (Invited)

Track: **Operations Planning, Scheduling and Control**

Chair: **Chris Geiger**

### **1. A Management Framework for Performance Management of Integrated Logistics Operations**

**Marco Busi**, Norwegian University of Science and Tehcnology / SINTEF Industrial Management

While companies are moving towards stronger collaborative relationships, performance management research is not keeping up the pace with this shifting focus. Practitioners' dissatisfaction with today's performance measurement systems (PMS) resides in their need to move from local to global focus. The objective of this paper is to define a framework that practitioners could use to monitor extended logistics operations' performance. The rationale is a general lack of understanding of what collaboration means and implies on development of appropriate PMSs. The outcome is the management framework including: a collaborative enterprise wide PMS model; customizable lists of KPIs and related selection frameworks; a PMS design process. The author discusses how the framework supports SCM, contributing to knowledge and supporting practitioners acting upon the emerging knowledge. This research employed action/constructive research strategies: the paper shows major contributions from a wheel-suspension manufacturer and the use this last has made of the framework

### **2. Optimizing Supply Chain Agility**

**Renee J Butler**, University of Central Florida

**Mariah Jeffery**, University of Central Florida

Supply chain agility has been recognized in recent literature for its potential to create a competitive advantage for organizations that determine successful and cost effective agile strategies. We present a two-phase modeling approach to quantify and optimize supply chain agility (the ability to respond to supply and demand uncertainty) and its cost. Polynomial and logistic regression are used to develop an equation of agility, which can be used as an objective or constraint in subsequent optimization models. The optimization models will recommend inventory levels by month based on desired service levels and cost. Additionally, we will evaluate various scenarios and determine guidelines for shipping speeds, expedited transfer of inventory, and expedited production during deviations from normal operating conditions. We present a problem based on the semiconductor industry, as well as expected outcomes and contributions.

#### **4. Coordinated Collaboration of Multi-Agents in Multi-Stage Production Scheduling Environments**

**Christopher D Geiger**, University of Central Florida

**Reha Uzsoy**, Purdue University

**Haldun Aytug**, University of Florida

This work is concerned with the coordinated collaboration of autonomous agents within multi-stage manufacturing settings. In particular, a novel approach is presented where individual workcenters (“agents”) autonomously learn their most appropriate scheduling policy in order to maximize the performance of the production system. Although we consider dispatching policies, the results show that the approach is amenable to learning more sophisticated scheduling policies. This work is a significant step beyond current intelligent techniques to production scheduling, which are mainly based on learning how to select a given policy from among a number of candidates, rather than identifying new and potentially more effective policies. We evaluate the performance of the learning system in flowshop scheduling environments under various shop conditions.

**SAT/Apr 30** 3:45 pm- 5:15 pm

Michigan Room (6th Floor, South)

Session **SE6: Innovation and R & D Effectiveness** (Contributed)

Track: **New Product and Technology Management**

Chair: **Francesca Gino**

#### **1. Strategic Alliances Between Biotech and Pharma: success or failure?**

**Jelena Siraliova**, University of Cambridge

**Jannis J Angelis**, University of Oxford

The cost of drug development, market forces and aspirations are among the myriad of factors driving pharmaceutical and biotechnology firms to establish alliances with each other. Although the high rate of strategic alliances might suggest win-win situations for the companies involved, alliance instability and mortality rates are high. 50-70 percent of the alliances terminate. Termination, however, is not necessarily viewed as a failure by the alliance partners. This study explores what makes an alliance successful or failed from the point of view of the various involved parties within an exploration-exploitation framework. Conclusions are based on analysis of 60 in-depth interviews with respondents from biotechnology and pharmaceutical companies and other professionals (e.g. investment bankers, equity analysts and venture capitalists), whose opinion and involvement can some times influence the decision-makers within biotech-pharma alliances. The study provides insights on the complex topic of performance measurement of alliances that goes beyond financial performance indicators.

#### **2. The Effect of Service Guarantee Strength**

**Julie M Hays**, University of St. Thomas

**Arthur V Hill**, University of Minnesota

**Daniel Corsten**, University St. Gallen

**Daniel Fitzek**, University St. Gallen

Based on a survey of 225 German automotive suppliers who report on their ramp-up relationships with (a) a key OEM-customer and (b) a key complementary supplier we empirically assess the determinants of failures and disruptions in automotive ramp-ups. We find that 23% of the ramp-ups do not meet technical and commercial targets, and 37% fail on one of those two dimensions and only 40% achieve their objectives. We also find that the suppliers relation-specific absorptive capacity and rules and responsibilities vis-à-vis the his customer and complementary supplier attenuate supply chain failures but

surprisingly collaborative processes do not. More results pending.

### **3. Institutional Context for Disruptive Technologies**

**Ian Graham**, University of Edinburgh

**Patricia Nelson**, University of Edinburgh

Christensen's concept of Disruptive Technology has been influential in shaping how firms respond to innovative technologies. This paper argues that the concept of disruptive technology has embedded within it assumptions about the institutional context of technological innovation, specifically valuing innovation through entrepreneurship over innovation within established firms. For example, Christensen argues that incumbent firms should respond to disruptive technologies by creating semi-autonomous business units that can respond as if they are new entrants. The paper will describe the response of Japanese camera manufacturers to the emergence of digital imaging technology and show how they successfully adapted to the technological change without disruption. The case is used to develop a New Institutionalist critique of Disruptive Technology/Disruptive Innovation, arguing that its validity is contingent upon the institutional structure of the industry facing disruption.

### **4. The role of Absorptive Capacity and Coordination Rules in Automotive Ramp-ups**

**Daniel Corsten**, University St. Gallen

**Daniel Fitzek**, University St. Gallen

Based on a survey of 225 German automotive suppliers who report on their ramp-up relationships with (a) a key OEM-customer and (b) a key complementary supplier we empirically assess the determinants of failures and disruptions in automotive ramp-ups. We find that 23% of the ramp-ups do not meet technical and commercial targets, and 37% fail on one of those two dimensions and only 40% achieve their objectives. We also find that the suppliers relation-specific absorptive capacity and rules and responsibilities vis-à-vis the his customer and complementary supplier attenuate supply chain failures but surprisingly collaborative processes do not. More results pending.

### **5. R&D Performance Volatility: A Behavioral Model**

**Francesca Gino**, Harvard Business School

**Gary P Pisano**, Harvard Business School

This paper explores the underlying causes of volatility in R&D performance over time at the firm level. R&D performance volatility has not been deeply examined in the innovation literature despite the fact that it plays a critical role in industries such as pharmaceuticals or the movie industry, where firms often undergo "hot" and "cold" streaks in R&D output. In this paper, we use a simulation model to explore such phenomenon, building on insights from behavioral theories of the firm: we argue that the swings in performance, while rooted in uncertainty, are exacerbated by the behavioral influences in how decision makers deal with risk and uncertainty in R&D. We explore the effect of scale, resource allocation strategies, and we focus in particular on the impact of risk preferences and behavior towards available information on R&D output and volatility.

**SAT/Apr. 30** 3:45 pm- 5:15 pm

Session **SE7: NPD Project Management (Invited)**

Track: **Product and Service Innovation**

Illinois Room (6th Floor, South)

Chair: **Weiyu Tsai**

### **1. NPD Project Planning Under the Threat of a Disruptive Event**

**Gary Mitchell**, University of Washington

**Ted Klastorin**, University of Washington

Modern NPD projects are increasingly affected by both endogenous and exogenous sources of uncertainty. In this research, we focus on the NPD project planning problem of reducing this risks through project crashing. Many of the methods and results apply equally to analogous problems in supply chain and production operations management.

### **2. Integrating Product Line Design and Service Offering Decision Making**

**Wenge Zhu**, University of Texas, Austin

**Vish Krishnan**, University of Texas, Austin

We study the impact of different types of after sales service offerings on a firm's product line design and channel selection decisions. Services are classified by their relationship to the product as substitutive or complementary, and by their contract terms as transaction-based or relationship-based. We show that different services will have fundamentally different impact on the firm's product line design decisions. For relationship-based substitutive service, the quality distortion in product line design may be mitigated. The quality improvement at the low-end is particularly pronounced when the firm sells its product line through a distribution channel.

### **3. Applying a New Slack Measure to NPD projects**

**Weiyu Tsai**, University of Utah

When solving NPD project scheduling problems, numerous researchers have shown that it is fruitful to use slacks/floats to prioritize tasks in heuristic and optimization algorithms alike. In this paper, we propose a new slack measure that is composed of event-related (path dependent) and task-related (path independent) slacks. Using this metric to prioritize tasks, we develop an efficient heuristic for the renewable resource-constrained project scheduling problem. A numerical example illustrates this new metric and associated heuristic.

**SAT/Apr 30** 3:45 pm- 5:15 pm

Session **SE8: Operations Strategy Implementation (Invited)**

Track: **Operations Strategy**

St. Clair Room (6th Floor, South)

Chair: **Joy Field**

### **1. The Balanced Scorecard and Operations Management: Impact on Strategy and Performance**

**Larry Menor**, University of Western Ontario

**Kevin Hendricks**, University of Western Ontario

**Christine Wiedman**, University of Western Ontario

The Balanced Scorecard (BSC) translates mission and vision statements into quantifiable measures to evaluate and direct a company's activities. Originally conceived as a performance measurement system, the BCS has evolved into a strategic management system. Firms that employ a BSC are presumably better positioned to achieve an external-internal alignment which, as suggested in the academic and practitioner literatures, is required for successfully implementing an operations strategy. Previous research illustrates the impact that business strategy has on the adoption and implementation of a BSC. In contrast, this research examines from a BCS perspective the alignment between business and operations strategy, and focuses on the operational component underlying the strategy and performance relationship.

### **2. Chasing Fads or Building Capabilities? A Test of Competing Accounts of Innovation Adoption**

**Kimberly A Bates**, Trent University

**Mikko A Ketokivi**, Helsinki University of Technology

Two powerful ideas dominate the research on innovation adoption, presenting reasons for innovation adoption that are fundamentally at odds with one another. The resource-based view posits that through the adoption of innovations, firms build on previous capabilities in order to distinguish themselves from their competitors and gain competitive advantage. The institutionalization literature posits that firms adopt innovations as a mimetic process; pursuing legitimacy by adopting innovations that will enhance outsiders' views of their. These two processes describe fundamentally different fates for innovations that are adopted. In the first, practices become routinized, and firms add new practices into an existing portfolio or configuration of capabilities. In the latter, adoption is more superficial; adoption is not necessarily predictive of future levels of practice. Our analysis evaluates these competing hypotheses by comparing the timing of the adoption of past innovations and the level of current practices.

### **3. Strategic Configurations Underlying Lean Production: In Pursuit of Responsiveness**

**Rachna Shah**, University of Minnesota

**Peter Ward**, The Ohio State University

Are lean firms different from non-lean firms in the business and manufacturing strategies they pursue? We attempt to answer this question by employing "means-ways-ends (Hayes, 1985)" perspective. We argue that in implementing lean production techniques, firms develop a manufacturing capability that

enables them to emphasize the competitive priorities of responsiveness and flexibility to produce any number of products. This manufacturing capability, in turn, allows them to compete in the markets where timely responsiveness and large product variety are the sought after business strategies. Thus, lean firms should pursue specific business and manufacturing strategy that are quite distinct from those that are pursued by non-lean firms. We develop conceptual archetypes, the polar-ends of which represent a “lean” and a “non-lean” archetype. We use data collected from a large sample of manufacturing firms and cluster analysis to empirically establish the archetypes.

#### **4. When does IT Matter? A Configurational Approach**

**Kate McKone-Sweet**, Babson College

**Rachna Shah**, University of Minnesota

In recent years, there has been controversy over the competitive value of information technology. Carr argues in his article (2003), “IT doesn’t matter”, that the ubiquitous growth of information technology has decreased its value as a “resource” for competitive advantage. We argue that IT does matter but the problem lies in its “conceptualization.” When IT is conceptualized as an infrastructure as in Carr (2003), its value eventually wears off. However, when IT is conceptualized as a capability that matches a firm’s supply chain, manufacturers can develop strong strategic positions. In this paper, we identify strategic groups of manufacturers with similar information technology and supply chain practices, that is, with similar sets of competitive capabilities. We also determine the environmental factors and manufacturing priorities that define the manufacturer’s selection of a particular strategic group.

**SAT/Apr 30** 1:45 pm- 3:15 pm

Hebron Room (2nd Floor, North)

Session **SE9: The Role of Leadership in Quality Systems** (Contributed)

Track: **Quality Management and Six Sigma**

Chair: **Albena Iossifova**

#### **1. Why is your kaizen activity program not so successful?**

**Lumbidi KUPANHY**, Euromed Marseille School of Management

Although there is an abundance of literature about QCC, SS and/or kaizen, the following issues are not well addressed. Can a company succeed in its implementation of improvement programs without QCC and/or without SS? If yes, can it sustain? What is the likelihood of a company featuring only QCC or only SS to make significant improvements? Which is easier to implement, QCC or SS? Which, in terms of improvements, is almost sure to pay off, QCC or SS? Who are the true contributors to improvements: engineers, line operators or consultants? The present study can not answer with mathematical accuracy those questions. However, it will have the merit to suggest answers that can be useful for companies willing or planning to implement kaizen programs. Tentative answers to those issues are based on our long Japanese experience; on the analysis of the data collected in Japan, France and Germany.

#### **2. Governance and the Brazilian Quality Award**

**Julio Facó**, EAESP-FGV Fundacao Getulio Vargas

**Joao M Csillag**, EAESP-FGV Fundacao Getulio Vargas

Non-profit organizations have significantly grown in the current scenery and more and more they need to render bills for their actions and enterprises, not just to the society but also to the institutions that contribute to the continuity of their activities. In that sense, two criteria of the Brazilian National Quality Award (PNQ), equivalent to Malcom Baldrige National Quality Award (MBNQA), stand out as more important: Leadership and focus on Results, where transparency and consequently the governance of these organizations are inserted. This research work discusses the inclusion of the theme governance in non-profit organizations and his relationship with PNQ. For that, a revision of the literature is presented on the PNQ Model related to MBNQA as well as concepts and governance theories including non-profit organizations. Two Brazilian cases are presented; contributing to the conclusion that PNQ model is applicable to non-profit organizations specifically for the governance criteria.

#### **3. Environmental Resources Management: Quality and Productivity Improvement Assessment**

**Petros Christofi**, Duquesne University

**Seleshi Sisaye**, Duquesne University

Currently, industrial organizations have undertaken sustainability development programs related to environmental resources management. They address water, air, land use, and other nonrenewable resources. Though these constitute public policy issues, industrial organizations have adopted them in their strategic initiatives in order to add value to the National Gross Domestic Product. In our paper, we will present examples that integrate the principles of Total Quality Management with Social Soundness Analysis, and Environmental Resources Management to broaden the scope of quality and productivity improvement.

#### 4. Influence of Leadership Style on Quality Management Practices

**Tipparat Laohavichien**, Kasetsart University, Department of Operations Management

**Lawrence D Fredendall**, Clemson University

Leadership is important to quality management, but existing leadership theory has not been integrated into existing quality management theory. This paper tests the effects of leadership on the infrastructure quality management practices, the core quality management practices and the quality performance of the firm. A survey of quality managers in the U.S. provided data that was tested using multiple regression analysis. The results show that leadership has a significant effect on the level of infrastructure quality management practices.

#### 5. The role of the consultant in the implementation process of management systems

**Albena R Iossifova**, University of Minnesota

**Kingshuk K Sinha**, University of Minnesota

The paper investigates the impact of the consultant's style on the quality of ISO 9000 and ISO 14000 implementation, based on several case studies.

**SAT/Apr 30** 3:45 pm- 5:15 pm

Session **SE10: RFD Technologies: The Impact on Operations** (Invited)

Track: **ERP**

Ohio Room (6th Floor, South)

Chair: **M.A. Venkataraman**

#### 1. RFID Technologies: The Impact on Operations - A Panel Discussion

**M.A. Venkataraman**, Indiana University

This session will provide an overview of the emerging area of RFID technologies and its impact on operations. Areas explored will be possible research avenues and curriculum development. The panelists are: Vince Mabert (Kelley School of Business, Indiana University); Frank Akaiwa (Kelley School of Business, Indiana University); Doug Blocher (Kelley School of Business, Indiana University); and Ashok Soni (Kelley School of Business, Indiana University).

**SAT/Apr 30** 3:45 pm- 5:15 pm

Session **SE11: Retail Operations Strategy** (Invited)

Track: **Operations Strategy**

Onyx Room (2nd Floor, North)

Chair: **Gregory Heim**

#### 1. Estimating Physical Inventory When There is Shrinkage

**Nicole DeHoratius**, University of Chicago

**Adam Mersereau**, University of Chicago

**Linus Schrage**, University of Chicago

The existence of inventory record inaccuracy makes it difficult for retailers to know with certainty the exact quantity of inventory available on store shelves. Inventory record inaccuracy is costly in that retailers may order more than they need, incurring holding costs, or could fail to order when they should, lost sales. In fact, nearly 12% of the SKUs audited at a one retail chain were out of stock at the store while the inventory record showed a positive on-hand amount. We derive a method of estimating the distribution of actual inventory, based on historical ordering and sales data, a probabilistic model of shrinkage, and using Bayes theorem. We show that it is feasible to track a distribution of the physical inventory that takes into account the existence of record inaccuracy and demonstrate the benefit of basing ordering decisions on this

distribution of actual inventory.

## 2. Contracting for Improved Retail Supply Chain Execution

**Nicole DeHoratius**, University of Chicago

**Canan Savaskan**, Northwestern University

Companies have invested substantial amounts of money to automate their inventory management process. However, current empirical research on this topic has shown that information used by these automated systems can have substantial errors. Such errors directly impact both supply chain profits as well as the customer service. We examine the incentives supply chain parties have to invest in the quality of order delivery (on-time, right quantity, right product, etc.) in a single manufacturer - single retailer supply chain. In particular, we investigate some of the contracts used in practice (linear wholesale, buy back, revenue sharing, and quantity discounts) and study the impact of supplier monitoring on supply chain profits.

## 3. Trade Promotions as a Driver of Operations Strategy: A Theoretical Framework and Propositions for Future Research

**Gregory R Heim**, Boston College

Many consumer goods manufacturers today are planning new systems to manage their trade promotions processes, which have been estimated to consume approximately 20% of manufacturer gross sales. Manufacturer best practices to date for managing promotion expenses have involved spreadsheets for tracking thousands of costs and service agreements. Most manufacturers possess little ability to track whether promotional service agreements made with retailers are faithfully carried out. Examples abound of retailers consciously breaking service agreements to serve their own interests. Historically this problem was owned by marketing and sales, yet new trade promotions management initiatives are enterprise-wide efforts to integrate the supply chain, finance, and marketing to resolve these problems. This paper proposes a research framework for operations strategy implications of trade promotions management. The framework serves as the basis for a set of research propositions and a research agenda identifying critical operational issues in trade promotions management.

**SAT/Apr 30** 3:45 pm- 5:15 pm

Session **SE12: Distinguished Panel: A Supply Chain Framework for the OM Discipline** (Invited)

Track: **Innovations in Teaching**

Valencia East (Lobby Level)

Chair: **Sanjay Ahire**

## 1. A Supply Chain Perspective of the POM Academics – Strategies to Enhance the Total Value Proposition

**Sanjay Ahire**, University of Dayton

As we train executives and advise industries to optimize the values of their supply chains, it is definitely time to introspect on the status of the POM field. Why not apply the same concepts to help move our own field forward in the market competition of various academic disciplines? This panel will view POM programs and teaching from the Supply Chain Perspective. Speakers will identify short and long-term strategies to enhance the total-value proposition from three dimensions: supply (students), production and operations/processes (actual program or field strategies and operations/processes for more relevant and higher-quality outcomes), and customers (industry, academic and other nonprofit employers). The panelists will be: Wickham Skinner, Harvard Business School; Sunil Chopra, Northwestern University; David Obergefell, United States Gypsum; Richard Miller, General Electric; Robert Sheehan, Sinclair Community College; and Ned D. Young, Sinclair Community College

**SAT/Apr 30** 3:45 pm- 5:15 pm

Session **SE13: Tutorial - Beyond Lean: Reducing Lead Time for Low-Volume and Custom-Engineered Products Using QRM & POLCA** (Invited)

Track: **Operations Planning, Scheduling and Control**

Valencia West (Lobby Level)

Chair: **Rajan Suri**

## 1. Tutorial - Beyond Lean: Reducing Lead Time for Low-Volume and Custom-Engineered Products

## Using QRM & POLCA

**Rajan Suri**, University of Wisconsin

Although Lean Manufacturing techniques can be powerful in certain situations, for companies making low-volume or custom-engineered products, Lean Manufacturing has several drawbacks. Quick Response Manufacturing (QRM) can be a more effective competitive strategy for companies targeting such markets. We provide an overview of QRM strategy which focuses on lead time reduction throughout the enterprise. We explain why Lean strategies of Flow, Takt time and Pull don't work well for these markets, and why QRM is more applicable. We describe POLCA, a material control system to be used as part of QRM. We show why a kanban system (used in Lean Manufacturing for material control) is not appropriate for these markets. Instead, POLCA provides an effective method to support both manufacturing and material control for companies serving these markets. The combination of QRM and POLCA provide companies with competitive advantage through their ability to deliver customized products with short lead times.

**SUN/May 1** 9:30 am-11:00 am

Sullivan Room (8th Floor, South)

Session **SUB1: Bullwhip Effects** (Contributed)

Track: **Supply Chain Management**

Chair: **Marc Lambrecht**

## 2. Factors Affecting Demand Amplification in Supply Chains

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

Using computer simulation models, this study investigates the factors that are believed to affect demand amplification and examines their effects on the variability of orders in supply chains. When there are multiple levels of echelons in supply chains, information sharing and coordination within and across the organizations are essential to reduce demand amplification. Sharing of accurate demand information leads to a better matching of supply and demand so that mismatch cost between supply and demand can be reduced. When few intermediaries are involved in a supply chain, a factory's activities tend to fluctuate as the actual demand changes. Market responsiveness or agility is a useful principle to dampen the bullwhip effect when there are few intermediaries involved in a supply chain.

## 3. A study comparing the effect of static and dynamic pricing approaches on sales variability and the bullwhip effect

**James W Hamister**, University at Buffalo

**Nallan C Suresh**, University at Buffalo

A significant cost driver in supply chain management is the bullwhip effect. Adopting static pricing models, sometimes referred to as Everyday Low Pricing (EDLP) has been suggested to reduce the impact of pricing behavior on increasing sales variability.

This research suggests that when demand is an autoregressive (AR1) process, static pricing yields higher demand volatility and lower profitability than does dynamic pricing. An optimal price and stocking level policy is developed for AR1 demand processes with normally distributed demand. A simulation model is used to compare static and dynamic pricing behaviors, using parameters extracted from supermarket scanner data. Results of the simulation suggest that sales variability can be reduced up to 19% in practice with dynamic pricing. This research contributes to the literature in establishing that EDLP approaches may be suboptimal in reducing bullwhip when demand is autocorrelated.

## 4. Reverse Bullwhip Effect in Pricing

**Ertunga C Ozelkan**, University of North Carolina at Charlotte

**Metin Cakanyildirim**, University of Texas at Dallas

This study analyzes the impact of procurement price variability on the retail prices. Procurement prices may fluctuate over time, for example when the supply chain players deploy auction type procurement mechanisms. Both simultaneous and sequential gaming scenarios are investigated here to show that there is an increase in retail price variability and a reverse bullwhip effect on prices under certain demand conditions.

## 5. Win-win policies for the bullwhip problem

**Robert N Boute**, KULeuven

**Stephen M Disney**, Cardiff Business School

**Marc R Lambrecht**, KULeuven

**Wim Van de Velde**, Procter and Gamble Services Company NV

**Van Houdt Benny**, University of Antwerp

We focus on a downstream inventory control policy that reduces the variation of upstream orders by generating a smooth order pattern. As a consequence the manufacturer (upstream) can smooth his production. However, a replenishment rule not only affects the order variability, but it also has an impact on the variance of the net stock downstream. More specifically, dampening variability in orders forces the safety stock to increase due to inventory variance increases. This is the key trade-off faced by the members of a supply chain. We can turn this conflicting issue into a win-win situation for both members of the supply chain when we treat the lead time as an endogenous variable. This way the variability in orders influences the replenishment lead time distribution. Since a less variable order pattern generates shorter and less variable lead times, smoothing orders has a dampening effect on the retailer's safety stock.

**SUN/May 1** 9:30 am-11:00 am

Holabird Room (8th Floor, South)

Session **SUB2: Channel Structure in Competitive and Complementary Supply Chains (Invited)**

Track: **Information and Contracting in Supply Chains**

Chair: **Stephen Gilbert**

### **1. The Contract Transformation: A Framework for Network Supply Chain Analysis**

**Pranab Majumder**, Duke University

**Shok Srinivasan**, IIM

We propose a stylized framework in order to analyze large supply chain networks. This framework applies to multiple supply chains, each with multiple retail outlets, multiple markets, and competition between the supply chains in these markets. Using this framework, we first consider a problem that is motivated by Japanese keiretsu, or industrial conglomerates. When two such conglomerates compete, there is horizontal competition between the conglomerates, but also a degree of vertical competition within the conglomerate. We then consider a problem that is motivated by multinational firms competing in multiple countries. In such cases, decisions regarding the supply chain may affect the competitiveness and market share of the firms across different countries. Finally, we propose how this framework can be used to look at a variety of other supply chain problems.

### **2. Joint Pricing-Production Decisions in Supply Chains of Complementary Products with Uncertain Demand**

**Yunzeng Wang**, Case Western Reserve University

Consider  $n$  manufacturers, each producing a different product and selling it to a market. The  $n$  products are perfectly complementary to each other, and their demand is both price-sensitive and uncertain. We explore how channel structure affects firms' individual price-production decision and profitability. Channel structure is parameterized by the number of firms involved, the sequence of decision-making among the firms, and the involvement of a retailer, etc.

### **3. A Simple Newsvendor Bounds Heuristic for Production-Distribution Systems**

**Erik Lystad**, Georgia Institute of Technology

**Mark Ferguson**, Georgia Institute of Technology

We consider the classic arboreal multi-echelon distribution system under periodic review. In the absence of ordering costs, we show that a base stock policy heuristic based on simple upper and lower newsvendor bounds provides solutions that are reasonably close to optimal and outperform previous approximations over a range of settings. In comparison to previous methods, our approach is intuitive, easily implementable, and lends itself to clean observations on the effect of parameter changes on the stocking levels and inventory costs. We show that this scheme may be useful in a number of supply chain contexts; for instance we investigate the proper extent of delayed differentiation without resorting to the common use of a decoupling assumption.

### **4. Channel Structure under the Presence of Complementary Products**

**Stephen M Gilbert**, University of Texas at Austin

**Xiaohui Xu**, University of Texas at Austin

Many firms produce products that are subject to complementarities from products provided by other firms. For example, the demand for the Playstation, the video game player that is produced by Sony, increases in the availability of video games. We examine how such complementary effects can influence a firm's decisions about the structure of its channels of distribution. In particular, we show that, by selling through intermediaries, a firm can credibly commit to higher levels of output in order to stimulate production of complementary products which indirectly increases its own profitability.

**SUN/May 1** 9:30 am-11:00 am

Wright Room (8th Floor, South)

Session **SUB3: Advances In Service Parts Supply Chain Optimization (Invited)**

Track: **Uncertainty in Integrated Supply Chains**

Chair: **Kathryn Caggiano**

### **1. A Military Analysis of Capacitated Service in Multi-Echelon Inventory Systems**

**Ben Van Roo**, University of Wisconsin-Madison

We discuss the design and placement of service capacity to support a multi-echelon, -item, -indentured inventory system in a military setting. The performance of a network of decentralized maintenance facilities is compared to a spectrum of alternative two-echelon base-depot networks. Our approach combines a MILP for determining facility locations with a METRIC-style model to determine finite repair capacity and inventory optimization. We present trade-offs between costs, capacity, and service.

### **2. New Frontiers in Service Supply Optimization (Part I)**

**Andrew J Huber**, Xelus, Inc

**John A Muckstadt**, Cornell University

Every year billions of dollars are spent on the purchase and management of service parts. Despite considerable financial investment and attention from management, spare part shortages continue to cause significant delays in returning inoperable equipment to functional use. At the same time, service organization are exploiting high-margin recurring profit opportunities associated with service, creating the need for improved performance. We will explore the complexities of service parts supply chains and provide an overview of a unified modeling environment being deployed in commercial software. Specific issues to be discussed include: Managing competing service objectives associated with contracts, products, and geographies; Delivering differentiated service levels for different customer classes; Minimizing incremental spend and stock level fluctuations; and sourcing customer demands from multiple types of locations in a service supply hierarchy.

### **3. New Frontiers in Service Supply Optimization (Part II)**

**John A Muckstadt**, Cornell University

**Kathryn E Caggiano**, University of Wisconsin-Madison

**Peter L Jackson**, Cornell University

**James A Rappold**, University of Wisconsin-Madison

We will introduce the application of time-based service level constraints in multi-echelon multi-item systems. This approach enables system stock levels and positioning of individual items to reflect the restore-time objectives associated with service contracts. Jack will describe the environment and the model formulation, as well as illustrate through the use of examples the implications of stocking decisions on customer experience

### **4. Integrated Real-Time Capacity and Inventory Allocation for Repairable Service Parts in a Two-Echelon Supply System**

**Kathryn E Caggiano**, University of Wisconsin-Madison

**John A Muckstadt**, Cornell University

**James A Rappold**, University of Wisconsin-Madison

We develop an integrated real-time model for making repair and inventory allocation decisions in a two-echelon repairable service parts system. We formulate the decision problem as a finite-horizon, periodic-review mathematical program, we show it can be formulated as a large-scale linear program, and we develop a practical heuristic method for solving the problem approximately. By simulating the

operation of a service parts supply chain, we demonstrate the value of employing integrated decision models over using separate repair and inventory allocation rules for a range of environments where inventory imbalances exist.

**SUN/May 1** 9:30 am-11:00 am

Burnham Room (8th Floor, South)

Session **SUB4: Inventory Trading, Bidding, and Rationing in a Supply Chain (Invited)**

Track: **Logistics, Distribution Channels, and Inventory Systems** Chair: **Hui Zhao**

## **1. How Should One Sequence Suppliers' Bids**

**Xinxin Hu**, University of Michigan

**Izak Duenyas**, University of Michigan

**Roman Kapuscinski**, University of Michigan

Consider a single retailer facing uncertain demand. Before demand is revealed, the retailer places orders with any subset of two suppliers, who compete through wholesale prices. The suppliers may decide to produce more than retailer originally ordered and offer additional quantities to retailer after demand is realized, if needed. The additional quantities are sold at the initial wholesale price. For retailer, ordering quantities and the sequence of offers are interrelated. Given that the two suppliers may differ in their capacities and costs, we investigate in what sequence the retailer should negotiate the contracts with the suppliers. When is it better for retailer to ask the suppliers for simultaneous bids? If sequential bids are better, how do the suppliers' costs and capacities influence the preferred sequence?

## **2. Optimal Policies for Retailers in the Presence of A Trading Market**

**Hui Zhao**, Purdue University

**Arnab Bisi**, Purdue University

With the help of internet and express delivery at relatively inexpensive costs, trading markets have become increasingly popular among retailers as a venue to sell excess inventory and a source to obtain products at lower prices. In this paper, we study retailers' optimal ordering and trading policies in the presence of both the manufacturer and a trading market in a periodic-review, finite-horizon setting in which the retailers dynamically update the demand distributions. Prices in the trading market change periodically with the demand and supply in the market. We first characterize and develop a solution technique for retailers' optimal ordering and trading policies when they face no entrance fee to participate in the trading market. We then extend the model and characterize retailers' optimal policies when they face entrance fees for selling in the trading market.

