Eighth Annual Meeting
of the
Production and Operations Management Society

Sponsored by
Florida International University

April 12 - 15, 1997

Westin Resort
Miami Beach, Florida, USA
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Production and Operations Management
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For information, contact: Professor Sushil K. Gupta, Past President and Executive Director - POMS, PC 543, Florida International University, Miami, Florida, 33199, USA. Phone: (305) 348-1413. Fax: (305) 348-1908.
E-mail: POMS@FIU.EDU.
POM-97 BULLETIN

Number 8

Production and Operations Management Society

PROGRAM

of the

EIGHTH ANNUAL MEETING

Sponsored by

FLORIDA INTERNATIONAL UNIVERSITY
MIAMI, FLORIDA, USA

Westin Resort
Miami Beach, Florida, USA

April 12 - April 15, 1997

Supported By

Massachusetts Institute of Technology
University of Minnesota
Indiana University
Rollins College
University of Baltimore
University of Toledo
University of North Carolina at Wilmington
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BellSouth Telecommunications, Inc.
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     Production and Operations Management  
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MESSAGE FROM THE PRESIDENT

Welcome to POM-97. It promises to be a stimulating, academically rewarding and a fun time, for all of us. As with past POMS conferences, this one shares a theme - *Integrating POM Research and Practice in the 21st Century* - that is not only forward-looking, but that also emphasizes the need for our research to fuse with practice. To help us make the most of this theme, the conference is structured with plenary and semi-plenary sessions that focus on it.

POM-97, our eighth annual conference, owes much to Florida International University, the current home office of POMS. Not only is FIU co-sponsoring the conference but the dedication of POMS Executive Director (and immediate past president) Sushil Gupta has touched every aspect of this meeting. Please take the time to thank him for all he has done.

Others, of course, have been instrumental in creating this meeting. Special thanks go to the General Chairs, Modesto (Mitch) Maidique and Gabriel Bitran, and to a superb coordinating group that includes, in various roles, Joseph Lacher, Arthur Hill, Jaime Fensterseifer, Anand Kunnathur, Christos Koulamas, Edward Baker, Kenneth Murphy, and Drew Rosen. I also thank their universities and organizations for the support.

May we all enjoy the camaraderie and the intellectual ferment to be found here. My best wishes are extended to you all.

Roger Schmenner
Indiana University
USA
MESSAGE FROM THE GENERAL CHAIRS

Welcome to the eighth annual meeting of the Production and Operations Management Society, cosponsored by Florida International University. An outstanding program has been developed by the Plenary Sessions Co-Chairs Joseph P. Lacher and Sushil K. Gupta; and Contributed Papers Co-Chairs Artur V. Hill and Jaime E. Fensterseifer.

The meeting starts with a Saturday afternoon workshop on "Writing Winning Research Grant Proposals" by Thomas Breslin of Florida International University. The contributed and invited papers will be presented in technical sessions during the following three days.

The plenary and semi-plenary sessions start on Monday. The plenary session on Monday morning features the insights of Martin Starr, Wick Skinner, and Jim Bright. They are followed by presentations of university-industry partnership programs at Massachusetts Institute of Technology, Cornell University and Georgia Tech. These, in turn, will be followed by a panel discussion on our theme of Integrating POM Research and Practice in the 21st Century.

The semi-plenary sessions on Monday afternoon include presentations from scholars at the University of Wisconsin-Madison; the University of Sevilla, Spain; and Indiana University.

We take this opportunity to thank everyone on the POM-97 Program Committee for their contributions.

Modesto A. Maidique
Florida International University
USA

Gabriel Bitran
Massachusetts Institute of Technology
USA
MESSAGE FROM THE CHAIRS OF CONTRIBUTED PAPERS

On behalf of the Program Committee we welcome you to the 1997 Annual Conference of the Production and Operations Management Society. The program offers a wonderful variety of papers with something for everyone who teaches, or conducts research in production and operations management.

We are particularly excited about the international flavor of the conference. We are confident that this perspective will enrich everyone involved in the program.

We want to thank the many people who have contributed their time and energy to make this a successful conference. We extend a warm thanks to all of the participants of the program.

Arthur V. Hill (Art)  Jaime E. Fensterseifer
Curtis L. Carson School of Management  Programa de Pos-Graduacao em Administrac
USA  Universidade Federal Do Rio Grade do Sul
Brazil
PROGRAM COMMITTEE

General Co-chairs
Modesto A. Maidique
Florida International University, USA

Gabriel R. Bitran
Massachusetts Institute of Technology, USA

Co-chairs, Plenary Sessions
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BellSouth Telecommunications, USA

Sushil K. Gupta
Florida International University, USA

Co-chair, Contributed Papers
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University of Minnesota, USA

Jaime E. Fensterseifer
Univ. Federal Do Rio Grande do Sul, Brazil

Chair, Doctoral Students Consortium
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University of Toledo, USA

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Florida International University, USA

Edward Baker
University of Miami, USA

Kenneth Murphy
Florida International University, USA

Exhibits Coordinator
Drew Rosen
University of North Carolina, USA

Advisory Committee
Roger Schmenner
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Martin Starr
Rollins College, USA

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Burton V. Dean
San Jose State University, USA

Jatinder N.D. Gupta
Ball State University, USA

Aleda Roth
University of North Carolina, USA

Tomislav Mandakovic
Florida International University, USA

Amiya Chakravartti
Tulane University, USA

Yash Gupta
University of Colorado, USA

Jose Machuca
GIDEAO, Spain

Willem J. Selen
Vesalius College, Belgium

John T. Flanagan
University of Wollongong, Australia

Robert S. Collins
IMD, Switzerland

Anuj Mehrotra
University of Miami, USA

For general information about
POM-97 and the Society, contact:

POMS Executive Office, PC-543
Florida International University
Miami, Florida, 33199, U.S.A.
Phone: (305) 348-1413
Fax: (305) 348-1908
E-mail: POMS@FIU.EDU
REGISTRATION FORM

Name ____________________________________________
Affiliation ____________________________________________
Address ____________________________________________

Phone __________ Fax __________ E-mail __________

Before After
March 21 March 21
Members for 1997 $225.00 $250.00
Non-Members (includes membership benefits for 1997) $280.00 $305.00
Students/Retired Members $80.00 $105.00

Less abstract fee $50.00 ($20.00 for students and retired members), if already paid $_______
Dinner Cruise for Guests (see details in the special events section) $_______

TOTAL AMOUNT $_______

Mode of Payment: Check (payable to POMS in U.S. dollars) ______ VISA ______ MasterCard ______

Name on the credit card ____________________________ Expiration Date ____________________________

Account # ____________________________ Signature ____________________________

The names of all those taking the cruise have to be given to the cruise line two weeks in advance for ticketing. Please list the names of your guests, if any, for the dinner cruise.

____________________________________________________________________________________________

Please provide the following information for planning purposes:

Do you plan to stay at Westin Resort? YES _____ NO _____ (If yes, please call Westin for reservation)
Likely Date of Arrival ____________________________ Likely Date of Departure ____________________________

Do you plan to attend Monday luncheon? YES _____ NO _____ (Number of guests, if any) ______

Please note that the luncheon is free for the meeting registrants and the cost for non-registered guests is $25.00 per person. The guest tickets will be available at the registration desk.

____________________________________________________________________________________________

Your fee must accompany this form. Mail this form or fax it to the POMS Executive Office, Florida International University, PC 543, Miami, Florida 33199, USA. Phone: (305) 348 1413. Fax (305) 348 1908. You may also send the necessary registration and payment information by e-mail to POMS@FIU.EDU. The preregistration fee will be refunded if written notice of cancellation is received at the above address on or before April 4, 1997.
HOTEL AND TRANSPORTATION INFORMATION

A block of rooms has been reserved for meeting attendees at the Westin Resort Miami Beach, 4833 Collins Avenue, Miami Beach, Florida 33140, USA. Special reduced rates have been negotiated for meeting attendees from April 10-April 15, 1997. Please call Westin Resort for reservations at (800) 203-8368 or (305) 532-3600, fax: (305) 532-2334. The room rates are: $125.00 for single and $135.00 for double occupancy per night. Junior suites are available at $170.00 per night. Taxes are 11.5%. Please identify yourself as a participant for the POMS meeting while making reservations. Attendees are encouraged to register early to be assured of space at the reduced rates. Room requests will be honored on a first-come, first-served basis. The cut-off date for the negotiated room rates is March 17, 1997.

Miami International Airport is 11 miles and the Fort Lauderdale Airport is 20 miles from the Westin Resort. The taxi fares to the Westin Resort are: $22.00 and $35.00, for up to 5 passengers, from Miami International Airport and Fort Lauderdale Airport respectively. The Super Shuttle from Miami International Airport costs $11.00 per person and the Gray Line from Fort Lauderdale Airport costs $12.00 per person.

Driving Directions: From Miami International Airport to Westin Resort Miami Beach

As you exit the terminal look for the signs for State Road 112 and “Beaches.” Follow the exit road to the left and you will be on State Road 112. Continue eastbound for about two miles to the tollbooths and stay eastbound. After passing I-95, the expressway becomes I-195. Continue east over the causeway following signs to Miami Beach and the Beaches. Once on Miami Beach, the expressway ends and becomes 41st street. Go about a mile to intersection with Collins Avenue and turn left (as soon as you are over the bridge). Go north on Collins Avenue - you will see the Fontainbleau Hilton Hotel on your right - continue north and the Westin Resort is on your right about six blocks.

MIA MI WEATHER AND ATTRACTIONS

April brings average high temperatures of 82°F (28°C) with lows of 68°F(20°C). Sun will abound - make sure to bring the proper attire including sun glasses!

South Florida and in particular Miami Beach, first and foremost offers its gorgeous weather and beautiful white sand beaches. However, there is much more. Since its early 80’s renaissance, Miami Beach and in particular South Beach (south of 20th Street) has become an internationally known Mecca for its night life and entertainment. South Beach, home to the largest collection of Art Deco architecture in the U.S., possesses restaurants and nightclubs catering to every imaginable taste. You may spend the evening enjoying the cafes and boutiques of Lincoln Road, one of the many eclectic hot spots along Washington Street, or simply the cool breeze while strolling along Ocean Drive.

Just a little further away, in the city of Miami, a variety of other attractions await-on Key Biscayne the Miami Seaquarium, fabulous shops and boutiques of Bayside Market Place and the Stunning Viscaya Estate and Gardens. The Florida Keys, with some of the finest fishing, snorkeling and scuba diving among the United States’ only living coral reefs, is only an hour down the road. Twenty minutes to the west, the sprawling Everglades National Park can be found. The “Sea of Grass”, as it is known, is home to a huge variety of bird and animal wildlife, including, of course, the alligators. Fort Lauderdale and Palm Beach are just to the north offering their own huge variety of entertainment choices, one of which is the grand daddy of outlet mall shopping experiences, Sawgrass Mills.

South Florida, with a population nearing six million, is home to franchises in all four major sports. There are horse tracks, dog tracks, jai alai frontons, and perhaps most importantly, a plethora of golf courses. Many major and celebrity golf tournaments take place in South Florida each year. If you wish to play, then contact the hotel’s concierge for more information on courses and times. The world comes to play in Miami and so should you!
GENERAL MEETING INFORMATION

PREREGISTRATION: Preregistration for the meeting is highly recommended. To encourage preregistration, a significant discount is offered. To preregister for the meeting, complete a preregistration form (included in this bulletin) and mail it with your payment to POMS Executive Office, PC 543, Florida International University, Miami, Florida 33199, USA. The payment can be made by credit card, check or money order. Checks and money orders should be made payable to POMS. Phone: (305) 348-1413; Fax: (305) 348-1908; E-mail: POMS@FIU.EDU.

PREREGISTRATION PAYMENT WILL NOT BE ACCEPTED AFTER MARCH 21, 1997.

The preregistration fee will be refunded if written notice of cancellation is received at the POMS Executive Office by April 4, 1997.

REGISTRATION: The registration desk for the meeting will be located in the Foyer at the following times:

- Saturday, April 12: 3:00 p.m. - 5:00 p.m.
- Sunday, April 13: 7:30 a.m. - 3:00 p.m.
- Monday, April 14: 7:30 a.m. - 5:00 p.m.
- Tuesday, April 15: 7:30 a.m. - 10:00 a.m.

ALL ATTENDEES, INCLUDING SPEAKERS, ARE EXPECTED TO REGISTER.

MESSAGE BOARDS: A bulletin board for messages will be located in the registration area. Attendees are encouraged to periodically check for messages at this center.

EXHIBITS: Exhibits will be located in Mediterranean Room West.

NO SMOKING POLICY: There will be no smoking in any of the rooms in which sessions will be held and in the exhibit areas.

TECHNICAL SESSIONS: The program has been organized around several tracks. See the concurrent sessions schedule for details. If possible, the papers will be presented in the order listed in the Bulletin. Requests for papers presented at the meeting should be made directly to the speaker, not to the session chair or member of the meeting committee.

INFORMATION FOR SPEAKERS: The total amount of time allotted to each speaker depends on the number of papers in the session. The time allowed by the chair includes the formal presentation, questions from the audience and discussion. Each speaker is encouraged to leave some time for questions from the audience. Speakers are also encouraged to bring copies of their paper to the meeting for distribution to interested members of the audience.

Speakers are reminded that the meeting rooms will contain only overhead projectors and that they are responsible for additional equipment and preparing their own transparencies at their own expense. It is advisable to bring along blank transparencies and markers for last minute revisions and responses to questions.

In the event the session chair is absent, then of those speakers present, the last speaker scheduled should assume the chair’s duties.

INFORMATION FOR SESSION CHAIRS: The speakers should present their papers in the order listed in the bulletin, if possible. Each presentation should be allotted an equal amount of time. Session chairs are responsible for starting and ending each presentation on time and for alerting speakers when they have five minutes of their allotted time remaining.
SPECIAL EVENTS

WELCOMING RECEPTION: A wine and cheese reception will be held in the Starlight Roof on Saturday, April 12, 1997 from 6:00 p.m. to 7:00 p.m.

DINNER PARTY CRUISE: A dinner party cruise is planned aboard DISCOVERY DAWN for the participants of the POM-97 meeting on Sunday, April 13, 1997. The shipboard activities include casino, cabaret style shows, disco, live calypso bands, jackpot bingo and horse racing. Round-trip transportation will be provided between the Westin Resort and the port of Miami. Boarding begins at 5:00 p.m. at the port of Miami. The ship sails at 6:30 p.m. and returns at 11:30 p.m. The cruise is free for the POM-97 meeting registrants. The cost for nonregistered guests is $40.00 per person. Include the cost of the dinner cruise for guests in the total payment.

POMS LUNCHEON: POMS luncheon will be held on Monday, April 14, 1997, from 12:30 p.m. to 2:00 p.m. in the Starlight Roof. The cost of the luncheon is included in the registration fee. The tickets for nonregistered guests may be obtained at the registration desk at a cost of $25.00 each.

POMS BUSINESS MEETING: A meeting for all members of the Production and Operations Management Society will be held on Monday starting at 5:15 p.m. in room Miramar North. Those who are interested in becoming members are also welcome to attend.
## MASTER SCHEDULE

<table>
<thead>
<tr>
<th>DAY</th>
<th>EVENT</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>SATURDAY</td>
<td>Registration</td>
<td>3:00 p.m. - 5:00 p.m.</td>
</tr>
<tr>
<td></td>
<td>Workshop-Research Grants</td>
<td>4:00 p.m. - 5:30 p.m.</td>
</tr>
<tr>
<td></td>
<td>Welcoming Reception</td>
<td>6:00 p.m. - 7:00 p.m.</td>
</tr>
<tr>
<td>SUNDAY</td>
<td>Registration</td>
<td>7:30 a.m. - 3:00 p.m.</td>
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<tr>
<td></td>
<td>Exhibits</td>
<td>9:00 a.m. - 3:00 p.m.</td>
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<tr>
<td></td>
<td>SA Concurrent Sessions</td>
<td>8:30 a.m. - 10:00 a.m.</td>
</tr>
<tr>
<td></td>
<td>Break</td>
<td>10:00 a.m. - 10:30 a.m.</td>
</tr>
<tr>
<td></td>
<td>SB Concurrent Sessions</td>
<td>10:30 a.m. - 12:00 p.m.</td>
</tr>
<tr>
<td></td>
<td>Lunch</td>
<td>12:00 p.m. - 1:30 p.m.</td>
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<tr>
<td></td>
<td>SC Concurrent Sessions</td>
<td>1:30 p.m. - 3:30 p.m.</td>
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<tr>
<td></td>
<td>Dinner Party Cruise</td>
<td>3:30 p.m. - 11:30 p.m.</td>
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<tr>
<td>MONDAY</td>
<td>Registration</td>
<td>7:30 a.m. - 5:00 p.m.</td>
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<tr>
<td></td>
<td>Exhibits</td>
<td>9:00 a.m. - 5:00 p.m.</td>
</tr>
<tr>
<td></td>
<td>Plenary Sessions</td>
<td>9:00 a.m. - 12:30 p.m.</td>
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<tr>
<td></td>
<td>POMS Luncheon</td>
<td>12:30 p.m. - 2:00 p.m.</td>
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<tr>
<td></td>
<td>Semi-plenary Sessions</td>
<td>2:00 p.m. - 3:30 p.m.</td>
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<td></td>
<td>Doctoral Consortium</td>
<td>2:00 p.m. - 3:30 p.m.</td>
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<tr>
<td></td>
<td>Break</td>
<td>3:30 p.m. - 3:45 p.m.</td>
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<tr>
<td></td>
<td>MA Concurrent Sessions</td>
<td>3:45 p.m. - 5:15 p.m.</td>
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<tr>
<td></td>
<td>POMS Business Meeting</td>
<td>5:15 p.m. - 6:15 p.m.</td>
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<tr>
<td>TUESDAY</td>
<td>Registration</td>
<td>7:30 a.m. - 10:30 a.m.</td>
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<tr>
<td></td>
<td>TA Concurrent Sessions</td>
<td>8:30 a.m. - 10:00 a.m.</td>
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<tr>
<td></td>
<td>Break</td>
<td>10:00 a.m. - 10:30 a.m.</td>
</tr>
<tr>
<td></td>
<td>TB Concurrent Sessions</td>
<td>10:30 a.m. - 12:00 p.m.</td>
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## CONCURRENT SESSIONS SCHEDULE

### SUNDAY APRIL 13, 1997 8:30 a.m. - 10:00 a.m.

<table>
<thead>
<tr>
<th>ROOM</th>
<th>SESSION</th>
<th>CHAIR</th>
<th>SESSION TITLE</th>
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</thead>
<tbody>
<tr>
<td>Miramar North</td>
<td>SA1</td>
<td>Kingshuk K. Sinha</td>
<td>Panel Discussion on Field Research in Operations Management</td>
</tr>
<tr>
<td>Miramar South</td>
<td>SA2</td>
<td>Jaime Fensterseifer</td>
<td>Manufacturing Strategy: A View from Brazil (1)</td>
</tr>
<tr>
<td>Castillian</td>
<td>SA3</td>
<td>Gerhard Plenert</td>
<td>Total Quality Management: The Big Picture</td>
</tr>
<tr>
<td>Valencia East</td>
<td>SA4</td>
<td>Drew Rosen</td>
<td>Service Quality Management: The Gaps Model</td>
</tr>
<tr>
<td>Valencia West</td>
<td>SA5</td>
<td>Chingping Han</td>
<td>Production Planning and Control Systems: Information System Design</td>
</tr>
<tr>
<td>Madrid</td>
<td>SA6</td>
<td>Kathleen E. McKone</td>
<td>Reliability and Maintenance (1)</td>
</tr>
<tr>
<td>Balboa</td>
<td>SA7</td>
<td>Frank Werner</td>
<td>Scheduling (1)</td>
</tr>
<tr>
<td>Regency CR</td>
<td>SA8</td>
<td>Ian Stuart</td>
<td>Supply Chain Management (1)</td>
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### SUNDAY APRIL 13, 1997 10:30 a.m. - 12:00 p.m.

<table>
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<th>ROOM</th>
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<th>SESSION TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miramar North</td>
<td>SB1</td>
<td>Amiya K. Chakravarty</td>
<td>Operations Strategy: New Product Development</td>
</tr>
<tr>
<td>Miramar South</td>
<td>SB2</td>
<td>Jaime Fensterseifer</td>
<td>Manufacturing Strategy: A View from Brazil (2)</td>
</tr>
<tr>
<td>Castillian</td>
<td>SB3</td>
<td>James R. Evans</td>
<td>Total Quality Management: Management Principles</td>
</tr>
<tr>
<td>Valencia East</td>
<td>SB4</td>
<td>Chris Voss</td>
<td>Service Quality Management (1)</td>
</tr>
<tr>
<td>Valencia West</td>
<td>SB5</td>
<td>James Putt</td>
<td>Production Planning and Control Systems: Production Control</td>
</tr>
<tr>
<td>Madrid</td>
<td>SB6</td>
<td>Gauri L. Ghini</td>
<td>Reliability and Maintenance (2)</td>
</tr>
<tr>
<td>Balboa</td>
<td>SB7</td>
<td>Gunter Schmidt</td>
<td>Scheduling (2)</td>
</tr>
<tr>
<td>Regency CR</td>
<td>SB8</td>
<td>Scott Svenset</td>
<td>Supply Chain Management (2)</td>
</tr>
</tbody>
</table>

### SUNDAY APRIL 13, 1997 1:30 p.m. - 3:00 p.m.

<table>
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<th>ROOM</th>
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<tbody>
<tr>
<td>Miramar North</td>
<td>SC1</td>
<td>Amitabh S. Raturi</td>
<td>Operations Strategy: Cross Functional Issues</td>
</tr>
<tr>
<td>Miramar South</td>
<td>SC2</td>
<td>Tomislav Mandakovic</td>
<td>Government Operations: A View from Chile</td>
</tr>
<tr>
<td>Castillian</td>
<td>SC3</td>
<td>Joy Benson</td>
<td>Total Quality Management: Pedagogy</td>
</tr>
<tr>
<td>Valencia East</td>
<td>SC4</td>
<td>Brit M. Shirley</td>
<td>Service Quality Management (2)</td>
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<tr>
<td>Valencia West</td>
<td>SC5</td>
<td>Mubin Ahmad</td>
<td>Production Planning and Control Systems: MRP and JIT</td>
</tr>
<tr>
<td>Madrid</td>
<td>SC6</td>
<td>Marek Szczewkowski</td>
<td>Process Improvement: Performance Measurement and Benchmarking</td>
</tr>
<tr>
<td>Balboa</td>
<td>SC7</td>
<td>Jerzy Kyparisis</td>
<td>Scheduling (3)</td>
</tr>
<tr>
<td>Regency CR</td>
<td>SC8</td>
<td>Vijay Gupta</td>
<td>Supply Chain Management (3)</td>
</tr>
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</table>
### MONDAY  
**AUGUST 14, 1997**  
**3:45 p.m. - 5:15 p.m.**

<table>
<thead>
<tr>
<th>ROOM</th>
<th>SESSION</th>
<th>CHAIR</th>
<th>SESSION TITLE</th>
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</thead>
<tbody>
<tr>
<td>Miramar North</td>
<td>MA1</td>
<td>Henk Akkermans</td>
<td>Operations Strategy: Strategic Decision Making</td>
</tr>
<tr>
<td>Miramar South</td>
<td>MA2</td>
<td>Danny J. Johnson</td>
<td>Manufacturing Cells/Flexible Manufacturing Systems/Automation</td>
</tr>
<tr>
<td>Castillian</td>
<td>MA3</td>
<td>Maling Ebrahimpour</td>
<td>Total Quality Management: ISO 9000</td>
</tr>
<tr>
<td>Valencia East</td>
<td>MA4</td>
<td>Jean Harvey</td>
<td>Service Quality Management (3)</td>
</tr>
<tr>
<td>Valencia West</td>
<td>MA5</td>
<td>Wenny H.M. Raaymakers</td>
<td>Production Planning and Control Systems: Integrated Planning Models</td>
</tr>
<tr>
<td>Madrid</td>
<td>MA6</td>
<td>Sant Arora</td>
<td>Process Improvement: Business Process Re-engineering</td>
</tr>
<tr>
<td>Balboa</td>
<td>MA7</td>
<td>Frank Werner</td>
<td>Scheduling (4)</td>
</tr>
<tr>
<td>Regency CR</td>
<td>MA8</td>
<td>Dhalua Krishna Sundar</td>
<td>Material Management, Logistics, and Distribution (1)</td>
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### TUESDAY  
**AUGUST 15, 1997**  
**8:30 a.m. - 10:00 a.m.**

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<tr>
<th>ROOM</th>
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<tr>
<td>Miramar North</td>
<td>TA1</td>
<td>Jack Meredith</td>
<td>Operations Strategy: Empirical Research</td>
</tr>
<tr>
<td>Miramar South</td>
<td>TA2</td>
<td>J. Brian Atwater</td>
<td>Production Planning and Control Systems: Theory of Constraints (1)</td>
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<td>Castillian</td>
<td>TA3</td>
<td>John Flanagan</td>
<td>Total Quality Management: Statistical Process Control</td>
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<tr>
<td>Valencia East</td>
<td>TA4</td>
<td>K. Ravi Kumar</td>
<td>Operations and the Environment</td>
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<tr>
<td>Valencia West</td>
<td>TA5</td>
<td>Roger W. Schmenner</td>
<td>Production Planning and Control Systems: Policies for Improvement</td>
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<tr>
<td>Madrid</td>
<td>TA6</td>
<td>Robert H. Burgess</td>
<td>Process Improvement: Innovations</td>
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<tr>
<td>Balboa</td>
<td>TA7</td>
<td>Lawrence Fredendall</td>
<td>Scheduling (5)</td>
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<tr>
<td>Regency CR</td>
<td>TA8</td>
<td>Powell Robinson</td>
<td>Material Management, Logistics, and Distribution (2)</td>
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### TUESDAY  
**AUGUST 15, 1997**  
**10:30 a.m. - 12:00 p.m.**

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<th>ROOM</th>
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<tr>
<td>Miramar South</td>
<td>TB1</td>
<td>Jake Simons</td>
<td>Production Planning and Control Systems: Theory of Constraints (2)</td>
</tr>
<tr>
<td>Castillian</td>
<td>TB2</td>
<td>Mabah Ahmed</td>
<td>Applications of Software Engineering Tools in Operations</td>
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<tr>
<td>Valencia East</td>
<td>TB3</td>
<td>Steve Zanakis</td>
<td>Linear Programming Applications in Operations</td>
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<tr>
<td>Valencia West</td>
<td>TB4</td>
<td>Tamas Koltai</td>
<td>Cost Management and Control</td>
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<td>Madrid</td>
<td>TB5</td>
<td>Edward Baker</td>
<td>Process Improvement: Simulation</td>
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<tr>
<td>Balboa</td>
<td>TB6</td>
<td>Scott Swenseth</td>
<td>Project Management and Scheduling</td>
</tr>
<tr>
<td>Regency CR</td>
<td>TB7</td>
<td>Jaesun Park</td>
<td>Lot-sizing Decisions</td>
</tr>
<tr>
<td>Miramar North</td>
<td>TB8</td>
<td>Diane H. Parente</td>
<td>Panel Discussion on Delivery of the Core Course in POM</td>
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## Room Schedule for POM 1997 Westin Resort Miami Beach

<table>
<thead>
<tr>
<th>Time</th>
<th>Saturday April 12</th>
<th>Sunday April 13</th>
<th>Monday April 14</th>
<th>Tuesday April 15</th>
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<tbody>
<tr>
<td><strong>Room</strong></td>
<td>4pm-5:30pm</td>
<td>6pm-7pm</td>
<td>8:30am-10am</td>
<td>10:30am-12pm</td>
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<td>Operations Strategy</td>
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<tr>
<td>Castillian</td>
<td>Total Quality Management</td>
<td>Total Quality Management</td>
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<td>Applications of Software Engineering</td>
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<tr>
<td>Valencia West</td>
<td>Production Planning and Control</td>
<td>Production Planning and Control</td>
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<td>Cost Management and Control</td>
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<tr>
<td>Madrid</td>
<td>Reliability and Maintenance</td>
<td>Process Improvement</td>
<td>Doctoral Consortium</td>
<td>Process Improvement</td>
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<tr>
<td>Balboa</td>
<td>Scheduling</td>
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<td>Scheduling and Project Management</td>
</tr>
<tr>
<td>Regency</td>
<td>Supply Chain Management</td>
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<td>Materials Management Logistics and Distribution</td>
<td>Lot Sizing Decisions</td>
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<tr>
<td>Conference Room</td>
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<tr>
<td>Mediterranean Room West</td>
<td>Exhibits</td>
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<tr>
<td>Mediterranean Room Center</td>
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<td>Plenary: “Integrating Research and Practice”</td>
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<tr>
<td>Starlight Roof</td>
<td>Welcoming Reception</td>
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<td>POMS Luncheon</td>
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### Dinner Cruise:
Sunday, April 13, 1997, 3:30-11:30p.m. (See details in bulletin.)