## **3. Using Imperfect Demand Information in Production-Inventory Systems with Multiple Demand Classes**

**Francis de Véricourt**, Duke University

**Jean-Philippe Gayon**, Ecole Centrale de Paris

**Saif Benjaafar**, University of Minnesota

We consider a make-to-stock supplier who operates a production facility with limited capacity. The supplier receives orders from customers belonging to several demand classes. Some of the customer classes share imperfect advance demand information with the supplier by announcing their orders ahead of their due date. Customer classes vary in their demand rates, expected due dates, and lost sales costs. The supplier must constantly decide whether or not to produce, and, whenever an order becomes due, whether or not to satisfy it from on-hand inventory. We formulate the problem as a Markov decision process and characterize the structure of the optimal policy. From numerical results, we obtain several insights into the value of both advance demand information and inventory rationing

## **4. An Analysis of Emergency Transshipments in Decentralized Dealer Networks**

**Hui Zhao**, Purdue University

**Vinayak Deshpande**, Purdue University

**Jennifer Ryan**, University of Notre Dame

In recent years, inventory transshipment among the dealers in a distribution network has drawn increased attention from both practitioners and researchers. From a dealer's perspective, transshipment decisions

have two components: when to fill transshipment requests from other dealers (the filling decision) and when to send a transshipment request to other dealers (the requesting decision). Surprisingly, most of the previous literature on transshipment, as well as most transshipment policies commonly used in practice, does not fully consider both the requesting decision and the filling decision, by assuming that transshipment is sought only when a dealer stocks out. In this paper we develop optimal inventory transshipment policies that incorporate both the demand filling and requesting decisions.

**SUN/May 1** 9:30 am-11:00 am

Adler Room (2nd Floor, North)

Session **SUB5: Project Management** (Contributed)

Track: **Operations Planning, Scheduling and Control**

Chair: **Willy Herroelen**

## **1. Project Management at POMS: Managing the POMS Annual Conference**

**James P Gilbert**, Rollins College

Planning for the annual meeting of the Production and Inventory Control Society (POMS) starts fifteen months in advance of the scheduled meeting dates. This paper looks at the planning and management aspects of putting on a meeting for 400 to 600 participants. Starting with POMS Board approval of the site city, this paper illustrates the project process of managing large budget items such as hotel selection, audio-visual contracting, and banquet/food event planning. Critical to a successful annual conference are the appointments of the conference planning team. Aspects of the call-for-papers, program publicity, web support, meeting room planning, programs booklets, and awards, among others, are illustrated. We see the complexity of project management in action here at POMS.

## **2. Optimal and heuristic procedures for time buffer allocation in solution robust project scheduling.**

**Stijn Van de Vonder**, K.U.Leuven

**Erik Demeulemeester**, K.U.Leuven

**Willy S Herroelen**, K.U.Leuven

Solution robust project scheduling is a growing research field aiming at constructing proactive schedules to cope with multiple disruptions during project execution. We will focus on activity duration disruptions. In this case, including time buffers between activities is a proven method to improve the stability of a baseline schedule. This paper introduces multiple algorithms to include time buffers in a given schedule while a predefined project due date remains respected. An optimal (minimal stability cost) buffer allocation procedure is provided. Due to the computational difficulty of the problem, also multiple efficient heuristic and meta-heuristic procedures are proposed. An extensive simulation-based analysis of the performance of all algorithms is given. The impact of the activity duration variance structure on the performance is discussed in detail.

## **3. Stable resource allocation heuristics for resource-constrained project scheduling under uncertainty**

**Kristof Braeckmans**, K.U.Leuven

**Erik Demeulemeester**, K.U.Leuven

**Willy S Herroelen**, K.U.Leuven

The objective of our research is to develop proactive heuristics for allocating renewable resources to project activities of a given baseline schedule in order to maximize its stability. The way in which resources are passed on between project activities in a baseline schedule can be described by a resource flow network. During project execution these resource flows affect the propagation of the schedule disruptions throughout the schedule. We develop several integer programming based models and heuristics for generating the resource flows such that the stability of the baseline schedule is maximized. As a measure of stability we use the expected sum of the weighted absolute deviations between the planned and realized activity start times. We report on computational results on a set of benchmark problems.

## **4. Proactive and reactive strategies for the RCPSP with uncertain resource availabilities**

**Erik Demeulemeester**, K.U.Leuven

**Olivier Lambrechts**, K.U.Leuven

**Willy Herroelen**, K.U.Leuven

We study the resource-constrained project scheduling problem where the renewable resource availabilities are subject to unforeseen breakdowns. Project instability, defined as the weighted absolute deviation between planned and realized activity start times, depends on both the proactive strategy used to develop the baseline schedule and the reactive strategy used during schedule execution.

We develop and evaluate four proactive and five reactive strategies to minimize project instability while meeting the project due date set by the project's client. Computational results obtained by the various proactive-reactive scheduling procedures on the well-known PSPLIB instances will be reported.

**SUN/May 1** 9:30 am-11:00 am

Session **SUB6: NPJ and Knowledge Transfer (Invited)**

Track: **New Product and Technology Management**

Michigan Room (6th Floor, South)

Chair: **Janice Carrillo**

### **1. Knowledge Transfer in the Presence of Forgetting**

**Gulru Ozkan**, Georgia Institute of Technology

**Cheryl Gaimon**, Georgia Institute of Technology

Models are introduced to analyze the dynamic strategies pursued by profit maximizing firms that seek to increase employee knowledge by hiring consultants who serve as a source for knowledge transfer. The firm earns net revenue in relation to the knowledge level of its employees. Therefore, knowledge transfer indirectly increases revenue. The pursuit of knowledge transfer, however, causes disruption to the firm's production processes and forgetting complicates the situation. We show that firm has control over the actual disruption costs and the rate of forgetting has significant impact on the knowledge transfer and on the accumulated base level of knowledge. Key questions that arise include what level of consultancy knowledge to employ, over what period of time should the consultants be employed, at what rate should the firm invest in knowledge transfer, with what rate should the level of consultancy knowledge be decreased and how forgetting effects knowledge transfer.

### **2. Product line design problem with multiple custom and common attributes**

**Kim Kim**, Sogang University

**Dilip Chhajed**, University of Illinois at Urbana-Champaign

Use of commonality or common features among products in a line is a popular design practice and examples of this can be found in many product categories ranging from automobiles to service goods to household appliances. We present an analytic model of product line design with multiple custom and common attributes that addresses the tradeoff relationship associated with commonality: cost saving versus product differentiability. From the model, we derive the specifications of optimal product line design, and show how the commonality affects the implementability of the first best solution and how the commonality benefits the firm and consumers simultaneously.

### **3. Matching Product Architecture with Supply Chain Configuration**

**Sezer Ulku**, Georgetown University

**Glen M Schmidt**, Georgetown University

While a modular product may reduce the need for collaboration and lead to more product variety, it may sacrifice performance and cost as compared to an integral design. We investigate whether a product should be more or less modular as a function of the degree of outsourcing, the buyer/supplier contract structure, the firms' capabilities, and inter-firm coordination costs.

### **4. The Optimal Pace of Product Updates**

**Cheryl T Druehl**, University of Maryland

**Glen M Schmidt**, Georgetown University

**Gilvan C Souza**, University of Maryland

Some firms (such as Intel and Medtronic) use a time-pacing strategy for new product development, introducing new generations at regular intervals. If the firm adopts a fast pace (introducing frequently) then it prematurely cannibalizes its old generation and incurs high development costs, while if it waits too long, it fails to capitalize on customer willingness-to-pay for more advanced technology. We develop a

model to gain insight into which factors drive the pace. We consider the degree to which a new generation stimulates market growth, the rate at which it diffuses (its coefficients of innovation and imitation), the rate of decline in its margin over time, and the cost of new product development.

### **5. NPD Pipeline Management with an Endogenous Budget**

**Raul O Chao**, Georgia Institute of Technology

**Stylianos Kavadias**, Georgia Institute of Technology

**Cheryl Gaimon**, Georgia Institute of Technology

Developing the right new products is critical to firm success and is often cited as a key competitive dimension. This paper addresses the link between new product development (NPD) pipeline strategy and firm success. We develop an analytical model to explore how a firm allocates resources between incremental and revolutionary product development projects in the pipeline in the presence of an endogenous budget. Our results indicate that the optimal balance depends on two contextual parameters: i) market competitiveness for the existing product, and ii) the firm's experience regarding the existing product. We show that the new product potential drives firm strategy. We provide managerial guidelines that highlight the following: which product(s) should be the focus of the firm's effort, and how this focus should change over time.

**SUN/May 1** 9:30 am-11:00 am

Illinois Room (6th Floor, South)

Session **SUB7: Research on New Product Development (Invited)**

Track: **Product and Service Innovation**

Chair: **Debashish Mallick**

### **1. Managing Risks in the New Product Development Portfolio: A Study of Late Stage Failures in the Pharmaceutical Industry**

**Karan Girotra**, University of Pennsylvania

**Christian Terwiesch**, University of Pennsylvania

**Karl T Ulrich**, University of Pennsylvania

Long lead times, inflexible resources and high failure rates expose pharmaceutical firms to substantial risks arising out of uncertain drug development outcomes. In this study, we identify and estimate the impact of these uncertain outcomes on the valuation of pharmaceutical firms. We conduct an event study around the failure of Phase III clinical trials and identify key portfolio properties that influence the impact of a failure on the pharmaceutical firm's value. Specifically, we find- (i) the utilization of development resources at the time of the failure plays a key role in determining the impact of a failure on firm value (ii) the impact of a failure is mitigated if backup projects were initiated. Our findings provide a useful framework to assess and limit the consequences of uncertain product development outcomes.

### **2. New Product Development: Impact of Innovation Strategies, Organization Learning and Market Condition**

**Sameer Kumar**, University of St. Thomas

We report a study on the impact of New Product Development (NPD) innovation strategies, organizational learning and market conditions. The results of the study show that [1] combining both innovative and customer-responsive strategies improve probability of product success when a new product is launched into a market; [2] organization learning and knowledge management can improve both NPD process success and NPD project success; and [3] the shrinking product life cycles force companies to adjust their market strategies to compete with more product differentiation rather than price battling, and to race in time-to-market by reducing their product development times. The study discovers that companies implementing innovation strategy are more competitive in the long run while those that follow customer-responsive strategy are more likely to have higher return on investment within a shorter time.

### **3. Product and Process Design: Success or Failure?**

**Daniel R Heiser**, DePaul University

**Charles Petersen**, Northern Illinois University

**Lori S Cook**, DePaul University

**Gerry Aase**, Northern Illinois University

Product and process design is important for firms to gain and maintain their competitive position in the global marketplace. This study examines the following research questions: a) what are the most important factors for successful product and process design, b) what are the most common causes of product and process design failure, and c) what will be the greatest challenges and/or opportunities over the next decade? Results from a survey of 220 North American managers will be presented.

#### **4. A CONTINGENCY APPROACH TO MANAGING NEW PRODUCT DEVELOPMENT**

**DEBASISH N MALLICK**, University of Minnesota

**Roger G Schroeder**, University of Minnesota

Faced with increased competition, rapidly changing technology and market, firms are under tremendous pressure to improve their new product development (NPD) performance. Increasingly, firms are adopting "best practice" NPD approaches popularized by the practitioner and academic literature as a quick fix. We question this "one-size-fits all" approach and propose a contingency approach to managing NPD projects. We draw upon contingency theory and information-processing theory to study the effect of project characteristics on the relationship between development strategy and development performance. We use a database of 300 NPD projects from ten countries to examine the effect of strategic fit between (1) product development project, (2) product development process, and (3) product development infrastructure (i.e., development team and supporting technologies) on NPD performance. Our findings provide new insights into the critical role of people, process and technologies in managing new product development.

**SUN/May 1** 9:30 am-11:00 am

St. Clair Room (6th Floor, South)

Session **SUB8: Panel Discussion: Transferring Manufacturing Research Knowledge to the Service Sector** (Invited)

Track: **Service Operations Management**

Chair: **Tim Smunt**

#### **1. Panel Discussion: Transferring Manufacturing Research Knowledge to the Service Sector**

**Timothy Smunt**, Wake Forest University

Four operations professors (Asoo J. Vakharia, University of Florida; F. Robert Jacobs, Indiana University; Roger W. Schmenner, Indiana University; and Tim Smunt, Wake Forest University) who are or were mainly involved in manufacturing operations management research will first present their ideas on how research on managing manufacturing operations can be applied to service operations. After these four short presentations, the panel will open the discussion to the audience for debate on the similarities and differences between the two related fields of study. The specific topics that will be presented by the panel to start the discussion and debate are: •Tracing the commonalities that exist in defining operations strategy, conceptualizing processes, and thinking about productivity between manufacturing and service businesses. •Applying constraint scheduling concepts to service sector problems. •Evaluating the arguments made in the service management literature that generalizable approaches for managing service operations cannot be implemented successfully.

**SUN/May 1** 9:30 am-11:00 am

Hebron Room (2nd Floor, North)

Session **SUB9: Lean Production Systems** (Invited)

Track: **Lean Production Systems**

Chair: **Rachna Shah**

#### **1. Lean Production and Performance**

**Stephen Wood**, University of Sheffield

**Lilian de Menezes**, City University

Studies of the effects of lean production on performance are in their infancy. This paper reports research designed to test different perspectives on lean production. In particular between viewing lean production as a set of practices or as a philosophy. The study uses data from a large representative sample of workplaces across the UK economy. Using latent variable analysis the authors are able to show that aspects of lean production are used in an integrated way, and an orientation does underlie elements of it,

but not all. This orientation is significantly more associated with performance than are the measures of the collective use of practices. The strongest relationship is with productivity change. Synergistic effects between practices were not found

## **2. Gender Differences in Lean Production**

**Robert Conti**, Bryant University

**Jannis J Angelis**, University of Oxford

**Colin Gill**, University of Cambridge

**Cary Cooper**, Lancaster University

**Brian Faragher**, UMIST

A large scale earlier study investigated the relationships between worker job stress and the conditions that workers were exposed to – a set of twenty lean production work practices and the degree of lean implementation. Statistical analysis revealed significant associations between job stress and eleven of the work practices. An unexpected non-linear, convex relationship between job stress and the level of implementation was identified. A total of 1,391 workers responded to our survey – 1,063 men and 328 women. As an extension of the study, the total sample was split by gender and the statistical analyses repeated for men and women. There were significant gender differences in both the associations between stress and work practices and the relationship between stress and the level of lean implementation. These differences are discussed in the context of relevant gender behavioral research.

## **3. Lean Production System – A stipulative definition**

**Rachna Shah**, University of Minnesota

**Peter Ward**, Ohio State University

This study is an initial attempt to provide conceptual and theoretical clarity to lean production system (LPS) given the enormous confusion surrounding it in academic and practitioner literature. We build on existing agreement related to lean practices and use “configuration theory” and “implementation orientation” to develop a testable model of LPS. We use pilot data and an iterative exploratory factor analysis (EFA) to extract ten underlying sub-dimensions of a LPS. We examine two complementary models during the confirmatory phase to validate the results obtained from EFA. We use data from 271 manufacturing firms and confirmatory factor analysis to examine measurement properties, reliability, convergent and discriminant validity of the underlying sub-dimensions that represent LPS. The recommended ten factor instrument containing 41 items is a reliable and valid tool to measure lean production for future researchers and should also help managers self evaluate their own progress in

## **4. Assessing lean practices for service processes**

**Susan Meyer Goldstein**, University of Minnesota

**Rachna Shah**, University of Minnesota

Many manufacturing firms have embraced the concepts and principles of lean manufacturing, and their experience with using these principles as their operations plan has been discussed and investigated in the literature. Much less attention has been devoted to the application of lean principles to service processes. We argue that the hallmark of lean service processes is that customer contact provides opportunities for enhancing customer value rather than burdening the organization with operational costs. Collier and Meyer (1998) provide a matrix which positions service offerings and service processes on a continuum. Opportunities for applying lean concepts become apparent by understanding the definitions of their matrix axes. Provider routed services are designed for efficiency but can entail lean characteristics as customers gain more variety in service offerings while the number of pathways (designed by management) remains small. Customer routed services are customer-responsive but can provide

**SUN/May 1** 9:30 am-11:00 am

Session **SUB10: Healthcare Operations Management I** (Invited)

Track: **Health-Care Operations**

Ohio Room (6th Floor, South)

Chair: **Marie Matta**

## **1. Scheduling Surgical Suites: The Effect of Constraints on the Daily Schedule Performance**

**Luis G Vargas**, University of Pittsburgh

**David P Strum**, Queen's University

Surgical procedures that have uncertain durations are typically scheduled with both hard and soft constraints. We examine the effect of selected constraints on daily schedule outcomes using scheduling heuristics and partially validate our approach using historical case records from a large academic medical center.

## **2. Factors Influencing the Decision to Schedule a Prostate Cancer Screening Exam**

**Matthew J Liberatore**, Villanova

**Robert L Nydick**, Villanova

**Ronald E Myers**, Thomas Jefferson University

This presentation discusses a study of decision making about scheduling a prostate cancer screening exam. Participants were 129 men enrolled in two studies of decision counseling in prostate cancer screening. A baseline survey was administered to collect sociodemographic data and measure perceptions about prostate cancer and screening. In a subsequent decision counseling session, survey respondents identified factors that were likely to influence personal choice to schedule an exam or not to schedule an exam. Univariable and multivariable analyses were performed to identify independent predictors of the decision. Among study participants, 85 (65.9%) men decided to schedule a prostate cancer screening exam, 44 (34.1%) men decided not to schedule or were unsure about scheduling an exam. Multivariable analyses showed that men who viewed prostate cancer screening as a salient and important behavior (OR=4.37) were more likely to decide in favor of scheduling a screening exam.

## **3. Optimization modeling of hospital operating room planning using a logistic perspective**

**Marie J Persson**, Blekinge Institute of Technology, School of Engineering

**Jan Persson**, Blekinge Institute of Technology, School of Engineering

There is a growing proportion of elderly which increases the demand for health care. As a consequence health care costs are rising and the need for hospital resource planning seems urgent. Different aspects (often conflicting) such as patient demand, clinical need and political ambitions must be considered. In this paper we analyze hospital surgical suite with focus on operating room planning and we suggest optimization modeling to support allocation of key resources. Medical examinations and treatments of patients are performed using a number of resources similar like products are refined in a number of processes in a logistic chain. Optimal resource allocation giving different objectives according to patient perspective, staff perspective, costs etc. under different system settings (e.g. principals for operating room allocation and amount of stand-by personnel) is proposed. Preliminary results are presented based on case studies from Swedish, both general and university hospitals.

## **4. Scheduling Outpatients in a Diagnostic Testing Center**

**Marie Matta**, The George Washington University

**Salah Elmaghraby**, North Carolina State University

This study focuses on the management of patient flows through a network of testing facilities at a major hospital. The multiprocessor open shop (MPOS) scheduling problem is NP-complete. A special case of a MPOS, a proportionate one, is examined as it relates to the machine environment of outpatient testing facilities in a hospital. A three-phase algorithm is developed that determines stage capacity, selects jobs from a wait list, and schedules jobs according to the criterion of minimizing makespan. A novel genetic algorithm is developed to schedule jobs on the proportionate MPOS and is tested on a carefully crafted set of problems. Computational results are discussed.

**SUN/May 1** 9:30 am-11:00 am

Session **SUB11: Operations Strategy in the Service Economy** (Invited)

Track: **Operations Strategy**

Onyx Room (2nd Floor, North)

Chair: **Joel Goldhar**

## **1. Operations Strategy in the Service Economy - A Panel Session**

**Joel D Goldhar**, Illinois Institute of Technology

**Mei Xue**, Boston College

The strong growth of the service economy and rapid changes in service operations enabled by the

advancement of technology require an updated review of service operations strategy and a discussion of future directions. Key issues include the following. First, how different are service operations strategies from manufacturing operations strategies? Are they becoming more or less different? Second, how has management science/decision science been applied in service operations strategy and what are the possible new applications? Third, with the ever-increasing demand for service management in business education, what are the challenges facing educators who offer a service operations course and how should they be addressed? Finally, what do we really know about service operations strategy and what do we still need to learn? The Panelists are: Paul R. Kleindorfer (Wharton School); Michael Pinedo (Stern School); Aleda V. Roth (Kenan-Flagler Business School); and Chris A. Voss (London Business School).

**SUN/May 1** 9:30 am-11:00 am

Valencia East (Lobby Level)

Session **SUB12: Forward Integration Efforts for OM Academics** (Invited)

Track: **Innovations in Teaching**

Chair: **Robert Amsden**

### 1. A New Supply Chain Approach to Identifying and Preparing Tomorrow's Operations Management Professionals - A Workshop

**Peter G Wagner**, University of Dayton

**Robert T Amsden**, University of Dayton

**Robert Sheehan**, Sinclair Community College

We describe a newly evolving partnership arrangement of the University of Dayton and Sinclair Community College serving as a nucleus for extended backward and forward integration of educational opportunities for prospective operations management professionals. We present ways in which the partnership differs from traditional articulation agreements to give students greater opportunities to transition to professional positions in operations management.

**SUN/May 1** 9:30 am-11:00 am

Valencia West (Lobby Level)

Session **SUB13: TUTORIAL - From Models to Decision Support Systems** (Invited)

Track: **Decision Support Systems**

Chair: **Ravindra Ahuja**

### 1. TUTORIAL - From Models to Decision Support Systems

**Ravindra K Ahuja**, University of Florida

In the IE/OR and business school curriculum, students acquire background in modeling, optimization, simulation, database, and programming, but there do not exist courses which teach students how to integrate these technologies to build decision models based information systems, also called decision support systems (DSS). A DSS uses the data residing in spreadsheets and/or databases, models it, processes or analyzes it using problem-specific methodologies, and assists the user in the decision-making process through a graphical user interface (GUI). The tutorial will give an overview of DSS and the need for DSS in the practice of operations research and operations management. We will illustrate using simple examples how to develop Excel VBA based and VB.Net based DSS, and demonstrate an extensive set of DSS case studies we have developed arising in forecasting, inventory, finance, location, sports, and medical applications.

**SUN/May 1** 11:15 am-12:45 pm

Sullivan Room (8th Floor, South)

Session **SUC1: Financial Models** (Contributed)

Track: **Supply Chain Management**

Chair: **Anna Nagurney**

### 1. Risk Management in Supply Chain Operations: An Analytical Approach

**Germaine H Saad**, Widener University

**Paul R Kleindorfer**, University of Pennsylvania

This paper introduces an Analytical Hierarchy Process (AHP) Model that helps mitigate different types of

risks faced in managing supply chains. These include risks resulting from the imbalance between supply and demand of both materials and finished products along the chain, as well as those resulting from disruptions that affect operations. This later category includes SHE risks and those resulting from unintentional, (natural hazards of hurricane, earthquake, floods), and intentional acts, as terrorism. We couple vulnerability discovery process (for both unintentional as well as purposeful acts) with a prioritization process based on AHP. A main feature of the model proposed is the incorporation of both tangible factors that can be easily measured in monetary terms, as well as intangible factors that are much harder to quantify, yet cannot be neglected as they contribute significantly to the outcome achieved. Guidelines for effective implementation of the model will be presented as well.

## **2. Financial Engineering of the Integration of Global Supply Chain Networks and Social Networks with Risk Management**

**Jose M Cruz**, University of Connecticut

**Anna Nagurney**, University of Massachusetts

**Tina Wakolbinger**, University of Massachusetts

In this paper, we focus on the financial engineering of integrated global supply chain networks and social networks. Through a multilevel, dynamic supernetwork framework consisting of the global supply chain network with electronic commerce and the social network, we capture the multicriteria decision-making behavior of the various decision-makers (manufacturers, retailers, and consumers), which includes the maximization of profit, the maximization of relationship values, and the minimization of risk. Increasing relationship levels in our framework are assumed to reduce transaction costs as well as risk and to have some additional value for the decision-makers. We provide some qualitative properties of the dynamic trajectories, under suitable assumptions, and propose a discrete-time algorithm, which yields explicit closed form expressions at each iteration for the tracking of the evolution of the global product transactions, relationship levels, and prices until equilibrium is attained. We illustrate the model and computational procedure with several numerical examples.

## **3. Evaluating Structural Flexibility in Supply Chains**

**Lars Petersen**, Saarland University

**Marcus Schweitzer**, Saarland University

Supply chain design problems are frequently addressed within a static model framework, whereas real-world applications typically exhibit uncertain, dynamic data. As a consequence, adaptability of supply chain structures to evolving environments might prove more important than ultimate optimization with respect to a momentary situation. Installation of storage facilities, improvement of process technologies, and intensification of coordination are examples for suitable measures to enhance adaptability of a supply chain. Based on an inventory model for safety stock placement and operations policy choice, we use a real options approach for evaluating various strategies of flexible supply chain design. To this end, we investigate the applicability of standard strategy types from real options theory to the area of supply chain design, and develop a model for quantifying the respective effects of analogous safety stock deployment schemes in view of uncertain and non-stationary demand and lead time distribution parameters.

## **4. Supply Chain Yield Management Framework: A Network Approach**

**Mehmet Barut**, Wichita State University

The study attempts to construct a framework providing guidance for supply chain managers to effectively manage capacity, and to globally maximize supply chain profitability in order driven environment, where governing the acceptance and rejection of incoming orders has a direct impact on the focal company's supply chain network profitability. It is this research's significance to benchmark current local approaches for a single focal company, and to modify and use them in the development of unified yield management network framework, consisting of both downstream order management and upstream capacity management.

## **5. Bank vs. Trade Credit Financing: The Effect of Financing Sources on Supply Chain Structure**

**Volodymyr Babich**, University of Michigan / Industrial and Operations Engineering

**Goker Aydin**, University of Michigan / Industrial and Operations Engineering

**Pierre-Yves Brunet**, University of Michigan / Industrial and Operations Engineering

**Jussi Keppo**, University of Michigan / Industrial and Operations Engineering

**Romesh Saigal**, University of Michigan / Industrial and Operations Engineering

In countries where monetary institutions are scarce, trade credit (supplier loans) is often the only recourse for financing firm's operations. In countries with developed financial markets, firms rely on both trade credit and bank loans. Using a one-period model with both operational and financial decisions we study how financial constraints, trade credit and bank loan terms, wholesale and retail prices, and fixed costs affect the supplier selection. As one would expect, the firm uses more suppliers if the alternative financing is not available. Surprisingly, we also find that the trade credit limit and the wholesale price affect the number of suppliers in a non-monotone way.

**SUN/May 1** 11:15 am-12:45 pm

Holabird Room (8th Floor, South)

Session **SUC2: Information/Collaboration in Manufacturing Supply Chains** (Invited)

Track: **Information and Contracting in Supply Chains**

Chair: **Douglas Morrice**

### **1. Misplaced Inventory at the Retailer: Information and Coordination**

**Zeynep A Camdereli**, University of North Carolina at Chapel Hill

**Jayashankar M Swaminathan**, University of North Carolina at Chapel Hill

In this paper, we consider an environment where although the items are physically in the store, a proportion of the items become unavailable for sale due to either inaccurate inventory records or misplaced stock keeping units. First, we analyze a centralized case where the manufacturer owns the retailer. Then, we analyze a decentralized case where the retailer and manufacturer act as different parties. We give conditions for coordinating the channel under buyback and revenue sharing contracts. We investigate the effects of investing in information technology to increase in the proportion of availability on retailer and manufacturer profits under different settings.

### **2. Supplier Selection and Sourcing Policies in Remanufacturing Supply Chains**

**Abhijit Gosavi**, University of New York at Buffalo

**Ananth Krishnamurthy**, Rensselaer Polytechnic Institute

**Rakesh Nagi**, University of New York at Buffalo

**Purvin P Shah**, University at Buffalo

We consider the sourcing problem in a remanufacturing supply chain consisting of a single remanufacturing facility receiving supplies of virgin material and remanufactured cores from independent suppliers. We assume that the suppliers and remanufacturing facility have distinct production characteristics, stocking policies and costs. In this setting, optimum sourcing policies that provide the desired service guarantee at the remanufacturing facility are determined. The problem is formulated as a semi-Markov decision process to determine the structure of the optimal policy. Subsequently, queuing models are used to examine the performance of simple threshold-type policies in more general settings. Computational results to support the theoretical models are also presented.

### **4. Impact of Improved Order Information on Product Family Assignments and Set-up Costs in a High-Volume, MTO Operation**

**Douglas J Morrice**, The University of Texas at Austin

**Susan Monkman**, The University of Texas at Austin

This paper addresses a production scheduling problem of a high-volume, make-to-order electronics assembly firm in which different products families are assigned to different identical assembly lines so as to fulfill demand, fully utilize available capacity, and minimize set-up costs due to product changeovers. Factory demand is stochastic but the potential exists to reduce uncertainty in this demand with better coordination and information sharing between order processing, which faces actual customer demand, and the factory. We formulate this situation as stochastic assignment problem and evaluate the impact of better coordination and information sharing between order processing and the factory.

**SUN/May 1** 11:15 am-12:45 pm

Wright Room (8th Floor, South)

Session **SUC3: Strategies For Coping With Uncertainty In Integrated Production-Inventory Supply Chains** (Invited)

Track: **Uncertainty in Integrated Supply Chains**

Chair: **James Rappold**

### **1. Demand Allocation in Systems with Multiple Inventory Locations and Multiple Demand Sources**

**Saif Benjaafar**, University of Minnesota

**Yanzhi Li**, University of Minnesota

**Dongsheng Xu**, Hong Kong University of Science and Technology

We consider the problem of allocating demand that originates from multiple sources among multiple inventory locations. Demand from each source arrives dynamically over time according to a Poisson process. There is a transportation cost associated with fulfilling an order from a particular location that varies from source to source. The inventory locations are replenished from a single production facility with a finite production capacity and stochastic production times. Our objective is to determine an optimal demand allocation and optimal inventory policy at each location so that the sum of transportation, inventory, and backorder costs is minimized.

### **2. Stochastic Model for Scheduling Pipeline Transmission in an Integrated Petroleum Supply Chain**

**Sophia Hui Wang**, Cornell University

**John A Muckstadt**, Cornell University

When scheduling the distribution of petroleum products in a distribution system, a number of key factors must be considered, including pipeline capacity, sequence dependent commodity shipments, uncertainty in demand, spot prices for each product, and tankage storage capacity at refineries and terminals. A modeling environment and solution methodology will be presented

### **3. The Value of Stable Production Cycles and Advanced Demand Information In Multi-Echelon Supply Chains**

**James A Rappold**, University of Wisconsin-Madison

**Keenan D Yoho**, University of Wisconsin-Madison

We analyze a policy of stabilizing production cycles in process industry manufacturing environments where there is a single, capacity constrained resource producing multiple products in a predetermined sequence, setup times between items is significant and customer demand is highly uncertain. Because of the nature of the equipment and the economics of production, lean or quick response manufacturing approaches are inappropriate. Emphasis on producing to inventory targets, and absolute reduction in processing flow time, only contribute to overall system uncertainty and increases in costs. A guiding principal underlying our philosophy is that short, predictable, and repeatable production cycle lengths are highly desirable. We construct a set of integrated, computationally efficient models to stabilize production cycle lengths. These models may be used to assess strategic changes in capacity, demand uncertainty, demand volume and the availability of information.

**SUN/May 1** 11:15 am-12:45 pm

Burnham Room (8th Floor, South)

Session **SUC4: Supply Chain Structures** (Invited)

Track: **Logistics, Distribution Channels, and Inventory Systems** Chair: **Yunzeng Wang**

### **1. Assuring Capacity During Supply Channel Selection**

**Ozalp Ozer**, Stanford University

**Holly Lutze**, University of Texas

Choosing a supply channel for a new product amounts to choosing the limits of that product's profitability. When production capacity impacts profitability, firms may not have sufficient information to choose their upstream supply chain partners optimally. We investigate the supply channel decision of an OEM outsourcing production of a new make-to-order product to one of several pre-qualified contract manufacturers. In addition, each contract manufacturer selects his own supplier for a key

component of the OEM's product. We show that competition gives expected profit maximizing firms an incentive to misreport available production capacity. We then devise simple request for quotation (RFQ) design strategies that induce firms to credibly relay supply channel capacity information.

## **2. The Optimal Supply Chain Structure for a Proprietary Component Manufacturer**

**Yi Xu**, University of Miami

**Haresh Gurnani**, University of Miami

**Ramarao Desiraju**, University of Central Florida

In consumer markets, we observe stronger focus on branding proprietary components (e.g., Intel's microprocessors). We study the optimal supply chain structure choice for the manufacturer of such proprietary component and investigate how various market factors such as component brand equity, market uncertainty, and form of contract, affect the manufacturer's optimal choice.

## **3. Structural Properties of Buy-Back Contracts for Price-Setting Newsvendors**

**Saibal Ray**, McGill University

**Yuyue Song**, McGill University

**Shanling Li**, McGill University

We analyze an optimal buy-back contract for a two-echelon supply chain facing price-sensitive stochastic demand. We identify the conditions under which: i) the manufacturer's optimal decisions are independent of the demand uncertainty, and ii) a no-return contract is optimal. The optimal performance measures for the decentralized channel are also discussed.

## **4. Wholesale-Price vs. Revenue-Sharing Contracts in Supply Chains of Complementary Products**

**Li Jiang**, University of Michigan

**Yunzeng Wang**, Case Western Reserve University

Consider  $n$  manufacturers, each producing one of a set of complementary products and selling it through a common retailer. Demand for the products is price-sensitive and uncertain. We examine how channel and individual firms' performances are affected by the choice of contractual arrangements between the retailer and the manufacturers.

**SUN/May 1** 11:15 am-12:45 pm

Session **SUC5: Scheduling** (Contributed)

Track: **Operations Planning, Scheduling and Control**

Adler Room (2nd Floor, North)

Chair: **Katariina Kempainen**

## **1. Experimental investigation of the applicability of ant colony optimization algorithms for project scheduling**

**Jade Herbots**, K.U.Leuven

**Willy S Herroelen**, K.U.Leuven

**Roel Leus**, K.U.Leuven

We investigate the potentials of Ant Colony Optimization (ACO) algorithms for solving the well-known resource-constrained project scheduling problem (RCPSP) that involves the scheduling of the project activities in order to minimize the project duration subject to zero-lag finish-start precedence constraints and renewable resource constraints. We develop two full-fledged ACO algorithms (ALG1 and ALG2) and evaluate their performance against non-hybrid state-of-the-art heuristics on a set of benchmark problems taken from the PSPLIB. The promising computational results reveal the potential of ACO in the creation of hybrid metaheuristics.

## **2. MINIMIZING THE EXPECTED WEIGHTED NUMBER OF TARDY JOBS WITH NON-IDENTICALLY DISTRIBUTED PROCESSING TIMES AND DUE DATES**

**Frank G Forst**, Loyola University-Chicago

In this paper we are concerned with finding a job sequence which minimizes the expected weighted number of tardy jobs on one machine. Three sufficient optimality conditions are derived when both the job processing times and the job due dates are independent, non-identically distributed random variables. We then derive more specific optimality conditions for the special case of normally distributed job processing times. Numerical examples are also provided.

### 3. Evaluating TSP Formulations for the SDST Flowshop Scheduling Problem

**Jatinder N Gupta**, University of Alabama in Huntsville

**Fan T Tseng**, University of Alabama in Huntsville

This paper evaluates different TSP formulations of the scheduling problem for the flowshop with sequence dependent setup times (SDST). It is well known that the no-wait flowshop scheduling problem (Fm/no-wait/Cmax) can be formulated exactly as a Traveling Salesman Problem (TSP). There have been reports on TSP-based heuristics for both regular and SDST flowshop problems, which do not have an exact TSP formulation. The TSP formulation in each of these heuristics is either solved using a heuristic or just a step of the heuristic. The effectiveness and efficiency of the TSP formulations alone has not been addressed. In this paper we review the TSP formulations in the literature, propose several new TSP formulations, and evaluate the efficiency and effectiveness of different TSP formulations for solving the scheduling problem for the SDST flowshop.

### 4. Developing a Decision Support System (DSS) for Workload Control (WLC): A Case Study

**Mark Stevenson**, Lancaster University Management School

**Linda C Hendry**, Lancaster University Management School

Workload Control (WLC) is designed for Make-To-Order (MTO) environments, where, given the complexity of production and highly customised nature of jobs, planning must be initiated at the customer enquiry stage. Other MTO approaches, such as POLCA and CONWIP, neglect this stage. Most empirical WLC research concentrates on the job release stage, assuming that accurate Delivery Dates and an appropriate mix of jobs have already been determined. This case study adds to the available literature by looking specifically at implementing WLC at the customer enquiry stage. This paper focuses on the strategy required to overcome a number of key implementation prerequisites specific to WLC, addressing issues such as grouping machines and determining capacities. Full details of the Decision Support System, including screen shots, and an extensive literature will be provided in the full paper. Future research including incorporating web technology to create an e-based Workload Control system will also be discussed.

### 5. A Review and Comparison of Scheduling Rules

**Katariina Kemppainen**, Helsinki School of Economics

**Ari P.J. Vepsäläinen**, Helsinki School of Economics

The role of order scheduling has increased due to outsourcing of operations and tightening performance objectives defined, for example, in response times and resource utilization. In supply chains, the scheduling task is further complicated by different organizational cultures and information available possibly undermining the coordination of decision processes. In this paper, we analyze the working of the inter-linked scheduling decisions by interpreting them as disciplines of dispatching heuristics. A classification system is introduced for evaluating the logic and performance of a broad range of scheduling approaches identified based on an extensive review of due date management, order release, and dispatching policies. Findings about the commonalities of the existing scheduling rules are presented, and the applicability of the policies into inter-organizational scheduling is discussed.

**SUN/May 1** 11:15 am-12:45 pm

Session **SUC6: Issues in NPD** (Invited)

Track: **New Product and Technology Management**

Michigan Room (6th Floor, South)

Chair: **Glen Schmidt**

### 1. Product Development Process Modeling: A Review (Part II)

**Tyson R Browning**, Texas Christian University

This talk will continue the presentation on Part I, to summarize a comprehensive review of the PD process modeling literature. (See abstract of Part I).

### 2. Product Development Process Modeling: A Review (Part I)

**Tyson R Browning**, Texas Christian University

Today's heightened pace of product introductions and mushrooming product variety makes product development (PD) a major competitive lever. The significance of PD and the challenges PD project

managers face has generated extensive, multi-disciplinary research modeling the PD process. Given the crucial role of process modeling in PD research and practice, the variety of frameworks in the literature, and a widening gap between the models preferred by researchers and practitioners, a review is useful for both camps. This presentation summarizes a comprehensive review of the PD process modeling literature (available as a working paper). We organize the review around the purposes of PD process models in practice. By comparing this structure to the PD process modeling research landscape, we uncover 62 avenues for further research. Examination of the various models and purposes also suggests that the generalized process modeling framework supports a variety of purposes.

### **3. Low-End Encroachment: A Framework to Help Recognize Disruptive Technologies**

**Cheryl T Druehl**, The University of Maryland

**Glen M Schmidt**, Georgetown University

Cell phones appear to be a disruptive technology, per Christensen's definition, in spite of the fact that they were initially very expensive. This seems anomalous, because disruptive technologies are generally thought of as being low-priced. Our model offers an explanation, showing how a new product might initially sell to a detached market segment but over time, still encroach on the old product market from the low end. We call this type of diffusion process the detached-market form of low-end encroachment. We fit our model to data from the cell-phone industry and contrast it with two other encroachment types; the fringe-market type of low-end encroachment, where the disruptive technology more typically starts out as being inexpensive, and high-end encroachment, where the new product first sells to high-end customers.

### **4. Changes in Product Attributes and Costs as Drivers of New Product Diffusion and Substitution**

**Glen M Schmidt**, Georgetown University

**Cheryl T Druehl**, The University of Maryland

Diffusion theory has typically focused on how communication internal or external to a social system leads to adoptions and diffusion of an innovation. We develop a diffusion and substitution model based on a somewhat different perspective: In some cases progressive improvements in product attributes and/or continual cost reduction seem to be a key driver of the diffusion process. For example, after introduction of the 5.25-inch disk drive, its capacity continually increased, and accordingly, so did customer willingness-to-pay. We fit our model to data from the disk-drive and the microprocessor industries.

**SUN/May 1** 11:15 am-12:45 pm

Illinois Room (6th Floor, South)

Session **SUC7: Innovations to Improve Health Care Delivery** (Invited)

Track: **Product and Service Innovation**

Chair: **Anita Tucker**

### **1. Determinants of Proactive Innovative Behaviour in the Development of New Services: An Empirical Research**

**Mercedes Romerosa-Martínez**, University of Granada (Spain)

**Francisco Javier Llorens-Montes**, University of Granada (Spain)

**Victor J García-Morales**, University of Granada (Spain)

**Antonia Ruiz-Moreno**, University of Granada (Spain)

**Daniel Arias-Aranda**, University of Granada (Spain)

The research described in this article performs a full study in the context of European Union firms of the differences between services and products based on several dimensions linked to processes of innovation. The goals of our research are the following: First, to analyze the critical dimensions that determine the adaptation capacity of firms to their environment through the development of new services. Second, to study the influence that the specific nature of services has on their capacity to adapt to their environment. Finally, to observe how the critical dimensions of the innovation process influence the gap generated by the difference in current level of innovation of the firm and that developed by the competition. The results show that the client's participation in the process of innovation is greater in service firms that possess a greater innovation gap and thus are more proactive.

### **2. Development of Fully Integrated Patient-Centered Hospitals for 21st Century**

**Gerhard Plaschka**, DePaul University

**Rohit Verma**, University of Utah

Historically, leading medical equipment manufacturers have been able to compete successfully via product-centric (e.g. “best of breed”) offerings. Today, leading suppliers are changing their business models to enable enhanced workflow through integrated disease-oriented solutions. In this presentation we will present the results of a large-scale empirical study of Sr. hospital administrators and cardiologists about their preferences for key suppliers of medical equipment providers.

### **3. A Lean Service Application in Health Care**

**Susan Meyer Goldstein**, University of Minnesota

**Rachna Shah**, University of Minnesota

While lean principles have been studied in the context of manufacturing firms, similar analysis is less prevalent in service-providing organizations. In their extensive examination of the Toyota Production System, Spear and Bowen (1999) identified four rules as the essence of lean; we apply these rules to the health care industry. A medical study (Transfer of STEMI Patients for PCI) provides the setting of this analysis. Spear and Bowen’s rules are: 1. Work must be standardized; 2. Inter-firm hand-offs must be direct and unambiguous; 3. The service pathway must be simple and direct; and 4. Improvements must be made using scientific methods. The medical study used the lean rules through the use of standardized protocols, inter-hospital hand-offs, a simplified treatment process, and revision of processes as more information became available, to address the response time for heart attack patients at remote hospitals.

### **4. The Contributions of Know-What and Know-How to Performance Improvement in Complex Service Organizations**

**Anita L Tucker**, University of Pennsylvania

**Ingrid C Nembhard**, Harvard University

**Amy C Edmondson**, Harvard University

**Richard M J. Bohmer**, Harvard University

This paper advances research on improvement projects by integrating team learning and best practice transfer literatures. We focus on groups engaged in projects to implement better practices who typically face two learning challenges: knowing what best practices to adopt (know-what) and knowing how to implement them (know-how). Prior work has identified this distinction, but has not clarified behavioral components, nor examined their effects on implementation success. We address this gap by presenting empirical data from a study of improvement projects in hospital intensive care units to identify activities associated with each type of learning. In addition, we consider the level of knowledge for each new practice and how it interacts with learning activities and success.

**SUN/May 1** 11:15 am-12:45 pm

St. Clair Room (6th Floor, South)

Session **SUC8: Managing Frontline Workers in Service Operations** (Invited)

Track: **Service Operations Management**

Chair: **Zeynep Ton**

### **1. Differences in Perceptions of Quality amongst Managers and Front Line Employees in a service organization**

**Vidyaranya G Gargeya**, University of North Carolina at Greensboro

**Michael Herzing**, Guilford County Social Services Department

**Maria Aparecida Gouvêa**, Universidade de São Paulo

It has been very well accepted that differences do exist in perceptions of what quality is. It is particularly difficult to define quality in an organization that provides a service as compared to defining the same in an organization that manufactures a product. Not only do different organizations have distinct definitions for quality, members within the same organization may have different perceptions of quality. This paper reports on an investigation (through a survey) on the extent to which top level managers, middle level managers, and front line (direct-care) employees in a residential care agency differ in their definition of who their customers are. Detailed statistical analysis is also presented in the paper to understand the differences in the perceptions of quality amongst the respondents. The article concludes with some recommendations for service organizations in defining quality.

### **2. Service Operations Management as Affected by Sales people’s Attitudes as Perceived by the**

## **Customer.**

**Joyce M Hoffman**, Stephen F. Austin State University

**Lone Wittliff**, Stephen F. Austin State University

Using the knowledge from research regarding sales people's traits, perceptions, attributes, intentions and behaviors and our current research activities, we develop a model that integrates knowledge gained from studying sales person's attitudes as influenced by sales management's behavior and the resulting perceptions by the customer of these attitudes. We want to show that the sales person's attitude, friendliness and treatment of the event coordinates with the customer's perception of the event and the purchasing decision at the time of the event along with the customer retention due to the environment created by the server/sales person. This study focuses on major durable purchase activities and concepts of service quality with the intent to enhance understanding of customer perceptions of sales people's attitudes and customer recommendations for management's behavior towards influencing sales personnel and the manner in which the sales personnel approach the customer and participation in recognizable service quality.

### **3. Mistake Mitigation in Professional Services**

**Douglas M Stewart**, University of New Mexico

The paper examines mistake-proofing of professional service employees, with regard to decision making errors. Drawing on the psychology of human error, specifically decision making biases; it discusses the implications for front-line professional service personnel within the context of financial planning services. Mitigation tactics currently used in the industry along with alternatives suggested by the underlying psychology are addressed.

### **4. Scripts and Skills**

**Larry Hunter**, University of Wisconsin, Madison

Drawing on survey and archival data for over 2,000 call center workers, in conjunction with qualitative data drawn from site visits, I examine the effects of scripting of customer service encounters on a range of contextually measured general and specific skills (in customer service, product knowledge, and the use of information technology), and on workers' affective responses to their jobs. Evidence suggests that although workers react negatively to scripts, such scripts are in fact associated with skill development.

### **5. The Effect of Frontline Worker Turnover on Retail Store Performance**

**Zeynep Ton**, Harvard University

**Robert H Huckman**, Harvard University

Using monthly data from over 250 stores of a large retailer, we examine the effect of frontline worker turnover on store performance. Our analysis shows that while, on average, frontline worker turnover is associated with decreased store performance (as measured by numerous operational and financial measures); turnover's impact on store performance is moderated by process conformance. Turnover has less of an impact on store performance at high process conformance stores—stores where frontline workers consistently follow prescribed processes—than at low process conformance stores

**SUN/May 1** 11:15 am-12:45 pm

Session **SUC9: Capacity Planning and Investment in Flexibility** (Invited)

Track: **Flexible Manufacturing**

Hebron Room (2nd Floor, North)

Chair: **Kathryn Stecke**

### **1. Capacity Investment and the Interplay between Volume and Product Flexibility**

**Manu Goyal**, University of Pennsylvania

**Serguei Netessine**, University of Pennsylvania

We model a manufacturing firm that has to invest into production capacity when facing demand uncertainty for two of its products. In terms of production equipment, the firm can select to invest into technology that allows for volume flexibility, product mix flexibility, both volume and product flexibility or no flexibility at all. We identify and isolate conditions under which the firm favors investment in a given technology in terms of the market characteristics and the costs of the technologies and distill the value of incremental product and volume flexible technologies.

## **2. Rethinking Lead Time Reduction Investment: A Real Options Perspective**

**Suzanne de Treville**, University of Lausanne

**Lenos Trigeorgis**, University of Cyprus

**Alessandro Crego**, University of Lausanne

Although it is generally agreed that companies are better off with shorter manufacturing lead times, investment in lead time reduction is often difficult to justify using traditional project valuation techniques such as net present value (NPV). In this article, we suggest that evaluating investment in lead time reduction from a real options perspective facilitates quantification of the value of manufacturing flexibility brought about by lead time reduction, particularly the value of the option to time production commitment based on better demand information. This flexibility is significant when demand is volatile. We also present examples to demonstrate how options inherent in lead time reduction can have synergistic effects with related investments, such that a combination of such investments may have positive value even when the NPV of the individual investments is negative.

## **3. Capacity planning in two-tier manufacturing systems to support product variety**

**Charu Chandra**, University of Michigan - Dearborn

**Janis Grabis**, Riga Technical University

**Mark P Everson**, Ford Motor Company, Scientific Research Laboratory

Long-term capacity planning in industries with limited short-term expansion flexibility is complicated by uncertainty in consumer demand, which is aggravated by demand for a large product variety. This paper studies such a capacity-planning problem for a two-tier multi-product, multi-facility system. Assembly facilities have flexibility to produce limited quantities of multiple products at one facility. Variety in product offerings is achieved by allowing a number of configurations for each product obtained by using different kinds of supplied parts. The objective of the study is to determine capacity requirements both at the assembly, and supply side of the system. An optimization model for this problem is developed. A simulation-based optimization approach is used to solve a restricted version of this model, which explicitly represents capacity optimization only for the most important parts. Numerical results are obtained using a case study from the automotive industry.

## **4. Evaluating and Visualising Production Flexibility Using the Method of FlexibilityWindows**

**Günther Schuh**, RWTH Aachen University of Technology

**Christian Friedrich**, RWTH Aachen University of Technology

**Nils Wemhöner**, RWTH Aachen University of Technology

Shortened product life cycles, an increasing variety of products and planning uncertainties compel companies to increase the flexibility of their production. Since a higher degree of flexibility usually necessitates additional investments the tradeoffs of flexible manufacturing systems must be verified. While investment alternatives are designed by production engineers with detailed technical knowledge investment decisions are generally made at management levels. Therefore, evaluation results have to be presented to the final decision maker in an aggregated way without over-simplifying facts since this might forestall a decision implicitly. A method for evaluating production flexibility is presented focusing on the aggregation and target-orientated representation of key measures for supporting investment decisions. The portfolio visualization developed allows a juxtaposition of monetary efforts and performance measures and facilitates the decision maker simultaneously to judge the risk caused by planning uncertainties. A case study report clarifies the application and the benefit of the method.

**SUN/May 1** 11:15 am-12:45 pm

Session **SUC10: Winds of Learning: Bluster from INSEAD** (Invited)

Track: **New Product and Technology Management**

Ohio Room (6th Floor, South)

Chair: **Michael Lapre**

## **1. Learning and Incentives under Unforeseeable Uncertainty**

**Svenja C Sommer**, Purdue University

**Christoph H Loch**, INSEAD

Novel and long-term projects are often plagued by unforeseeable uncertainty, events that cannot possibly

be foreseen at the outset. Project managers often learn unforeseen influence factors in due course of the project and identify new actions to respond to the new information. Thus all actions cannot be specified at the outset, since they would no longer be optimal at the time they should be executed. This poses a fundamental problem for the firm to set targets and incentives.

We characterize adjustable contracts between a principal (e.g., the firm) and an agent (e.g., a project manager) that maintain optimal incentives for the agent in the face of unforeseeable uncertainty. This is achieved by a priori defining time points and aspects of contract adjustment, depending on what each party learns about the unforeseen variables.

### **3. Dynamic Testing of Product Designs**

**Stelios Kavadias**, Georgia Institute of Technology

**Sanjiv Erat**, Georgia Institute of Technology

Testing new product designs often requires substantial resources and is considered a critical phase of new product development (NPD). Research in NPD has conceptualized testing as a “design-build-test-analyze” cycle, emphasizing the importance of analysis and learning from test results when guiding the testing decisions (Thomke 1998). Product designs are often complex configurations of multiple architectures and components, which render the ex-ante assessment of performance difficult. However, designs may share common features, and such commonalities facilitate learning about the performance of untested configurations and the structure of the “design landscape.” We derive the optimal dynamic policy for the testing process while accounting for design and performance dependencies. We specify both the order in which the tests must be conducted and the stopping conditions, extending classic results of search theory (Weitzman 1979). We also assess the effects of imprecise managerial knowledge on the testing costs and on the net payoffs.

### **4. Managing Customer Outrage: Focus Organizational Learning Efforts on Service Failure or Recovery?**

**Michael A Lapré**, Vanderbilt University

As service failures are inevitable, firms need to recover from service failures in order to turn angry customers into loyal customers. Despite the compelling economics of customer loyalty, firms continue to struggle with service recovery. Should firms focus on learning efforts in reducing service failure or on reducing recovery dissatisfaction? I hypothesize that dissatisfaction with recovery contributes more to the variation in customer dissatisfaction than service failure does; that a U-shaped learning-curve effect is more important for dissatisfaction with recovery than for service failure; and that heterogeneity in learning curves is more important for dissatisfaction with recovery than for service failure. Quarterly data on mishandled baggage for nine major U.S. airlines support all three hypotheses. Dissatisfaction with recovery contributes 89% to the variation in customer outrage, whereas service failure contributes only 11%. The results suggest firms should focus on improvement rates in service recovery.

**SUN/May 1** 11:15 am-12:45 pm

Session **SUC11: Developing operational capabilities/competencies** (Contributed)

Track: **Operations Strategy**

Onyx Room (2nd Floor, North)

Chair: **Michael Way**

### **1. Agile Manufacturing: Competitive Advantage for Semiconductors Industry**

**Gan Kai William Lee**, Singapore Institute of Manufacturing Technology

**Tim Baines**, Cranfield University

Economic network resulted from semiconductors industry has also been widely recognized as a powerful generators of wealth, employment, and innovation. In the light of the global trends of shortened product lifecycle, increasing product customization, high demand variability and increasing expectation of lower leadtime, agile manufacturing strategy has been proposed as the key to achieve competitive advantage in the semiconductors industry. This paper identifies the research gaps in the area of agile manufacturing system for semiconductors industry through the literature review of four manufacturing strategies and critical review of the opportunities and challenges faced in this industry. A theory of “Quality-of-Agility” is proposed with a framework for the implementation of agile manufacturing system in semiconductors industry. This framework and propositions developed will form a foundation to guide future research in the

application of agile manufacturing strategy for semiconductors industry.

## **2. Manufacturing Strategy: from Academic Interests to Industrial Practices**

**Lucía J. Mariño B.**, Universidad Pablo de Olavide

**José A. D. Machuca**, Universidad de Sevilla

The aim of this paper is to provide an analysis of organizational concerns in order to understand the process of capabilities development in production management. This paper consists of two main parts. The first examines theoretical arguments regarding the role of manufacturing strategy in building strategic capability. The second part presents an exploratory analysis of data gathered from an automotive components plant, and identifies specific aspects of the dynamic capabilities development process. One of the weaknesses of existing operations strategy literature is that the majority of studies rely on responses provided by a single informant per company. This study employs a combination of survey and case study methods. The results of the study suggest that an environment exists in this case which favours the concept of strategy manufacturing, as do specific elements that map out the path and the process for the building of dynamic capabilities.

## **3. EMPIRICAL TESTING OF THE AGILE MANUFACTURING MODEL IN SPAIN**

**Daniel Vazquez-Bustelo**, University of Oviedo

**Lucia Avella Camarero**, University of Oviedo

This paper focuses on the analysis of the agile manufacturing paradigm and its implementation in Spain. Based on the literature, a conceptual model has been designed, relating environment turbulence, agile manufacturing practices, manufacturing strength and business performance. This model has been tested in a sample of Spanish manufacturers, using the survey methodology to obtain information and a structural equations model for the data analysis. Through the development of a measuring scale, the multidimensional nature of agile manufacturing has been confirmed, reflected in the systematic integration of (a) agile human resources, (b) advanced design, manufacturing and administrative technologies, (c) the integration of the value chain, (d) concurrent engineering and (e) knowledge management. It has also been tested that agile manufacturing is driven by dynamic and hostile environments and positively influences the attaining of a manufacturing strength that leads to higher levels of operational, financial and market performance.

## **4. Sequence Issues in the Implementation of Best Manufacturing Practice**

**Michael Way**, California State University Bakersfield

Best Manufacturing Practice (BMP) is composed of a variety of elements. This paper examines whether the degree of successful implementation of BMP is affected by the sequence of implementation of its various elements. An accepted model is the cumulative “wedding cake” model of Nakane-Hall, which asserts that companies will experience the best results if they start with quality and proceed through cost/efficiency to speed/flexibility. A total of 120 manufacturing plants that had been identified as exemplars of BMP were surveyed, with data points collected over a 10-year period. Plants were grouped based on their chosen path/sequence for BMP implementation. These groups were then compared based on the degree of improvement of their BMP efforts. Support for the Nakane-Hall cumulative model is shown.

**SUN/May 1** 11:15 am-12:45 pm

Session **SUC12: Mixed Approaches to enriching OM Learning** (Invited)

Track: **Innovations in Teaching**

Valencia East (Lobby Level)

Chair: **John Kanet**

## **1. Teaching a Blended Course in Operations Management**

**Alysse R Morton**, Westminster College

By taking portions of a traditional course and adding a myriad of interactive assignments, such as online discussions, active learning takes front stage in enhancing students' understanding of operations concepts. As blended courses become more and more commonplace on college campuses, one professor shares experiences with blended techniques, such as online assessment, case studies, effective use of discussions to potentially reduce

## 2. Using Computer Simulation as an Educational Alternative to Hands-On Application

**Dana M Johnson**, Michigan Technological University/School of Business & Economics

**Mark A Johnson**, Michigan Technological University/School of Technology

Internships and cooperative educational opportunities serve as a tool to apply concepts learned in the classroom to on-the-job experiences provided by companies. When universities are “geographically challenged” and do not have an abundance of local or regional companies for hands-on experiential learning avenues, an alternative is to use computer-based simulation. In the operations management field some of the software programs available include Arena, Virtual U, Capstone, and SimCity 4.0 Deluxe with Rush Hour Traffic. These programs were selected because they provide a broad and diverse range of skill sets for the students. The focus of the paper is to identify the differing educational objectives of each simulation, advantage and disadvantages, potential courses, and level of student.

## 3. Vertical Integration of Business Students’ Exposure to OM in First- through Third-Year Undergraduate Experiences

**Sanjay L Ahire**, University of Dayton

**Peter G Wagner**, University of Dayton

We describe efforts at the University of Dayton that seek to create early awareness of the field of operations management by all business students, and to reinforce and deepen their knowledge through their first three years of study. We present ways in which careful design of segments of selected first and second year courses, combined with the third-year survey operations management course, contribute to the students’ understanding of the coherence of business information they receive in general, and in particular, of operations management.

## 5. Developing International Learning Experiences in Operations Management

**John J Kanet**, University of Dayton

One of the joys (if not duties) of teaching American university students is in introducing them to the world beyond US borders. In the context of Operations Management (OM) this has particular current meaning as increasingly we see companies operating on a global scale. In this presentation, the author chronicles his experiences in developing and carrying out student learning experiences in Germany. Germany, like the US is a major industrialized society, with its own unique approaches to the management of operations. Such experiences enable students to not only benchmark American practices with those of qualified competitors but also serve to broaden their perspectives to the world forces that will be molding the practice of OM in the coming decades.

**SUN/May 1** 11:15 am-12:45 pm

Valencia West (Lobby Level)

Session **SUC13: Six Sigma: An Animated Computer Simulation, Case-Based, Active Learning Approach for Improving & Optimizing Processes** (Invited)

Track: **Quality Management and Six Sigma**

Chair: **Herbert Moskowitz**

## 1. Six Sigma: An Animated Computer Simulation, Case-Based, Active Learning Approach for Improving & Optimizing Processes

**Herbert Moskowitz**, Purdue University

A key aspect of Six Sigma is DMAIC ... define, measure, analyze, improve, and control. The tutorial presentation will consist of the following: 1. Overview of our learning model which consists of the following components: (a) Case studies to motivate and apply Six Sigma principles in various phases of DMAIC. (b) A computer animated simulation which serves as the virtual active learning environment for system understanding and improvement. (c) Database and analysis software tools (Excel and Minitab) for data collection and statistical analysis. (d) Power Point slides of supporting core and reference learning materials. 2. Demonstration of the animated simulation and improvement process in action. 3. Overview and demonstration of a newly developed automated intelligent manufacturing system (AIMS) applied to the simulation which employs machine learning and genetic algorithms to model and optimize a simulated or real process.

### **1. The impact of batching on supply chain costs in a schedule sharing multi tier supply chain**

**Ahmet Ozkul**, State University of New York

One of the leading causes of Bullwhip effect is order batching. Literature suggests that information sharing and coordination helps to reduce Bullwhip related costs. This research investigates impact of different batching methods on the total supply chain cost under a schedule sharing environment. Previous research mainly focused on impact of schedule sharing parameters and forecasting errors on supply chain costs. Based on rolling horizons with frozen schedules, n level, m company supply chain is simulated. Explicit cost measures included capacity change, expediting, idleness and holding costs. Impact of large and small batches, and interactions of environmental factors are studied.

### **2. Demand Planning – Framework and case study**

**Juan S Valencia**, Bright Logistics / University of Dallas (Graduate School Of Management)

**Ehap Sabri**, I2 Technologies / University of Dallas (Graduate School Of Management)

**Carlos M Tobon**, Universidad EAFIT

Manufacturing companies have to perform a balancing act between offering high service levels avoiding stock-outs while reducing inventory. This is achieved using forecasting tools that processed historic demand trends. Due to its dynamic nature companies often fail to offer the right product in the right place when costumers need it. Businesses are changing; proliferation of product lines, increasing competition, multiple distributions channels and different geographical networks make Demand Planning (DP) even tougher. Therefore DP has become a competitive advantage. Best Practices in DP can obtain better benefits than traditional tools. It can also become a differentiation strategy when combining software and human intelligence. This paper provides a framework and case study of the AS-IS process at a furniture manufacturer, specifically in DP processes. It highlights pain points and its root causes, suggests a To-Be Process, and shows potential benefits of implementing best practices of DP.

### **3. OPTIMIZATION MODEL TO PLANNING OF SUPPLY CHAIN ON A PALM OIL PLANTATION**

**Mario E Matinez**, La Sabana University

**Rafael García**, Universidad de La Sabana

**Maria Margarita Cervantes**, Universidad de La Sabana

**Edgar Gutierrez**, Universidad de La Sabana

This paper presents the partial result of a research on the Agro-industrial supply chain in Colombia. It has been designed as optimization model to the actual condition process of supply in the plantation from the plantation plot to the production center. The model permits periodic planning horizon, that minimizes the operative costs and make the approximation of a hypothetic working condition in the supply chain. Model constrains include production, collecting, pick up, transporting and storing capacities. Mass balance and minimal historic quota demand constrains beginning from scheduling and whole fruit gathering in the planning period. Based on this model and its implementation, we obtain a better understanding of chain behavior in this industry and a broader base for the study of the real chain. Furthermore, this supports better decision making in tactical planning and help the design of new models.

### **4. Supply Chain Design: An Integrated Decision-Making Approach**

**Hussein Naseraldin**, Technion - Israel Institute of Technology

**Yale T Herer**, Technion-Israel Institute of Technology (On Sabbatical-Northwestern University)

We research a management approach that quantitatively combines strategic and operational decisions. This approach, integrating decisions from various horizons, has been increasingly attracting attention due to the potential benefits it offers. Designing and managing a supply chain entails making different decisions of different horizons. Number and location of retail outlets are part of the strategic design of a supply chain. Inventory control decisions, on the other hand, are part of the operational design of a supply chain. Integrating these strategic and operational decisions has the potential to improve the system's performance. The system contains customers and retail outlets. Customers are dispersed over a

homogenous region, where demand follows a normal distribution. We formulate the problem, present the development of the expected cost function, and solve the problem. We point out managerial insights.

## **5. A MULTI-CRITERIA DEMAND MANAGEMENT MODEL IN A TWO-LEVEL SUPPLY CHAIN**

**Elias Kirche**, Florida Gulf Coast University

**Rajesh Srivastava**, Florida Gulf Coast University

**Vaidy Jayaraman**, University of Miami

Effective demand management in a make-to-order environment requires synchronization between customer specifications with corresponding production processes upstream the supply chain. Consequently, the firm should understand the constraints of its suppliers, in terms of criteria such as capacity, quality, lead times, and costs, in order to accurately quote prices and delivery dates. We develop a decision support system in a two-level supply chain integrating multiple suppliers with cost, capacity, quality, lead time constraints. The problem is solved through a multi-criteria mixed-integer program module from a major ERP vendor. The integration and enterprise visibility created by the demand management system will synchronize resources and balance workloads to maximize performance on the stated criteria and adapt to a dynamically changing environment.