### POMS Business Meeting:
Monday, April 14, 1997, 5:15-6:15p.m., Miramar North.
PLENARY SESSION

MONDAY    APRIL 14, 1997  9:00 a.m. - 12:30 p.m.

ROOM: MEDITERRANEAN ROOM CENTER

The plenary session includes presentations by Martin Starr, Wickham Skinner, and Jim Bright followed by presentations of university-industry partnership programs at Massachusetts Institute of Technology, Cornell University and Georgia Institute of Technology. These presentations will be followed by a panel discussion on Integrating POM Research and Practice in the 21st Century.

SEMI-PLENARY SESSIONS

MONDAY    APRIL 14, 1997  2:00 p.m. - 3:30 p.m.

The semi-plenary sessions include the following three concurrent presentations of the work done at the University of Wisconsin-Madison, the University of Sevilla, Spain; and Indiana University.

ROOM: MIRAMAR NORTH

Issues in Implementing Lead Time Reduction: Insights from Industry Projects, Rajan Suri, Quick Response Manufacturing Center, University of Wisconsin-Madison, 1513 University Avenue, Madison, WI 53706, USA, SURI@ENGR.WISC.EDU; Urban Wemmerlov, Quick Response Manufacturing Center, University of Wisconsin-Madison, 1513 University Avenue, Madison, WI 53706, USA, UWEMMERLOV@BUS.WISC.EDU

The strategy of competing on speed, or time-based competition, has been widely discussed in the literature in recent years. This talk describes an ongoing, multi-year action research study involving 14 manufacturing firms. A research team consisting of five faculty and several graduate students linked to the Center for Quick Response Manufacturing at the University of Wisconsin-Madison are working with these firms to analyze their operations on the factory floor and in the offices, and to suggest recommendations for response time improvements. Observations and insights from the analysis and implementation processes will be presented.

ROOM: MIRAMAR SOUTH

Improving POM Learning: Systems Thinking and Transparent-Box Business Simulators, Jose A.D. Machuca, Dept. Econ. Fin. y Dir. Operaciones, G.I.D.E.A.O. Research Group, University of Sevilla, Avenida Ramon y Cajal 1, 41018, Sevilla, Spain, JMACUCA@III.E.S.C.C.S.

It is well known by systems thinkers that the behavior of systems (for example, the company as a whole or the operations subsystem) depends upon their structure (the set of system variables and their interrelationships). In our opinion, the methods and tools presently used for P. O. M. Teaching are insufficient to cope with an ever more complex reality. Over the last few years, the research group G.I.D.E.A.O. Following an original idea (Machuca 1992 a and b) has been developing transparent-box business simulators (TBBs) based on systems Thinking and system Dynamics models; the aim was to maintain the advantages of the existing didactic tools while mitigating their drawbacks. The most distinctive feature of TBBs (as opposed to the traditional black-box business games) is that the structure of the system to be simulated is always accessible to the users, who can thus reflect on the causes underlying the results obtained and thereby improve decision-making and the learning process. We will show how to work with TBBs and we will comment on the results obtained in an empirical experiment which aims to measure the influence of TBBs on the learning process.
Engaging Students in POM Class Discussion: Experiences with Class Voting and Internet Based Interactive Games,
F. Roberts Jacobs, School of Business, Indiana University, 10th and Fee Lane, Bloomington, IN 47405, USA,
JACOBS@INDIANA.EDU.

This session will discuss recent experience with using a mechanism to poll students of their opinions prior to and during a class. For example, prior to an in-class discussion of a case students are asked to complete a simple questionnaire. The questionnaire consists of a few multiple choice and True/False questions, which relate to the main issues of the case. Possibly, the easiest way to administer the questionnaire is via a form which is made available to the students over the Internet. Prior to the class, the instructor tabulates results in summary and annotates a seating chart with the responses of each student. Using this information, a series of engaging questions can be developed for individual students or groups of students thus facilitating the discussion. In addition to the voting, we have recently begun experimenting with Internet based games. The initial project involves the use of a version of the "Beer Distribution Game." Experiences with the use of this technology will be discussed in the session.

WORKSHOP ON RESEARCH GRANT PROPOSALS

SATURDAY APRIL 12, 1997  4:00 p.m. - 5:30 p.m.

ROOM: MIRAMAR NORTH

Writing Winning Research Grant Proposals, Thomas A. Breslin, Florida International University, Miami, Florida 33199, USA, BRESLIN@FIU.EDU; Catherine Thurman, Florida International University, Miami, Florida 33199, USA, THURMAN@FIU.EDU.

This workshop will focus on how to locate appropriate funding sources; lay the professional and institutional groundwork for a successful proposal; craft the proposal; budget appropriately; and follow up.

DOCTORAL STUDENTS CONSORTIUM

MONDAY APRIL 14, 1997  2:00 p.m. - 3:30 p.m.

ROOM: MADRID

Doctoral Students Consortium, Anand Kunnathur, University of Toledo, Toledo, Ohio 43606, USA,
FAC2282@UOFT01.UTOLEDO.EDU.

The consortium will provide an excellent opportunity for doctoral students to present their research and obtain feedback from prominent academicians and practitioners from industry.
Sunday, 8:30 am - 10:00 am  Room: Miramar North

SA1  Title: Panel Discussion on Field Research in Operations Management
Chair: Kingshuk K. Sinha, University of Minnesota

Panel Members:

Arthur V. Hill, Operations and Management Science Department Carlson School of Management, University of Minnesota, Minneapolis, MN 55455, ahill@csom.umn.edu.

Aleida Roth, Kenan - Flagler Business School, UNC - Chapel Hill, Campus Box 3490 Carroll Hall, Chapel Hill, NC 27599-3490, USA, ROTHAB@BSACD1@MHS.UNC.EDU.

Chris Voss, London Business School, Sussex Place, London, UK, CVOSS@LBS.LON.AC.UK.

Increasingly, operations management scholars are conducting field research. This panel discussion will focus on (i) the challenges and rewards of conducting field research, (ii) training doctoral students in conducting field research, and (iii) publishing papers based on field research.

Sunday, 8:30 am - 10:00 am  Room: Miramar South

SA2  Title: Manufacturing Strategy: A View from Brazil (I)
Chair: Jaime Fensterseifer, PPGA/UFRGS, Brazil.

SA2.1 The Truth is Out There: Strategic Environment and the Bording of a Manufacturing Operations Strategy, Adriano Procenca, Universidade Federal do Rio de Janeiro, Barata Ribeiro, 184/503, CEP 22011-000, Rio de Janeiro - RJ - Brazil, ADRIANO@PEP.UFRJ.BR.

Methodologies of manufacturing/operations strategy usually take the firm as an autonomous entity in a given market. This paper presents elements of a conceptual model that would allow for an understanding of the way key environmental variables restrain and potentize the actual formation of firm's manufacturing/operations strategy. Brazilian experience seems to provide positive returns as to its utility.

SA2.2 Analyzing the Competitive Strategies Adopted by Belo Horizonte Software Companies, Marcelo Blaser, Universidade Federal de Minas Gerais, Rua Bernardo Guimarães, 833/02 - Funcionários, CEP 30140-080 Belo Horizonte - Minas Gerais - Brazil, MBLESER@GOLD.HORIZONTES.COM.BR; Carlos Alberto Gonçalves, Universidade Federal de Minas Gerais, R. Curitiba, 332 sala 1007, CEP 30170-120 BH - MG - Brazil, CAPESQ@ORACULO.I.CC.UFMG.BR.

The software industry in Brazil is taking its first step towards acquiring some share and recognition both in internal market and in external one. In such an environment, the government decision of creating the SOFTEN 2000 project, under CNPq sponsorship should be remarked. This program aims at pushing Brazilian companies into the international markets for software not only backing the creation of new companies but also giving international logistic support of them to export their product and services. We first study some marketing models well known in the literature, notably the relationship model (McKenna), the leading company model, (Tracy and Wiersema), the chain value model (Porter). In this paper we try to check the validity of those above mentioned models in explaining the performance of leading Brazilian companies and those which are operating in the marketing for longer than ten years. Besides, some action plans were proposed for helping those companies that may intend to compete in such market segments.

SA2.3 Competitiveness of Apple's Industry in Brazil, Marcia Varaschin, Universidade Federal de Santa Catarina, Rua Capitão Ronualdo Barros, 622/102B, CEP 88040-600 Florianópolis - SC - Brazil, JANICE@MBOX1.UFSC.BR; Mauricio Pereira, R.Gal.Bittencourt 127 AP.116, Florianopolis, Brazil; Cristiano Cunha, Universitario-Frotois, UFSC/EPS-CAMPUS, Brazil, CUNHA@PRODAU.SC.COM.BR.

The aim of this paper is to discuss the competitiveness of apple’s industry in Brazil, by applying Porter’s model. In this sense, the work is divided in five sections: an introductory, where some general aspects are discussed; a second where is presented Porter’s model; a third where the apple’s industry of the state is characterized; pressure of substitute products, negotiation power of buyers and suppliers; and finally, some relevant conclusions are stated.
SA3 Title: Total Quality Management: The Big Picture  
Chair: Gerhard Plenert, IBM

SA3.1 Competing Through Quality in the Global Economy, Aysar P. Sussan, P.O. Box 292971, Davie, Fl. 33329, USA, SUSSAN@POLARIS.NCS.NOVA.EDU.

Many companies such as IBM, American Express, Motorola, United Airlines, and others have introduced various quality progress, due to deregulations, takeovers, downsizing, budget cut, and the entrance of new competitors into the market place profoundly impact many organizations. Techniques for measuring the overall results of quality programs are not yet well developed. Yet, many companies are making a valiant effort to measure the impact of their quality efforts on customer's perception. This means you must have customer-focused performance measurement, and organizational structures aligned with business process and strategies. The research finding of this paper will be generated from the evaluation of the questionnaires based on the model that was developed in this study.

SA3.2 Quality Strategic Management: A Practical Proposal, Ely Paiva, PPGA/UFRGS, Av. João Pessoa 52 sala 11, CEP 90040-400 Porto Alegre - RS - Brazil, ELY@FUNDATEC.TCHE.BR.

In the widely accepted manufacturing strategy framework, quality is one of the nine decision categories. However, there is a little research in manufacturing strategy that deals with the strategic approach to quality management. This work seeks to identify some crucial strategic aspects of quality management. The approach includes: business strategy deployment, performance indicators utilized, employees participation scope, and problem solution methodology. Finally, We present a case study in a plastic manufacturing firm. This study helps to identify important practical issues related to performance indicators, implementation difficulties and necessary future steps.

SA3.3 Taking the Measure of TQM Program After Full Implementation, Hossein Jamshidi, Management & Marketing Dept., P.O. Box 429, Normal, AL 35762, USA, HJAMSHIDI@ASNAAM.AAMU.EDU; Emeka Samuel Dunn, P.O.Box 344, Normal, AL 35762, USA, AADUNO1@ASNAAM.AAMU.EDU.

A key to assessing the progress of a TQM program is measurement. Organizations must develop a tool to measure achievement. This is an experimental study that is designed to introduce a methodology to measure the achievement of a TQM program. The performance criterion is set to be "customer satisfaction." This methodology measures the rate of "customer satisfaction" in any period till steady state condition is reached. A markov chain is used as a tool to measure the rate of TQM implementation. The results will provide feedback to management about the success of the TQM program and whether the employees, machines, products, and services are aligned with the organizational goals.

SA3.4 Total Quality Management in POM, Gerhard Plenert, IBM, BYU-IBM-660TNBR, Provo, UT 84602, USA, GERHARD-PLENTER@BYU.EDU.

This presentation will discuss research on both the philosophical and the operational aspects of Total Quality Management (TQM) and how it relates to Production/Operations management. It will look closely at what the TQM change strategy proposes. It will discuss issues like the Quality Council and how it should be organized, three-P teams and how they should be built, and systematic problem solving and how this helps to implement change. Last it will look at examples of effective TQM implementations.
The service sector of the economy is booming in most countries. The application of TQM in the service industry is a controversial subject on account of specific characteristics of services. In order to apply TQM in services companies, it is suggested a framework which combines TQM with service quality models, such as SERVQUAL and SERVPERF, and benchmarking systems. It will also be useful to support the managerial activities and to prevent omission or lack of control of essential variables through lack of knowledge of their importance.

SA4.2 Quality Measurement in the Hospitality Industry: A Dining Experience, Drew Rosen, Cameron School, University of North Carolina, 6011 S. College Road, Wilmington, NC 28403, USA, ROSENL@UNCWILL.EDU.

Numerous studies of quality have been conducted by various authors in a multitude of industries employing a variety of tools. This study is an attempt to determine the usefulness of SERVQUAL as a tool in accessing customer expectations and perceptions of restaurant service and the associations with the determinants of service quality. Data collected statistical analysis will be presented in an attempt to develop a means by which a manager could operationalize the derived determinants of quality to improve overall restaurant patron satisfaction.

SA4.3 Service Quality: Gap Model Versus Performance Model, David Martin Johnston, FUNDATEC, Rua Cristiano Fischer, N° 2018, CEP 91410-000 Porto Alegre - RS - Brazil, DAVID@FUNDATEC.TC.HE.BR, Fernando Bins Luce, PPGA/UFROSAV. Joao Pessoa, No. 52-Sala 11, Porto Alegre, RS CEP 90040-000, Brazil, Yves Evrad, Groupe HEC-FRANCE!, Av. Joao Pessoa, No. 52-Sala 11, Porto Alegre, RS. CEP 90040-000, Brazil.

Parasuraman, Zeithaml And Berry (1988) and Cronin and Taylor (1992) have developed, respectively, multiple-item scales called SERVQUAL (Service Quality) and SERVPERF (Service Performance) for assessing customer's perception of service quality. Data were collected from 332 organizations. Statistical procedures were employed basically to evaluate banking service quality. Number of service dimensions and the validity of SERVQUAL @ SERVPERF scales. Results indicate that banking service quality is composed of three dimensions: factor F1 (covering reliability, responsiveness and assurance), factor F2 (tangibility) and factor F3 (empathy). SERVQUAL convergent validity is not conformed, while SERVPERF scale has superior performance in measuring service quality.

SUNDAY, 8:30 am - 10:00 am Room: Valencia West

SA5 Title: Production Planning and Control Systems: Information System Design
Chair: Chingping Han, Florida Atlantic University

SA5.1 An Object Oriented Model for MRP II Systems, Karen Kastritis, Dept. of Mechanical Engineering, Florida Atlantic University, Boca Raton, FL 33431, USA; Chingping Han, Department of Mechanical Engineering, College of Engineering, Florida Atlantic University, P. O. Box 3091, Boca Raton, FL 33431, USA; Eduard Fernandez, Dept. of Computer Science and Engineering, Florida Atlantic University, Boca Raton, FL 33431, USA.