**SUN/May 1** 1:45 pm- 3:15 pm

Holabird Room (8th Floor, South)

Session **SUD2: Supplier Management** (Contributed)

Track: **Supply Chain Management**

Chair: **Vidyaranya Gargeya**

### **1. Cognitive Maps for an Initial Theory of Business Relationships within Supply Networks**

**Natércia F Carona**, FGV/EAESP - Fundação Getúlio Vargas

**João M Csillag**, FGV/EAESP - Fundação Getúlio Vargas

Cognitive maps are often used by operations management researchers as tools for elaborating and communicating theory, specially to prepare empirical projects and analyze its results. This article propose the use of such kind of maps to study the Development and Maintenance of Relationships in Supply Networks. First it is presented the synthesis and the analysis of literature of Relationships in Supply Networks, which, through an approach of undirected cognitive maps, describes, organizes, determines boundaries and categorizes the main related issues. It results in the table of the principal characterizing elements of relationships, their respective definitions and parameters. Then, the FAST- Functional Analysis Systems Technique diagram, a type of directed cognitive maps, is developed for linking those elements and parameters identified. The application of such tools in a case study proved its methodological, theoretical and managerial potential.

### **2. Does suppliers' performance affect buying firms' trust building and order allocation?**

**Hojung Shin**, University of Notre Dame

**Wolfgang ULAGA**, ESCP-EAP European School of Management

Under supply chain management, manufacturing firms tend to reduce the number of suppliers to work with, and maintain close ties with selected key suppliers. In order to sustain profitable growth, suppliers should also take a different strategy to gain greater shares of the current customers' business by broadening collaborative relationships with the customers. In this paper, we investigate the relationship between supplier performance attributes (quality, delivery, cost, responsiveness, and technological capability), and the buying firm's trust, collaboration, and order allocation decisions, analyzing empirical data collected from North American Manufacturing firms by regression. The analytical results provide mixed evidence that the supplier's superior performance in responsiveness, cost, and technological capability has positive influence on the buying firm's level of trust on collaboration with the suppliers. However, the improved level of trust and collaboration may not be a significant determinant for the buying firm's order allocation decisions.

### **3. Chief Purchasing Officer Perceptions of Future Supply Innovations**

**Robert D Klassen**, Ivey Business School, University of Western Ontario

**Fraser Johnson**, Ivey Business School, University of Western Ontario

**Amrou Awayshea**, Ivey Business School, University of Western Ontario

Global competition is forcing companies to make changes to their supply chain management practices that provide lower costs, better quality, improved delivery, and greater flexibility in meeting customer demands. The research literature contains a variety of examples where firms are implementing innovative supply chain strategies, such as partnering and information sharing with key suppliers, adopting new e-business technologies, and implementing supplier development programs. Using a survey of chief purchasing officers at Fortune 1000 companies, our study explores three aspects related to future innovations in the supply function. First, we consider which innovations managers expect their company to adopt in the supply function over the next five years. Second, we assess how their views are influenced by individual, corporate and industry-level factors. Finally, a research agenda is proposed based on the most frequently expected innovations.

#### **4. Supplier Performance Evaluation in a Contract Manufacturing Environment**

**Samuel V CONCEIÇÃO**, Federal University of Minas Gerais

**Luiz R EPAMINONDAS**, Federal University of Minas Gerais

**Rafael R RENNO**, Federal University of Minas Gerais

The market of computer and electronic products is characterized by a scenario of high volatility demand, short products life cycle, pressure for cost and high degree of obsolescence of components and final products. In that scenario, the companies of contract manufacturing service (CM) need tools to guide in its acquisition process, aiding in the selection of the best suppliers in order to improve the supply chain. This paper uses Data Envelopment Analysis (DEA) to evaluate and selecting global suppliers in the electronic sector in a multinational firm based in Latin America, using inputs variables .such as lead time, inventory policies, quality, flexibility and cancel window.

#### **5. Sourcing and Supplier Evaluation Practices in Small and Medium Firms in the U.S. Textile and Apparel Industry**

**Jin Su**, The University of North Carolina at Greensboro

**Vidyaranya B Gargeya**, The University of North Carolina at Greensboro

Within the global dynamic business environment, three key factors – the supply environment of the firm, the level of competition, and changes in the purchasing/sourcing function – appear to have created the opportunity and necessity for an increase in integrating purchasing and supplier into global strategic supply chain management. For small and medium sized firms, one powerful method of improving the firm's competitiveness is through strategic approaches of sourcing and suppliers, which emphasize supplier's contributions to the total product and to overall customer satisfaction. However, little is known about how and to what extent small and medium firms are implementing sourcing and supplier evaluation practices in global supply chain management. This study presents the results of an empirical study of companies within textile and apparel industries in the U.S. Southeastern area.

**SUN/May 1** 1:45 pm- 3:15 pm

Session **SUD3: Issues in Environmental Supply Chains** (Invited)

Track: **Environmental Issues and Reverse Logistics in Manufacturing**

Wright Room (8th Floor, South)

Chair: **Vaidy Jayaraman**

#### **1. A Framework for Reverse Supply Chain Decision-Making**

**Kanwalroop K Dhanda**, DePaul University

**Rajesh K Tyagi**, DePaul University

In this paper, we seek to present a framework for reverse supply decision-making. We formulate four drivers in the reverse chain as Facilities, Transportation, Channels, and Information and we aim to discuss the impact of each of these four drivers upon the effectiveness and performance of the overall reverse chain. We will also present a reverse chain questionnaire that will address these four drivers by presenting a series of questions aimed at the design / redesign of the new / existing facility. We hope to apply this framework to two industries in order to gather assess the reverse chain effectiveness of these industries. We are hoping that this application will shed light on the existing state of reverse chains in industry.

## **2. Some Suggestions for Enhancing Environmentally Conscious Supply Chains in Developing Countries**

**Hilmi Yüksel**, University of Dokuz Eylül

Firms in developing countries may meet with different barriers and problems in their environmentally conscious supply chains that are caused from the characteristics of developing countries. It can be stated that these problems are mostly related with economic situations of these countries and lack of environmental consciousness and infrastructure of remanufacturing and recycling practices in these countries. In this paper, with the interviews that are made with big firms in Turkey, the barriers and problems that big firms, in developing countries, meet while enhancing environmentally conscious supply chains has been examined. According to the results of the interviews, the barriers and problems that big firms meet in their supply chains while enhancing environmentally conscious practices were evaluated and some suggestions were given for the firms in developing countries to achieve environmentally conscious supply chains.

## **3. Multi-Phase Strategic Planning of a Reverse Supply Chain**

**Kishore K Pochampally**, Massachusetts Institute of Technology

**Surendra M Gupta**, Northeastern University

A few location models have been reported in the literature for strategic planning (also called designing) of reverse supply chains. In the case of discrete location models, all the recovery facilities are assumed efficient while in the case of continuous location models, it is assumed that efficient recovery facilities were already established or can be established at the locations solved for. Each of these location models deals with a used-product that is given to be economical. Even though every location model reported in the literature assumes that all used products are economical and are re-processed (recycling / remanufacturing) in efficient recovery facilities, it does not show how to either select that used-product from a set of different used-products or identify those recovery facilities in a region where the reverse supply chain is to be designed. To address these limitations, this paper proposes a multi-phase approach for strategic planning of a reverse supply chain.

## **4. Expectation of Using Tractability Technology for Managing Transport Packaging Take-Back**

**Lerpong Jarupan**, Northeastern University

**Sagar Kamarthi**, Northeastern University

**Surendra M Gupta**, Northeastern University

The collection of the high value transport packaging is often ignored. There are times when these assets are lost in the logistics networks. As a result, companies are unable to gain full benefit from multiple uses of these packaging. One promising and emerging technology that has the potential of achieving an effective implementation and control of packaging is radio-frequency identification (RFID), which employs wireless communication between a tag and a reader to provide hands-off monitoring of transport packaging. To this end, RFID offers benefits not only to a firm in cost saving from maintaining minimal stock of packaging, but also to destination customers in terms of accurate and timely delivery. This paper addresses the benefits of using RFID and performs a cost-benefit analysis to support the RFID argument.

## **5. Strategic Purchases of Bundled Products & Services in a Closed-Loop Supply Chain Environment**

**Anthony Ross**, Michigan State University

**Vaidy Jayaraman**, University of Miami

An increasingly important, and emerging area of closed-loop supply chain management is concerned with the recovery and reuse of products from the end user. Firms have also become increasingly concerned with product returns from retailers (e.g., overstocks) and dissatisfied customers (e.g., product failure). We collaborated with MedStar Health System, a large healthcare provider in the eastern U.S. The company's geographical network of service includes several Mid-Atlantic States. Given the current price/reimbursement squeeze on its services, its staff of buyers was charged with discovering alternative sources of both generic and critical components (such as hospital beds, wash basin, baby warmers, stethoscopes, diabetic shoes, orthopedic braces, SUDs and a host of other items central to its delivery of quality care) in the aftermarket or refurbishing sector.

**SUN/May 1** 1:45 pm- 3:15 pm

Burnham Room (8th Floor, South)

Session **SUD4: Implementing Change Supply Chain: Research Opportunities and Challenges**  
(Invited)

Track: **Purchasing**

Chair: **Amelia Carr**

### **1. Implementing Change Supply Chain: Research Opportunities and Challenges - A Panel Discussion**

**Amelia Carr**, Bowling Green State University

**Janet Hartley**, Bowling Green State University

Effectively managing supply chains and leveraging relationships with customers and suppliers is important for many organizations. Supply chain management requires increased teamwork, coordination, and integration across multiple organizations. However, changing from an internal focus to a supply chain management focus can be a major challenge for most organizations. This panel will discuss supply chain change processes and discuss research opportunities and challenges. The use of organization development concepts in a supply chain context will be explored. Panelists: Thomas Choi, Department of Supply Chain Management, W. P. Carey School of Business, Arizona State University; Bertie Greer, Department of Management and Marketing, Northern Kentucky University; Arnold Maltz, Department of Supply Chain Management, W. P. Carey School of Business, Arizona State University; Carol Prahinski Richard Ivey School of Business, University of Western Ontario; Jane Wheeler, Department of Management, College of Business Administration, Bowling Green State University.

**SUN/May 1** 1:45 pm- 3:15 pm

Adler Room (2nd Floor, North)

Session **SUD5: Production Planning and Control I** (Contributed)

Track: **Operations Planning, Scheduling and Control**

Chair: **Massimo Bertolini**

### **1. Optimization of a Production Plan Using Taguchi Robust Design**

**John F Kros**, East Carolina University

The research structure simulates production schedules while incorporating Taguchi design philosophy with multi-response surface methodology. A Master Production Schedule is the planning system experimentation vehicle and is illustrated for a make-to-stock manufacturing situation. The experimental design results are used to create a manufacturing planning system robust to business environment uncertainties.

### **2. Optimizing Lot Sizing and Order Scheduling with Non-Linear Production Rates**

**Terry P Harrison**, Pennsylvania State University

**Robert O Neidigh**, Shippensburg University

We developed a method to determine an optimum schedule in a production process with a nonlinear (increasing) production rate. We focused on processes in which the learning effect is completely forgotten from lot to lot. We varied lot sizes in the short term in response to a deterministic demand schedule so that production and holding costs were minimized. We developed a new mathematical programming model to determine the optimal production schedule and lot sizes under various process assumptions. Even for the largest problems, solution times are very fast.

### **3. Grey Programming Modeling and Optimization Method in Aggregate Production Planning**

**Zhixiang Chen**, Zhongshan University

Considering the uncertainty of demand of supply chain and internal production condition, this paper studies the aggregate production planning method using grey programming and optimization theory. In the model, two types uncertainties are considered, one is demand dynamical change because of market competition; another is resource requirement (workforce) change because of learning curve. This paper builds up the model and constructs algorithm, gives out one case study in a factory of mosquito expellant factory. The result shows the applicability and significant effect of such an approach in aggregate production plan decision when dynamic environment is considered.

### **4. ADVANCED MANUFACTURING CONTROL SYSTEMS: A SIMULATION COMPARATIVE**

## ANALYSIS

**Massimo Bertolini**, Università degli Studi di Parma - Dipartimento di Ingegneria Industriale

**Maurizio Bevilacqua**, Università degli Studi di Bologna - DIEM sede di Forlì

**Andrea Grassi**, Università di Modena e Reggio Emilia - Facoltà di Ingegneria – Sede di RE

This paper presents a comparative analysis of an advanced manufacturing control systems using simulation. In particular, three PULL productions philosophy have been analyzed: a Just In Time (JIT), a Constant Work-In-Process (CONWIP) and a Hybrid System environments. The different production control philosophies have been applied to flow shop systems with four, six and eight machines, evaluating the manufacturing system performance (i.e. Service Rate, WIP, finished Goods, Time in System, Maximum Queue Size). The performance have been analyzed both in the ideal case (machines efficiency equal to 100%) and in the real case (machines efficiency lower than 100%), so that to consider machine breakdowns. To overcome the limit of low performance in presence of a machine failure, two further solution have been proposed, keeping into account the introduction of "Kanban Break" cards together with a re allocation of workers during a machine downtime towards the upstream work centers.

**SUN/May 1** 1:45 pm- 3:15 pm

Session **SUD6: IFAME** (Contributed)

Track: **Innovations in Teaching**

Michigan Room (6th Floor, South)

Chair: **Sushil Gupta**

### 1. Meeting of the IFAME Planning Advisory Committee

**Sushil Gupta**, Florida International University

This session is the meeting, by invitation, of the Planning Advisory Committee (PAC) Members of the International Foundation for Advancement of Management Education (IFAME). The concept of IFAME is being presented in the Operational Advantage Group (OAG) Session on Saturday. Contact Dr. Sushil Gupta at the conference for more details if you plan to attend the PAC meeting. You may also send him an e-mail message at ifame\_gbsn@yahoo.com.

**SUN/May 1** 1:45 pm- 3:15 pm

Session **SUD7: New Ideas in Product and Service Design and Delivery** (Invited)

Track: **Product and Service Innovation**

Illinois Room (6th Floor, South)

Chair: **Craig Froehle**

### 1. Direct to Customers: Integration Operations, Marketing and IT to Deliver to the Home

**Kenneth K Boyer**, Michigan State University

With online sales of tangible goods surpassing \$70 billion in 2003, there is little doubt that e-commerce is becoming a major retail channel. Companies are working to define a coherent multi-channel strategy that integrates stores, home delivery and other methods of retailing. This talk will present results from an ongoing study of 5 - 10 retailers in several different industries. Surveys of over 6000 customers provide insights to how companies are integrating their operations, IT and marketing functions to optimize the shopping experience. Companies are compared based on their fulfillment model: pick orders from a DC or from a store and based on their delivery model: indirect versus direct delivery. There are numerous successful companies operating in each of the four strategies defined by these two choices. This paper presents data comparing aspects of the ordering/communication process, product quality and service quality.

### 2. Framework and Model for Multi-attribute Competitive Bidding

**Uday S Rao**, University of Cincinnati

**Amitabh Raturi**, University of Cincinnati

**Lukas Vavrla**, University of Economics - Prague

In this talk we study a competitive bidding environment in which the bidder (potential supplier) can position itself along several dimensions (attributes such as price, lead time, and quality). The bidder incurs a cost for improving its attributes, which reduces the bidder's net margin. On the other hand, improved attribute

levels increase the chance of the bidder winning the contract with the buyer. The bidder must determine attribute level settings so as to maximize expected profit under uncertainty in the attribute levels of the bidding competitors. We provide a simple model to assist the bidder's decision making and investigate the effect of different problem parameters, such as degree of uncertainty in knowledge of the competitor's attributes, on the bidder's optimal choices and profit.

### **3. Managing Outsourced Product Design: The Effectiveness of Alternative Coordination Mechanisms**

**Edward Anderson**, University of Texas

**Alison Davis-Blake**, University of Texas

**Geoffrey Parker**, Tulane University

Many firms have moved toward outsourcing more complex and central activities such as product and process development. Outsourcing such activities increases the difficulties of coordinating with suppliers. We examine the frequency with which firms use, and the impact on project performance, of various inter-organizational coordination mechanisms. Interim results from a three-year multi-firm, multi-industry study suggest that most firms employ dedicated personnel to managing the outsourcing relationship. Initially, firms rely on ad hoc face-to-face communication rather than co-location to manage the interface with outsourcing partners. However, over time, firms move to co-location to manage relationships with non-domestic suppliers. Surprisingly, firms make relatively little use of either sophisticated information technology or modular product designs.

### **4. The stakeholder and customer requirements analysis in a high tech product maintenance service**

**Yang-Cheng-Kuang Chen**, Cranfield University

**Peter Sackett**, Cranfield University

The Far East Company manufacturing or processing products for sale of the high tech products for the developed country are competing in a global marketplace where customers are demanding the highest standards of quality. The way to identify the stakeholders and customer is a challenge and important issue for identify the customer requirements. The characters of the high tech products markets are continuous technological change...short product life cycles...Fast-moving, innovative start-up competitors. They face a number of unique challenges not encountered by companies in other industries. To develop successful product policies—including technological change, product differentiation, timing, and contingency planning, as well as marketing and financial considerations, the company should identify the market stakeholders and their requirements. This paper will show you the different types of stakeholder and customer in the high tech product market and identify their requirements for the future research.

**SUN/May 1** 1:45 pm- 3:15 pm

Session **SUD8: Technology in Service Operations (Invited)**

Track: **Service Operations Management**

St. Clair Room (6th Floor, South)

Chair: **Pedro Oliveira**

### **1. Knowledge-based services: Three case studies on dyadic characterization**

**Silvia I PONCE**, HEC Montreal

**Jean-François BOURQUE**, HEC Montreal

Knowledge-based services (KBS) have largely transformed the business landscape in the last 25 years. Indeed, by considering the dynamics developed by constant and rapid changes in technologies involved, these services will continue to evolve in the next decades thus creating a growing need in identifying and understanding key features and managerial challenges they present. Since 1997, we are conducting research on KBS in order to elucidate and explain essential service features and variables. We present here three case studies of service-delivery successes where we explored variables such as type of technology and level of standardization of the service-delivery process. We have characterized the dyadic relationship and successes were defined in terms of suppliers and clients' satisfaction. We have also observed that in providing value to customers, KBS suppliers have evolved from a project management perspective into a service management approach. Practical implications for service operations managers are highlighted.

## **2. The Effects of Strategic Provisioning of Interconnected Communications Networks**

**Pedro Ferreira**, University of California at Berkeley

N/A

## **3. Measuring the Dimensions of Supply Chain Adaptation**

**Murat Kristal**, York University

**Aleda V Roth**, University of North Carolina – Chapel Hill

In this study we focus on supply chain management from the strategic perspective of a single manufacturer, and develop the key attributes of supply chain adaptation and subject them to empirical scrutiny. After defining supply chain adaptation, we explore its two different components, namely exploration and exploitation adaptation. We then draw the relationship between supply chain adaptation and the notion of complex adaptive systems (CAS) and define how supply chain adaptation is realized in supply chain management practices. Lastly, we study the psychometric properties of our measures

## **4. Double Moral Hazard and the Design of Technology into High-Contact Services**

**Paulo J Gomes**, Universidade Nova Lisboa, Campus de Campolide

This paper presents a framework for evaluation of technology implementation in high contact service processes based on a double moral hazard perspective. The framework distinguishes technology that enhances the service process (knowledge-embedded) from technologies that enhance the service provider skills (knowledge-based). The moral hazard model is used to analyze how the implementation of technology can affect the relationships among the service encounter triad – between clients and service providers, between service providers and the service organization, and between the organization and the clients. Several implications in terms of service design are presented

## **5. Customer Technology Receptivity: the Missing Link of the B2B e-Service Chain**

**Pedro Oliveira**, Catholic University of Portugal

**Aleda V Roth**, University of North Carolina – Chapel Hill

This research investigates the role of customer technology receptivity, defined as the level of a business' receptivity and readiness to engage in electronic interactions and transactions, as an operational antecedent of B2B e-service capability. Using data gathered from 181 companies that have deployed B2B e-services, we find that a company's level of orientation towards service will have an impact on the receptivity of its customers to participate in B2B transactions, which on its turn has a positive impact of a company's B2B e-service capability

**SUN/May 1** 1:45 pm- 3:15 pm

Hebron Room (2nd Floor, North)

Session **SUD9: Human Aspects in Flexible Automation** (Contributed)

Track: **Flexible Manufacturing**

Chair: **Kathryn Stecke**

## **1. An evolutionary strategy for implementing a Mass Customization and Personalization (MCP) Manufacturing Process**

**SHYH-JIAN TANG**, CRANFIELD/SIMS

**JOHN M KAY**, CRANFIELD/SIMS/HEAD OF MANUFACTURING SYSTEM

Mass Customization and Personalization (MCP) is perceived as a future market trend. There are several levels of MCP manufacturing from the level 1-limited options of assembly components, level 2-customized functions/specifications, to level 3—a wider range of un-specified personal needs. Literature demonstrates that several theories deal with the development of the first level and second level of MCP. Nevertheless, few publications deal with the third level of MCP. At this level, the customer's needs are not always precisely described and presented with an evolving setting. Therefore, success at this level is achieved by a rapid response manufacturing system which is flexible to integrate the process flow through the concept phase, design phase, manufacturing phase to the delivery phase. The aim of this paper is to explore the planning of an innovative manufacturing process to fulfill the most proactive level of individual desires, based on an evolutionary acquisition strategy.

## **2. Communication and co-operation for flexible and robust manufacturing systems**

**Sabina Fjällström**, Chalmers University of Technology

**Monica Bellgran**, Mid Sweden University

Manufacturing companies must handle change and dynamic conditions to stay competitive. For achievement of a flexible and robust manufacturing system, the full potential of technical as well as human resources need to be properly utilised. By developing robust production systems, able to compensate for changes and variation, the production efficiency will increase. Similarly, if the variety of competences and experiences of the employees' (e.g. operators, maintainers, engineers, and designers) are acknowledged and properly utilised, the overall performance will also be improved. This paper will present results from case studies at two manufacturing companies, focusing on information exchange and communication during design and operation of manufacturing systems with the purpose of achieving robust manufacturing. Management of information and the utilization of different co-operation forms will be discussed as tools for communication among personnel from different disciplines. By facilitating a problem-solving environment the possibility of handling dynamic conditions and improvements will increase.

### **3. Perceptions of Waiting Times in Different Service Queues**

**Li-Jen Jessica Hwang**, University of Surrey

**Peter Jones**, University of Surrey

This article investigates the extent of the gap between customers' perception of waiting time compared with actual waiting times and whether this gap varies according to service context. Whereas previous research compared perceived and actual wait times within one service operation and the literature identified a number of propositions based on the premises that the perception of waiting lines can be modified by a range of factors, this study aims to ascertain whether customers perceptions are affected by the type of service environment. An experimental study collected 454 actual and perceived customer waiting times in a single queue single server system from a retail grocery store, cafeteria, library, post office, bus stop and vegetable market. Results showed that perceptions can be significantly greater than actual waiting time across the study, but not in correlation to service context, and varied inversely to the time they had available.

### **4. Incorporating Human Factors in Manufacturing Automation Decision Making**

**Bader D Al-mannai**, Cranfield University

**Richard M Greenough**, Cranfield University

**John M Kay**, Cranfield University

In manufacturing systems design literature, many authors direct their emphasis toward the design of human-centered systems as an alternative to technology-centered systems. They advise managers and designers to ensure appropriate consideration of both technical and human aspects in the design and evaluation of manufacturing systems. In support of this notion, tools such as HITOP, ACTION, and CIMOP have been developed for design, decision support, and simulation of human infrastructures for advanced manufacturing systems. However, despite the abilities of these tools to integrate technology, organization, and people, their application has been sparse. This paper will investigate the practical application of human-centered systems concepts as well as the development of a practical decision support tool that enables organizations to address the integration of technology, organization, and people at the earliest stages of automation decision-making.

**SUN/May 1** 1:45 pm- 3:15 pm

Session **SUD10: Healthcare Operations - A Canadian Perspective** (Invited)

Track: **Health-Care Operations**

Ohio Room (6th Floor, South)

Chair: **Martin Puterman**

### **1. Managing Surgical Waitlists for Fraser Health Authority**

**Pablo Santibanez**, Fraser Health Authority

**Mehmet Begen**, University of British Columbia

**Derek Atkins**, University of British Columbia

Managing surgical facilities to provide acceptable waitlists for a Health Authority in the publicly funded

Canadian system is complex. We were asked for a system wide (11 hospitals) strategic tool to enable management explore trade-offs between operating room (OR) availability, bed capacity, OR booking privileges by surgeons, and waitlists for patients by specialty and procedure. An integer programming model was developed to schedule procedures into OR's for all the hospitals, under OR time availability and post-surgical resources constraints.

## **2. Collections Scheduling at Canadian Blood Services**

**John Blake**, Dalhousie University

In all parts of Canada, except the Province of Québec, blood products are collected by Canadian Blood Services (CBS) from unpaid volunteers and provided free of charge to accredited health care facilities. Nationally, CBS collects approximately 800,000 units of whole blood. In the province of Nova Scotia, CBS collects approximately 30,000 units of whole blood and 2,000 units of blood products collected through plasma and platelet aphaeresis. In this talk we will discuss our work to develop a vehicle routing model to optimize blood collections for CBS in Nova Scotia. The model makes use of the rather unique road network in Nova Scotia (a hub and spoke system) to simplify the problem. Routes are generated using a simulated annealing based heuristic.

## **3. Managing Surgical Waitlists at British Columbia Children's Hospital**

**Eric Cope**, University of British Columbia

**Craig O'Neill**, British Columbia Children's Hospital

**Geoffrey Blair**, British Columbia Children's Hospital

**Mehmet Begen**, University of British Columbia

The Centre for Operations Excellence (COE), in collaboration with B.C. Children's Hospital (BCCH), conducted a study regarding the improvement of patient throughput at the hospital in order to reduce patient waiting times for elective surgical services. The project team built scheduling and simulation tools in order to assess the effects of various changes in hospital procedure. An in-depth analysis of several specific possible operational scenarios led to concrete recommendations for improving operations.

## **4. Improving the Efficiency of Porter Operations at Vancouver General Hospital (VGH)**

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

**Li Chen**, University of British Columbia

**Ryan Quee**, University of British Columbia

**Fredrik Odegaard**, University of British Columbia

**Mats Gerschman**, University of British Columbia

**David Puterman**, University of British Columbia

The importance and impact of the porter service is often overlooked in by hospital managers. This study shows that timely access to porters greatly enhances utilization of scarce resources. This study reviewed porter operations at VGH, developed appropriate performance metrics and identified system inefficiencies. A simulation model was developed to identify the impact of changes. It showed that through enhanced scheduling, reducing delays in dispatching and improving communication with wards, significant improvements in performance could be obtained. Further, a checklist was developed to enable managers to study porter operations at other hospitals.

**SUN/May 1** 1:45 pm- 3:15 pm

Session **SUD11: Globalization of operations** (Contributed)

Track: **Operations Strategy**

Onyx Room (2nd Floor, North)

Chair: **Peter Knittig**

## **1. The impact of the congruence between national and organizational culture on manufacturing performance**

**michael naor**, University of Minnesota

**Roger Schroeder**, University of Minnesota

The current study investigates two research questions. First, is organizational culture similar to national culture in manufacturing plants in different countries? Second, what is the effect of the congruence between national and organizational culture on manufacturing performance dimensions (cost, quality,

delivery, and flexibility)? Several studies in the international management academic literature argue that organizational culture maintains and enhances the effect of national culture since employees and managers bring their cultural background and ethnicity to the workplace. However, studies in the operations management literature on the adoption of Japanese practices by U.S. manufacturers suggest that plants can create an internal organizational culture that overrides the national culture. In an era of globalization, the study has high value for organizations that seek to diffuse management techniques or adopt successful practices, and are interested in overcoming cultural barriers in order to achieve high manufacturing performance.

## **2. International Manufacturing in Spanish SME's: Changes and Challenges**

**Josefa Mula**, Polytechnic University of Valencia

**Raúl Poler**, Polytechnic University of Valencia

The process of globalization has brought important changes in manufacturing companies. In the first place, the companies understood that could sell their products in any part of the world, and adapted their logistical and production systems to this new global market. Later on, big companies began to locate internationally their production, looking for reductions in the production costs, mainly originated by low labor costs. In the Spanish industry, formed mainly by small and medium enterprises (SME's), and in sectors, such as, the footwear and textile, the process of international manufacturing has extended considerably. The objective of this paper is to present through several real study cases the changes that have suffered Spanish SME's, that in less than 4 or 5 years have passed of having 100% of its production in Spain to outsource most of its production in China. Also, the challenges that these companies have to cope are analyzed.

## **3. Transfer vs. adaptation of production process: a small survey of European and US firms in Vietnam**

**Hoc H Le**, University of Trento

This paper presents the results of a survey of the internationalization practices in European and US manufacturing firms in Vietnam, which is conducted to strengthen the findings of the case studies in the same topic. The degree of transfer/adaptation of production process to Vietnam, whether the local conditions influence this process, and what are the influential factors will be discussed. The discussion aims at arguing on Thompson's assumption on isolated technical core and propositions of interrelations between firm's goals, product, production technology, and organizational environment; and the adaptability of coordination system (the coordination or organization design in planning, forecasting, scheduling production activities, monitoring inventory, preventive maintaining, allocating workforce etc.) when confronting environmental changes in global context.

## **4. Future Strategies in Coping with the Transfer of Automobile Production to Eastern European Countries**

**Peter R Knittig**, Sophia University

**Shinji Shimizu**, Sophia University

This paper proposes future strategies for the Western European automobile industry to deal with the transfer of automobile production to Eastern European countries. For this purpose, the industry structures of the countries in the European Union (EU) pertaining to their market volumes, cost levels and educational standards are evaluated. This evaluation reveals that major differences between Western and Eastern European countries exist, eventually resulting in the transfer of automobile production to Eastern Europe. This production transfer has considerable consequences, mainly on the automobile manufacturers operating in Western European countries. Though, wide-ranging re-organisations in areas such as R&D, production engineering, and manufacturing might be remedies to ensure the future survival of the automobile industry in Western Europe.

**SUN/May 1** 1:45 pm- 3:15 pm

Session **SUD12: Comprehensive Experiential Learning through Field Projects (Invited)**

Track: **Innovations in Teaching**

Valencia East (Lobby Level)

Chair: **James Gilbert**

## **1. Bridging the gap between university and industry: experiences with a senior level**

### **undergraduate supply chain course.**

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

**Erik J de Bruijn**, University of Twente

Teaching operations and supply chain management courses can be challenging especially because textbook materials and “real” life experiences don’t always coincide. At Eastern Washington University a new approach has been introduced with an emphasis on knowledge relating to careers in supply chain management. The approach taken is comprehensive, i.e. both purchasing and logistics aspects of supply chain management are treated, and focuses on analysis and application of theories rather than for example memorization of textbook material. More than half of the time, students were interacting with companies either in company visits, during which students had to analyze the specific supply chains and their implications for management, and in small projects during which students performed quantitative analysis to help companies. Despite several challenges, the approach has led to increased industry interaction, more practically oriented knowledge for students, increased knowledge on job opportunities and requirements, and industry feedback on class content.

### **2. At the Intersection of Research, Practice and Pedagogy: University of Dayton’s Operations Management Capstone Course**

**Michael F Gorman**, University of Dayton

**Sanjay L Ahire**, University of Dayton

We describe how University of Dayton’s capstone course in operations management has led to big successes in many dimensions for its constituencies. Students gain experience working in teams on real-world problems. Corporate clients apply cutting-edge analytics to important problems they are facing. Faculty gains the opportunity to employ research and textbook methodologies to real-world situations and evaluate their success. The course has led to highly satisfied and employable students, publication and consulting opportunities for faculty, and multi-million dollar savings for clients.