This paper presents the development of an object oriented model for a manufacturing Resource Planning System (MRP II). It demonstrates that the use of objects and object oriented techniques to model complex systems such as MRP II results in system models being more easily understood and more flexible to change than other more conventional representations. MRP II systems are functionally complex systems. In providing effective resource management tools, they support the integration of a wide variety of complex functions. These systems also undergo frequent changes as business needs change. For these reasons the object oriented analysis technique is applied to create clear and flexible representations. Object Modeling Technique (OMT) is used in this study.

SA5.2 Reengineering a Manufacturing Resource Planning System Using an Object Oriented Approach, Aziz E. Elsayed, Production Engineering Department, Faculty of Engineering, Alexandria University, Alexandria, 21544, Egypt, AZIZ@ALEX.EUN.EG; K.S. Elkilany, Production Engineering Department, Faculty of Engineering, Alexandria University, Alexandria, 21544, Egypt; S.A. Deweek, Production Engineering Department, Faculty of Engineering, Alexandria University, Alexandria, 21544, Egypt.

A manufacturing resource planning system (MRP II) is an integrated manufacturing planning tool which is most appropriate to production-to-order environment. This paper presents a comprehensive computer-based methodology to reconstruct an MRP II system. An intelligent object oriented approach together with a group of analytical models present the background environment and the interfacing mechanism between the system modules. Basic features of the suggested system include: user-friendly procedures, flexibility, and open-architecture features.
SA5.3 An Integrated Medium Range Business Planning and Information System: A Linked-Spreadsheet Approach, Ying Chien, School of Management, University of Scranton, Scranton, PA 18510, USA, CHIEN@UOFS.EDU; Wayne Cunningham, School of Management, University of Scranton, Scranton, PA 18510, USA, CUNNINGHAM@UOFS.EDU.

Sales forecasting, aggregate production planning and budgeting are three functions which must be performed for firms to succeed in today's marketplace. Frequently, however, coordinating these activities is difficult because critical information may not be easily shared. This paper presents a means whereby the three planning activities can be integrated through the use of spreadsheet linking procedures. Doing so provides the opportunity for managers to share information in developing plans for better decisions.

SUNDAY, 8:30 am - 10:00 am Room: Madrid

SA6 Title: Reliability and Maintenance (1)
Chair: Kathleen E. McKone, University of Minnesota

SA6.1 Throughput Dependent Periodic Maintenance Policies for General Production Units, Eleftherios Iakovou, Dept. of Industrial Engineering, University of Miami, P.O. Box 248294, Coral Gables, FL 33124, USA, LEFTERIS@ENG.MIAMIEDU; Chi Ip, Alamo Rent-A-Car, Inc., 110 Tower 110 SE 6th St. P.O.Box 22776, Ft. Lauderdale, FL 33335, USA, CHIP@ALAMO.E-MAIL.COM; Christos Koulamas, Dept. of Dec. Sci. & Info. Systems, College of Business Administration, Florida International University, Miami, FL 33199, USA, KOULAMAS@FIU.EDU

A Markov decision model is presented to determine the optimal maintenance policy for a general production unit. The unique characteristic of the proposed model is the inclusion of the unit's throughput rate as a decision variable. We show that under appropriate assumptions the generator matrix of the underlying Markov chain, that models the unit's deterioration process, exhibits a separability property which facilitates significantly the solution procedure. The proposed solution method is then demonstrated using a numerical example. The proposed model can lead to substantial savings since the interrelationship between throughput rate and the unit's production lifetime is considered.

SA6.2 On the Use of Optimization Models in Maintenance: A State of the Art, Romain Dekker, Econometric Institute, Erasmus University Rotterdam, P.O. Box 1738, 3000 DR, Rotterdam, The Netherlands, RDEKKER@FEW. EUR. NL.

In this paper we give a state-of-the art of application of optimization models in maintenance. We discuss several application areas, like machinery, civil structures and airplane as well as several tools like operational strategic decision support systems. A number of cases will be discussed in detail. Finally, we discuss future prospects.

SA6.3 Policies for Implementing Predictive Maintenance Tools within a Traditional Periodic Maintenance Environment, Kathleen E. McKone, Department of Operations and Management Science, Carlson School of Management, University of Minnesota, Minneapolis, MN 55455, kmckone@csom.umn.edu; Elliot N. Weiss, Darden Graduate School of Business, University of Virginia, Box 6550, Charlottesville, VA 22906-6550, weiss@darden.gbus.virginia.edu.

The models in this paper explicitly evaluate the decision to utilize both predictive and periodic maintenance when the objective is to minimize the expected maintenance costs. Renewal theory is used to obtain optimum policies that depend on the failure distribution and prediction capabilities. We develop a closed form solution that establishes a maintenance policy under decreasing failure rates, a case where traditional periodic maintenance models recommend not conducting any maintenance. Our solutions provide a method for determining an optimal predictive maintenance policy and provide guidelines for selecting equipment for the effective use of predictive technologies.

SUNDAY, 8:30 am - 10:00 am Room: Balboa

SA7 Title: Scheduling (1)
Chair: Frank Werner, Otto-von-Guericke-Universitat

SA7.1 Resource Constrained Project Scheduling for Multi-functional Teams in Ship Maintenance, W.H.M. Zijm, Production and Operations Management Group, Faculty of Mechanical Engineering, University of Twente, P.O. Box 217, 7500 AE, Enschede, The Netherlands, W.H.M.ZIJM@WB.UTWENTE.NL.
We describe the basic architecture and the algorithmic framework of a decision support system to enhance process planning and capacity scheduling at a large shipyard. The yard is responsible for the complete overhaul and modification program for various classes of navy ships. The work is of a mixed job shop and project character. Most maintenance activities are carried out by so-called multi-functional teams, consisting of a group of multi-skilled people. In this paper, we discuss the allocation of (parts of) teams to carry out repair and overhaul work at the ships. In addition, we outline the basics of a project scheduling system and discuss its implementation.

SA7.2 Scheduling Flexible Manufacturing Systems, J.N.D. Gupta, Department of Management, Ball State University, Muncie, IN 47306, USA, JNGUPTA@BSUVC.BSU.EDU; L.H.S. Luong, School of Engineering (Manufacturing), University of South Australia, The Levels, Pooraka, SA 5095, Australia, LEELUONG@UNISA.EDU.AU.

This paper describes the development of a dispatching approach for FMS scheduling where all parts are stored in a central buffer. When a machine becomes available, a part from the buffer which can be performed by that machine will be dispatched. If there are more than one candidate parts, a part will be selected according to pre-determined loading rules. Simulation was used to compare the performance of the proposed dispatching algorithm with the traditional approach where parts were sent directly to the local machine buffers which have been pre-selected during process planning stage. These results show that the proposed dispatching approach outperforms the traditional one with respect to makespan, average flow time, and average tardiness. Machine failures and loading rules have also been shown to have less impact on the proposed dispatching algorithm than the traditional one.

SA7.3 A Decision Theoretic Heuristic for Resource Constrained Scheduling, V. Sridharan, Department of Management, Clemson University, Clemson, SC, SUHAS@HUBCAP.CLEMSON.EDU.

We present a heuristic based on decision theory for constructing schedules with inserted idle times in a multiple resource constrained job shop. The effectiveness of the heuristic is evaluated by comparing its performance on a set of random problems for which the optimum solution is obtained using a branch and bound procedure.

SUNDAY, 8:30 am - 10:00 am Room: Regency CR

SA8 Title: Supply Chain Management (I)
Chair: Ian Stuart, University of Bath

SA8.1 Reconfiguration of Supply Chains After Trade Liberalization, Guillermo Abdel Mustik, Camino a Santa Teresa 930, 10700, Mexico, D.F., GAMUSIK@DYSYS2.STER.ITAM.MX.

This paper will describe how Mexican firms’ supply chains have evolved in response to trade liberalization. The previous import substitution regime created firms which are extremely inward oriented or outward oriented. Decreasing barriers to trade have expanded the set of potential suppliers and buyers, as well as potential competitors, resulting in increased complexity of firm networks. These new structures are having a profound impact on the role Mexican firms are playing in North American supply chains, and in the way firms are managing their customers and suppliers.

SA8.2 The Dawn of a New Manufacturing Concept: Suppliers are Assemblers, Harro Stamm, UDESC, Rua Dr. Roberto Koch, 135/701, CEP 89201-720 Joinville - SC - Brazil, Wilson J. Mafra, UDESC-FeJ Rua Tte. Anf Joao, 89223-100 Joinville SC-, Brazil, DEM2WJM@DEC.FEJ.UDESC.BR.

The paper describes the operation of a truck assembly in Brazil working under the concept of modular partnership, devised and set up by Lopez de Arrioeur, International Vice President at Volkswagen. The main issues of this novel manufacturing design are analyzed and compared to key characteristics identified by researchers in order to evaluate how well the experiment, beyond being extremely revolutionary and deeply challenging, fits into the ideal patterns considered necessary for future operations to thrive in the global economy of the information age. The paper concludes that there is room for future improvements.

SA8.3 Managing Vendors: The External Employees, Frederick Tesch, WCSU, 181 White Street, Danbury, CT 06810, USA, TESCH@WCSU.CTSTATE.EDU; Ronald Benson, WCSU, 181 White Street, Danbury, CT 06810, USA, BENSONR@WCSU.CTSTATE.EDU.
The management of vendor relations is changing rapidly, driven by factors such as JIT, the Japanese Keiretsu, and the American TQM crusade. Vendors are no longer treated as adversaries: they are now partners chosen primarily for their willingness and ability to work closely with customers both design and problem solving. This new relationship is analogous to the ideal employer-employee relationship. This paper examines the Human Resource Management Literature on managing internal employee relationships and extrapolates these ideas to managing external employee (i.e., vendor) relationship.

**SA8.4 Information Exchange and Supplier Alliance Maintenance**, Ian Stuart, School of Management, University of Bath, Bath BA 27AY, UK, I.SU11ART@BATH.AC.UK; David McCutcheon, Faculty of Management, P.O. Box 3015, Victoria, V8W 3PL, Canada, DMCCUTCH@BUSINESS.YIC.CA.

Many firms have attempted to achieve the elusive goal of competitive advantage through supply chain management, particularly with the use of strategic supplier alliances. While some alliance development have been successful, many have failed. At least some of these failures could be attributed to the firm's use of a rigid, static approach to the dynamic situation of a developing relationship with the prospective alliance partner. To understand more about the changing requirements for alliance development, we identified firms that had successfully established long-term alliance-like relationships with key suppliers. We then conducted in-depth field studies with operating managers, focusing on the information exchanges that were used in dealing with suppliers. Field sites included firms from the United-States, Canada and the United Kingdom in both manufacturing and service industries. A summary of the field observations and the resulting conceptual model will be presented.

**SUNDAY, 10:30 am - 12:00 noon  Room: Miramar North**

**SB1 Title:** Operations Strategy: New Product Development  
Chair: Amiya K. Chakravarty, Tulane University

**SB1.1 An Empirical Study of the Relationship Between Concurrent Engineering Environmental Factors and Product Development Performance**, Marc Schniederjans, College of Business Administration, University of Nebraska, Lincoln, NE 68588, USA, MSCHNIED@UNLINFO.OM, SU; Suk-Ki Hong, Strategic Planning Department, Samsung Electronics Co. Ltd.

Researchers have shown that without establishing the appropriate environments for concurrent engineering (CE), companies may fail to achieve all the benefits of using CE as product development process. The main purposes of this study are to identify: environmental factors that contribute to a successful CE program. The relationships between these factors and product development performance, and the effects of a balanced approach among the factors on performance. This research is based on two case studies and a survey of managers having product development experience.

**SB1.2 Acceleration of New Product Development: Effects on Product Manufacturability**, Morgan Swink, School of Business, Indiana University, Bloomington, IN 47405, USA, MSWINK@INDIANA.EDU.

Performance results for accelerated new product development (NPD) projects have been mixed and most NPD efforts continue to face a high risk of failure. This research examines the effect of accelerated NPD on product manufacturability under varying conditions of project scope, product complexity, and technological uncertainty. The study also assesses the impacts of design-manufacturing decision integration in the project. Survey data from NPD programs in different contexts are analyzed to assess the impacts of accelerated NPD methods and to provide guidelines regarding the proper roles of acceleration in a firm's product development strategy.

**SB1.3 Designing and Developing Products with Multiple Options in Assemblies and Components**, Amiya K. Chakravarty, Tulane University; Nagarat Balakrishnan, Clemson University

The tradeoff in designing a product typically involves the consideration of manufacturing (and development) cost, and the potential market share. We model the profit maximization problem including product attractiveness based on the type of options provided, consumer switching if certain options are not available, manufacturing cost, and one-time development cost.

**SUNDAY, 10:30 am - 12:00 noon  Room: Miramar South**

**SB2 Title:** Manufacturing Strategy: A View from Brazil (2)  
Chair: Jaime Fenstersheifer, PPGA/UFGRS, Brazil.
SB2.1 The Globalization Effects on Relationship Client-Supplier in Present Changing Times: From Mass Production to Lean Production, The Case of the Automotive Parts Industry in Brazil, Ivan A. Pinheiro, PPGA/UFRGS. Av. João Pessoa, 52 sala 11, CEP 90040-000 Porto Alegre - RS - Brazil, RSF7341@PRO.VIA-LS.COM.BR.

Car industry reveals three strong tendencies: the global supplier, the follower supplier and the system supplier. This paper tries to evaluate whether the implementation of the lean production system (widespread among Brazilian car companies) means effectively a new kind of relationship among companies in the productive chain, now based on trust and cooperation. The basic idea is developed from the conceptual topics that characterize the passage of a mass production up to the lean production model. Then, such concepts were compared to the opinions (collected and economy magazines) emitted by some car industry’s CEOs and managers. Also, other information sources were used, such as academic journals and preliminary data used on fieldwork by a research group at UFRGS/PPGA.

SB2.2 A discussion about Subcontractor Conceptual Aspects and the Analyses of some Cases in the Automotive Parts Industry In Rio Grande Do Sul, Brazil, Ivan A. Pinheiro, PPGA/UFRGS, Av. João Pessoa, 52 sala 11, CEP 90040-000 Porto Alegre - RS - Brazil, RSF7341@PRO.VIA-LS.COM.BR.