### **3. Hands-on Planning and Control: Improving Supplier, Customer, and Internal Production-Logistics Planning Systems.**

**Donald P Warsing**, North Carolina State University

**Cecil C Bozarth**, North Carolina State University

The supply chain perspective has changed production planning and control from a top-down, intra-company process to one in which horizontal flows of information---between companies and their downstream customers, between companies and their upstream suppliers, and even within areas of the same company---drive the planning process and its effectiveness. In response to this shift, we implemented company-sponsored projects within an MBA-level planning and control course to give students the opportunity to map, evaluate, and propose improvements to such horizontal information flows in a real-world setting. In these projects, students assess the accuracy, timeliness, reliability, form, and completeness of information flows and quantify the benefits of their recommendations to close the gaps between current flows and ideal flows. In this session, we will: describe the methodology we use to structure the projects and manage team interactions with companies and other teams; and share illustrative results from past projects.

### **4. Bridging the gap between university and industry: experiences with a graduate IE and Management capstone course**

**Erik J de Bruijn**, University of Twente

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

In an increasingly global world, operations and supply chain managers can not only focus on their country of origin but also have to be aware of international issues. The University of Twente developed an approach that focused on hands-on experience in operations and supply chain management and also taught students about dealing with international environments. In this approach students have to carry out their capstone project during a typically 6-month period inside a company. This time is spent on solving practical problems and allows the students first hand experience with the practicalities of a job in for example operations and supply chain management. This paper focuses on capstone projects that were specifically designed to combine typical disciplinary capstone projects with an international orientation.

### **5. Incorporating a Large-Scale Consulting Project into an Executive MBA Operations Management Course**

**James P Gilbert**, Rollins College

Learning is the active pursuit of knowledge. The process of Independent Learning is based on meaningful learning experiences, usually, out of the classroom. Executive MBAs usually bring substantial, practice-based experiences with them into graduate school. This paper looks at the incorporation of a large-scale consulting project into the MBA operations management core course. The project was sponsored by G&T Conveyor Company, Inc. of Tavares, Florida. G&T is a world leader in baggage handling systems and airport services. The purpose of the project was to develop an OM strategy to move G&T from a “traditional” manufacturing firm to a lean manufacturing firm. This OM consulting project developed modeling and practical learning skills, transferred responsibility from the professor to the individual students, developed a deep understanding of OM issues for students and firm executives, and fostered collaborative instruction techniques developing true OM concept understanding.

**SUN/May 1** 1:45 pm- 3:15 pm

Valencia West (Lobby Level)

Session **SUD13: Tutorial - Teaching the Costs of Uncoordinated Supply Chains** (Invited)

Track: **Supply Chain Management**

Chair: **Charles Munson**

### **1. Tutorial - Teaching the Costs of Uncoordinated Supply Chains**

**Charles L Munson**, Washington State University

**Jianli Hu**, Chapman University

The primary theme of supply chain management is that communication and coordination among members of a supply chain enhance its effectiveness, creating financial benefits to be shared by the members. In particular, the mere act of working together (global optimization) instead of separately (independent optimization) can “create money out of thin air,” resulting in a win-win scenario for all parties. In this tutorial, we present various numerical examples, tailored for classroom use either as a self-contained lecture or usable throughout a course, that clearly demonstrate the financial rewards obtainable from coordination. The examples cover areas such as (1) location decisions, (2) centralized warehousing, (3) lot sizing, (4) demand forecasting, (5) pricing, (6) newsvendor environments, and (7) aggregate planning. Sample notes and Excel spreadsheets will be provided to audience members.

**SUN/May 1** 3:45 pm- 5:15 pm

Sullivan Room (8th Floor, South)

Session **SUE1: Supply Networks** (Contributed)

Track: **Supply Chain Management**

Chair: **Andreas Hammer**

### **1. Are Supply Chains Moving Towards Markets or Hierarchies?**

**Deepak Iyengar**, University of Maryland, College Park

**Joseph P Bailey**, University of Maryland, College Park

**Philip T Evers**, University of Maryland. College Park

Drastic reduction in the cost of transmitting information has tremendously increased the flow and availability of information. Greater availability of information likely increases the firm's ability to manage their supply chain and, therefore, increases their operational performance. However, the current literature is ambiguous about whether increased information flows enable supply chains to migrate towards more market-based transactions or hierarchal-based transactions. We empirically demonstrate that the changing configuration of supply chains depends upon several industry characteristics. The methodology used is based on Input-Output tables that have heretofore been used primarily for economic analysis. This methodology helps in understanding the changing nature of supply chain lengths and the added value from different supply chain members. We explain our results based on the theory of transaction cost economics, and the role of asset specificity, uncertainty, and frequency in determining whether or not industries are moving towards markets or hierarchies.

### **2. Exploring the Effect of Manufacturers on their Suppliers' Environmental Performance**

**Olga Kaminer**, York University / Schulich School of Business

**Markus Biehl**, York University / Schulich School of Business

An effective management of the natural environment can not be limited anymore to the single manufacturing firm, but has to be viewed in the context of supply chain networks. This paper presents the initial results of three case studies that investigate the impact of customer incentives on the environmental performance of their suppliers. A very interesting issue emerged from the initial analysis of the cases data – the large manufacturing firms under investigation did not feel that they were forced by their customers to improve their environmental performance; the manufacturers themselves, however, indicated that they provided incentives to suppliers in order to enhance their suppliers' environmental performance. We discuss these findings and relate them to the current environmental literature, the resource-based view of the firm as well as the institutional, stakeholder and resource-dependence theories.

### **3. Supply chain resilience - Analysis of a distribution network model under changing scenarios**

**Partha P Datta**, Cranfield University

**Peter M Allen**, Cranfield University

In turbulent operating environment, recently aggravated by the tragic incidents of 9/11, an effectively designed supply chain, capable of recovering in the face of disruptions and responding to changes in customer needs, is considered source of competitive advantage. The present paper provides a conceptual framework of supply chain resilience and supply chain modeling methods after conducting a systematic review of evidence base in the field. A hypothetical supply chain is modeled as complex system based on a single echelon self-organizing distribution model. The paper then shows how the emerging supply chain structure adapts to changing business environments hence giving rise to resilience. This includes analyzing the system under stochastic demand, lead times. Also effects of non-functioning of crucial distribution centers are studied.

### **4. The effect of supplier manufacturing capabilities and collaboration on buyer responsiveness**

**Paul D Cousins**, The Queen's University Belfast

**Benn R Lawson**, The Queen's University Belfast

**Brian C Squire**, University of Bath

**Steve Brown**, University of Exeter

This study investigates the impact of three different types of supplier manufacturing capabilities (flexibility, customer responsiveness and product modularity) on a buyer firm's manufacturing responsiveness. In addition to a direct effect, we propose that collaboration between buyer-supplier has a positive moderating effect on the link between supplier capabilities and buyer performance. We also argue that collaboration has a curvilinear (inverted-U) relationship with buyer responsiveness. Analyses from 104 medium-to-large manufacturing companies based in the United Kingdom largely support our hypotheses. Our results indicate that supplier capabilities have a direct effect on buyer responsiveness, while collaboration strengthens the contribution of supplier responsiveness to buyer responsiveness, but weakens the relationship between supplier modularity and buyer responsiveness. No support is found for the influence of collaboration and supplier flexibility on buyer performance. Furthermore, we show that collaboration is curvilinearly associated with buyer responsiveness, first increasing and then decreasing a firm's responsiveness capability.

### **5. A FORMAL MODEL FOR SUPPLY CHAIN NETWORKS – CAPTURING SUPPLY CHAIN MANAGEMENT BY A MATHEMATICAL ILLUSTRATION**

**Andreas Hammer**, International University in Germany

**Frank Maier**, International University in Germany

The purpose of this paper is to provide a formal framework for Supply Chain Management that takes into account the complexity of supply chain networks. This is achieved by developing a formal, mathematical representation that captures all involved supply chain network connections by using existing viewpoints and by adding additional aspects into a new emerging model. Integrating value-added elements into the model allows identification of generic implications. Furthermore, the model can be applied to specific supply chain networks. The practical value lies in the possibility of better evaluating a given supply chain network structure. The model supports the strategic decision making process in Supply Chain Management. This approach promises further potential by enhancing the model; it may be also used as a basis for economic modeling.

### **1. Evaluation and Compensation of Disturbances in Production Networks**

**Holm Fischaeder**, Ilmenau Technical University

**Sebastian Hild**, Ilmenau Technical University

**Herfried M Schneider**, Ilmenau Technical University

The authors focus on reactive disturbance management in supply networks and introduce a simulation tool supporting the configuration of specific adaptation strategies following the occurrence of disturbances. Based on open Markov models, this approach allows simulation of disturbance's effects concerning the circumstances of operation in networks as well as the outcome of different adaptive measures. The concept supports internal induced disturbances affecting quality and/or capacity (e.g. rework, scrap) as well as market driven influences (e.g. rush orders). Available capacity in production facilities is represented by aggregated cells, orders by standardized capacity demand units. The effect of disturbances and adaptation is projected in both inventory position and monetary values. To allow for valuation of inventory and utilization changes, a calculation based on theory of production and cost is developed. Cost-minimal adaptation strategies – as sets of different adaptive measures over time – are determined as the solution of a multi-objective optimization problem.

### **2. An Integrated Strategic Supply Chain Positioning Methodology for SMEs in Singapore**

**Yan Guan Roland Lim**, Singapore Institute of Manufacturing Technology

**Weidong Lin**, Singapore Institute of Manufacturing Technology

The SMEs in Singapore employ 51% of the workforce and generate one third of the total value added in the economy. With the fast changing global economic landscape, the SMEs in Singapore are facing increasing challenge to make key decisions to define their competitive space in the global manufacturing supply chain. Unfortunately, current methodologies and techniques provide inadequate support for these SMEs in Singapore. The aim of this paper is to develop a generic and practical integrated strategic supply chain positioning methodology, which enables modeling and analysis of supply chain positioning strategies and practices, and application of these techniques to understand critical tradeoffs and alternatives in practical decision-making contexts. The intention of this research is to provide a generic and practical integrated strategic supply chain positioning methodology to support the decision making process of SMEs in Singapore.

### **3. Upstream and Internal Supply Chain Life Cycle**

**Roby Thomas**, Elmhurst College

**Gurram Gopal**, Elmhurst College

Successful supply chains evolve over time in conjunction with changes to a variety of variables in the operating environment. One of the impetuses for the evolution of a firm's supply chain is the progression of the firm's products through various stages of the product life cycle. In this study we have developed a framework for the changes required in the information and product flow in the supply chain as products progress through each stage of the product life cycle. The framework addresses the evolution required in the upstream and internal macro processes of the supply chain. Some of the processes that we examine include outsourcing decisions, supplier certification, inbound logistics strategies, forecasting, supply and demand planning, and fulfillment.

### **4. The Effect of Supply Chain Disruption on Sourcing Strategy**

**Gilles Reinhardt**, DePaul University

Common sources of supply uncertainty are machine breakdowns, congestion of orders, and quality problems. Another important form of supply uncertainty that has gained attention is the disruption caused by low likelihood events: earthquakes, terrorism, or storms. We focus on errors that result when supply chain managers do not decouple the uncertainty of disruption from ongoing supply uncertainty. We show that bundling disruption and ongoing supply uncertainty into a single measure results in the supply chain carrying more inventory than optimal, higher than optimal costs, and underutilization of reliable backup

sources of supply. We consider two models to prove our results. To show that bundling of uncertainty increases supply chain inventory and cost we use a model with a single supplier. To show that bundling of uncertainty decreases the use of backup, reliable suppliers we use a model with two suppliers – one subject to uncertainty and the other perfectly reliable.

**SUN/May 1** 3:45 pm- 5:15 pm

Wright Room (8th Floor, South)

Session **SUE3: Impact of Technology on Integrated SCM I** (Invited)

Track: **Impact of Technologies on Integrated SCM Operations**

Chair: **Pedro Reyes**

### **1. Supply Chain Integration Using a Maturity Scale: An Analytical Approach**

**Gilbert Aryee**, Cardiff Business School, Cardiff University

**Chandra Lalwani**, Cardiff Business School, Cardiff University

**Mohamed Naim**, Cardiff Business School, Cardiff University

World-class manufacturing organisations are pursuing supply chain integration initiatives in order to stay competitive. This paper uses a maturity scale to assess supply chain integration which extends the works of Stevens (1989), Anderson and Lee (2000), Frohlich and Westbrook (2001), and those of other authors of supply chain integration maturity initiatives. The research is based on a thesis by Aryee (2004) which involved a survey of 270 UK manufacturing companies followed by 10 case studies where supply chain integration is tested for empirical relevance. Cluster analysis using the Euclidean norm and multivariate statistical analysis is used with the data. The results from both approaches are similar and this confers additional rigor to the study. The insight gained from the research is that although supply chain integration contributes towards performance, a closer look indicates that the underlying driver is attributable to integration at the organizational rather than the inter-organizational level.

### **2. Do unto Others: The Value of Consistency in Supply Chain Integration**

**Jerry C Wei**, University of Notre Dame

**Sarv Devaraj**, University of Notre Dame

**Lee J Krajewski**, The University of Notre Dame

To cope with uncertainties in demand and supply, firms in a supply chain engage in information and business process integration. The degree of supply chain integration is reflected in the consistency of information flows and purchasing agreements between a firm and its customers and suppliers. However, whether a firm is better off in adopting supply chain integration practices consistently with its customers and suppliers remains an unanswered question. To examine this research question, we collected data from 120 manufacturing firms. We find strong support for our principal proposition that manufacturing firms who implement similar practices in production information flows and purchasing agreements with upstream and downstream partners significantly outperform other firms. These findings have important implications on the information sharing that occurs in a supply chain as well as the relationships between supply chain partners

### **3. RFID Technology Adoption Motivations and Implementation Issues**

**Alan R Cannon**, University of Texas at Arlington

**Edmund L Prater**, The University of Texas at Arlington

**Pedro M Reyes**, Baylor University

**Gregory V Frazier**, University of Texas at Arlington

RFID technology, particularly RF tags, will soon become ubiquitous in retailing, warehousing and most supply chains. Some companies will try to be early adopters to gain a competitive advantage. Others will be pressured into adoption by customers, suppliers or competitors. While RFID has garnered a great deal of research interest, that research has primarily focused on RFID's impact on general supply chain issues; failing to place the discussion within a specific strategic context. What necessary is a strategic description of why and how businesses should apply this technology? This research investigates the various strategic drivers for RFID adoption, as well as the different implementation approaches used by companies. A framework is proposed for RFID adoptions, and critical adoption and implementation issues are assessed. The grocery industry is used as an example area of study. This research is the theoretical precursor to a

more in-depth.

#### **4. E-commerce and Collaborative Planning: Linking the Travel Plaza and Truckstop Industry to their Suppliers using RFID Tec**

**Pedro M Reyes**, Baylor University

Through the driving force of supply chain optimization and far-reaching advances of business-to-business (B2B) e-commerce, Radio frequency identification (RFID) developments have sparked massive interest in new and experimental ideas and processes. The onset of RFID developments presents forthcoming ideas and techniques that promise to be profitable and rewarding for supply chain channel partners. The objective of the proposed research is to examine the business applications that link the travel plazas and truckstops with their suppliers and the effects of RFID in B2B e-commerce as a supply chain coordination solution (SCCS). Ultimately, we expect to propose a model that could be used for e-commerce and collaborative planning using the potential of RFID technology specific to the travel plaza and truckstop industry.

**SUN/May 1** 3:45 pm- 5:15 pm

Burnham Room (8th Floor, South)

Session **SUE4: Supplier Development** (Contributed)

Track: **Purchasing**

Chair: **Wenming Chun**

#### **1. Supply network and responsiveness: An information processing view**

**Ednilson S Bernardes**, University of Minnesota

The markets in which manufacturers compete are increasingly influenced by intense foreign competition, rapid technological change, shorter product life cycles, and customers ever more unwilling to settle for mass-produced items or services with limited value. These are characteristics of a new competitive landscape for manufacturers. Academic and practitioner literatures suggest that the new competitive landscape not only requires manufacturers to develop superior mechanisms for processing information, but also places critical importance on organizational learning for the firm to achieve responsiveness. In contrast to a production unit, we view the firm as an information-processing unit. In this view, knowledge gathered from a network of suppliers are the main inputs processed by the firm in its pursuit of responsiveness. We adopt a socio-cognitive perspective to learning in order to investigate how firms become responsive from the perspective of strategic sourcing.

#### **2. Factors Influencing the Suppliers' Capability Improvement in Global SCMs: Learning from the Socio-economic Theories**

**Yootaek Lee**, Boston University

**Jay Kim**, Boston University

As more firms are developing linkages with globally dispersed suppliers, more attention is paid to find ways to improve suppliers' performance and capability in order to achieve competitive advantage at the chain level. Numerous studies have addressed "how buyers can lead suppliers to improve their performance and capability" from the buyer's perspective. However, there has been a lack of effort in exploring the question of "why some suppliers improve their performance and capability faster/better than others" from the suppliers' perspective. By adopting two proven theories (the theory of global commodity chains and the theory of industrial upgrading) from the socio-economic approach in the international trade research community, this study develops a set of hierarchical research questions focusing on factors that can influence the improvement of suppliers' performance and capability. This study will provide an alternative perspective in managing suppliers in order to configure a competitive global supply chain.

#### **3. Strategic Sourcing – Framework and case study**

**Juan S Valencia**, Bright Logistics / University of Dallas (Graduate School Of Management)

**Ehap Sabri**, I2 Technologies / University of Dallas (Graduate School Of Management)

**Maria G Gonzalez**, University of Dallas (Graduate School of Management)

**Quynh Cao**, University of Dallas (Gradate School of Management)

In the average manufacturing firm in the U.S., purchased goods and services account for 55 cents of every sales dollar. By contrast, direct labor in the manufacturing process accounts for only 10 cents;

therefore every effort in the sourcing process will have a huge impact in the bottom line. Strategic Sourcing (S.S.) process is defined as an organized, systematic, collaborative way to identify competitive suppliers for longer-term agreements; but this process is hardly found in mid-size companies and it's a manual process in large-size companies. S.S. is considered as one of the major supplier Relationship Management (SRM) processes. This paper provides the best practice process for strategic sourcing, and a framework to implement strategic sourcing solution successfully. Finally, a case study from a leather furniture manufacturing company is presented describing the benefits of implementing the solution

#### **4. Minimizing Risk in Supplier Development**

**Srinivas Talluri**, Michigan State University

**Ram Narasimhan**, Michigan State University

**Wenming Chung**, Michigan State University

Supplier development is concerned with the issue that firms often find it necessary to become involved (invest) in suppliers' operations in the aspects of process, quality, and technical support to assure that quality, delivery, and cost expectations are met. Supplier development can be costly and time-consuming. Consequently, long-term relationship with candidate suppliers is often emphasized. Risk involved with supplier development decisions is yet to be explored and discussed fully by researchers. This paper attempts to model supplier development risk and addresses the question of how best to allocate supplier development dollars among candidate suppliers. We propose an optimization model that addresses this question. Numerical examples are presented to explicate the mode and managerial implications are discussed. We investigate whether firms could gain risk reduction benefits from cooperating with other firms in supplier development. The results indicate that cooperative supplier development is a worthwhile initiative for firms to pursue.

#### **5. Technology in Retail Security**

**William C Figg**, Dakota State University

**Christopher Ahrendt**, Dakota State University

The retail industry worldwide suffers an enormous financial burden year after year due to one ugly problem, shrinkage. There are several types of electronic countermeasures that retailers can employ to reduce or prevent losses. Digital video recording (DVR), electronic article surveillance (EAS) and radio frequency identification are but a few technical fixes to the problem.

Early deployment of technology often comes with a high price tag. Retailers must evaluate the risk with the costs of the cure. The employment of a workable security plan integrates cost effective non-technical measures with more advance and efficient technological innovations. The implementation of a workable security policy can provide a defense in depth.

A 2003 survey cites losses by US retailers estimated at \$33.6 billion annually. These losses can be ranked by product exposure, costs and frequency. An effective security policy can reduce the losses through a deployment of technology.

**SUN/May 1** 3:45 pm- 5:15 pm

Session **SUE5: Production Planning and Control II (Contributed)**

Track: **Operations Planning, Scheduling and Control**

Adler Room (2nd Floor, North)

Chair: **Julie Niederhoff**

#### **1. Scheduling Multiple Product Families on Identical Parallel Assemble Lines With Space Constraints to Minimize Setup Costs**

**Susan Monkman**, The University of Texas at Austin

**Douglas Morrice**, The University of Texas at Austin

We address a production scheduling problem for a make-to-order company who assembles high volumes of products within product families. Each customer order has no due date, but short lead-times are desired. Multiple assembly lines can each produce products from any family, but from only a few families without requiring a setup. Setup costs are sequence dependant. Full demand information is unknown when the schedule must be created. The schedule specifies when the parts for each product family are on each line (determining the time windows in which orders for each family can be produced). We present a

scheduling heuristic utilizing MILPs to minimize setup costs. Simulation shows that the scheduling heuristic results in short order lead-times. The interesting aspect here is that each line can produce products from more than one family without requiring a setup. Therefore, the sequencing of product families is more complicated than often seen in literature.

## **2. Organizational Structures and Systems for Implementing Theory of Constraints: An Action Research.**

**Rogério Calia**, School of Engineering of São Carlos - University of São Paulo - EESC

**Fábio M Guerrini**, School of Engineering of São Carlos - University of São Paulo - EESC

It is possible to achieve significant performance improvement in the Production Planning, Scheduling and Control even in complex manufactures. However, the effectiveness and efficiency of the improvement depends on the organizational structures and systems for implementing and maintaining the change. This paper describes an action research that compares two implementations of Theory of Constraints in plants with a complex demand environment (a majority of make-to-order products and high demand variability in the make-to-stock products). Both implementations decreased delays, reduced inventory and decreased lead-time. However one of the implementations was much faster than the other, because of a structured project team, clear performance metrics and data driven validation of actions and results.

## **3. Capacity-Driven vs. Demand-Driven Material Procurement Systems**

**Esmail Mohebbi**, University of Nebraska-Lincoln

**Fred Choobineh**, University of Nebraska-Lincoln

**Anupam Pattanyak**, United Airlines

Material planning methodologies have traditionally relied on demand information as their main driver for generating procurement plans. Using the results of a comparative simulation study, we examine the merits of an alternative approach to material procurement planning which is driven by the system capacity and provide insights into circumstances under which this approach may be considered viable.

## **5. Using Separable Programming to Solve the Multi-Product Multi-Constraint Newsvendor Problem and Extensions**

**Julie Niederhoff**, Washington University in St. Louis

The newsvendor model has been applied to a wide range of business situations. A natural extension is to the multi-product, multi-constraint system in which multiple products are stocked but are constrained under common resources such as budget or space constraints. Previous research has attempted to solve this problem with Lagrange Relaxation techniques or by limiting the distribution of demand. However, by taking advantage of the separable nature of the problem, a close approximation of the optimal solution can be found using convex separable programming for any demand distribution for the traditional newsvendor model and extensions. Sensitivity analysis of the linear program provides managerial insight into the effects of parameters of the problem on the optimal solution and future decisions.

**SUN/May 1** 3:45 pm- 5:15 pm

Michigan Room (6th Floor, South)

Session **SUE6: Technology and Knowledge Management** (Contributed)

Track: **New Product and Technology Management**

Chair: **Paulo Gomes**

## **1. Managers' Use of Return on Investment during Information Technology Implementation in Florida Hospitals**

**Donald A Forrer**, International College

**Joseph Heinzman**, International College

**Elaine Kruse**, International College

This report is an examination of technology implementation in healthcare in Florida hospitals. Surveys were sent to all 285 hospitals in Florida with responses from 93 respondents. This research centers on the implementation of Information Technology (IT) and the impact of three important constructs – performance measurement, decision making and Return on Investment (ROI). The survey focused on managers responsible for information technology such as IT Department Director, Chief Information Officer, Finance Department Director Chief Financial Officer, Business Unit Executive, Chief Executive officer, or a specific other. The determining factors for selecting a manager for the study were: 1)

supervision of the use of information technology, 2) instrumental in the decision making for the purchase of information technology, and 3) active in the implementation of newly purchased information technology.

## **2. Creating new technology visions for integrating new and emerging technologies**

**Christer Karlsson**, Copenhagen Business School

**Eva Lovén**, Linköping University

Integrating new and emerging technologies in traditional products creates a challenge to established organizations. The new technology may not be represented by engineers in relevant areas or there are conflicts arising between new engineering areas and earlier existing ones. This research identifies ways to initiate new technology thinking into the company based in traditional technology. The paper presents case studies conducted in Swedish manufacturing industry. A significant finding is the different ways small companies may handle this in comparison with large organizations. In the large organizations there may typically be persons with the responsibility to push integrated hard- and software projects ahead as well as individual integrators and departments handling integrated work. Creative solutions in small organizations included consultants working as contact procurers and initiative takers in relation to the new technology. The consultants could demonstrate the new technology and take initiatives to different actions for example organized idea seminars.

## **3. The Three Dimensions of the Technological System**

**Michelle D Lane**, Bowling green State University

This research focuses on empirically validating a three dimensional framework for defining technology at the process level. It can be observed that technology is a complex concept that seems to defy a consistent definition in the literature. The complexity of the technology concept can be simplified by understanding that there are three components co-mingled in the definition. The three major components include the equipment itself, the task to be done, and the social system that accomplishes the task. Defining technology becomes difficult since it becomes easy to aggregate task, technique, and tools into a single variable. When the hardware and software, task design and social factors are conceptually combined it is impossible to examine their interactions and the best fit of the technology to the social and task environment. It is therefore important to establish a definition of technology that differentiates between these dimensions.

## **4. Integrating Knowledge Depreciation and Knowledge Transfer into the Learning Curve**

**Ilhyung Kim**, Western Washington University

It is well known in the psychological literature that knowledge acquisition (learning) and knowledge depreciation (unlearning) are governed by quite different behavioral rules. It is also known that knowledge embedded in organizations can be transferred within and among organizations. We propose a new model that measures acquisition, depreciation, and transfer of knowledge in a single framework but governed by different rules. We empirically demonstrate the applicability of our model using a dataset based on the construction of homogeneous ships built in sixteen different shipyards during World War II.

## **5. Knowledge Management Practices and Development Performance: A Contingency Perspective**

**Paulo J Gomes**, Universidade Nova de Lisboa

The focus of this paper is on the effectiveness of knowledge management practices (KMP) during product development. It is our understanding that knowledge management is best studied as a set of specific routines. Focus on the routines directly involved in the development and application of knowledge bases provides a more tractable situation for research. We hypothesize that the impact of knowledge management practices on uncertainty reduction during the planning stage, and on project performance is contingent on the information processing characteristics of the innovation. We use data from 46 projects to empirically test the predictions. The findings indicate general support for the contingent perspective on the effectiveness of KMP in product development.

**SUN/May 1** 3:45 pm- 5:15 pm

Session **SUE7: Innovation and NPD** (Contributed)

Track: **Product and Service Innovation**

Illinois Room (6th Floor, South)

Chair: **Satya Chakravorty**

## **1. Integration of the Government's Actions: an experience of planning oriented by projects on the state government level.**

**Adriane L Queiroz**, USP-POLI

**Susana F Pereira**, FGV-EAESP

The public sector has been receiving, during the last decades, many marks from the impact caused by the revolution of different governing styles. This complex process of acceleration of the development of new ways of public management is still confronted by the paradox of dependence on a bureaucratic model. We will explore theoretical and practical questions associated with an effort in integrating different government actions, in order to improve public management through the usage of tools such as strategic planning and project management. This objective is parallel to an illustration of how organizationally, the development of such a paradigmatic change may occur in public management, together with an analysis of the role of the state in society. Henceforth, a case is analyzed in which a new innovative experience is being implemented as far as a democratic-participative management in the plan of state government, conducted by a number of political actors.

## **2. Tactical Capacity Planning for Innovation Projects under Risk**

**Marcus Schweitzer**, Saarland University

**Lars Petersen**, Saarland University

Innovation management is usually considered from a strategic point of view. Translation of strategic goals on the tactical level, however, does not always obtain the appropriate attention. Given the increased certainty of data and quantifiability of risk in comparison with strategic settings, tactical planning problems are accessible by formal planning instruments to a far greater extent. In this context, we develop a stochastic approach towards capacity planning for innovation projects. Our model is bipartite, reflecting the different degrees of certainty of data pertaining to the immediate and the more distant future, respectively. The first partial model aims at a joint deterministic short term planning of resource capacities and project schedules. Its results are complemented with capacity plans for subsequent periods, which are determined by the second partial model based on stochastic data. Coordination between these two partial problems is achieved by an iterative procedure.

## **3. Planning Innovation and R&D in SME Sector Firms**

**John F Dalrymple**, RMIT University

This paper describes a project that involved a group of 15 sme sector firms in planning innovation and R&D activity. The firms, based in Northern Metropolitan Melbourne, were all actively engaged in product and process development activity and all were making significant investment in innovation. However, none of the firms had engaged with planning, costing or prioritising their innovation activity. The project involved a process of education and training of owner managers in the planning and costing of innovation and R&D to enable them to identify and allocate the resources required to bring the benefits of product and process development. The outcome is reported.

## **4. e-Government: Innovative Services in the Brazilian Municipal Administration**

**Richard R Lucht**, ESPM (Escola Superior de Propaganda e Marketing)

Lately in Brazil, public organizations have adopted several initiatives to enhance efficiency, productivity and the services quality to face the pressures coming from the new business environment. The adoption of Electronic Commerce (EC) resources has been used as one of the aspects that leverage sustainable competitive differentials. However, scattered and punctual studies are found in literature showing how EC is being employed by the Brazilian municipal administration to achieve such advantages. This article is the result of a qualitative exploratory survey concerning the analysis of city hall websites which focus on supply of public services and information to the citizen. The main contribution of this work is the elaboration of a detailed scenario for the current EC initiatives at the Brazilian municipal administration, starting from which it is possible to identify the development stage of these entrepreneurial initiatives as well as the most significant among them.

## **5. Learning by Doing: A Prototyping Experience**

**Satya Chakravorty**, Kennesaw State University

**Richard Franza**, Kennesaw State University

We describe our experience in developing an electric tiedown prototype, which was sold to Q'straint, a

tiedown manufacturing company. A tiedown enables physically challenged individuals to operate motor vehicles independently and was developed by repeated applications of problem solving approach. The prototype was developed by correctly identifying the problem (or opportunity), which was accomplished by addressing customer complaints while simultaneously meeting product design requirements. Relevant information was gathered primarily based on hands on cross-functional experience, and many hours were spent in generating and evaluating solution ideas. These solution ideas were then iteratively implemented to build the final prototype. In applying problem solving approach, we found that the approach was not always as smooth and sequential as implied by the problem solving literature.

**SUN/May 1** 3:45 pm- 5:15 pm

St. Clair Room (6th Floor, South)

Session **SUE8: Revenue Management** (Contributed)

Track: **Service Operations Management**

Chair: **Mark Ferguson**

### **1. Revenue Management of professional services**

**Michael Hoeck**, University of Hamburg / Institute for Industrial Management

This paper deals with the bid/no-bid decision and proposal coordination problem of large consulting firms, i.e. how much of the available capacity should be assigned to orders under negotiation and how much should be reserved for projects to come. In practice the sequential decision process is often based on an aspired project ROI and a rough-cut capacity requirements planning. In the following two other revenue management techniques popular in the airline industry, an EMSR-oriented approach and bid-price mechanism, are applied to the problem. A simulation study indicates, that the conventional approach works well in an environment with rising prices and a highly volatile demand. However, in more stable market segments the EMSR-oriented approach outperforms the other heuristics.

### **2. On the value of warranty returns**

**Simme Douwe P Flapper**, Technische Universiteit Eindhoven

There are many potential reasons why companies offering products under warranty should consider the parts replaced in the context of a warranty claim to be returned. In most literature related to warranties, product recovery and quality management, attention is paid to one or some of these reasons. However, combinations of the above reasons, may justify the return whereas individual reasons may not. A mathematical model is presented to estimate whether some or all of these reasons justify the effort to get back a certain part or not and whether/when the party involved in the actual replacement will be willing to return when desired. Some attention is paid to the application of the model in practice. The paper ends with a brief summary of the main findings and suggestions for directions for further research.