This paper discusses the main theoretic arguments that sustain the subcontracting decision by firms. It also reports a fieldwork conducted in Rio Grande do Sul (Brazil) that tries to verify how such theoretical concepts perform in practice. Secondary data was collected on business magazines and scientific journals. These data reinforces the author’s argument that subcontracting should not be considered as a general tendency, because in some cases it may be unprofitable, raising costs, reducing quality, increasing uncertainty about the product lead time and delivery schedules. Moreover, when the technology is the advantage of a company, subcontracting may reduce its competitive power.

SB2.3 Manufacturing Strategy Process: Marketing Questions for Manufacturing Answers. A Case Study of a Make-to-Order Company, José Mario Carvalho Jr., MURI ENGENHARIA, Rua Marcelo Gama, 1275, Porto Alegre - RS - Brazil.

A recent literature review has showed us that, in general, the formulation of a manufacturing strategy has been on insiders (middle and senior managers) assessments and beliefs about manufacturing performance and customer needs. In our work, a manufacturing strategy formulation for a make-to-order company, we used a customer survey to identify the “order winning” and “qualifying” criteria, as well as the company’s performance on these criteria when compared to its major competitors. Our results indicate that the idea of “marketing questions for manufacturing answers” may be an alternative for future research on the process of manufacturing strategy formulation.

SB2.4 Manufacturing Flexibility: Managerial Perception and Application, Márcio Zukin, Departamento de Engenharia Industrial, Rua Marquês de São Vicente, 225, Rio de Janeiro - RJ - Brazil, MARZUKIN@RDC.PUC-RIO.BR; Paulo R. T. Dalcol, Dept of Industrial Engineering, PUC/RIO, Brazil, PRTD@RDC.PUC-RIO.Br.

Companies increasingly focus on flexibility as a way to achieve competitive advantage in manufacturing. This paper aims at providing fresh insights as how consumer electronics companies are dealing with the flexibility issue. It shares some of the most relevant results of the authors’ empirical investigation into rapid response manufacturing in 16 leading firms in Brazil, including multinationals. The survey examines the managers’ perception of the importance of flexibility strategies. It also explores how these companies are applying concepts and techniques that improve the manufacturing flexibility of the firm, in terms of changeover frequency and range of product.

SUNDAY, 10:30 am - 12:00 noon Room: Castillian

SB3 Title: Total Quality Management: Management Principles
Chair: James R. Evans, University of Cincinnati

SB3.1 Academic versus Non-Academic Leadership in the Quality Management Literature, Ronald Heady, Dept. of Management and QM, University of Southwestern LA, P.O. Box 43570, Lafayette, LA 70504, USA, HEADY@USL.EDU; Mark Smith, Dept. Mgmt.&QM, MSS2356@USL.EDU; Lionel Robert, Dept. Mgmt. & QM, Glenn Logan.
To fully understand quality management, as well as its subtopic total quality management, it is important to know the background of the authors. This work goes beyond analyzing the contributions of the well-known leaders to examine the authorship of the relevant periodical literature across twenty-one years. Our results show that the non-academic literature is about five times larger than the academic literature, but when size is ignored the publication patterns of academics and non-academics are strikingly similar. Statistically speaking, when controlled for total quality and non-total quality components, the two groups had indistinguishable patterns, although the non-academics appear to have been the first to make a substantial contribution.

SB3.2  Understanding Quality Values and Culture Through Baldrige Assessment, James R. Evans, University of Cincinnati, P.O. Box 210130, Cincinnati, OH 45221, USA, EVANS@UC.EDU; Matthew Ford, University of Cincinnati, P.O. Box 210130, Cincinnati, OH 45221, USA, FORDMW@UCBEH.SAN.UNC.EDU.

We propose an approach for determining how strongly the eleven core values in the Malcolm Baldrige National Quality Award Criteria are reflected in an organization’s culture based upon MBNQA assessment scores. This leads to better understanding of the criteria, raises important issues for national and state award program training, and suggests several future research directions.

SB3.3  Human Resource Requirements to Total Quality Management: Case Studies in Four Brazilian Manufacturing Companies, Fernanda C. A. Santos, Universidade de São Paulo - Escola de Engenharia de São Carlos, Área Engenharia de Produção, Av. Dr. Carlos Botelho, 1465, CEP 13560-250 São Carlos - SP - Brazil, ALMADA@TIGRE-PROD.PROD.EESC.USP.BR; Marilson A. Gonçalves, Faculdade de Economia e Administração, Universidade de São Paulo, Av. Prof. Luciano Guelfert, 908, CEP 05508-900 São Paulo SP, Brazil, MARILSON@USP.BR; Luiz C. R. Carpinetti, Escola Engenharia de Produção, Universidade de São Paulo, Av. Dr. Carlos Botelho, 1465, CEP 13560-250 São Carlos SP, Brazil, CARPINETI@TIGRE-PROD.PROD.EESC.USP.BR

This article presents the results of an exploratory research on human resource requirements to Total Quality Management. This research was conducted in four large and medium size manufacturing companies located in the northwestern region of Sao Paulo State, one of the five high technology centers in Brazil. The results give evidence of the importance of human resource and quality management partnership through emphasizing the competitive advantages which may be created by cross-functional programs such as learning organizations, core competencies and organizational culture management.

SB3.4  Data Mining: A Process of Knowledge Discovery, James Grayson, School of Business Administration, Augusta State University, 2500 Walton Way, Augusta, GA 30904, USA, JGRAYSON@ADMIN.AC.EDU; George Runger, Industrial & Management Systems Engineering, College of Engineering and Applied Sciences, Arizona State University, Tempe, AZ 85287-5906, USA, GEORGE.RUNGER@ASU.EDU.

This paper will overview the role of data mining for managers. Topics to be discussed include: What is data mining? Why is data mining important? What type(s) of projects are expected to be most successful? Management issues. Comparisons of data mining to traditional methods.

SUNDAY, 10:30 am - 12:00 noon    Room: Valencia East

SB4  Title:  Service Quality Management (1)
Chair:  Chris Voss, London Business School

SB4.1  The Service Value Chain: An International Empirical Examination, Chris Voss, London Business School, Sussex Place, London, UK, CVOSS@LBS.LON.AC.UK; Kate Blackmon, LBS Sussex Place, Regents Park, London NW1 4SA, UK, K.BLACKMON@LBS.LON.AC.UK; Aleda Roth, Kenan - Flagler Business School, UNC - Chapel Hill, Campus Box 3490 Carroll Hall, Chapel Hill, NC 27599-3490, USA, ROTHA.BSACD1@MHS.UNC.EDU; Richard Chase, USC.

The service value chain proposed by Heskett et al. proposes a set of relating employee management, service quality, customer satisfaction and perceived value, and customer retention, and profit growth. This linkage as yet had received limited empirical testing. In addition, it is not clear whether the proposed relationships are US based, or hold in international conditions. This paper presents a test of the concept using empirical data derived from an interview based study of 320 service organizations in the US and UK. It will critically evaluate the model and propose extensions.

SB4.2  Assessing Health Care Quality Improvement Methods Using Simulation, Susan Paul Johnson, Kenan-Flagler Business School, UNC - Chapel Hill, Carroll Hall, CB # 3490, Chapel Hill, NC 27599, USA, JOHNSON@EMAIL.UNC.EDU; Curtis P. McLaughlin, Kenan - Flagler Business School, UNC - Chapel Hill, Carroll Hall, CB#3490, Chapel Hill, NC 27599-3490, USA, MCLAUGHC.BSACD1@MHS.UNC.EDU.
What is the impact of implementing quality improvement methods on a health care clinical delivery process? If given a choice of different methods, which provides the greatest benefit to health outcomes, costs, and time? These are only two of the questions that are addressed in this research. We model the effects of implementing different quality improvement methods on the health care delivery processes used during premature labor and delivery and the subsequent complications and care of premature infants. Using simulation allows us to combine information from many research fields without the time and cost burden of conducting controlled trials that are the "gold standard" in health care.

SB4.3 Hospital Radiology Equipment Purchasing Decisions, Ling Li, Butler University, Indianapolis, IN 46208-3485, LLi@BUTLER.EDU.

Today a growing number of hospitals are providing diagnostic and therapeutic radiological procedures in their radiology departments and outpatient centers separate from the hospital. Heavy capital investment in radiology equipment leads to higher health service cost. Unlike the era of cost reimbursement, when hospitals could expect to receive payment for the costs of service delivered, current reimbursement policies in the U.S. are creating increasing incentives for ensuring efficient use of hospitals resources. This research investigates alternative methods hospitals adopt to acquire radiology equipment.

SUNDAY, 10:30 am - 12:00 noon    Room: Valencia West

SB5 Title: Production Planning and Control Systems: Production Control  
Chair: James Putt, Coles School of Business, Kennesaw State University

SB5.1 The Fundamental Characteristics of Good Negative Feedback, James Putt, Coles School of Business, Kennesaw State University, 1000 Chastain Road, Kennesaw, GA 30144, USA, JPUTT@KSUMAIL.KENNESAW.EDU.

The negative feedback control loop is the most common control mechanism in production control. Judged by the performance of some production systems, more understanding of this critical control loop is needed. The major features of the negative feedback control loop are output, input, transformation process, and feedback. Although feedback is usually the last element to be designed, it is no less important to proper operation of the control loop than the other three. Improper design of feedback can drive an otherwise excellent design toward very unacceptable results. This paper identifies the fundamental characteristics of proper negative feedback design.

SB5.2 Convergent Information Feedforward Process Control, Denis Ridley, Florida A&M University, 1 SBI Plaza, Tallahassee, FL 32307, USA, DRIDLEY@WANE-LEON.SCRI.FSU.EDU; Colin Benjamin, Florida A&M U, 1 SBI Plaza, Tallahassee, FL 32307, USA, COHENJAM@NS1.FAMU.EDU.

Feed forward control feeds information on measurable disturbances, ahead of time, to the manipulated inputs of a process, the output of which is to be controlled, to counteract the effect of the disturbance. The required predictions of the effect of the disturbance on the controlled process output, are typically biased, and therefore diverge from actual values. A recent discovery: antithetic time series analysis and forecasting, makes it possible to make unbiased predictions. The result would be convergence between the predicted and actual process outputs, minimal need for feedback trim, reduction in process variability, and quality beyond that currently conceptualized by TQM.

SB5.3 Order Processing Versus Order Control, Hans-Henrik Hvolby, Aalborg University - Department of Production, Fibigerstreet, 16, 9220, Aalborg, Denmark, P9HHH@PROD.AUC.DK.

Small and mid-range companies throughout the world have moved towards customer specific production during the last years, but the order flow has not changed to meet the new demands. Customers orders pass a large number of departments such as sales, construction, production preparation, purchase and economy. Often no specific function or department is responsible for handling and completing the individual customer orders, and the information systems often do not function well. Furthermore too much time are used to handle non value-adding activities. In the paper a new method for improving the order flow are presented, included an extended use of activity chain models.

SUNDAY, 10:30 am - 12:00 noon    Room: Madrid

SB6 Title: Reliability and Maintenance (2)  
Chair: Gauri L. Ghai, Florida International University
SB6.1 Extended Warranty Policy Design, Hakan Polatoglu, Management Department, Frank Sawyer School of Management, Suffolk University, 8 Ashburton Place, Beacon Hill, Boston, MA 02108, USA, HPOLATOG@ACAD.SUFFOLK.EDU.

An extended warranty (EW) is a service contract, between a service provider (e.g., manufacturer, dealer, or authorized service center) and a user (who is willing to continue using the product beyond its original warranty) that covers the repair cost of a system during a contract period which starts after the termination of the original warranty. In this presentation, we shall introduce the cost, profitability and risk-of-loss measures that we have developed, and demonstrate their use in the determination of price and length of EW arrangements. We shall also discuss the impact of repair mode (type) selection on EW policy design.

SB6.2 Preventive Maintenance, Reliability and Replacement Model, A. Kader Mazouz, Manufacturing Systems Engineering, Florida Atlantic University, Boca Raton, FL 33431, USA; Chingping Han, Department of Mechanical Engineering, College of Engineering, Florida Atlantic University, P.O. Box 3091, Boca Raton, FL 33431, USA.

A preventive maintenance, reliability and replacement model is developed based on historical data. The main objective of this research work is to develop a model that combines reliability engineering analysis with cost accounting techniques for a maintenance data analysis. A maintenance engineer is able to estimate the time to schedule the next preventive maintenance, for any repairable system under consideration before failure occurs. The model performs replacement analysis between the system and similar equipment in order to select an alternative based on reliability and maintenance history.

SB6.3 Relationship Between the Failure Rate Function and the Mean Residual Life of Components, Jie Mi, Department of Statistics, Florida International University, Miami, FL 33199, USA; Mi@SERVAX.FIU.EDU; Gauri L. Ghai, Dept. of Statistics, Florida International University, Miami, FL 33199, USA, GHAIG@SERVAX.FIU.EDU.

The mean residual life (MRL) and the failure rate an functions play an important role in many areas such as reliability and survival analysis. In reliability theory, methods using these functions are frequently used to characterize lifetime distributions. In this paper we explore the relationship between these two functions. The results obtained show that if the life time distribution of a component has a bathtub (DB) shaped failure rate function, then the MRL has an upside-down bathtub (IDB) shape but the converse does not hold. However, some sufficient condition have been developed for the unimodal MRL to imply DB failure rate.

SUNDAY, 10:30 am - 12:00 noon  Room: Balboa

SB7 Title: Scheduling (2)
Chair: Gunter Schmidt, Universitat des Saarlandes, Saarbrucken, Germany

SB7.1 A General Approach to Solve Some Hybrid Flowshop Scheduling Problem, A. Vignier, E3i - Université de Tours, 64 Avenue Jean Portalis, 37200 Tours, France, VIGNIER@UNIV-TOURS.FR; C. Proust; P. Goerart L. Poucheau.

The aim of this article is to propose a general approach which allows us to solve very different kind of HFSP. More precisely, we will consider different constraints in order to optimize either one criterion or several criteria. Utilizing the framework of Vignier et al and a branch and bound algorithm, we present an optimal and a heuristic method.

SB7.2 Stacker Crane Scheduling in an Automated Warehouse, Hiroshi Kise, Dept. Mechanical and System Engineering, Kyoto Institute of Technology, Matsugasaki, Sakyou-ku, Kyoto 606, Japan, KISE@IPC.KIT.AC.JP; Naoki Katoh, Department of Management Science, Kobe University of Commerce, Gakuen Nishi-chou, Nishi-ku, Kobe 65121, Japan; Yasushi Chudani, Department of Mechanical and System Engineering, Kyoto Institute of Technology, Matsugasaki, Sakyo-ku, Kyoto 606, Japan,

We consider optimal scheduling of a stacker crane with twin forks (denoted SCTF) in an automated warehouse. The SCTF can simultaneously hold two pallets to be stored in or to be delivered out. This means that in each cycle of the SCTF that travels in an aisle between two rack stackers, it inputs two pallets and outputs another two pallets. Then, we would like to optimally select an input pair among pallets to be stored and an output pair among ones stored for each cycle. Heuristics are proposed for a few criteria such as the total travel distance of the SCTF.