### **3. Towards the systematization of the Service Development Process: guidelines for development of the Quality Control Plan**

**Noel Torres Júnior**, São Paulo University / São Paulo - PRO

**Dario I Miyake**, São Paulo University / São Paulo - PRO

The purpose of this work is to contribute in the structuring of Service Development Process (SDP) a field that is lagging behind in comparison to systematized development of new products. Firstly, based on literature review, an effort was made to consolidate a set of selected specific approaches, in order to delineate what could constitute a general scope of the SDP. Next, a model for productive process planning diffused in certain manufacturing sectors is revisited. The application of this model provides a Control Plan which objectively indicates the monitoring activities that should be conducted throughout the development process. This work examines the appropriateness of adapting the application of Control Plans to the service development environment, considering its requirements and the application of specific methods and tools. A merit of this approach lies in placing on the SDP agenda critical elements and controls which should not be overlooked during the process.

### **4. Linking Revenue Management Practices to Performance**

**Carrie Crystal**, Georgia Tech

**Mark Ferguson**, Georgia Tech

**Soumen Ghosh**, Georgia Tech

Revenue management originated in the airline industry and has been gaining popularity in other, non-traditional industries. As interest in revenue management application increases, it is important to identify the key factors that drive revenue management effectiveness. While research on revenue and price optimization models have been gaining strength lately, the literature does not contain any published research which empirically investigates the impact of different revenue management approaches/practices on performance. We propose an empirical model linking core revenue management practices to revenue management performance, along with the key enablers that have a moderating effect between practices and performance. We provide the theoretical foundation and develop the scales for this model.

**SUN/May 1** 3:45 pm- 5:15 pm

Session **SUE9: FMS Scheduling and CAD/CAM** (Invited)

Track: **Flexible Manufacturing**

Hebron Room (2nd Floor, North)

Chair: **Kathryn Stecke**

### **1. An Object Oriented Approach to Extract Manufacturing Features for CAM Applications**

**Emad S Abouel Nasr**, University of Houston

**Ali K Kamrani**, University of Houston

Automatic feature recognition from CAD systems plays an important key towards CAD/CAM integration. Different CAD packages store the information related to the design in their own databases. Structures of these databases are different from each other. As a result no common or standard structure has been developed so far, that can be used by all CAD packages. For that reason this paper will propose an intelligent feature recognition methodology to develop a feature recognition system which has the ability to communicate with various CAD/CAM systems. The system takes a neutral file in Initial Graphics Exchange Specification format for 3D prismatic parts as input and translates the information in the file to manufacturing information. The boundary geometrical information of the part is analyzed by a feature recognition program based on object oriented and geometric reasoning approaches.

### **2. Scheduling Unrelated Parallel Machines with Resource Dependent Processing Times**

**Bharatendu Srivastava**, Marquette University

We consider the problem of scheduling  $n$  independent tasks on  $m$  unrelated parallel machines where the processing times are resource dependent. Using the resource reduces the processing times required on the machines. We formulate the problem with the objective of minimizing the makespan and develop a heuristic procedure to solve the problem. Computational results are presented to demonstrate the effectiveness of the proposed algorithm.

### **3. Real-time scheduling of vehicle-based internal transport systems**

**René B De Koster**, Erasmus University Rotterdam

**Tuan Le Anh**, Erasmus University Rotterdam

In this paper, we study the performance of dynamic scheduling approaches for vehicle-based internal transport systems. To solve static instances of scheduling problems, we propose two heuristics: combined and column-generation heuristics. We solve the real-time scheduling problem by applying a heuristic to solve a series of static instances according to a rolling horizon policy. A rolling horizon can be seen either as a fixed-time interval in which advance information about loads' arrivals is available, or as a fixed number of loads which are known to become available in the near future. We compare these dynamic scheduling strategies with a look-ahead dynamic assignment algorithm and two of the best vehicle dispatching rules. Experimental results show that the real-time dynamic scheduling approaches consistently outperform vehicle dispatching rules. Results also reveal that look-ahead information has different values for different scheduling approaches.

### **4. Mathematical Modeling and Analysis of Flexible Production Lines**

**Young Jae JANG**, MIT

**Stanley B GERSHWIN**, MIT

This paper presents a model and analysis of a production line that processes different part types on unreliable machines. The machines operate according to a rule in which they operate on the highest priority part whenever possible, and only operate on lower priority parts when unable to produce those with

higher priorities. Part priorities are static and are a function only of part type. As a first step, we restrict ourselves to two-part-type systems. The purpose of this paper is to present mathematical formulations and algorithms for estimating production rates and average inventory levels for each part type in a flexible production line. The qualitative behavior of the two-part-type line under different supply and demand scenarios is described.

**SUN/May 1** 3:45 pm- 5:15 pm

Session **SUE10: Healthcare Operations Management III (Contributed)**

Track: **Health-Care Operations**

Ohio Room (6th Floor, South)

Chair: **Kenneth Fordyce**

### **1. Innovation in Aged Care - Operations Management Challenges**

**Marian E Dalrymple**, MCM

**John F Dalrymple**, RMIT

A not-for-profit organisation in Melbourne, Australia embarked on a redevelopment of their aged care facility. The new facility is based on a cottage model of four fifteen ensuite room cottages. This replaced a hospital ward model with eleven four bed bays. In addition, central services were discontinued to enable each cottage to be free standing. This paper describes how the Director of Nursing overcame the task of producing innovative solutions to the operations management challenges that the new facility faced.

### **2. An Assessment of Performance Metrics in Healthcare Management**

**Suresh K Tadisina**, Southern Illinois University

**Kiattisak Phongkusoichit**, Southern Illinois University

The current challenges faced by healthcare providers such as rising costs, reduced reimbursement, workforce shortages, outsourcing, are pressurizing them to adopt appropriate management tools to improve operational efficiency and quality of care. Critical to improving performance is the availability of robust and timely performance metrics. Use of such metrics enables goal setting through benchmarks and monitoring of progress. The paper attempts to provide a detailed review of currently used performance metrics with the focus on metrics related to management of healthcare operations rather than the practice of medicine. The review includes metrics used by multiple stakeholders such as management, physicians, patients, policy makers, etc. A critical assessment of the existing metrics, including comprehensiveness, extent of use, strengths and weaknesses, will be presented. Discussion will cover issues associated with identifying, developing, and implementing appropriate metrics. Gaps will be identified and opportunities for research and future contributions will be presented.

### **3. Exploring Error Management System Implementation at US Hospitals**

**Kathleen L McFadden**, Northern Illinois University

**Gregory N Stock**, Northern Illinois University

**Charles R Gowen**, Northern Illinois University

The report entitled To Err is Human (2000) highlighted the problem of errors in medicine. The study estimated that medical errors are linked more than 98,000 deaths annually, and that 58% of these errors are preventable. In a previous study, McFadden et al. (2004) used a case study approach of hospitals in the Chicago area to identify seven critical success factors for reducing medical errors. By conducting a nationwide survey of US hospitals, this study will explore the extent to which quality managers at hospitals across the country find these factors to be important in reducing hospital errors. It will also examine the level of implementation of these factors in the hospitals, study barriers to implementation, and identify desired performance outcomes or benefits of implementation. The framework developed here, if supported, will offer insight into a very important national issue.

### **4. Reducing Barriers to Effective Colorectal Cancer (CRC) Awareness, Screening, & Compliance in busy, under resourced, urba**

**Kenneth J Fordyce**, IBM

**Thomas Weber**, Einstein School of Medicine, Montifiorie Hospital

Colorectal cancer (CRC) is second leading cause cancer death in the US, striking many otherwise healthy individuals who could expect to live long and productive lives. The current body of scientific research

clearly demonstrates through appropriate screening the number of people dying from CRC could be substantially reduced and these people will live healthy lives free of any CRC side effects. The challenge recognized by the National Cancer Institute (NCI) is to profile the health care management (HCM) processes to identify barriers and develop decision support tools to overcome these barriers. This presentation will present an overview of CRC, the importance of screening, and cover work done by Einstein School of Medicine profiling the delivery process in under resourced urban areas, identify barriers to effective screening, and use decision and information technology to provide CRC screening decision support to health care providers to overcome these barriers.

**SUN/May 1** 3:45 pm- 5:15 pm

Session **SUE11: Managing networks** (Contributed)

Track: **Operations Strategy**

Onyx Room (2nd Floor, North)

Chair: **Kirit Patel**

### **1. Collaborative Manufacturing Networks - A study of success factors**

**Andreas Sandgren**, Jönköping University, School of Engineering

**Mats Winroth**, Jönköping University, School of Engineering

Why should companies leave their independence and enter close collaboration, perhaps even with companies with similar competence? The next question is which factors are most important when creating efficient supply networks? Technical foresights and roadmaps exemplify several things that are important to work with to be successful in the future, such as to have an environmental consciousness for product and production. It is also important with collaboration between suppliers as a mean to become more interesting as partners for systems integrators. This is a process for small and medium sized enterprises in their efforts to meet the increasing global competition. Collaborations between independent enterprises are however not easily created. Several factors will affect suppliers' ability to create these collaborative networks and make them strong enough to enable competitive strength towards threats from actors on the global market. This article describes the most important success factors for these collaborative networks.

### **2. Sourcing and Location of Commonality in Multi-plant Networks**

**Lauren Xiaoyuan Lu**, Kellogg School of Management at Northwestern University

**Jan A Van Mieghem**, Kellogg School of Management at Northwestern University

We consider the operations strategy of a firm that manufactures two products for two geographically separated markets using one common component and one product-specific component. Intermarket transportation of the common component is possible but incurs a positive cost. We analyze two strategic network decisions. First, should the common part be produced in a single facility or in two local facilities? Second, if a centralized facility strategy is adopted for the common part, in which market should that plant be located? We use the newsvendor network framework to find the optimal operations strategy. We show how both sourcing and location of commonality crucially depend on the transportation cost. Moreover, a process- or a product-plant network configuration may emerge as a boundary solution of the multi-plant network problem under certain conditions. We provide insight in how market and financial characteristics drive the optimal network strategy.

### **4. What can an international manufacturing network offer that a factory cannot?**

**Yongjiang SHI**, Cambridge University

**Mike Gregory**, Cambridge University

This paper explores and identifies strategic capability and performance measurement indicators of internationally dispersed factory network owned, or partly owned by a multinational corporation. Based on observations on the transformations of international manufacturing networks, new insights into the capabilities of various configurations of network are introduced and categorized in order to lay down a foundation for a practical approach to audit and measure the potentials and performances of the network. From theoretical perspective, this paper seeks to explore the latency of international manufacturing networks and to conceptualize it into strategic capability parameters.

### **5. THE MANAGEMENT OF OPERATIONS IN COMPLEX PARTNERSHIPS: THE CASE OF LOCAL GOVERNMENT AND THE VOLUNATRY SECTOR IN BRITAIN**

**Kirit Patel**, Middlesex University

In Britain changes in legislation now require local authorities to work in partnership with the voluntary sector to deliver various services and given this requirement both these sectors are rapidly becoming competent and sophisticated in the use of various management models. Various management tools and models such as the balanced scorecard, project management, process improvement and knowledge management have been considered or implemented in various forms. The paper will analyse results from an on going survey which will examine the successes and failures and lessons to be learnt in using the above mentioned models and tools for delivering and improving operations in a partnership setting. The survey includes the thirty three councils which make up London and sample of voluntary sectors organizations which have a partnership contract with councils. This is an important issue given that over a half a billion pounds is tied up in such partnerships annually.

**SUN/May 1** 3:45 pm- 5:15 pm

Valencia East (Lobby Level)

Session **SUE12: Implementing and Assessing OM learning innovations** (Contributed)

Track: **Innovations in Teaching**

Chair: **Lori Cook**

### **1. Creating Significant Learning Experiences**

**CONSUELO P QUIROZ**, PONTIFICIA UNIVERSIDAD CATOLICA DEL PERU

How can I create a course that will provide significant learning experiences for my students. I have seven years of experience as a professor. During this time, I used many tools in teaching, some successful, others were not as successful. I began from a content-centered approach, then after a deeper evaluation, shifted to a learning-centered approach that asks "what kind of learning is significant for students?." Based on an analysis of the results, my conclusion is to follow the latter strategy.

### **2. Enhancing an MBA Curriculum Using Outside Business Ideas: Lessons Learned**

**Larry C Meile**, Boston College

**Gregory Stoller**, Boston College

The paper we propose to present describes a graduate curriculum development initiative undertaken at our school and the lessons learned from the experience. We actively seek business ideas from outside the university and use their development as a unifying theme within the curriculum. The result has been the creation of a three-course sequence (one core course and two electives) that is based on the process of taking these ideas from embryonic business thoughts to marketable products. The two primary goals are to provide "real-world" situations for our students and, as much as possible, to establish viable for-profit companies for our clients. The paper will describe several dimensions on which the resulting program has been successful and some of the issues that still need to be worked out.

### **3. Harnessing Technology to Improve Instructional Processes**

**Brad C Meyer**, Drake University

This paper will discuss the author's experience with three teaching ideas. The first is the use of some very simple macros in Excel to greatly improve the efficiency of grading quantitative assignments submitted via email. The second is a lean approach to processing assignments that reduced grading throughput time to under 5 hours (time from submission of assignment to receipt of graded work by student, for a class of 40 students). The third is the use of customized exam spreadsheets to reduce cheating in an online course. In all cases, the work submitted is graded individually by the instructor so that personal feedback is given to each student. (I.E., this is not a multiple choice question approach.)

### **4. eLearning for the Lazy?**

**Bo van der Rhee**, University of Utah

**Rohit Verma**, University of Utah

**Gerhard Plaschka**, DePaul University

**Jill Kickul**, Simmons School of Management

More and more Business Schools are offering classes online. In this article we will first examine whether students are susceptible to this teaching method. Second, we conducted a large scale survey to determine whether there exists a participation bias such that only students with low work ethics will register for online

classes due to the (invalid) perception of having to spend less time on an online class in comparison with a face-to-face class. We conclude with professorial implications and recommendations for business schools that are interested in offering online classes.

## **5. Assessing the Effectiveness of Experiential Learning Activities in an Operations Management Course**

**John R Olson**, University of St Thomas

**Lori S Cook**, DePaul University

An important method that many instructors use to bring clarity to the class material is through the use of experiential learning activities to simulate a “real world” application of the material. To provide the clarity that a student needs, instructors must structure their class situation to enable their students to not only understand the material, but also be able to apply the material to the new situations that they will encounter after they are out of school. A key element in the design of the activities is establishing clear linkages between the exercise, the lecture and the course learning objectives. An assessment of the impact of the activities based on a comparison of varying levels of student ability will be presented.

**SUN/May 1** 3:45 pm- 5:15 pm

Valencia West (Lobby Level)

Session **SUE13: Tutorial: How to Build and Manage the Lean Supply Chain** (Invited)

Track: **Supply Chain Management**

Chair: **Mandyam Srinivasan**

### **1. Tutorial: How to Build and Manage the Lean Supply Chain**

**Mandyam M Srinivasan**, University of Tennessee

This tutorial presents the principles and steps that enterprises can jointly undertake to build and manage the lean supply chain. It will discuss how lean thinking and the theory of constraints combine to help flow the product smoothly across the supply chain. One tool we discuss in detail is Rate-Based planning, a lean thinking concept that allows multiple enterprises in a supply chain to plan and schedule production at the same rate. This concept has, however, not been explicated until now. Rate-based planning helps synchronize the production plans and schedules of upstream suppliers with the drumbeat of the downstream customer. The customer’s drumbeat is determined by the constraint, which could be either the market or the customer’s internal production capacity. The spreadsheet-based tool we present identifies which type of constraint (market or production capacity) is expected to be the bottleneck in the future.

**MON/May 2** 8:00 am- 9:30 am

Sullivan Room (8th Floor, South)

Session **MA1: Strategic Issues I** (Contributed)

Track: **Supply Chain Management**

Chair: **Gyula Vastag**

### **1. Concurrent Networks**

**José Paulo A Fusco**, UNIP

**José A Gobbo**, UNESP

**Rosangela C Rubiato**, UNIP

**Gressiqueli R Chiachio Buosi**, UNIP

The formation and development of networks and the SCM theory has gained relevance in recent years. Many contributions have been done by researchers primarily concerning aspects of competitiveness, producing a great variety of assessment models and typologies. This paper intends to present an alternative methodological approach grounded on three main dimensions or concurrent networks, e.g., business, value and physical, to subsidize the assessment of networks and supply chain competitiveness in a general sense. Additionally, the paper proposes a new typology to classify activities and relationships within the networks. To illustrate the model, a qualitative and exploratory research has been done in a Brazilian pulp and paper network of firms. The findings presented in this paper allow to visualize the potential of the suggested model, under an analytical point of view, whose application revealed important aspects from each network and from the related relationships linking networks.

## **2. Supply Chain Integration: A Grounded Examination**

**Ron D McLachlin**, University of Manitoba

This paper focuses on supply chain integration, especially various key factors and implementation issues for integration. It addresses several themes, with emphasis on the broad theme of improving a firm's overall supply situation by helping others in the supply network. This assistance includes management efforts to improve the operations, capabilities, and advantages of other participants in the supply network, in both the customer and supplier directions. The methodology follows a grounded, case-based approach to the systematic analysis of mainly qualitative data, aimed at theory development. Data were collected primarily through on-site interviews, augmented by a brief questionnaire. The interviews were conducted with a number of mid-level managers at each of a number of local firms, representing various industries. Each manager was knowledgeable about the firm's supply chain situation, typically from a particular functional perspective. The paper concludes with propositions and themes for further exploration.

## **3. Strategic Positioning - an integrated decision process for manufacturers**

**Tim S Baines**, Cranfield University

Strategic positioning is concerned with choosing those production related activities that an organisation should carry out internally, and those that should be external and under the ownership and control of suppliers, partners, distributors and customers. This concept extends traditional decision paradigms, such as those associated with make versus buy and outsourcing, by looking at the interactions between manufacturing operations and the wider supply chain networks associated with the organisation. In particular it requires analysis of manufacturing related activities at the interface with customers, infrastructure, product range as well as the more traditional material supply base. This paper describes research that has sought to create a formal and rational process that guides manufacturers through the strategic positioning decision. Both the research programme and decision process are presented in detail.

## **4. Contributions of the ISO 9000 Certification to the Service-Profit Chain**

**Gyula Vastag**, Kelley School of Business, Indiana University

**Ronald D Anderson**, Kelley School of Business, Indiana University

**Vincent B Thompson**, IBRC, Indiana University

This paper, guided by the service-profit chain model, explores causal linkages through which the benefits of the ISO 9000 certification are realized. Using a sample of ISO 9000 and EMAS (Eco-Management and Audit Scheme) certified German sites, a Bayesian network model is fitted with the focus on the analysis of actual and potential actions. The diagnostic and predictive capabilities of Bayesian networks are used to explain system relationships and anticipate the impacts of potential managerial approaches. The main conclusion of the paper is that, ceteris paribus, an external route to increased profits (that goes through customer satisfaction, realized delivery benefits, and increased market share) is more advantageous than following an internal route (focusing on costs, productivity and internal morale improvements). Neglecting the internal side and reducing the internal investments to focus on the external side, however, will result in conditions worse than the a priori situation.

## **5. Changing Facets of OM**

**Enar A Tunc**, Ball State University

**James E Walters**, Ball State University

**Sushil K Sharma**, Ball State University

Operations management (OM) has gone through tremendous changes in last five decades. From modest applications of operations research techniques to manufacturing scheduling in the 70s and service management in the 80s to today's supply chain management, OM has changed considerably. This evolution has impacted number of job opportunities, student enrollments in operations management programs, and the focus of research. Examined will be how these changes affect operations management researchers, academicians and practitioners and student enrollments, how job opportunities are currently perceived in this area, why some schools have low enrollments in operations management, and why few schools have changed the name of their department from operations management to Supply Chain Management. Data are being collected from across the schools, and across the countries. The data analysis and research findings will be presented and discussed in the conference.

### **1. Product Proliferation and the Supply Chain: A Case Study**

**Frances M Randall**, Kidde Safety

**Vidyaranya B Gargeya**, The University of North Carolina at Greensboro

It has been said that the customer is always right; however, that does not mean that the customer is always profitable to the business. As customers desire changes to existing products or special order items and as companies fail to eliminate dying product lines, the supply chain can become clogged. Product flexibility (with or without "necessary" demand volumes) could cause forecasting problems with vendors, excess raw material inventory issues, and manufacturing capacity concerns on the production floor. Pricing items without considering these issues could have a significant effect of a company's bottom line. The paper presents a case of a medical manufacturer of gastro-intestinal endoscopy accessories and supplies regarding the issues at hand. Using a questionnaire survey of the employees at the company, this research provides an insight into company policies regarding proliferation/consolidation. The article concludes with some recommendations for the company.

### **2. Supply Chain Design in the Brazilian Automotive Industry**

**Luiz C Di Serio**, FGV-EAESP

**Mauro Sampaio**, FGV-EAESP

**Susana F Pereira**, FGV-EAESP

**S. Marco André Moreira**, FGV-EAESP

The Brazilian economy suffered a number of social, economic and structural changes through the nineties. Modern management techniques were adopted by Brazilian managers in order to obtain increasing competitive advantages, after having spent many years obtaining financial profits which hid their operating inefficiencies. In this context, the supply chain management came as an answer to this new competitive environment. This paper intends to provide a contribution on this matter, focusing the point of view of a 3-D architecture that is the product, process and supply chain project and the different relationships inherent within the members of the supply chain of the automobile industry.

### **3. PERFORMANCE EVALUATION SYSTEMS FOR FRESH PRODUCTS SUPPLY: A CASE STUDY IN THE FOOD RETAIL**

**Renato M Bonfim**, Federal University of São Carlos

**Hildo M Souza Filho**, Federal University of São Carlos

**Andrea L da Silva**, Federal University of São Carlos

**Ana Elisa B Lourenzani**, Federal University of São Carlos

This study analyzes performance evaluation systems developed by a retail chain in Brazil. These systems aim to improve supply efficiency, enhance customer service level, and raise FFV profitability. These systems were known as Supplier Evaluation Systems (SES), and the Commercial Level of Service (CLS). The systems showed to be suited to the purpose for which they were developed. However, their scope was not broad enough and they did not include important indicators for improving process management, besides, technology department was not able to create systems capable of providing access to the data generated by these models.

### **4. Modularity as a global competitive strategy : Automotive case studies**

**James F O'Kane**, Newcastle Business School, Northumbria University

**Zhengwen XU**, Newcastle Business School, Northumbria University

Modularity, as an evolving management and strategic concept, emerging from the IT and automotive industries, has had considerable effects on global manufacturing, which have quickly spread into other industries and is congruent with the total value-chain concept. This project researches the question "how can a modularity strategy drive global competitive advantage within automotive supply?" The research is realised through cases studies of an automotive manufacturer main 1st tier suppliers, focusing on the prerequisites, critical success factors and the barriers of implementing modularity, as well as the effects to

global competitive advantage in the automotive sector. A systematic and dynamic framework of best practices within the emerging modular environment is proposed and the research suggests that there are some risks to adopting modularity with the transfer of more value and more function to upstream suppliers, and that a strategic partnership should be the key bond of a modular supply chain

### **5. Biobased Business Supply Chains**

**Rhonda R Lummus**, Iowa State University

**Robert J Vokurka**, Texas A&M University - Corpus Christi

While there is much interest and support for biobased businesses, the development of these businesses requires advances in science and technology, evaluation of agricultural practices, and resolution of supply chain issues. The issue of supply chain development for biorefineries is discussed in the national vision and roadmap document for biobased products and bioenergy with the need for research and development for

**MON/May 2** 8:00 am- 9:30 am

Wright Room (8th Floor, South)

Session **MA3: Impact of Technology on Integrated SCM II** (Contributed)

Track: **Impact of Technologies on Integrated SCM Operations**

Chair: **Greg Frazier**

#### **1. Designing Online Reverse Auctions to Reduce Purchase Prices**

**Loay Sehwal**, Oklahoma State University

**Ricki Ingalls**, Oklahoma State University

Although business-to-business online reverse auction have recently become a popular method to buy and sell products and services, procurement professionals and academicians are still unaware of the auction design parameters required to ensure the success of the online reverse auction event. In this paper, the authors examine how to implement one-sided online reverse auctions to meet the buying organizations emphasis of cost management through reducing the purchase prices. The authors study the auction design from four dimensions: Auction format (Open bid versus sealed-bid), event organization (in-house versus with market maker help), closing rule (soft versus hard close), and the reserve price policy (with versus without a reserve price).

#### **2. Internet Grocery Shopping and Convenience Food Manufacture**

**Rob Darlington**, Loughborough University

The food industry presents many challenges that are distinct to most other manufacturing sectors, and when considering fresh, value-added and convenience foods in particular, there may be numerous complications to be overcome. Shelf life constraints of products and ingredients in convenience foods may be measured in hours, while the volatility of demand may be dependant upon diverse factors such as weather conditions. In the worst cases, such as ready-meal sectors, production make-spans may exceed order lead-times, generating considerable waste as manufacture is then based upon forecast. Technology driven changes to improve added-value convenience have been reported with mixed success, in particular internet grocery (e-grocery) shopping. These developments represent a considerable shift to current retailer methods, provided the many documented problems can be overcome. This paper describes the opportunities that may be presented to food manufacturers should e-grocery consumer markets develop as world-class e-retailers become established.

#### **3. Evolving Models of B2B eMarketplaces**

**Timothy M Laseter**, Darden School/UVA

This presentation will examine the results from tracking over 1,200 B2B e-Marketplaces over a four year period. The findings provide insight into the rate of failure and the evolving models for success. Specifically, the research presents a new taxonomy for classifying the survivors which suggests that the majority of B2B e-Marketplaces pursue a business model that is more evolutionary than revolutionary. Through interactive discussion, the session should also identify additional research opportunities for application in the years ahead as the collection of B2B e-Marketplaces continues to change.

#### **4. Internet versus traditional supplier selection tools: The effect on seller perceptions of buyer firms**

**Xiaowen Huang**, Miami University  
**Thomas F Gattiker**, Miami University  
**Joshua L Schwarz**, Miami University

The effect of Internet reverse auctions on buyer-seller relationships is an important issue. As the economy shifts to a seller's market, supplier goodwill becomes increasingly important. Many buyer firms strive to become a "buyer of choice." Using a lab experiment, we examine differences in antecedents to seller's attitudes toward buyers when various sourcing mechanisms (e.g. reverse auctions, email negotiations, traditional negotiations) are used.

**MON/May 2** 8:00 am- 9:30 am

Burnham Room (8th Floor, South)

Session **MA4: Purchasing Issues** (Contributed)

Track: **Purchasing**

Chair: **Alexandre Graeml**

### **1. Public Procurement of Telecom Services/Function; consequences for buying and selling organizations**

**Helena Lindskog**, Linköping University

More and more public and private organizations decide, "to buy" instead for "to make", they decide to outsource and to buy services or whole functions. One of the most obvious candidates for many organizations is a telecom-function. Telecom market has a relatively well-developed competition. At the same time the technical development is dramatic and there are several solution to the same requirement and high potential for rationalization, increased efficiency and/or better service level to customers and internally. The decisions to buy telecom services/functions have long-lasting consequences for all the parts involved in the procurement process. This paper investigates and analyzes the consequences of public procurement of telecom services/function for both buying (authority) and selling (enterprise) organizations.

### **2. The Internet's impact on the purchase function of Brazilian manufacturers**

**Alexandre R Graeml**, UNICENP / CEFET-PR

**Joao M Csillag**, FGV-EAESP

E-sourcing is claimed to have helped many companies reorganize corporate purchases lately, speeding up the sourcing process. In addition to the reduction of cycle times, the use of the web as a purchasing tool leads to substantial cost savings for those who embrace it, according to some of its early adopters. This paper first reviews the literature about e-procurement, reverse auctions and other practices and technologies related to the use of the Internet to leverage sourcing activities. It then presents the results of a survey, which included questions about the Internet's impact on the company's purchase function. The questionnaire was answered by 655 manufacturers from the state of Sao Paulo, Brazil, early in 2004. The analysis of such data offers support to the findings of previous studies and reveals the current status of adoption of the Internet by Brazilian organizations, with respect to the procurement of goods and materials.

**MON/May 2** 8:00 am- 9:30 am

Adler Room (2nd Floor, North)

Session **MA5: Manufacturing** (Contributed)

Track: **Operations Planning, Scheduling and Control**

Chair: **Charles Petersen**

### **1. SIMULATION OF COMPLEX LAYOUT PROBLEM IN IN THE ELECTRONIC INDUSTRY OF CONTRACT MANUFACTURING**

**Samuel V CONCEIÇÃO**, FEDERAL UNIVERSITY OF MINAS GERAIS

**Luiz R PINTO**, Federal University of Minas Gerais

**Milena E DINIZ**, Federal University of Minas Gerais

**Thiago O SILVA**,

**Ana C VAZ**, Federal University of Minas Gerais

Facility layout design is very important for a company to measure the performance of its manufacturing

system. This article presents a case study of simulation and implementation of a complex layout problem in the internal production environment of an industry in the electronic sector of contract manufacturing. The software Arena was used for the modeling and simulation of the operational and tactical conditions of the assembly line. The performance of the production line is measured by how well it meets the volatile demand during the working shift available. Several alternatives or scenarios to reconfiguring the assembly line (by varying the number of service sites, variety of products, demand pattern, standard time, etc.), is introduced in order to optimize the balancing efficiency and measure the manufacturing system.

## **2. Pareto-optimality under Limited Information Sharing in Semi-conductor Testing**

**Sricharan Poundarikapuram**, University of Wisconsin, Madison

**Dharmaraj Veeramani**, University of Wisconsin, Madison

**Andrew Miller**, University of Wisconsin, Madison

This paper presents a distributed decision-making method that provides Pareto-optimal solutions for collaborative planning without disclosing private local information in the semi-conductor testing industry. In the semi-conductor testing process, simultaneous allocation of resources such as testers, handlers, load-boards and tooling is required under a limited budget. This study develops and implements a branch-and-bound based Lagrangian dual decision-making method that optimizes a mixed integer programming model involving: (1) the type and number of testers that should be invested to deal with forthcoming orders, and (2) the simultaneous allocation of resources to orders so as to maximize company profit. Experimental results show the efficiency of the method using data from a semi-conductor company in Taiwan.

## **3. Simulation tools for executing quantitative lean manufacturing.**

**Gary J Lutfy**, Indiana University / Hamilton Sundstrand Corporation

This paper looks at the use of simulation tools to optimize throughput and minimize cost in an electronics assembly manufacturing facility. The paper discusses the creation of factory and cost models to capture activity-based total manufacturing cost of each product. It then discusses the findings of the simulation and the scenarios that were performed to optimize the factory operation. Factory and cost models will be demonstrated.

## **4. Manufacturing Lead Time. Functional Approach**

**Skomorokhov Riurik**, Independent consultant

Manufacturing lead time of both single product and all products scheduled for manufacturing and delivery depends on not only scheduling methods used. There are other factors that influence manufacturing lead time. In the case, we can use functional approach for determining manufacturing lead time and related schedule parameters. When determining factors influencing the lead time most, we can also determine most important optimization problems, including scheduling ones, for system manufacturing and supply chain management optimization. For conditions of low and mid-volume machine-building production, we found out factors most influencing on the lead time and determined more effective optimization system. Our research demonstrated significant limits of changing the lead time depending on the above. Proper manufacturing scheduling and manufacturing management optimization allow us to significantly reduce manufacturing lead time of both single product and all products scheduled for manufacturing and delivery.

## **5. U-shaped Assembly Lines with Operator Travel**

**Gerald R Aase**, Northern Illinois University

**Charles G Petersen**, Northern Illinois University

**Daniel R Heiser**, DePaul University

The use of U-shaped assembly lines has received much attention as a means to improve labor productivity and to increase communication among operators when producing high volume products. A fundamental operating decision that affects labor productivity involves "balancing the line." Solution procedures for the Simple U-shaped Line Balancing (SULB) Problem are extended to address operator travel. This research examines how sensitive the expected improvement in labor productivity is to the 'additional' travel time an operator spends when crossing between the two legs of the line. Results indicate that Percent Improvement in Labor Productivity (relative to a traditional straight assembly line) decays rather rapidly as the level of additional operator travel time increases.

### **1. Assumptions for sustaining profit growth**

**József Vörös**, University of Pécs

A model is introduced and analyzed, where demand depends on price and the performance quality of the product. Demand depends on time as well because we assume that monopolistic competition is effective, where later more and more companies are able to offer the product at the same quality and price.