SB7.3 The Unrelated Parallel Machine Scheduling Problem with Earliness, Tardiness Penalties, and Job Splitting, Marco A. E. Coelho, University of Campinas, C. P. 6101 FEEC DENSIS 13081-970, Campinas - SP - Brazil; Paulo Morelato Franca, FRANCA@DENSIS.FEE.UNICAMP.BR.
This article deals with a quite complex machine scheduling problem comprising the following features: 1. Unrelated parallel machines, 2. Jobs have different due dates, 3. Job splitting is allowed, 4. Set up times are sequence dependent, 5. The objective function is to minimize the weight sum of early, tardy and setup cost. The problem is formulated as a mixed-integer programming model which is used to develop a branch-and-bound solution method capable of solving small instances to optimality. For large ones a filtered beam search heuristic procedure is proposed. A set of randomly generated test problem is used to compare the solutions obtained by four different versions of the heuristic of the search with optimal solutions and also with a dispatching rule.

SB7.4 Production Scheduling with Prearranged Jobs, Gunter Schmidt, Universität des Saarlandes, Infom, Postfach 151150, d-66041, Saarbrücken, Germany, Gs@W12.UNI-SB.DE.

We will give a survey on results related to production scheduling problems where machines have to process two sets of jobs. Jobs which are prearranged to certain machines and time intervals and jobs which can be processed using the remaining production capacity of the machines. Scheduling criteria are related to the makespan, the maximum lateness, and the sum of flow times. We will report on results for single and multi machine environments.

SUNDAY, 10:30 am - 12:00 noon Room: Regency CR

SB8 Title: Supply Chain Management (2) Chair: Scott Swenseth, University of Nebraska

SB8.1 Macro Logistics: Supply Chain Management, Ralph G. Lewis, Florida International University, Miami, FL 33199, USA; Frank Voehl, Strategy Associates; Martin Stein, Massachusetts Institute of Technology.

This paper focuses on Supply Chain Management as the systematic effort to provide integrated management to the total Supply Chain - from suppliers of raw materials through manufacturing to end customers even the recycling of waste and waste products - in order to meet customer needs and expectations. The focus of Supply Chain Management are the results needed to survive in an environment of increased competition. Supply Chain Management differs from historic efforts to manage resource procurement, manufacturing and the delivery of products in at least two ways: 1) the supply chain is seen as a single interdependent process not isolated functions; 2) all members of the supply chain are seen as sharing a vested interest in the ultimate success of the chain in meeting the needs and expectations of customers.

SB8.2 Assessment of Production Planning & Inventory Management Needs for Supply-Chain Integration, Charu Chandra, Los Alamos National Laboratory, TSA-7, MS F609, Los Alamos, NM 87545, USA, CHARU@LANL.GOV.

The impact of production planning and inventory management decisions in shaping the overall business strategy of an enterprise, is important to be recognized in the design of a supply-chain integration model. Textiles, like many other industries, is moving towards implementing coordinated planning and inventory management philosophies, to stay competitive in a global market. In this paper, we suggest production planning and inventory management approaches to reduce manufacturing time and cost, high work-in-process and finished goods inventories, and discuss their implementation from the perspective of individual textile sectors, as well as textile supply-chain.

SB8.3 Managing Inventory Decisions Across Organizational Boundaries, Michael Godfrey, College of Business, Winona State University, Winona, MN 55987, USA, MGODFREY@VAX2.WINONA.MSUS.EDU; Scott Swenseth, College of Business, University of Nebraska, Lincoln, NE 68588, USA, SSWENSET@CBAMAIL.UNL.EDU.

Cooperation among organizations within supply chains has a fundamental necessity in channel management. Several authors have suggested EOQ type inventory models that incorporate costs incurred at multiple organizations. Others have extended this to include transportation costs. Recent surveys have indicated, however, that alternatives to EOQ are becoming more prevalent in industry. This study examines the effects of incorporating transportation costs in multiple organization decision scenarios when alternatives to EOQ are more appropriate inventory models. Results indicate that alternatives are available that provide improved decisions without added complexity.

SUNDAY, 1:30 pm - 3:00 pm Room: Miramar North

SC1 Title: Operations Strategy: Cross Functional Issues Chair: Amitabh S. Raturi, University of Cincinnati
Identification of the order-winning and qualifying criteria for a firm's products is as critical in formulating an operations strategy which is consistent with its business and marketing strategies. However, intuitive as it may seem, the identification process may become problematic due to the diversity of markets served by the firm, even at operating unit level. This research attempts to examine this process in practice, using multiple manufacturing sites. Preliminary results are presented, which uncover various issues with important research and managerial implications, such as the difficulties with market segmentation, the varying view of functional head in the organization, reconciliation of those views, and difficulties in linking those competitive priorities to operations key tasks.

In depth case studies of six manufacturing firms reveal a comprehensive set of research issues in assessing, monitoring and controlling the interfunctional co-ordination between operations and marketing. The "rich" data collected and presented here is used to develop several propositions about the nature of relationship between the marketing and operations functions in a typical manufacturing firm. We explore the implications of alternative structural mechanisms used for the co-ordination of these two business functions as well as those of the performance evaluation mechanisms in place. We present a theoretical framework for assessing the significant dimensions of the operations marketing interface.

Foreign Direct Investment in Development Countries is typically predicted on the exploitation of such resource advantages as lower labor costs. The output tends to be exported to the host market in an Advanced Industrial Nation. Thus the criteria for FDI decisions in DC's are dominated by factor seeking aspects. The current research uses the Country-of-Origin paradigm to examine such decisions from a marketing prospective. Using conjoint analysis, a survey based technique, the market value of an automobile manufactured in Mexico is examined. A sample of over 300 consumers indicated that the perceived value of the Mexican-built auto is almost $2000 less than the equivalent vehicle manufactured in the US. Implications for FDI are drawn.

Using an Interfunctional Classification System (ICS) developed in this author's prior research, recent manufacturing/human resource is classified. Situational dimensions and the strategic/tactical/operational levels are among the classification variables. Areas for future research are identified.
An experimental conversion of physical documents and files, with different dates, subjects, etc., to virtual electronic records has allowed for a quicker access, and for a reliable compilation of each subject file in the largest private social security institution in Chile. Implications include a more efficient paper handling process, a fast response to demands from clients and government agencies, and an agile access to each subject's full compiled file.

SC2.3 **Improving Benefits Delivery to Retirees**, Maria Eugenia Sharbaro, Retiree Benefits Manager, Instituto de Normalizacion Previsional, Chile; Tomislav Mandakovic, Florida International University, Miami, FL 33199, USA, MANDAKOV@FIU.EDU.

A modernization effort and its results are shown within the Chilean, government managed, social security system. Specifically, it is shown how retired citizens have been receiving a growing package of benefits just by improving the delivery system. The methodology used to achieve these results is fully described and discussed.

SC2.4 **A Model to be Ahead of Service Demands**, Luis Ginecchio, Marketing Manager, A.F.P. Sunuma, Chile. Tomislav Mandakovic, Florida International University, Miami, FL 33199, USA, MANDAKOV@FIU.EDU.

With the explosion of the Chilean, private managed, social security system, new direct face to face service volume increased dramatically due to the expectations of the new system. The size and service process in each agency became an issue because of the conflict between desired service level and the capital and operating costs of agencies. We developed a simulation model which, on the basis of historical and on line information, allows the quantification of personnel in each agency and predicts future growths. The model followed a service classification which separated each agency into job-shop and line processes.

SC2.5 **Implications of Co-existing Private and Public Social Security Systems**, Tomislav Mandakovic, Department of Decision Sciences and Information Systems, College of Business Administration, Florida International University, U.P. Campus, Miami, FL 33199, USA, tmandak@volcan.facea.puc.cl.

The development of the social security industry in Chile, since a mixed system was established, is analyzed. We find that there has been a crossed operational benefit for the users but that some commercial strategies may endanger the image of the system.

**SUNDAY, 1:30 pm - 3:00 pm  Room: Castillian**

SC3 **Title:** Total Quality Management: Pedagogy  
Chair: Joy Benson, Department of Management, University of Illinois

SC3.1 **Developing Quality and Team Skills**, Richard Luette, Miami University, 313 D Laws Hall, Oxford, OH 45056, USA, LUEBBER@MUOHIO.EDU; Kaye Snively, Miami University, 307 Laws Hall, Oxford, OH 45056, USA.

This paper reports on a team-taught course involving faculty from organizational behavior and operations management that focused on the integration of quality tools, and the processes and behaviors of teams. This collaborative effort was grounded in the content knowledge of these disciplines and required students to demonstrate the mastery of the skills associated with the use of quality tools and the behaviors and processes necessary in a team environment. The QI story provided the framework from which teams worked through real world problems. Simulations were used to help shape appropriate team behaviors.

SC3.2 **The QI Story: A Necessary Part of the Business Curriculum**, Richard Luette, Miami University, 313 D Laws Hall, Oxford, OH 45056, USA, LUEBBER@MUOHIO.EDU.

The Quality Improvement (QI) story has proved to be useful and valuable tool for quality improvement efforts in Business and Industry. Despite the importance placed on this tool by American and Japanese businesses, it has not been widely incorporated in Operations Management and Quality Management texts, and thus has not gained wide acceptance in the academic community. The need for a team-based decision making model in the curriculum, such as the QI story is discussed. The QI story is presented as a valuable team-based decision making framework. Linkages are also established to the seven old and seven new tools.

SC3.3 **An Inter and Intra Team Simulation for Developing TQM Skills**, Joy Benson, Department of Management, University of Illinois, L-31, Springfield, IL 62794, USA, BENSONJOY@UIS.EDU; Kimberlee Snyder, Dept. of Business Administration, University of Illinois, L-97, Springfield, IL 62794-9243, USA, SNYDER.KIMBERLE@UIS.EDU.

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Total quality management (TQM) requires systemic management of both quantitative and qualitative issues, for example, technical design, culture, and interpersonal processes. Integrating the concepts in a complex simulation stresses the dynamics of managing a TQM organization. Building on earlier work in the field, this paper provides an overview of a simulation that requires students to work in self-directed teams, with representation to a cross-functional management team. As the first lunar colony, the team must design their station, develop team and organizational norms, and propose material management, process design, and marketing protocols that factor in three planetary conditions.

SC3.4 **Experience: A Lesson in Team Decision Making Skills,** Kimberlee Snyder, Business Administration Program, University of Illinois at Springfield, L 97, Springfield, IL 62794, USA, SNYDER.KIMBERLEE@UIS.EDU.

In a total quality management organization, team decision making is a frequent occurrence but a difficult procedure to grasp. Team members bring to the decision arena diverse personalities, agendas, and goals. This paper describes a unique approach to teaching team decision making outside the sterile environment of the classroom. Using the resources of the local Boy Scout camp, two classes faced several challenges that required working through various alternatives to successfully complete each challenge. The teams learned the folly of poor brainstorming, little to no organization, and lack of planning. At the completion of the course, the student came away with a better understanding of successful team decision making skills. These "learned" skills transferred into the classroom's team organization environment for the rest of the semester.

**SUNDAY, 1:30 pm - 3:00 pm   Room: Valencia East**

SC4 **Title:** Service Quality Management (2)  
**Chair:** Britt M. Shirley, The University of Tampa

SC4.1 **A Field Study of Self-Control in the Financial Services Industry,** Britt M. Shirley, College of Business, The University of Tampa, 401 W. Kennedy Road, Tampa, FL 33606, USA; Frank M. Gryna, The University Of Tampa, Tampa, FL 33606, USA.

Self-control is a universal concept that applies to a general manager running a division of a company, to a plant manager responsible for a plant, to a developer of software, or to a bank teller serving customers. In this paper, we report on the results of some research to investigate the three criteria of self-control as they apply to the financial service sector, particularly for personnel in backroom operations. We selected backroom operations to focus the research in one type of work. The results will be presented in a form that can be used to design or redesign jobs.

SC4.2 **A Study of the Factors Influencing Students to Choose a Major in POM Using Planned Experimentation,** Mary Gandor, Winona State University, 324 Somsen Hall, Winona, MN 55987, USA, MGAND@VAX2.WINONA.MSUS.EDU; Kelly Poppe, Winona State University, 102 Somsen Hall, Winona, MN 55987-5838, USA.

This study examines a variety of factors to determine their importance in the decision making process of students who have decided to major in POM, utilizing the iterative process of planned experimentation. The purpose of the study is three-fold: (1) to create and test a non-manufacturing application of these methods; (2) to create and test the usefulness of an application of these methods that is adaptable to a teaching situation where student teams can plan an experiment, gather and analyze "real" data, to enhance classroom learning; and (3) to actually attempt to increase number of students selecting the POM major at our school.

SC4.3 **Evaluating the Service Quality of a Business School,** Ricardo Texeira Veiga, Universidade Federal de Minas Gerais, R. Souto dos Ramos, 226A, CEP 31030-250 - BH - MG - Brazil, CAPES@ORACULO.LCC.UFMG.BR; Alexandre I. Moura, Universidade Federal de Minas Gerais, R. Curitiba, 832 sala 1007, CEP 30170-120 - BH - MG - Brazil, CAPES@ORACULO.LCC.UFMG.BR; Jose Fausto Diniz Alves, Universidade Federal de Minas Gerais, R. Curitiba, 832 sala 1007, CEP 30170-120 - BH - MG - Brazil, CAPES@ORACULO.LCC.UFMG.BR.

In this paper it is suggested the use of a service quality model to investigate the basic quality dimensions of a business school under the student's view. So we can make broader diagnoses in such a way that problem and priorities can be identified more clearly, considering the search for excellence in the educational process. In an exploratory research carried out at UFMG, we have pointed out the quality attributes that the students of the Business Administration course seem to consider more relevant.
SC5 Title: Production Planning and Control Systems: MRP and JIT
Chair: Mebshah Ahmed, ISOM Department, University of Toledo

SC5.1 A Strategic Approach to MRPII/JIT as an Integrated System, Antonio D. Padula, PPGA/UFRGS, Av. João Pessoa, 52 - sala 11, CEP 90040-000 Porto Alegre - RS - Brazil, PPGA@VORTEX.UFRGS.BR; Leandro D. Kuhn, Rua Santo Agostinho, 1099, 93025-700 Sao Leopoldo, Brazil.