However, increasing productivity knowledge decreases unit production cost, and productivity and quality knowledge can be developed through induced and autonomous learning in order to strengthen company position. The presentation provides an optimal control formulation of the problem and develops necessary conditions for optimality and characterizes the dynamics of optimal price, quality and investment decisions. Then the dynamics of the optimal profit level is analyzed and the sufficient level of efficiency is determined for strategic improvement efforts. It is an interesting finding as well that quality attributes that can be considered non-strategic ones, have no direct effect on how profit shapes.

### **2. An Exact Resource Allocation Model with Hard and Soft Resource Constraints**

**Ferenc Kruzzlicz**, University of Pécs

In this paper we present a mixed integer linear programming (MILP) resource allocation model with hard and soft resource constraints for projects. By definition, a hard resource constraint is not resolvable within the given planning horizon, but a soft resource conflict may be managed by a flexible hiring-firing strategy. A well-balanced optimal schedule for the soft resources is characterized by a new global bicriteria measure, namely the peak resource requirement and the idle time, simultaneously. The application of the idle time measure for hard resources is optional, but if used it defines a smooth load schedule. In the proposed approach the goal function of the MILP model is defined as a weighted combination of the single criteria measures. The MILP model is created by automated transformational steps from a non-linear initial model based on the immediate precedence relations of the GANTT diagram. The practical interpretation of the proposed model is demonstrated in an analysis of a simplified small-scale business software development environment.

### **3. Optimizing the average waiting time at cash desks using line structuring rules**

**Tamás Koltai**, Budapest University of Technology and Economics

**Noemi Kallo**, Budapest University of Technology and Economics

The decrease of waiting time of customers in lines is an important management objective in many areas of the service industry, and in a time based competition environment it might have marketing implications as well. An empirical study of the waiting time of customers at the cash desk of a supermarket revealed, that the application of express lane may not always improve performance. The analytical and numerical analysis of the limit number – that regulates which customer can access the express lane – showed that this parameter has an optimal value. The paper presents an analytical and numerical model for finding the optimal value of this limit parameter. Sensitivity analysis of the optimum is also provided to highlight the most important parameters operation managers have to control. Based on sensitivity results some general conclusions are also presented for the management of waiting lines when line structuring rules are applied.

### **4. Quantitative methods and models in measuring customer satisfaction in the electricity industry**

**Gabor Rekettye**, University of Pecs

**Jozsef Pinter**, University of Pecs

The large database gained by the nationwide survey of the customer satisfaction with the electricity supply provides the possibility to analyze the factors contributing to the satisfaction of the Hungarian households. The objective of the paper is to measure the marketing-related and operation-related components of customer satisfaction. To analyze this large database consisting of more than 9000 elements multivariable statistical methods seem to be most appropriate. The factor analyses based on the main component methods and the cluster analyses give the opportunity to classify and analyze the main factors. The

identification of groups of the influencing factors helps to construct the multivariable model of customer satisfaction. Based on this model simulations are carried out to identify those fields of marketing and operations where company measures should be taken to improve the efficiency of the service. These measures of improvement will then contribute to the future increase of customer satisfaction.

## 5. Hammock Activities in Project Scheduling

**György Csébfalvi**, University of Pécs

**Anikó Csébfalvi**, University of Pécs

The concept of hammock activities plays a central role in project management. They are used to fill the time span between other "normal" activities since their duration cannot be calculated or estimated at the initial stage of project planning. However, the recent literature does not offer a general and useful method to compute the unconstrained (resource constrained) duration of such activities. In the proposed approach, a hammock activity is characterized by two dummy activities; therefore the estimation of the unconstrained hammock duration can be formulated as a simple linear programming (LP) problem. The estimation of the resource-constrained duration can be described as a mixed integer linear programming (MILP) problem with big-M constraints, which can be solved for small-scale projects in reasonable time. The presented implicit enumeration algorithm for the resource constrained hammock duration is formulated as a tree-search problem with effective pruning rules.

**MON/May 2** 8:00 am- 9:30 am

Session **MA8: Service OM Potpourri** (Contributed)

Track: **Service Operations Management**

St. Clair Room (6th Floor, South)

Chair: **Martha Cooper**

## 1. After-Sales Service configuration in computer market

**mario tucci**, university of florence

**filippo visintin**, university of florence

**mario rapaccini**, university of florence

The main objective of this paper, realized starting from the results of several case studies carried out in the ASAP project (After-Sales Advanced Planning, [www.progettoasap.org](http://www.progettoasap.org)) is to provide a reference model for the configuration of the on field service network, in computer industry' firms. Results achieved, can be summarized as follow: •There are several factors, related to products, manufacturers and costumers that determine: the way products have to be repaired and the kind of technical assistance centre where reparations have to take place. •In order to make it possible and cost effective, service network has to be structured at least in two levels: distributed (first tier) and centralized (second tier) technical assistance centres, each one dedicated to a particular kind of products and/or customers. This configuration, in fact, guarantees a widespread presence on the territory and, at the same time, scale, scope and specialization economies.

## 2. Integrate or isolate? Impact of organizational structure choices on service deployment strategies by product manufacture

**Heiko Gebauer**, Inst. Tech. Mgmt. – University of St. Gallen

**Jeremy M Brann**, Texas A&M University

**Rogelio Oliva**, Texas A&M University

Management literature suggests product manufacturers should expand their service offerings as a way to extend customer contact and stabilize revenue streams. This requires the development of a service organization with structures, processes, and values that differ from what is typical in a manufacturing environment, and frequently the dominant manufacturing norms suppress the emergence of a service culture and a relationship-based business model. Our study examines 216 transitioning European manufacturers in the high-value durable equipment industry to determine how well the creation of a profit center service organization and its associated level of service visibility mediate the effects of the firms' service offering and strategy on its service profitability and customer satisfaction. We find evidence to support Oliva and Kallenberg's (2003, IJSIM) finding that the creation of a separate service organization, organized as a profit center, is a success factor for making the products to services transition in this industry.

### **3. Lean Manufacturing tools: an application in service operations.**

**Paulino G Francischini**, University of Sao Paulo

**Andresa N Francischini**, Anhembi Morumbi University

This article analyses the application of Lean Manufacturing concepts in service operations in order to improve productivity. The literature review about Lean Manufacturing and Lean Service is included. The case studies evaluate call center processes and four companies which develop this service category are considered. The analyses show that some Lean Manufacturing tools can be adapted and applied to Lean Service concepts, as pokayoke, one-piece-flow, pre-processing, service cells among others. The improvements in productivity are more evident in processes which are easier to standardize. The results indicate that these companies were able to achieve a considerable loss reduction in customer attendance process. This evidence was based mainly in process standardization and technology use to support employees that deal with customers in call centers.

### **4. A Framework for Understanding the Services and Goods Mix of a Product**

**Annibal José Scavarda**, Fundação Getúlio Vargas Business School/ Department of Production and Operations

**Martha C Cooper**, The Air Force Institute of Technology/ Department of Operational Sciences

**Lisa M Ellram**, Arizona State University/ Department of Supply Chain Management

The products that organizations offer their customers can be classified along a continuum from "pure services" to "pure manufacturing/goods." The operations, marketing, and purchasing literatures are searched for development of discriminating characteristics in order to create a multidimensional framework. The framework can be used to help management position product offerings along the continuum and to build appropriate supply chains. Examples are given of approaches for managing the range of services and goods combinations. Future research is suggested for testing the framework.

### **5. Optimal Inter-territory Server Sharing in Field Services**

**Sal Agnihotri**, SUNY Binghamton

**Srinivas Chakravarthy**, Kettering University

We consider a field service system with two territories, each with a single server who repairs equipment on-site. In order to reduce excessive delay, it is a common practice to re-deploy servers between territories whenever the queue length exceeds a certain threshold value. We develop an appropriate queuing model to obtain optimal server sharing decisions between the two territories.

**MON/May 2** 8:00 am- 9:30 am

Hebron Room (2nd Floor, North)

Session **MA9: Service Capacity Planning and Scheduling (Invited)**

Track: **Service Capacity Planning and Scheduling**

Chair: **John Goodale**

### **1. Workforce Scheduling for Call Centers**

**Farzaneh Fazel**, Illinois State University

Call centers have become an integral part of many service organizations as they provide a convenient and relatively inexpensive means of customer contact and customer service. A major challenge for many call centers is workforce scheduling. Even though many of them already use sophisticated software for staff scheduling, there remains much room for improvement of these schedules and the operations of call centers. This study examines the mathematical models used to generate staff schedules, discusses managerial practices at some call centers, and provides suggestions for improvements in call center operations.

### **2. Optimal Service Capacity Model**

**Peter T Ittig**, University of Massachusetts

This paper considers the problem of estimating the service capacity that should be provided in a situation in which additional capacity may result in greater demand. These situations may also be characterized as queuing situations in which longer waiting times may result in reduced customer demand. A convenient computer model is shown that will project the customer response and estimate optimal service capacity in such situations. The model has been constructed using Visual Basic, is easy to use and has pedagogical

as well as practical uses in Service Operations.

### **3. Bottleneck Management: Theory and Practice**

**Satya Chakravorty**, Kennesaw State University

**Brian Atwater**, Utah State University

**Richard Franza**, Kennesaw State University

Advocates of TOC believe that bottlenecks restrict an operation's ability to make money, and the best way to maximize income is to fully exploit the bottleneck. Almost all TOC literature focuses on situations where 100% bottleneck utilization is applied. Based on our action research, we find that the optimal level of bottleneck utilization is less than 100% and any attempt to increase utilization beyond the optimal level brings disastrous results for a door shop operations. We find effective bottleneck management is critical to improve and maintain the performance of the door shop operations. We develop a deeper understanding of how to design shop operations and provide insights for practicing managers and academics, which could be beneficial for managing such operations.

### **4. Simulating Unloading Activities for Rail Freight Traffic**

**Anupam Kulshreshtha**, Indian Institute Of Management, Lucknow

**Rajiv K Srivastava**, Indian Institute Of Management, Lucknow

Management of freight transportation is an important area of attention in railway networks. This paper discusses a study of freight unloading operations at a representative unloading station. The aim of the research is to help assess the influence of various factors that cause congestion and queue formation at the unloading sidings at a freight train unloading station. We have used simulation to model the unloading operations. The Model presently incorporates the impact of arrival rate of unloading traffic, arrival rate of passing-through freight traffic, working hour constraints, unloading time for rakes, and material removal time from the platform. The model is intended to provide the service levels at the unloading stations, indicated by the average queue content or the average queue time at the station. It can further be used to gauge the impact of different operating policies that can be followed at unloading stations to deal with incoming unloading traffic.

### **5. Cargo Overbooking Models**

**Sirong Luo**, University of Texas at Dallas

**Metin Cakanyildirim**, University of Texas at Dallas

This paper addresses the two dimensional (weight and volume) overbooking problems arising in cargo revenue management. For a one dimensional problem, it shows that ignoring booking requests does not alter the optimal solution. For two dimensional problems, two models, General Acceptance Region (GAR) and Box Acceptance Region (BAR) are provided. In both models, booking requests falling within the acceptance regions are accepted. General acceptance region is defined by a curve. The optimal curve is shown to be unique and be obtainable by solving simple equations. Finding the optimal box for the BAR model is more challenging. Instead of the exact solution of the BAR model, a limiting solution is proposed by taking booking requests large enough. The approximate BAR solution is numerically shown to be close to the optimal GAR solution.

**MON/May 2** 8:00 am- 9:30 am

Session **MA10: Healthcare Operations Management IV (Contributed)**

Track: **Health-Care Operations**

Ohio Room (6th Floor, South)

Chair: **Sadananda Sahu**

### **1. Automated Nurse Scheduling Systems**

**William S Borders**, Troy University

This paper briefly reviews the history of analytical approaches to nurse scheduling, which includes a variety of mathematical optimization, artificial intelligence, and heuristic models described in the published literature. Selected automated nurse scheduling systems are reviewed, and the influences of these analytical approaches on the scheduling systems are explored. Implementation aspects of automated nurse scheduling from the perspectives of nursing administration and senior management are discussed, and possible future directions for automated nurse scheduling systems, especially those based on

analytical approaches, are proposed.

## **2. The supply chain management and the development of sustainability in the health care industry in Brazil**

**Vital Ribeiro**, Escola de Administração de Empresas de São Paulo EAESP/FGV

The health assistance sector has been pressured for improvements in environmental aspects. In Brazil, the actions in this area are limited by the resources and knowledge lack, however, the search for treatment services for the health services waste increases progressively while less onerous and more rational measures, involving reduction or recycling are little spread. We analyze the health industry value chain highlighting health services and they relations with the levels above and below, aiming identify aspects that favor or complicate the improvements in the environmental performance. This analysis was compared with some of the most used managerial environmental administration models and with two international projects. We conclude with the suggestion that, so much the models, as the successful projects, they involve cooperation and integration along the productive chain and that other studies are necessary to establish models for the development of environmental sustainability in the health sector in Brazil.

## **3. Care Delivery Process – a Model for Social Health Insurance Scheme in India**

**Winfred S William**, Xavier Institute of Management

**Sadananda Sahu**, Indian Institute of Technology, Kharagpur

The Employees' State Insurance Corporation (ESIC) established in 1948 by the Government of India is the largest and the oldest self-financing social health insurance organization in Southeast Asia. The beneficiaries are employees and their dependants working in the manufacturing and the services organizations with an income of Rupees.7,500 per month or less. It has been delivering medical care to 35 million beneficiaries through its 142 hospitals and 1500 dispensaries having aggregate capacity of more than 26,849 beds. Besides its own hospitals, it has a network of state medical colleges, district hospitals and many private super specialty hospitals for referral purpose. In the last decade due to changes in the population-mix of existing and new insured persons, many hospitals are under-utilized. The objective of this study is to understand the existing care delivery process including referral system to suggest a cost-effective patient-centric model.

**MON/May 2** 8:00 am- 9:30 am

Session **MA11: Operational performance** (Contributed)

Track: **Operations Strategy**

Onyx Room (2nd Floor, North)

Chair: **Chris Adams**

## **1. A Model to Manage SMEs through Corporate Performance Management approach**

**Piero Lunghi**, University of Perugia

**Marco Calamita**, University of Perugia

Maturity level achieved by research in Corporate Performance Management field allows researchers to focus on a drill down analysis in order to differentiate approaches utilised to deal with Small Medium Enterprise's problems from approaches adopted to manage Big Enterprise. Nowadays, performance management community is focused on how organizations can be managed with measures, how they extract value from data they collect, and whether organizations are taking advantages or not from the expected benefits of their systems. The effectiveness of CPM systems strictly depends on their capability in modelling companies to correctly detect objectives and features. Difficulties related to data collection and different roles played by some stakeholders respect to Big Enterprise's contests prevent SMEs from applying receipts provided by CPM systems. This analysis pushed authors to propose an approach to extend CPM models in order to determine KPI in a dynamic way by considering real enterprises' capabilities and needs.

## **2. Hopi Hari: a great adventure**

**Mauro Sampaio**, FGV-EAESP

**Susana F Pereira**, FGV-EAESP

**Flávio Vasconcelos**, FGV-EAESP

**Andres Andres**, FGV-EAESP

In 1996, Marcelo Gutglas decided for the development of a new Thematic Park in the state of São Paulo, Brazil. It was built to be the biggest thematic park of Latin America. A series of difficulties delayed its inauguration in 18 months. The stated period for the recovery of the investments, that initially were five year, had been strained for ten years. Despite the increase in the number of visitors, 1,6 million in 2004, the park never achieved the foreseen return. The executives admit that the main problem of the park have been the demand forecasts based mainly on the American Market. The Brascan Bank was chosen in November of 2004 for the mission to present the Hopi Hari to potential buyers.

### **3. The Performance Prism: Lessons from Application**

**Andy D Neely**, AIM Research

**Chris Adams**, Cranfield School of Management

**Mike Kennerley**, Cranfield School of Management

The Performance Prism was introduced as a stakeholder oriented measurement framework by Neely et al. in 2002. Since publication of their original book, public and private sector organisations across the globe have adopted the framework as the basis for their measurement systems. This paper provides a review of how these organisations have used the Performance Prism and what lessons they have learnt in doing so.

### **4. New Japan Production Method, An Innovative Production Management Methodology:Strategic Implementation of New JIT**

**Kakuro AMASAKA**, Aoyama Gakuin University / School of Science and Engineering

At present, Japanese companies are endeavoring to survive in the competitive market by expanding their global production and achieving globally consistent levels of quality and production at optimal locations. From a such background, an innovative production management methodology, the New Japan Production Method is proposed, which involves the systematization of Japanese production management methodologies as a strategic application for global production. The New Japan Production Method was developed through establishing a Global Production Technology and Management Model based on New JIT utilizing the four core elements (TMS, TDS, TPS and TQM-S)— a new management technology principle, proposed and verified in previous studies. Formation of the model through utilization of these elements signifies the high linkage of business processes that enables a speedy production cycle. Effectiveness of the proposed New Japan Production Method was verified at Toyota Motor Corporation.

**MON/May 2** 8:00 am- 9:30 am

Valencia East (Lobby Level)

Session **MA12: Theory development in operations strategy** (Contributed)

Track: **Operations Strategy**

Chair: **TIM BAINES**

### **1. Do Customers and Suppliers Really Believe that Supply Chain Cooperation is Strategic?**

**David A Johnston**, Schulich School of Business , York University

Increased cooperation between customers and suppliers in supply chains is frequently mentioned as strategic to both party's interests. This cooperation is expressed in longer contracts, increased operational coordination and systems integration and identified by terms such as "partnership" or "strategic supply alliance". We use data from 89 dyads consisting of a manufacturing firm and its most cooperative supplier to test for the presence of alternative definitions of strategy behavior. The results suggest that suppliers and buyers differ, depending on the definition, as to whether they believe they are behaving in a strategic manner. A direct link between cooperation and sustainable competitive advantage is found to be tenuous even though cooperation may make both parties more capable of improved performance.

### **2. Achieving Leadership in Project Styled Operations**

**TIM S BAINES**, Cranfield University

The UK Aerospace industry is crucial for the UK economy and rated the second largest in the world and the largest in Europe. While major improvements in competitiveness have occurred in recent years, principally through the adoption of 'Lean' manufacturing techniques, these practices are insufficient to prepare the industry for the new and emerging challenges of the 21st Century. If this sector is to survive

and grow, it needs to radically redevelop its approach to delivering complex, diverse, knowledge-based products and services. There is however no challenging, complete, and integrated vision about how such operations should be designed and operated, and therefore this research is setting out to articulate a new paradigm guiding the attainment of leadership in project styled operations. The strategic implications of this initiative go beyond the aerospace sector and this programme will offer an exemplar for the future of UK manufacturing industry.

### **3. Developing a process rationality for the organizational design**

**Edson Pinheiro de Lima**, PUCPR

**Sergio E Gouvea da Costa**, PUCPR

The organizational design of a productive system could be seen in the dimensions of its contents and the process of its creation and development. Based on a framework that guides and founds the development of a practical tool for the design task, this paper explores the process approach to develop rationality for the organizational design process. All the developments done are based on a framework or conceptual map that defines the domain and the design areas. The approach that guides the definition of the processes models is based on competence development. The usefulness of the organizational design methodology development is connected to the organization and development of a method for intervention in the organizations design, giving them the required competencies to sustain a competitive sustainable position.

### **4. A Theory of Implementation**

**Mike Bourne**, Cranfield School of Management

The current problem for practicing managers is not strategy formulation, but execution – making the strategy happen in the business. This paper will look at the implementation of strategic projects in manufacturing business units. Starting from a grounded approach, it will develop a theory of implementation success based on six intervention case studies. This theory has four key assumptions, and the paper will conclude by presenting the results of testing these assumptions in a further series of six quasi-experimental longitudinal interventions. The research focused on the implementation of performance measurement systems, but the findings suggest wider applicability in determining the success and failure of a range of strategic projects in manufacturing business units.

**MON/May 2** 10:00 am-11:30 am

Session **MB1: Strategic Issues II** (Contributed)

Track: **Supply Chain Management**

Sullivan Room (8th Floor, South)

Chair: **Robert Klassen**

### **1. Adaptation and Localization: how subsidiaries make it happen**

**Lalit Johri**, Asian Institute of Technology

**Phallapa Petison**, Asian Institute of Technology

Set in the context of the automobile industry in Thailand, the purpose of this research is to learn from the experiences of Toyota, Hino and

DaimlerChrysler - the art and science of managing the product adaptation and localization strategies successfully. The study is based on case research method involving interviews with 48 local and expatriate staff of 3 companies and their 6 suppliers and 6 dealers.

### **2. Emerging Challenge for Supply Chain Management (SCM) Matching Applications: Improving Organizational Responsiveness wit**

**Kenneth J Fordyce**, IBM

**John Milne**, IBM

Every organization is faced with the challenge of responding to events in a synchronized and timely fashion. In SCM most work has focused on improving the level of centralized control to intelligently match assets with demand to optimize the supply plan and synchronize the enterprise. There have been a number of major successes in this area including the IBM Microelectronics application OFASCP. As with any science, the accomplishment of one goal, not only brings a sense of pride, but a dose of reality in what is left to achieve. In SCM, there are clearly identified gaps in timely synchronized response that can only

currently be handled with ad hoc methods and passive support that operate without global awareness. This presentation will cover a set of strategic initiatives underway by the OFASCP team involving more complex models and sense & respond to close these gaps.

### **3. SUPPLY CHAIN MANAGEMENT AND PLANT PERFORMANCE**

**Jorn-Henrik Thun**, Industrieseminar, Mannheim University

In this paper Supply Chain Management will be analyzed empirically based on the data of the "High Performance Manufacturing"-Project, a research cooperation of universities from different countries. The aim of the paper is to investigate the relation between Supply Chain Management and plant performance. The empirical analysis is based on Fisher's model. Following this model two different kinds of Supply Chains can be distinguished: physically efficient vs. market-responsive Supply Chains. In order to identify existing differences the data base will be divided by a cluster analysis. Differences concerning plant performance in terms of efficiency and responsiveness can be shown by T-tests based on the clustering. Finally, the overall relation of Supply Chain Management and plant performance will be examined by a canonical correlation.

### **4. An empirical investigation of business uncertainty and supply chain investment**

**Carol Prahinski**, Richard Ivey School of Business, University of Western Ontario

**Canan Kocabasoglu**, University of Kansas

**Robert D Klassen**, Richard Ivey School of Business, University of Western Ontario

With rapidly shrinking product life-cycles, increased competition and ever more demanding customers, supply chain managers must carefully consider both the size and form of their investments to improve. Investments can take the form of supplier development, new supplier evaluation systems or improved information exchange, to name several. This paper investigates the impact of business uncertainty on supply chain investments. The theoretical model is based on earlier studies on risk management, which strive to specify relationships between different forms of risk and behavioral outcomes. Canadian plant managers' responses to a mail survey in four industries were analyzed using regression analysis to understand whether supply chain investments are influenced by business uncertainty.

**MON/May 2** 10:00 am-11:30 am

Session **MB2: Case Studies II** (Contributed)

Track: **Supply Chain Management**

Holabird Room (8th Floor, South)

Chair: **Richard Lucht**

### **1. Survey on Brazilian Logistics Operators**

**Claude Machline**, EAESP-FGV

**Manoel S Reis**, FGV-EAESP

**Mauro Sampaio**, FGV-EAESP

A survey was conducted in 2004 on 30 Brazilian Logistics Operators, concerning their strategies, processes, costs and problems. As most manufacturers are outsourcing their transportation and warehousing operations, the role of Logistics Operators has become preeminent. In spite of the country's wanting logistic structure and thanks to personal efforts of all employees, the operators are able to deliver goods door to door at thousands of miles distances in record times, monitoring each parcel with high tech information systems. The Logistics Operators face severe quality and reliability requirements from their clients, and must comply with ever increasing demands for new services, such as collecting defective parts and repacking, or operating Distribution Centers and Cross-Docking installations. Most opportunities lie in international operations, not only in Latin America, but also in other continents, as Brazil increases its external commerce.

### **2. Improve the Internal Supply Chain by Reducing the Production Downtime**

**Luiz R PINTO**, Federal University of Minas Gerais

**Samuel V CONCEIÇÃO**, Federal University of Minas Gerais

**Paulo K MOREIRA**, Federal University of Minas Gerais

**Osmar A NETO**, Federal University of Minas Gerais

This paper presents a case study research about the results of a downtime production evaluation in a

electronic manufacturing service. The research was performed in a transnational corporation based in South America and has evaluated several downtime classes over 12 months. In addition it presents how to integrating with accuracy, the downtime information about production, facilities, process, material, manufacturing and capacity planning, in order to develop a methodology to improve the internal supply chain management by design a database software, using delphi language.

### **3. Supply Chain Management in the Textile Industry in Spain**

**Josep Capó**, Polytechnic University of Valencia

**Manuel Expósito**, Polytechnic University of Valencia

**José V Tomás**, Polytechnic University of Valencia

**Enrique Masiá**, Polytechnic University of Valencia

This paper focuses on current trends in Supply Chains. In this sense, new organizational architectures begin to appear, the consequence of the strategic project that the integration into a Supply Chain implies. This integration must be understood in the field of Extended / Virtual Enterprise as an extending and improving of external company management, allowing the basic flows (physical and information), with a client orientation. We will study the particular case of textile industry in Spain. There, subcontracting is getting more and more important. This involves the specialization of the companies, which creates a change in the organizational models of the sector. In this sense, some companies are establishing alliances constituted as networks of collaborative companies, which act as nodes of a Virtual Enterprise (VE), each of them contributing with the best that it knows. All operate directly with the client as if it were dealing with a single company.

### **4. Supply Chain Performance: a proposed model for the Autoparts Industry**

**Richard R Lucht**, ESPM (Escola Superior de Propaganda e Marketing)

**Luiz Carlos di Serio**, EAESP - FGV

The business environment is undergoing rapid and intense changes and all the organizations are looking for alternatives to face these challenges. In this context, a major initiative involves supply chain management. After all, the odds that an enterprise will be successful are directly related to its competence in managing and participating in its supply chain (SC). This fact implies that business performance becomes strategic, when observed under the perspective of its performance as a SC's link. On the other hand, there's an expressive lack of analytical models that can aid both in evaluating SC performance and ranking the initiatives aimed at systemic improvements. The objective of this work is the proposition of a model that measures business performance, when observing it as a SC link. This research considers the Brazilian Autoparts Industry as its investigation field, since this industry holds the potential for larger returns accruing from efficient SC management.

**MON/May 2** 10:00 am-11:30 am

Wright Room (8th Floor, South)

Session **MB3: Impact of Technology on Integrated SCM III** (Contributed)

Track: **Impact of Technologies on Integrated SCM Operations**

Chair: **Omar Cesar**

### **1. IT Alliance in A Supply Chain**

**HY Sonya Hsu**, Southern Illinois University

**Stephen C Shih**, Southern Illinois University

Information/communication technologies serve as an enabler in a supply chain network. For example, using Supply Chain Management System (SCMS) creates value and/or retains a portion of value for an organization. Furthermore, "spillovers" from a channel member's IT investment that provide positive gains for other members in its value chain are well documented. Increasingly, researchers emphasized organization capabilities that aim to satisfy management information, and to enable technological adaptation and systems integration. This research attempts to find ways to improve companies' flexibility and responsiveness in terms of competitiveness. In gaining competitiveness, firms have to constantly update their operations strategies, and technologies by a "network" of supply chain members instead of by an individual firm. The focus on this research is two-fold: the "spillover" effects of IT investment in a supply chain, and contrast and compare the difference between SCMS and Electronic Enterprise Portal.

## 2. The Role of Web-Portals in SCM Operations

**Katariina Kemppainen**, Helsinki School of Economics

**Sanna Laukkanen**, Helsinki School of Economics

**Sami Sarpola**, Helsinki School of Economics

The development of information technology, and especially Internet, has offered new media – e-marketplaces, extranets, buy-sites, and e-auctions – for improving supply chain operations. A variety of these web-portals are implemented to increase the efficiency of transactions via online self serve ordering, and to improve demand visibility in supply networks, to name a few. Empirical studies in 16 Finnish companies show that system-to-system connections are primarily used to exchange large volumes of transactional data. Meanwhile, web-portals are typically used either to facilitate infrequent transactions or to extend the scope of information shared, for example, to demand forecasts and production plans. Hence, extranets and buy-sites are often implemented as complementary solutions to system-to-system connections. Some of the case companies, in turn, see semi-automatic web-portals as preliminary solutions helping them to align and integrate capabilities and processes in the supply network before implementing fully automated inter-firm systems.

## 3. E-business Technologies Impact on Supply Chain

**Juan S Valencia**, University of Dallas (Graduate School Of Management) / Bright Logistics

**Ehap Sabri**, I2 Technologies / University of Dallas (Graduate School Of Management)

Executives realized that producing high quality products is not enough in today's competitive environment, the new challenge is to get products to customers when and where they need it, exactly the way they want it, with a competitive price and in a cost effective manner. E-business technologies address this challenge by enabling firms to collaborate with their suppliers and customers online and providing visibility. Although the clear benefits of e-business technologies, firms struggle in integrating e-business technologies into supply chain operations. This paper addresses the strategic and operational impact of e-business technologies on supply chain, and explains the performance benefits and challenges firms can expect in implementing e-business technologies. Also, it provides the best practice framework in leveraging e-business technologies in supporting process improvements and re-engineering to achieve cost reduction and velocity for the supply chain. Finally, success stories will be shared and linked to the best practice framework.

## 4. Factory gate pricing in Dutch food retail distribution

**René B De Koster**, Erasmus University Rotterdam

**H. Fleuren**, Tilburg University

Factory Gate Pricing (FGP) is a relatively new phenomenon in food retail distribution. Under FGP, products are no longer delivered at the retailer distribution center, but collected by the retailer at the factory gates of the suppliers ('ex works'). Owing to both the asymmetry in the distribution networks (the supplier sites greatly outnumber the retailer distribution centers) and the better inventory and transport coordination mechanisms, this is likely to result in high savings. A model was used to analyze the benefits of FGP for a case study in the Dutch retail sector. On top of this we carried out interviews, to investigate the feasibility of the concept in practice. We present numerical results to show the (theoretical) effects of the orchestration shift from supplier to retailer, the improved coordination mechanisms, and sector-wide cooperation. The interviews show that although many retailers show great enthusiasm for the concept, suppliers are mostly skeptical.

**MON/May 2** 10:00 am-11:30 am

Burnham Room (8th Floor, South)

Session **MB4: Impact of Technology on Integrated SCM IV** (Contributed)

Track: **Impact of Technologies on Integrated SCM Operations**

Chair: **Ashok Kochhar**

## 1. IT applications and garment quality

**Serge A Carrier**, Université du Québec à Montréal

**Marie-Ève Faust**, École Polytechnique de Montréal

**Puerre Baptiste**, École Polytechnique de Montréal

Dissatisfaction with fit in women's ready-to-wear is a recurring topic in the literature. Most explanations refer to the fact that the standard sizes charts are so obsolete that they are useless, that order initiators do not adhere to standards, and that size labels provide no information on the body measurements. A number of articles have stated that the body scanner can benefit all involved in the supply chain by allowing the regular and continuous update of massive data bases on which standard sizes charts are based or, on the other hand, by making them obsolete through the generalization of mass customization. This paper reports on an empirical research, conducted with a large retailer, that set out to determine if, and how, other IT technologies can contribute more advantageously to product quality thereby facilitating the women's garment purchase experience and improve the SCM strategy.

## 2. Examining the use of Technology in the Supply Chain of the Beef Industry

**Brian D Neureuther**, Indiana State University

**George Kenyon**, Lamar University

The growth of the beef industry has been hampered by the various entities within the beef industry's supply chain. The primary obstacles to growth are the large number of participants in the upstream groups and the lack of coordination between them. We examine the upstream participants, primarily the buyer agencies and principles between the cow-calf producers and the meat packing companies, to determine the degree to which information technologies are currently being utilized.