This paper presents a strategic view on the implementation process of the MRPII and JIT integrated system in a medium enterprise of the chemical industry. The research has focused on the processes of organizational changes and evolution, the operations functions, the product mix and the material management. Finally we discuss some of the strategic advantages achieved with the integrated use of MRPII and JIT, such as lower stock levels, smaller storage areas and more reliable manufacturing processes.

SC5.2 The Application of a Kanban Card Controller, Prashanth Nagendra, Dept. of Management, Indiana University of Pennsylvania, 308 ECB, Indiana, PA 15705, USA, NAGENDRA@GROVE.IUP.EDU; Brian Freeman, 215 Gabriel Avenue, Indiana, PA 15701, USA, KTSB@GROVE.IUP.EDU.

Kanban Card Controller (KCC) is a technique that we have developed to integrate the planning capabilities of Materials Requirement Planning (MRP) and the execution capabilities of just-in-time (JIT). KCC uses the output from MRP (planned order release) to calculate the most important design parameter of the JIT/Kanban system-the number of kanbans. A simulation model of a manufacturing shop is used to demonstrate the application of the KCC. Some of the performance measures used in this model to compare MRP, JIT, and KCC are the work-in-process inventory, idle time, and throughput of the system.

SC5.3 A Common Platform Simulation Model for MRP and Kanban coordination System, Pavan Batchu, ISOM Department, The University of Toledo, Toledo, OH 43606, USA; Mebshah Ahmed, ISOM Department, The University of Toledo, Toledo, OH 43606, USA, FAC0016@UOHFT1.UOLOEDO.EDU; Udayan Nandkeolyar, ISOM Department, The University of Toledo, Toledo, OH 43606, USA.

In this paper, a common platform simulation model is developed. The model is applied to compare the performances of MRP and Kanban system in a hypothetical shop. By "common platform" it is meant that a decision maker can use the same model to simulate a chosen production coordinating system (say Kanban or MRP) just by changing the parameters in the model. The simulation model is based on the conceptual framework "Production Authorization Card System" developed by Shantikumar and Bazacott.

SUNDAY, 1:30 pm - 3:00 pm Room: Madrid

SC6 Title: Process Improvement: Performance Measurement and Benchmarking
Chair: Marek Szwejczewski, Cranfield University

SC6.1 The Characteristics of Leading Manufacturing Plants, Marek Szwejczewski, Cranfield School of Management, Cranfield University, Bedford, MK43 0AL, England; Keith GoIIn, Cranfield SOM, Cranfield University, Bedford, England; Colin New, Cranfield SOM, Cranfield University, Bedford, England.

In trying to characterize "World-Class" manufacturing performance, some researchers have used to survey method to collect data on manufacturing plants. This has proved an elusive concept and many of the surveys have limitations in the way they measure performance. This paper analysis the methodologies of previous surveys and contrasts this with the unique approach taken by the Best Factory Awards (BFA) study. Also, key findings from the BFA database of 1000 companies arc presented which identify the attributes of leading UK manufacturing plants and give ideas on how to continue the search for a definition of World-Class performance.

SC6.2 Customer and Strategy: An Integrative Performance Measurement Framework, Keshav Gupta, Indian Institute of Management, Hostel # 7, Prabandh Nagar, Lucknow 226 013, India, P11087@IMI1.GLOBEMAIL.COM; Chandan Sharma, Indian Institute of Management, Hostel # 7 Prabandh Nagar, Lucknow, UP 226 013, India
Most contemporary manufacturing literature has emphasized the need to derive manufacturing strategy imperatives from corporate strategy to achieve manufacturing operation excellence. The stress so far has been on most efficient operationalization of manufacturing strategy with focus on generating a set of efficiency centered performance measures. We propose a new performance measurement framework that is driven by the twin imperatives of (a) Efficient compliance with competitive strategic manufacturing intent and (b) effective incorporation of customer centered Quality concerns. The effectiveness dimension measures degree of synchronization of internal manufacturing processes to customer Quality perceptions. This necessitates generation of a new set of performance measures that provide information on not only the cost of performance and value adding activities but also the cost of non-performance and opportunity cost of value loss activities.

SC6.3 Study to Enhance Effectiveness of Benchmarking, Sameer Kumar, Dept. of Industrial Management, University of Wisconsin-Stout, Menomonee, WI 54751, USA, KUMARS@UWSTOUT.EDU; Sant Arora, Dept. of Mechanical Engineering, Industrial Engineering Division, University of Minnesota, Minneapolis, MN 55423, USA.

Benchmarking is an important tool to emulate existing best practices in the industry for continuous improvement of business operations. Numerous examples are available in the professional literature of corporations which have successfully used benchmarking to attain world class manufacturing/service stature. This paper, in particular, studies the differences and the similarities in the approaches and the effectiveness of benchmarking in a few successful corporations. The results of this study are aimed at identifying factors which would enhance the effectiveness of benchmarking.

SC6.4 Benchmarking: A Facilitator Agent in the Change Process, Claudia Bitencourt, FUNDATEC, R. Lusitana, 1241/201, CEP 90520-880 Porto Alegre - RS - Brazil, CLAUDIA@FUNDATEC.TCH.BR; Ivan Pinheiro, PPG/UFGRS, Av. João Pessoa, 52 sala 11, CEP 90040-000 Porto Alegre - RS - Brazil, RSF7341@PRO.VIA-RS.COM.BR.

Benchmarking is an important element in change process, since its indicator shows the performance of other companies. These examples increase people’s commitment and promote the changing process. This paper analyzes four enterprises that are implementing TQM (Total Quality Management) and applying benchmarking as a facilitator agent in process of reaching better results. These companies belong to various industrial sectors and they are in different stages of TQM’s implementation. This paper seeks to demonstrate that in spite of the fact companies recognize the importance of benchmarking in the commitment process, they really make little use of benchmarking.

SUNDAY, 1:30 pm - 3:00 pm Room: Balboa

SC7 Title: Scheduling (3)
Chair: Jerzy Kyparisis, Florida International University

SC7.1 An Improved Branch and Bound Algorithm for the Continuous Flowshop Problem, J.N.D. Gupta, Department of Management, Ball State University, Muncie, IN 47306, USA, 00JNGUPTA@BSU.VC.BSU.EDU; C. Rajendran, Division of Industrial Engineering, Indian Institute of Technology, Madras 600 036, India.

We propose tightened lower bounds on flowtime of jobs for scheduling in the constrained (or continuous) flowshop and use these to describe an improved branch and bound algorithm. The computational experience shows that the proposed lower bound is more effective than the existing one in terms of curtailing the scheduling tree and the execution time.

SC7.2 Scheduling Batch Chemical Process Industries Under Minimum Cash Flow Constraints, Mariama Badell, Chemical Engineering Department, Universitat Politècnica de Catalunya, ETSEIB, Avda. Diagonal 647, 08028 Barcelona, Spain, BADELL@EQUIPCIES; Moises Graells; Gustau Santos, Luis Puigjaner.

This paper proposes a procedure for scheduling and planning batch process under cash flow constraints. Intermediate storage (IS) is considered and used to define schedules as sequences of production runs for intermediate and final products. Simulated annealing (SA) is used to rearrange such sequences. The resulting schedules are gradually improved taking into account the trade off between customer satisfaction (meeting due dates) and the company liquidity (minimum net cash flow constraint). Quadratic deviation between due-dates and obtained deliveries has been used as the objective function to minimize under the constraint of minimum cash, previously determined for the economic description of the specific case under study.
Simultaneous Batching and Scheduling for JIT Chemical Manufacturing, Maged Dessouky, Department of Industrial and Systems Engineering, University of Southern California, Los Angeles, CA 90089-0193, USA, MAGED@RCE.USC.EDU; Brian Kijowski, Dept. of Ind. & Systems Engineering, University of Southern California, Los Angeles, CA 90089, USA; Sushil Verma, Dept. of Ind. & Systems Engineering, University of Southern California, Los Angeles, CA 90089, USA.

To make use of equipment efficiencies in batch chemical manufacturing, it is common for the production of a particular batch to satisfy the demand of more than one customer order. In contrast to discrete parts-manufacturing where each job typically has one unique due date, batches (jobs) in chemical manufacturing may have multiple due dates since the customer orders may have different due dates. We consider the allocation of demand from different customer orders to production batches and the schedule of resulting batches to minimize the total weighted earliness and tardiness penalties.

SUNDAY, 1:30 pm - 3:00 pm		Room: Regency CR

SC8	Title: Supply Chain Management (3)
Chair: Vijay Gupta, Temple University

SC8.1 Pull/Replacement System: An Improvement Over Distribution Requirements Planning System for a Multi-Echelon Production-Distribution Configuration, Satyaj Chakravorty, Kennesaw State University, 100 Chastain Road, Kennesaw, GA 30144, USA, SCHAKRAVORTY@KENSU.EDU; Brian Atwater, Utah State University, Logan, UT 84322, USA.

A distribution Requirements planning (DRP) system work backwards from the forecast of demand at the retail level to determine the time-phased requirements of orders at all levels of multi-echelon production-distribution configuration. A Pull/Replacement (P/R) system replenishes the demand which has been consumed in the preceding period. To compare both the system seven conditions were identified. They were: type of demand, change in demand, demand variability, order policy, safety stock, plant capacity, and distribution configuration. The study found that under all combinations the P/R system performed significantly better than the DRP system.

SC8.2 Mathematical Programming Model for Vendor Selection, Vijay Gupta, MSOM Department, School of Business and Management, Temple University, 1810 N. 13th Street, Philadelphia, PA 19122, USA, vgupta010@astro.ocis.temple.edu.

In recent years the manufacturing sector has decreased the production costs by increasing its reliance on purchased goods. To achieve the best results, the buyer has to select the suppliers that can supply the material at the least cost and also meet some standards on quality, service level, and lead-time. In this paper a linear programming model is developed that can aid the buyer in selecting the vendors and allocating the supplies among the qualified vendors. This model differs from the previous models in the terms of the criterion that are used for qualifying a vendor. In the model a construct for the discordance level requirement is developed. The discordance level is used by every one in daily life for making decisions. In it, the main idea is that of setting a minimum standard that should be met by a qualifying supplier. The linear programming model also gives the flexibility of carrying out the sensitivity analysis to study the effect of any change in the discordance level on overall cost of purchasing.

SC8.3 A Framework of Business Process Modeling & Simulation for Supply Chain Logistics Management, Shigeki Umeda, National Institute of Standards and Technologies, Room A-127 Met. Build. 220, Gaithersburg, MD 20899, USA, UMEDA@CMEMNIST.GOV; Albert Jones, National Institute of Standards and Technologies, Room A-127 Met. Build. 220, Gaithersburg, MD 20899-001, USA, JONESA@CMEMNIST.GOV.

Modern manufacturing enterprises must correspond to management of multiple suppliers to develop and produce their products. This paper proposes a system framework for supply chain management. The purpose of this system is to build integration test-bed of supply chain for production & operations management. This system is a simulation-based decision support system for production management. The system possesses modeling libraries, a simulation engine, and a WEB-based data-handling system. This paper describes the system concept, the system architecture, and generic business process models. The models implies material-flow model, information model, business process model, and decision process model, each model is described in object-oriented modeling manner.
MA1 Title: Operations Strategy: Strategic Decision Making
Chair: Henk Akkermans, Origin International

Design and Evaluation of a Method to Support Strategic Decision Making in Omni. Issues, Henk Akkermans, Origin International, IPS, P.O. Box 6374, 5600 HJ, Eindhoven, The Netherlands, HENK.AKKERMANS@NL.EHVIPS.ORIGIN.NL; Wil Bertrand, Eindhoven University of Technology, The Netherlands.

This paper describes a method to support strategic decision making on OM issues in complex organizational settings, i.e., with multiple stakeholders from different functional backgrounds, who have to be involved in the making and implementation of the decision. The method builds upon insights regarding the critical features that determine organizational ownership of and commitment for strategic decisions. It is a synergetic mix of techniques from the fields of process consulting, systems dynamics modeling and group knowledge elicitation. Empirical results from its application in four cases, based upon extensive analysis of post-project client interviews, are discussed.

MA1.2 Leaning away from Trade-offs: Investigating the Trajectories, Christer Karlsson, Stockholm School of Economics, P.O. Box 6501, S-11383, Stockholm, Sweden, TCK@HHS.SE; Par Ahlstrom, London Business School, Sussex Place, Regents Park, London, NW145A, England, P.AHLSTROM@LBS.AC.UK.

Recent developments in manufacturing strategy have been challenging the existence of trade-offs in manufacturing strategy. Alternatives argue that different competitive priorities are not necessarily in conflict but can rather reinforce one another and that there are patterns of "best practices". This paper investigates the trajectories when changing from traditionally organized manufacturing into lean structures and processes. The analysis and conclusions: 1) demonstrates how "leanization" (development toward lean) creates a wider scope of options along the trade-offs (cost/unit versus process variety) curve, 2) compares different paths of restructuring and evaluate their effectiveness, and 3) indicates how a more effective although seemingly less productive system occurs. This eventually calls for redefining the trade-off concept and context.

MA1.3 Strategic Manufacturing Facility Decision-Making, Robert J. Vokura, Department of Business Analysis, Texas A&M University, College Station, TX 77843, USA, R-VOKURKA@TAMU.EDU.

A major decision area for multi-facility manufacturing firms is the strategy that assigns specific products, processes, customers, and markets to individual facilities. These decisions have received limited exposure in the strategic planning with most of the research being theoretical. Changes in the competitive environment including global competition, technology, and product-related factors may be making these strategies more critical today. Past literature is reviewed and a research agenda is suggested for classifying facility strategies, determining differences based on priorities and performance, and developing a more formal structure for firms to formulate their overall facilities strategy.

MA1.4 The Emerging Applications of Learning Curves in Operations Management, Behram Nakhaj, Department of Business Administration, Millersville University of PA, Millersville, PA 17551, USA; Bahador Ghabramani, School of Engineering, University of Missouri-Rolla, Rolla, Missouri 65409, USA, GHAIRAMA@SHUTTLE.CC.UMR.EDU.

Despite recent innovative applications of the learning curve, the discussions of their usage in POM texts is limited to their traditional applications such as bid preparation, financial planning, and work force scheduling. This paper examines the emerging environments and illustrates how cost-improvement curves can be designed and used as an effective tool for determining an optimal level of technology.
Advantages of computerized automated manufacturing, service, and information systems are accelerating the rate of substitution of machinery and sensory devices for human labor and thought. At the present time, this accelerating rate of substitution is mainly the result of the improved productivity and higher quality goods and service produced by automated systems. Besides these microeconomic advantage, automation has numerous socioeconomic benefits. For example, automated systems do not need schools for children, highways, health care, parks, police, courts, judges, prisons, mass transportation, parking areas, etc. Recognition and inclusion of these socioeconomic benefits in decision-making would further increase the current rate of automation. The objective of this paper is to introduce a comprehensive decision-making model in which all the microeconomic and socioeconomic advantage of automation are included and evaluated.