## 3. Antecedents of Supply Chain Visibility: A Resource-based Theory Perspective

**Mark A Barratt**, Arizona State University

**Goke Oke**, Cranfield School of Management

Visibility is a concept that is often discussed in the supply chain management literature. It is assumed that if companies within the supply chain have visibility of demand, inventory levels, processes, etc., that organizational performance will improve. This research explores the antecedents of high levels of supply chain visibility from a resource-based theory perspective in five different supply chain linkages. We find that the level of visibility across the linkages differs considerably. The differences appear to be related to various contributing factors some of which are technology-based and others that are non-technology based. Using the resource-based theory, we identify those factors that can potentially give a sustainable competitive advantage to a supply chain linkage through a "distinctive" or high level of visibility.

## 4. Knowledge tree in the context of modern organizations

**Ashok Kochhar**, Aston University

**Le Zhang**, Aston University

Knowledge is the icon of the new economy. It has also become a desired object of management in modern organizations. Knowledge management is increasingly imperative as it is the key determinant of a firm, industry or country for survival and growth. Knowledge management, intellectual capital and competence based management are closely related subjects in business management research. They all emphasize the importance of intangibles and aim at improving the capability of organizations. While they engage in the same scope they have different foci. For example, learning is hardly mentioned in intellectual capital literature. Although the theory of knowledge tree is developed from KM literature, it can also be related to intellectual capital and competence based management. Learning is hardly mentioned in intellectual capital literature. Based on an assessment of knowledge management, intellectual capital and competence based management this paper clarifies the relationship between knowledge tree and these three subjects.

**MON/May 2** 10:00 am-11:30 am

Session **MB5: Continuous Improvement** (Contributed)

Track: **Continuous Improvement**

Adler Room (2nd Floor, North)

Chair: **Richard Greenough**

## 1. Extrapolation, Prediction and Intuitive Forecasting in Collaborative Demand Planning Framework

**Flavio Tonelli**, University of Genoa

**Riccardo Melioli**, University of Genoa

**Marco Calamita**, University of Perugia

**Roberto Mosca**, University of Genoa

The collaborative planning approach is the most effective way to face the Master Production Schedule definition. The actors involved are customers, vendors and people of financial and operation areas and goals are a higher level of service, of customer satisfaction and better stock and operative policies. Our research unit was directly involved in a project for the design of a new product for demand planning in a collaborative environment, coordinated by an Italian software company. For this project, we developed a panel of algorithms which enquires the questions of demand planning area related to historical data analysis and decomposition. Functionalities and information exchange were derived from literature and implemented in the newly developed tool prototype. The rules and logic implemented were then tested for their consistency and the related benefits were evident in terms of feasibility and prevision performance.

## **2. Using Psychological Insights for an improved human resource management—Empirical**

### **Investigation within the ,HPM'-project**

**Johannes C von Mikulicz-Radecki**, mannheim University/ Industrieseminar

The potential of psychological insights for a continuously improved human resource management is investigated empirically. Based on the 'High Performance Manufacturing'-database a factor analysis for building up the main pillars of HRM, a cluster analysis for distinguishing between different types of companies and finally a canonical correlation analysis for identifying best HR-practices are conducted. The results show that the hypotheses adopted from work motivation theories which intend improvements within the individual and also organizational performance are confirmed in a highly significant manner. The used theories from Herzberg and Hackman/Oldham assume that every person shows the same pattern within their personality; alternative theories which differ between different types of personality patterns are not considered in these examinations. Continuous improvements often associated with concepts like TPM or TQM are also reachable through the right handling of the workforce. These improvements can be enlarged by integrating knowledge from psychology in human resource decisions.

## **3. IMPROVING TEAMWORK USING THE THEORY OF CONSTRAINTS: A CASE STUDY**

**Danilo Sirias**, Saginaw Valley State University

Teamwork has become the structure of choice of many organizations to solve complicated problems. The development of high performing teams allows organizations to take advantage of their most precious asset: the expertise and knowledge of their employees. Also, much better solutions come from a team environment than from isolated efforts. However, no all teams are successful in their quest and important projects expected to be completed end up in chronic conflict and fights among employees. Several techniques and team building activities have been developed to smooth out the way to a high performing team. In this paper, we will explore a management philosophy referred to as the Theory of Constraints and its application to teamwork. Then, we will present a case study where TOC was applied with great success.

## **4. Continuous improvement through innovative information management**

**Benny Tjahjono**, Cranfield University

**Richard M Greenough**, Cranfield University

Innovation remains central to competitiveness. Most manufacturers, regardless the products, share a common set of challenges: improving quality, reducing wastes and optimizing productivity; and at the same time striving to be more responsive to the customers' demand. For those reasons, manufacturers tend to rely upon accurate, timely provision and management of information to support particularly manual, operative tasks. The paper describes some insights from a study of the development and implementation of information systems to support continuous improvement initiatives at two global manufacturers in the UK. The study has revealed typical problems associated with managing abundant information and suggests an innovative method of addressing the problems. The method ensures the provision of task-related information that is accurate and concise, delivered only when and wherever needed, and is adapted to the users' levels of skill. The benefits of the proposed method include improved accuracy of information, time/cost reduction and increased efficiency.

## **5. Paperless changeover instructions using an internet kiosk**

**Richard M Greenough**, Cranfield University

**Colin R Brown**, Highland Spring

**Benny Tjahjono**, Cranfield University

This paper reports the initial findings of a study to determine the impact of electronic work instructions upon operations in a water bottling plant. The study draws on the reported benefits of electronic performance support systems which include enhanced revision control of information, more effective training and speedy access to information. Among the different types of information presented to the operators of a bottle packaging machine are standard operating procedures for machine changeovers, production plans and product data. This information is presented as web pages and viewed via an intranet browser. For usability and security reasons, an internet kiosk was used to present information and to collect information usage statistics. These are compared with performance measures such as changeover times, line operational efficiencies and rework. The kiosk is popular with users who have found it reliable and highly usable. Quantitative results will be reported in a future paper.

**MON/May 2** 10:00 am-11:30 am

Session **MB6: Rule-based Forecasting: Using expert knowledge to combine forecasts** (Invited)

Track: **Forecasting**

Michigan Room (6th Floor, South)

Chair: **Nadia Sanders**

### **1. Rule-Based Forecasting: Using expert knowledge to combine forecasts**

**Monica Adya**, Marquette University

Rule-based Forecasting (RBF) has emerged in response to a need for integrating statistics and domain knowledge to deliver more robust and accurate forecasting techniques. RBF is an expert system that uses features of time series to select and weight extrapolation techniques. This expert system consists of 99 rules that combine forecasts from four simple extrapolation methods – random walk, linear regression, Holt's exponential smoothing, and Brown's exponential smoothing. Results from independent validations and the recent M-3 Competition have indicated that RBF is consistently more accurate than leading benchmarks such as random walk and equal weights combining. In this presentation, I will provide an overview of the design, development, testing, and validation of RBF. My presentation will provide an overview of the forecasting knowledge represented in RBF's 99 rules. Results from multiple independent validations are presented and future directions for research on RBF are provided.

**MON/May 2** 10:00 am-11:30 am

Session **MB7: Operations-Marketing Interface II** (Invited)

Track: **Operations-Marketing Interface**

Illinois Room (6th Floor, South)

Chair: **Jozsef Voros**

### **1. Managing quality and complexity in the supply chain: the**

**Hong Woo**, Middlesex University

**Kirit Patel**, Middlesex University

The NHS is the largest employer in Britain. It is not only the key arm of the welfare system in Britain but also one of the biggest purchasers of goods and services in Europe. The vastness of the requirements alone make specifications for goods and services complex. However, there are issues that need to be analysed in the context of the supply chain

### **2. Six Sigma: Analysis and Application for Use in the People's Republic of China for**

#### **Production-Marketing Interface Improve**

**Jonathan Liu**, Middlesex University

**Yuanhui Li**, Beijing JEG Walls Decoration Limited

Six Sigma, a quality management programme, was first developed and used by Motorola in the 1980s, to achieve a higher standard of quality in its manufacturing process which has less than 3.4 defects per million. It was initially used in the manufacturing process but has today gain popularity in the service field as well. The company which spread this programme worldwide was however, General Electric. Since the 1980s, General Electric has sought improvements in its business-performance and profitability through a variety of quality initiatives.

### 3. Organisational Self – Evaluation as a Possible Tool of Organisational Analysis

**Mariann Veres-Somosi**, University of Miskolc

One of the many conditions of successful operation of production or service processes is an organizational structure, which helps to achieve the required operational objectives. The clue of enduring success of companies/institutes is the ability to recognize new challenges in times and to react quickly and flexibly. Management, however, does not dispose of the appropriate tools and methodological knowledge in cases of complex and complicated organizational forming to map fields in critical situations. In the presentation one of the possible systems of goals and fields of organizational analysis with the help of the organizational analysis process are examined. A methodological typology is constructed; and self evaluation as an effective method for organizational forming is proposed.

### 4. Analysis of customer loyalty to the electricity distributors

**Erzsebet Hetesi**, University of Szeged

**Gabor Rekettye**, University of Pecs

The paper reports about the longitudinal surveys carried out in Hungary about the customer loyalty to the local electricity distributors. The objective of the paper is twofold: firstly it wants to explore those fields of customer loyalty which should be interpreted differently in the case of a basic utility; secondly it aims to analyze the role of operations-management and marketing-management in building customer loyalty; and to show the interrelation of these fields. The findings of the paper: •prove that the loyalty factors known from the international literature should be dealt with special care in the case of the electricity industry. The 'quality-satisfaction-loyalty' chain applied to normal tangible goods and everyday services are functioning differently in the case of this basic utility. •They help the electricity suppliers to understand the behavior of their clients; and with this they contributed to their preparation for the full market opening.

**MON/May 2** 10:00 am-11:30 am

Session **MB8: Service OM Applications** (Contributed)

Track: **Operations Strategy**

St. Clair Room (6th Floor, South)

Chair: **Kenneth Boyer**

### 1. Outsourcing: Does it Make “Rational” Sense?

**Charles G Petersen**, Northern Illinois University

**Jack T Marchewka**, Northern Illinois University

Outsourcing is usually defined as turning over some organizational activity to an outside firm. In last year's presidential election, outsourcing or offshoring was defined as exporting jobs overseas. What has made this offshoring different is that now many white-collar jobs (programming, help desks, call centers, etc.) have been moved overseas whereas in the past it was typically only blue-collar manufacturing jobs. However given today's business climate are too many firms outsourcing too many activities overseas because that seems to be what every other firm is doing; i.e., just keeping up with the Jones so to speak? Based on an examination of the literature, this paper presents a case for firms to take a closer look at the purported benefits and drawbacks of outsourcing.

### 2. Enterprise-level technology deployment in services

**Paul Mulligan**, Babson College

The infrastructure of most service organizations contains a considerable volume of legacy information technology. The majority of this technical infrastructure was developed to support specific functions at the department or divisional level. As a result, technology management organizational structures, policies and procedures were designed to support and reinforce these vertical boundaries. Today, many firms are struggling in their efforts to deploy enterprise-level technology solutions. The challenges faced here are consistent with those faced by any organization encountering broad-based, technology-enabled change initiatives. Conflicts that arise during the integration of legacy (vertical) and enterprise technology serve only to exacerbate these challenges. This paper explores the need for new organizational structures, policies and procedures to smooth the integration and deployment processes. A case example in financial services is used to inform the analysis.

### 3. Service Dissatisfiers of Corporate and Non-corporate Sellers in Online Auctions

**Byron J Finch**, Miami University (Ohio)

Catalog and online retailers have begun to use online auctions as a permanent channel for selling their goods. The largest of the online auction sites, eBay, has become an outlet for such traditional retailers as Sears, Home Depot, and The Sharper Image, as well as manufacturers like IBM, Hewlett-Packard, and Kokak. These sellers are known as “corporate sellers,” and like other large sellers, have completed thousands of transactions. In an anonymous market like eBay, buyers provide feedback about seller performance as part of its reputation system, which archives feedback about sellers so that buyers can learn about seller reputation. This study examines the service-related content of negative seller feedback for corporate and non-corporate sellers to determine how the feedback content for corporate sellers differs from that of non-corporate sellers.

#### **4. Internet and after-sale support: current situation and perspectives for Brazilian manufacturers**

**Alexandre R Graeml**, UNICENP / CEFET-PR

**Joao M Csillag**, FGV-EAESP

The Internet allows for the provision of additional and purchase reinforcing services to customers. New communication channels can be developed to improve the interaction among manufacturers, their direct customers and even the consumer of final goods, who may be several links down the value chain. For companies that develop the required infrastructure and change their processes to take advantage of the new technology, possible rewards are the increase in current customers' loyalty and the attraction of new customers, impressed with the additional value that is generated. This paper presents the results of a survey involving 655 manufacturers from the state of Sao Paulo (Brazil), with questions about the use they make of the Internet for after-sale purposes. The authors analyze the impact of the Internet on the companies' after-sale activities and make considerations about future changes the participants anticipate, considering the potential benefits of the new technology.

#### **5. On-line Ordering, Fulfillment and Customer Satisfaction: A Longitudinal Analysis**

**Andrea M Prud'homme**, Michigan State University

**Kennth K Boyer**, Michigan State University

**Roger Calantone**, Michigan State University

Internet for purchasing has been studied for products such as books and music CDs and for services such as banking or travel arrangements. However, the groceries differ from the products most often purchased via the Internet in that they are less standardized. And groceries differ from the services that are often purchased, because of their more tangible nature. This importance mix of service and tangibles makes the Internet grocery channel an interesting area of research. This study uses longitudinal survey data from 2003 and 2004 of 305 customers of four on-line grocery providers to determine the significant antecedents of customer satisfaction and preference for the on-line channel. The data is analyzed using latent variable growth curve modeling to test constructs relating to technological comfort, service quality, product quality, and others, to determine if the drivers of on-line grocery satisfaction and channel preference change over time.

**MON/May 2** 10:00 am-11:30 am

Session **MB9: Healthcare Operations Management II (Invited)**

Track: **Health-Care Operations**

Hebron Room (2nd Floor, North)

Chair: **Maria Shunko**

#### **1. Productivity & Quality Improvement of Patient Flow at a Medically Underserved Clinic in Indianapolis**

**Suresh Chand**, Purdue University

**Herbert Moskowitz**, Purdue University

**Steve Shade**, Purdue University

**Deanna R Wills**, Indiana University Purdue University

Abstract: This talk will describe the results of a project to analyze and improve the patient flow at a clinic in Indianapolis whose patient base consists primarily of the Medicare patients. After developing a value stream map, we collected data on “task” times for various tasks required to process patients. Using this

data along with a simulation model, we identify sources of variability and their impact on operations. We use the simulation model to develop recommendations to improve the registration process at the clinic. We believe that these findings could form a benchmark for improving operations at other underserved clinics. We also believe that the approach that we used in this project can be used by other researchers involved in similar projects.

## **2. Health Care Supply Chains: Problems, Challenges, and Future Research Opportunities**

**Vicki Smith-Daniels**, Arizona State University

With U.S. health care spending growing at an annual increase of 9% in 2002 to \$1.6 trillion, it is vital that the health care industry identify opportunities for improving operations across the extended supply chain. The health care industry has complex supply chains that purchase, manufacture, and deliver a variety of products and services. This presentation will provide a framework for defining health care supply chains and the specific problems and challenges the industry faces today and in the near future. After reviewing the manufacturing and service supply chain literature, a research agenda will be proposed for the operations management community to consider.

## **3. Improving the Performance of a Specimen Transportation System at a Large Cancer Center**

**Doug Blocher**, Indiana University

**Maria Shunko**, Indiana University

**M.A. Venkataraman**, Indiana University

The University of Texas M. D. Anderson Cancer Center is a healthcare facility dedicated to cancer patient care, research, education and prevention. Of particular interest to this healthcare institution is a courier system used to pick up lab specimens at various clinics around the hospital and then subsequently deliver the specimens to laboratories for analysis. Currently there are three couriers used to handle the pick up and delivery and hospital management is unsatisfied with the level of service provided by the courier system. Using MIP formulation and implicit enumeration techniques, we provide solutions where we reduce the number of couriers needed to service all locations within a desired timeframe of 30 minutes, decrease couriers' travel time and subsequently maximize their idle time that is used to service emergency requests. As a result, the system becomes more accommodating for emergency cases and service levels increase drastically.

**MON/May 2** 10:00 am-11:30 am

Ohio Room (6th Floor, South)

Session **MB10: Human factors in operations management** (Contributed)

Track: **Operations Strategy**

Chair: **Laird Burns**

## **1. A Study of Intelligence-Diagnosis Method HID for Global Production Strategy at Toyota**

**Hirohisa Sakai**, Toyota Motor Corporation

**Kakuro Amasaka**, Aoyama Gakuin University

The Japanese manufacturers today have established their production facilities and are operating for global production strategy. To overcome this sense of crisis, the authors believed it crucial to improve the intelligence skill level of the production operators who are the foundation of manufacturing. The authors recognized the requirements for 'creating a new production system: "Advanced TPS" utilizing "New JIT" that centers around people,' where they can be more creative and find their jobs worth working for. As a solution, the authors have suggested 'HI-POS' (Human Intelligence-Production Operating System) which was designed to realize improvement as the intelligence operator. In this article, the authors suggested implementation of 'HID' (Human Intelligence Diagnosis System), which is the core system of 'HI-POS' for global production strategy and assessed its effectiveness at Toyota, a leading global company. More specifically, they discussed the training processes for the assembly line operators in order to become more intelligent.

## **2. Using Agency Theory to Investigate Potential Problems in Project Management**

**James E Brown**, University of Texas at Arlington

**Gregory V Frazier**, University of Texas at Arlington

Project management (PM) is a popular method of managing tasks. PM provides increased flexibility,

innovation, and control when delivering complex and customized projects. Costs are incurred in PM that would not be incurred in a normal hierarchical organization. The freedom of a project manager allows greater flexibility and innovation, but the freedom also allows for some abuses. Agency theory is used to explain the potential abuses and how to prevent them. This paper will develop compensation methods that should help to reduce the agency problems that can occur in projects. Companies can pick and choose which problems are most troubling to them and implement the compensation scheme to help reduce these human tendencies. Even if not implemented, this paper will expose senior management to the inherent problems that project management has and will know what areas they need to monitor.

### **3. The Development of Operations Strategy in Emerging Economies through Free Trade with the US**

**Amrou Awaysheh**, University of Western Ontario

International firms in developing countries are beginning to recognize the importance of a comprehensive operations strategy; and how developing competitive priorities will help improve the firm's performance. A model is introduced that attempts to define the focus of a firm's operations strategy whose environment changes drastically as a result of free trade. The relationship between the perceived threat and the firm's ability to respond to that threat are integral parts of the model, which attempts to explain the firm's operations strategy focus. This model is tested using the data from a preliminary survey study that examined the operations strategy of firms in Jordan, a country that recently (2001) signed a free trade agreement with the US. The focus of the study was to identify the development of competitive priorities in a changing environment.

### **4. Organizational Change: Modeling the Effects of Resistance to Change and Influential Agents**

**Laird A Burns**, Michigan State University

A considerable literature exists on organizational change within companies. A smaller literature exists on resistance to change. Modeling integrated supply chains requires a deeper understanding of how resistance to change affects the rate of change within firms, especially where the firms are working toward integration of operational activities to lower product costs, improve responsiveness to customer demand, and lower transactional costs. This research paper uses agent based modeling to develop an understanding of how the degree of resistance to change within companies affects the time (and variance) necessary to implement changes and, by implication, the costs to implementing change as resistance to change increases. The study of influential agents is also examined to determine the difference in the time necessary to implement organizational changes when influential agents are present.

**MON/May 2** 10:00 am-11:30 am

Onyx Room (2nd Floor, North)

Session **MB11: Mass customization and lean operations** (Contributed)

Track: **Operations Strategy**

Chair: **Raj Selladurai**

### **1. Integrative Total Productive Maintenance: Lean Practices**

**Mark A Johnson**, Michigan Technological University

**Dana M Johnson**, Michigan Technological University

A key aspect of lean manufacturing practices is the implementation of an integrative total productive maintenance (TPM) system. Manufacturers and others implementing lean practices need to understand the importance of employee involvement and support of an integrative TPM approach. The paper seeks to discuss the summary of findings in a union environment that support and impede the implementation of integrated TPM as a part of lean practices.

### **2. What's your excuse for not using TPS/JIT techniques?**

**Lumbidi KUPANHY**, Euromed Marseille School of Management

The prowess of Toyota and its production system has attracted the attention of manufacturers since the first oil shock in 1973. In the late 1970s and early 1980s, Ohno and Shingo revealed to the world the management philosophy, key concepts underlying the system; and the operational modes and techniques of the system. Although scores of companies around the world have benefited from implementing the system techniques, there are still, for different reasons, too many that don't seem ready to consider

implementing it. We think that the true reason is their ignorance of its main advantages: intrinsic simplicity; low cost; efficiency regardless of the company scale; capabilities to create and tap in-house expertise; capabilities to transcend cultural differences and industry boundaries; capability to fit into a unionized environment; etc. This lesson is drawn from an analysis of collected data and factory visits/audits in Japan and in France.

### **3. The impact of modularization on plant flexibility and business performance**

**Brian C Squire**, University of Bath

**Steve Brown**, University of Exeter

Modular product architecture is considered to be an important source of strategic flexibility (Sanchez and Mahoney, 1996). The standardization of component interfaces enables firms to rapidly vary product variants in a cost effective manner. However, many of the claims made for modularity remain anecdotal, based on case study and theory. This study examines the impact of product modularization on two types of manufacturing flexibility, reporting on the results of a survey of 102 UK manufacturers in eight industry sectors. The results indicate that modularization has a significant impact on mix flexibility, but not on volume flexibility. Furthermore, we show that capabilities in flexibility have a direct effect on customer satisfaction and an indirect or mediated effect on growth performance. Our study indicates that although modularization can improve plant level flexibility, this flexibility is of a specific type.

### **4. The Impact of Supply Chain Management on Mass Customization: A Conceptual Framework**

**Gensheng Liu**, University of Minnesota

Due to rapid technological innovations and increasing customer demand for variety, more and more companies are implementing mass customization strategy, which enables plants to design, produce, and deliver a high volume of differentiated products that meet specific customer needs in a timely manner and at close to mass-production prices. In this study we investigate the enablers of mass customization. While a lot of different factors might facilitate mass customization, this study focuses on the role of supply chain management. The contribution of four aspects of supply chain management to mass customization capabilities is considered in this study: supply chain planning, supplier relationship, customer relationship, and internal functional integration. A framework relating these supply chain management aspects with mass customization capabilities is constructed and tested with survey data.

### **5. Mass Customization: Operations Strategy Enhancing Supply Chain Management**

**Raj S Selladurai**, Indiana University Northwest

Mass customization has become extremely popular in operations management. The tremendous success of Dell Inc. in the computer and business world, through its effective use of the mass customization strategy, has enhanced the importance of mass customization. This presentation and paper explore the relationship between mass customization and supply chain management and attempt to show how mass customization would improve and enhance supply chain management.

**MON/May 2** 10:00 am-11:30 am

Valencia West (Lobby Level)

Session **MB13: Tutorial: Creating Competitive Advantage Through Operations: Teaching Lessons from Toyota, Alcoa, and others (Invited)**

Track: **Continuous Improvement**

Chair: **Steve Spear**

### **1. Tutorial: Creating Competitive Advantage Through Operations: Teaching Lessons from Toyota, Alcoa, and others**

**Steve Spear**, Harvard University

Though undifferentiated from competitors by strategic factors such as product or service, process technology, and target market, there are companies that maintain dominant positions through the capabilities of their operations, with quality, workplace safety, productivity, and flexibility better than others can manage, leading to superior market growth and profitability. The source of these advantages is that these operationally excellent organizations have learned how to manage their complex systems so that doing work and learning to do work better are exceptionally tightly coupled. This tutorial will introduce material — written and video case studies, simulations, field projects, and readings — used to teach students and managers how companies such as Toyota and Alcoa achieve operations based competitive

advantage. This material has been developed through a decade's worth of studying Toyota to understand the principles and testing the validity of those findings with industrial companies and healthcare organizations.

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**The Warrington College of Business Administration (WCBA)** at the University of Florida offers degree programs ranging from the undergraduate to the doctoral level. As a part of the state's premiere research institution, the Warrington College provides business education to the builders of tomorrow, the men and women who shape the future of commerce in our state, our nation and our world. The programs of the WCBA are fully accredited by AACSB International –The Association to Advance Collegiate Schools of Business, the premier accrediting agency for bachelor's, master's and doctoral degree programs in business administration and accounting. In 2000, Warrington became the first U.S. business school to earn EQUIS (European Quality Improvement System) accreditation from EFMD, the European Federation of Management Development. The College is committed to developing interpersonal and total management skills through team and small group work; providing opportunities for development of leadership skills; promoting academic mastery of business functional areas, and fostering the habits and attitudes that constitute a solid research and work ethic. There are approximately 8,000 students enrolled in business classes at the WCBA, including undergraduate, graduate, doctoral, and exchange students.

**The Warrington College undergraduate programs** are ranked among the top 20 public institutions in country, with many majors in the top 10. Warrington also offers opportunities for specialized study through its 16 research centers, including the David F. Miller Center for Retailing Education and Research, one of just three in the country, the Professional Development Center slated to open in 2006, and the Center for International Business Education and Research, one of only 30 designated by the U.S. Department of Education.

**Graduate business programs** at UF provide hundreds of students the opportunity for intensive study in our specialized master's programs in accounting, finance, international business, international financial management, management and real estate. The Florida MBA Program is ranked among the Top 25 public programs by *U.S. News & World Report* for 2006, with four specialty areas ranked (accounting, finance, management and marketing) in the Top 12.

**Doctoral programs** emphasize the development of strong analytic skills and sophisticated research methods. Our graduate students routinely present papers at academic conferences and publish in scholarly journals, often as coauthors with members of their department. All of our Ph.D. candidates also teach at least one course

at the introductory level while in the program. Our graduates have accepted academic positions at Carnegie Mellon, University of Chicago, Columbia, Harvard, Texas-Austin, MIT, Wharton and a number of other research institutions. These placements are directly attributable to the quality of our students, the rigor of their training, and the devotion of our faculty. To learn more, see our Web site at [www.cba.ufl.edu](http://www.cba.ufl.edu).

**Master of Science in Decision and Information Sciences Program:** The DIS program requirements span traditional academic disciplines to produce an interdisciplinary major. DIS graduates typically fill such positions as Decision Support Specialist, Information Systems Specialist and Systems Analyst. Students from a variety of backgrounds, including engineering and business administration, enroll in the MSDIS program. All students in the program are required to take core courses in programming, technology, and analytical methods. After completing the core courses, students choose a specialty: Information Technology (IT) or Supply Chain Management (SCM). Students then take seven additional courses: four from their chosen track, the capstone course, plus two electives.

**Program's Length:** The M.S. program of study in DIS consists of a minimum of 36 credit hours, normally obtained within three semesters of study. Program prerequisites include study in three fundamental areas of business equivalent to the undergraduate business core: accounting, microeconomics, plus either finance, human resources or marketing. In addition to the program prerequisites, students lacking strong quantitative skills may need additional course work to prepare for some of the required courses.

**Program Electives:** In addition to the 24 credit-hours of required courses, each student must take a minimum of 12 credit-hours of approved electives, chosen by the student in consultation with an advisor. In general, each student in a track selects electives from: (a) required courses in the other track; and/or (b) additional graduate courses offered by the DIS Department and the College.

The PeopleSoft course gives an introduction to life cycle development of a product in PeopleSoft and focuses on practical applications of the software, with much of the work occurring outside of the classroom. Students will be exposed to a modern set of development and project management tools that are used on the UF PeopleSoft Bridges project. The PeopleSoft Internship provides the DIS master's student with first-hand exposure to the many challenges in implementing an ERP system. The University of Florida has recently implemented a state-of-the-art ERP system based on PeopleSoft with fully integrated financial, human resource and portal applications.

The Warrington College of Business is a member of the SAP University Alliance Program! As a member of the University Alliance Program, the College now has a copy of SAP's R/3 software and training database and R/3 software is incorporated into our curriculum. SAP is the third largest software vendor in the world and has a market share of over 30 percent in Enterprise Business Solutions. More than half of the Fortune 500 companies have installed R/3 and a recent survey showed companies pay a significant premium to employees with R/3 skills.

**Combined Degree Program:** Students currently enrolled in the Bachelor of Science in Business Administration and Bachelor of Science in Accounting programs at the University of Florida may pursue the DIS master's degree through the Combined Degree Program. The distinct advantage of this program is that up to 16 credit-hours of approved graduate-level DIS courses may be counted as dual credit towards both the undergraduate and graduate degree. The number of dual credit-hours a student may earn depends on the undergraduate major, but usually varies between 12 and 16. All other requirements for both the BSBA/BSAC and M.S. degree must be met.

**Certificates:** The Department of Decision and Information Sciences has developed three certificate programs for graduate business students: Auditing and Information Technology, Decision & Information Sciences, and Supply Chain Management. The latter two provide structured programs of study for MBA students who desire more than the typical concentration in DIS. The Supply Chain Management program provides MSDIS students with an opportunity for a multidisciplinary specialty within the Master of Science degree program framework. The recent compliance requirements (specifically those imposed by the Sarbanes-Oxley Act) has led to an increased need for a combination of auditing and technology skills by students interested in employment opportunities with corporations and consulting firms. The Fisher School of Accounting and the Department of Decision and Information Sciences are jointly offering a Certificate to MBA students interested in developing these skill sets.

#### Curriculum

Advanced Business Programming  
Advanced Business Systems Design and Development I & II  
Business Telecom Strategy and Applications I & II  
Database I  
Intermediate Business Programming  
Managerial Quantitative Analysis I & II  
Professional Communication Skills  
Professional Writing Skills  
Statistical Analysis for Managerial Decisions  
Capstone Course: eCommerce and Logistics

**Other Graduate Programs in DIS:** In addition to the M.S. Program in Decision and Information Sciences, the DIS Department offers a Ph.D. program and an MBA concentration. Visit our Web site at: [www.cba.ufl.edu/dis/misdis/index.asp](http://www.cba.ufl.edu/dis/misdis/index.asp)

# Managing Innovation

Integrating Technological, Market and Organizational Change, 3rd Edition

Joe Tidd, *University of Sussex,*

John Bessant, *Cranfield University and*

Keith Pavitt (*Deceased*)

Established as the European market-leading text, the scope of this book is unique as it seeks to provide a framework which integrates the management of technological, market and organizational innovation. The integrating themes are the identification and development of core competencies, the constraints imposed by different technologies and markets, and the structures and processes for organizational learning. It draws on the very latest management research and international best practice in strategy, marketing, organizational behaviour and technology management to provide managers with the knowledge to understand and the skills to exploit innovation at all levels.

## NEW FEATURES

- Two new perspectives are introduced through which to re-examine material presented in each chapter: sustaining versus disruptive innovation and organizations versus networks (greater discussion of the network issues raised in each chapter)
- Greater internationalization of case examples. More examples have been included from Asia and Latin America among others
- Provides more treatment of innovation in services
- More discussion of contemporary issues in innovation, such as innovation in the service sector, and innovation and sustainability
- Improved supplementary materials for lecturers have been developed including additional examples and links to other sources of case material, a wide range of case studies, teaching notes, suggested structure for a course based on the book, exercises and more
- Provides a balanced approach to the management of innovation including market and organizational as well as technological issues.
- Draws on the latest research in innovation management.

0470093269 • 600 pages • April 2005



## BRIEF CONTENTS:

### PART I: MANAGING FOR INNOVATION

Key Issues in Innovation Management  
Innovation as a Management Process

### PART II: TAKING A STRATEGIC APPROACH

Developing the Framework for an Innovation Strategy  
Positions: The National and Competitive Environment  
Paths: Exploiting Technological Trajectories  
Processes: Integration for Strategic Learning

### PART III: ESTABLISHING EFFECTIVE EXTERNAL LINKAGES

Learning from Markets  
Learning through Alliances

### PART IV: BUILDING EFFECTIVE IMPLEMENTATION MECHANISMS

Managing the Internal Processes  
Learning through Corporate Ventures

### PART V: CREATING THE INNOVATIVE ORGANIZATION

Building the Innovative Organization  
Creating Innovative New Firms

### PART VI: ASSESSING AND IMPROVING INNOVATION MANAGEMENT PERFORMANCE

An Integrative Approach To Innovation Management  
Index

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