MA2.2 Factors Influencing Reorganizations to Cellular Manufacturing - Some Preliminary Results from a Multiple Case Study, Danny J. Johnson, School of Business, University of Wisconsin-Madison, 975 University Avenue, Madison, WI 53706, USA, JOHNSOND@BUS.WISCONSIN.EDU; Urban Wimmerlov, School of Business, University of Wisconsin-Madison, 975 University Ave., Madison, WI 53706, USA, UWEMMERLOV@BUS.WISCONSIN.EDU.

Four plants with hybrid cellular manufacturing systems and one plant which has decided not to adopt cells are being studied to examine the factors considered important when deciding whether to adopt or not adopt manufacturing cells. We present preliminary results for two of the research questions investigated. Specifically, we focus on 1) factors that caused these plants to choose, or not to choose cellular manufacturing, and 2) factors that were considered by these plants when deciding which initial cell(s) to implement. The relative importance of these factors, and the underlying reasons, are discussed.

MA2.3 Design of Cellular Manufacturing System with Interval Objective Function, Prem Vrat, Mechanical Engineering, Indian Institute of Technology, Hauz Khas, New Delhi, 110016, INDIA, PVRAIT@MECHIITD.INDIANET.IN; Ravi Shanker, Mechanical Engineering, Dept., I.I.T, Hauz Khas, New Delhi, 110016, India, RSHANKER@MECHIITD.INDIANET.IN.

In the present paper CMS design problem is modeled as a special type of mathematical programming problem. The objective is a cost minimization function with coefficients being expressed with interval estimates. This takes care of uncertainty in information such as duplication cost of every bottleneck machines plus inter-cellular transfer cost and sub-contracting cost of every exceptional elements. In real life too, the designer has these cost figures from experts available in the form of interval estimates. To minimize the interval objective function decision maker's preferences between interval costs are defined by order relations. Consequently, using such order relations, the problem gets converted into a multi-objective problem. The solution set provides optimal solutions against the worst case and against the average case. The model presented here is illustrated with case examples from literature.

MA2.4 Optimizing Processing Times for Tool and Operation Allocation in FMS, Bhuviendra Srivastava, Marquette University, Milwaukee, WI 53201, USA, SRIVASTAVAB@VMS.CSD.MU.EDU.

Modern flexible manufacturing systems can operate at variable processing speeds. Operating at high speeds increases the throughput rate of the system but causes high tool wear. On the other hand operating at lower speeds increases tool life and lowers the throughput rate. Tool and operations allocation is an important production planning problem in FMS. In this paper, we address the tool and operations allocation problem which takes into account the variable processing speed of machine. We first formulate this problem as a mixed integer program that optimizes the processing times and present a Lagrangian based heuristic to solve it. Computational results are also presented.

MONDAY, 3:45 pm - 5:15 pm Room: Castillian

MA3 Title: Total Quality Management: ISO 9000
Chair: Maling Ebrahimpour, University of Rhode Island

MA3.1 Impact of ISO 9000 Registration on Suppliers and Customers: A Case Study, Maling Ebrahimpour, Dept. of Mgt. Sci. & Info. Sys., College of Business Administration, University of Rhode Island, Kingston, RI 02881, USA, MALING@URI.CC.URI.EDU.

This paper discusses the effect of a single company's certification on its suppliers and customers. Vendors and customers of this company were surveyed. The purpose was to identify specific improvements, if any, gained by the company (from its customer and suppliers' view) as a result of obtaining ISO 9000 certification. This study reveals that customers see no measurable difference in product quality, delivery time, or service. From the supplier's point of view, some minor positive trends were identified. In general, it was observed that ISO 9000 certification could be used as an effective marketing tool for this company, if its customers were familiar with the standard.
MA3.2 The Introduction of Hoshin Kanri in one Brazilian Manufacturing Industry, João Batista Turroni, Departamento de Engenharia de Produção - USP, Pedro Bortolini, 358, CEP 13200-000 Jundiaí - SP - Brazil, TURRONI@USP.BR; Costa Neito; Pedro Luis de Oliveira.

This paper aims to discuss the introduction of Hoshin Kanri at one manufacturer of agriculture equipment in Brazil. The organization initially introduced a Quality System and achieved certification in ISO 9000. The next phase is the introduction of Hoshin Kanri to coordinate the Quality System integration with the core objectives of the organizations. We discuss problems and difficulties in the introduction of Hoshin Kanri in this situation.

MA3.3 Integrating Improvement Actions in ISO 9000 Certified Manufacturing Companies, Dário Henrique Alliprandini, Dept. of Engineering Production, Universidade Federal de São Carlos, CP 676 - CEP 13565-905 São Carlos - SP - Brazil, DARIOH@POWER.UFSCAR.BR; Andrzea Marize Rodrigues, Programa de Pos-graduação em Engenharia de Produção, Universidade Federal de São Carlos, CP 676 CEP, CEP 13565-905 Sao Carlos SP, Brazil.

This paper identifies the need for a formal mechanism aiming to integrate different improvement actions for quality and productivity in the manufacturing function. It outlines some of the desired characteristics of a potential method to fulfill the mentioned need. It proposes a method to integrate improvement actions in strategic environment in order to promote the integration between actions and the strategic priorities defined, and it also presents a system to define a dynamic scale of priorities to implementation of the actions. Actually, companies define many improvement actions and quality policy without a continuous verification of their manufacturing strategies. Partial results of a running field research among Brazilian ISO 9000 certified manufacturing companies are presented.

MA3.4 The Importance of an ISO 9000 Series From the Company's View, Carlos Alberto Gonçalves, Universidade Federal de Minas Gerais, R. Curitiba, 832 sala 1007, CEP 30170-120 BH - MG - Brazil, CAPESQ@ORACULO.LCC.UFMG.BR; Ricardo Teixeira Veiga, R. Santissima Trindade, 226 A, 31030-250 BH-MG, Brazil, CAPESQ@ORACULO.LCC.UFMG.BR; Tarcisio Afonso, R. Curitiba, 832- sl 1007, 30170-120 BH - MG, Brazil, CAPESQ@ORACULO.LCC.UFMG.BR

Research carried out in 1996 with executives of thirty ISO 9000 series certified companies gave some insights about the consequences of their certification. In general, it pointed out the strategic, managerial, and operational benefits for the companies. The strengthening of companies' competitiveness, increasing of the workers' commitment, decreasing of rework and other aspects often quoted stress the strategic importance of an ISO 9000 series certificate.

MONDAY, 3:45 pm - 5:15 pm Room: Valencia East

MA4 Title: Service Quality Management (3)
Chair: Jean Harvey, University of Quebec at Montreal

MA4.1 Opportunities and Challenges in the Hotel Business, Michael Tierney, General Manager of Westin Resort.

This presentation will include challenge facing hotel industry today and in the future; variances of franchising hotels vs. independently run hotels; obligation of management companies to ownership and associates; importance of continual capital funding to maintain and improve guest experience; and what the traveler should look for when selecting a hotel for a conference or on an individual basis.

MA4.2 Value Analyses on Airline Companies, Alexandre I. Moura, Universidade Federal de Minas Gerais, R. Curitiba, 832 sala 1007, CEP 30170-120 BH - MG - Brazil, CAPESQ@ORACULO.LCC.UFMG.BR; Carlos Alberto Gonçalves, Universidade Federal de Minas Gerais, R. Curitiba, 832 sala 1007, CEP 30170-120 BH - MG - Brazil, CAPESQ@ORACULO.LCC.UFMG.BR; Ricardo Teixeira Veiga, R. Santissima Trindade, 226 A, 31030-250 BH-MG, Brazil, CAPESQ@ORACULO.LCC.UFMG.BR

The most important variables of the airline service's cycle was investigated in an exploratory research with a representative sample of passengers that travel on business. The relative importance of some aspects as flights punctuality, on board service, care with luggage etc. was measured in such a way that critical success factors for airlines companies could be identified. Thus, some priorities for marketing and operations strategies can be chosen from a framework that integrates the evaluation of services quality with the strategic operations management. Therefore the airline companies can become better able to fill their customers needs.
MA4.3 Quality Measurement as a Guide to Action in Professional Services: A Case Study, Jean Harvey. University of Quebec at Montreal, P.O. Box 6192, Downtown Station, Montreal, Quebec H3C 4R2, Canada, HARVEY.JEAN@UQAM.CA; Louis A. Lefebvre, Ecole Polytechnique, P.O.Box 6979 Branch "A", Montreal, Quebec H3T 3A7, Canada; Elizabeth Lefebvre, Ecole Polytechnique, P.O BOX 6979 Branch A, Montreal, Quebec H3T 3A7, Canada

As three organizations providing different types of services to children were merged, they agreed that a quality diagnostic should be the guiding principle in the reorganization of their services. The quality "gaps" model has been adapted to fit the complex environment of child protective services. A methodology was developed to operationalize the model. Professionals were involved in gathering and using the data.

MONDAY, 3:45 pm - 5:15 pm Room: Valencia West

MA5 Title: Production Planning and Control Systems: Integrated Planning Models
Chair: Wenny H.M. Raaymakers, Eindhoven University of Technology

MA5.1 An Integrated Model for Planning and Scheduling, William Roux, LAAS/LNRS (SP), 7 Ave. du Colonel Roche, 31077 Toulouse Cedex, France, WROUX@LAAS.FR; Jean-Bernard Lasserre, lASS/LNRS, LASSE@LAAS.FR; Stephane Daunize-Percy, EMN, Puchanelec France, Dauize@EMN.FR

We compare two approaches for planning and scheduling in a general shop environment. The first is the standard top-down approach in which the planning level first determines a plan according to the estimated capacity of the scheduling level (the workload of each machine is less than its capacity). We show that these constraints are necessary but not sufficient. The second one is an integrated approach where the planning level takes the exact capacity of the shop into account. The capacity constraints are replaced by sufficient conditions which ensure feasibility of the production plan.

MA5.2 Hybrid Production Planning and Control for Heterogeneous Manufacturing Systems, Herfried M. Schneider, Prod. & Operations Mgt. Dept., Faculty of Bus. Adm. & Economics, Technical University of Ilmenau, P.O. Box 100565, D-98684 Ilmenau/Thu, Germany, HERFRIED.SCHNEIDER@WIRTSCHAFT.TU-IlMENAU.DE.

The impact of highly competitive markets on industry has extremely changed production. Accompanied by the introduction of flexible technologies new organizational principles took over. Despite these changes most Production Planning and Control Systems handle the problem the traditional MRP II-way. Diversity of organizational models on shop floor level existing next to one another even in SME calls for a new approach, reducing central production planning (CPP) and leaving a definite task to decentralized planning and control (DPC) on shop floor level. This requires coordination between CPP and DPC. The paper describes to some extent the modeling of the coordination tasks.

MA5.3 A Production Control Structure for the Multipurpose Batch Process Industries, Wenny H.M. Raaymakers, Faculty of Technology Management, Eindhoven University of Technology, P.O. Box 513, 5600 MB, Eindhoven, The Netherlands, W.H.M.RAAYMAKERS@TM.TUE.NL; Jan C. Fransoo, J.C.FRANSOO@TM.TUE.NL; J.Wil M. Bertrand, J.W.BERTRAND@TM.TUE.NL.

Multipurpose batch process industries produce a large variety of low volume, high added value products. Planning and scheduling is complex because of the variety of products and routings, and because several resources are required simultaneously or consecutively without intermediate storage. In this paper a hierarchical production planning method is proposed for these industries. Complexity scores determine how much planning and scheduling difficulties can be expected from a processing step. On the medium term these scores are used to obtain a set of production orders for which a short term feasible schedule can be realized.

MONDAY, 3:45 pm - 5:15 pm Room: Madrid

MA6 Title: Process Improvement: Business Process Re-engineering
Chair: Sant Arora, University of Minnesota

MA6.1 Identification of Common Causes of Failure of Reengineering Projects, Sant Arora, Industrial Engineering Division, Dept. of Mechanical Engineering, University of Minnesota, Minneapolis, MN 55455, USA; Sameer Kumar, Department of Industrial Engineering, University of Wisconsin - Stout, Menomonice, WI 54751, USA, KUMARS@UWSTOUT.EDU.
Re-engineering, aimed at seeking incremental improvements, has become a popular tool to downsize, restructure and revitalize businesses and their production systems and processes. The re-engineering concept is analogous to the concepts of continuous improvement and Total Quality Management in quality control. A study of a large number of re-engineering projects carried out over the recent years has shown that these projects range from extremely successful to utter failures. In spite of each re-engineering project being unique, there are common causes of failure. This paper focuses on identifying these common causes so that chances of success of the future re-engineering projects can be improved.

MA6.2 Applications of Re-Engineering Processes in Technology, Bahador Ghaehramani, School of Engineering, University of Missouri - Rolla, 225 Engineering Management Building, Rolla, MO 65401, USA, GHAHRAMA@SHUTTLE.CC.UMR.EDU.

Rapid evolution is a feature of today's competitive environment in the general industry. Leading modern companies have responded to this evolutionary phenomena by implementation and adaptation of re-engineering processes within their businesses. In industry, many of today's initiatives evolved by changes with the technology, often as a series of decisions made as reactions to functional groups with little awareness about cross-functional effectiveness and impacts. This paper positions re-engineering in technology as an evolutionary approach compatible to futuristic advancements in technology. The methodology will unite the recent advancement in technology and re-engineering doctrines. This process utilizes process quality management & improvement (PQMI) as a framework for re-engineering. The methodology, therefore, adopts PQMI as the framework for applications of re-engineering process in technology.

MA6.3 Multifunctional Teams and Elimination of Waste: An Empirical Examination, Par Ahlstrom, Centre for Operations Management, London Business School, Sussex Place, Regent's Park, London NW1 4SA, UK, PAHALSTROM@LBS.LON.AC.UK; Kate Blackmon, LBS Sussex Place, Regents Park, London NW1 4SA, UK, K.B.BLACKMON@LBS.LON.AC.UK; Christopher A. Voss, CVOSS@LBS.LON.AC.UK

Is there a link between the use of multi functional teams and elimination of waste? Several authors have argued that teams are important vehicles for improving production systems, but few have tested this relationship empirically. This paper uses data collected through structured interview at 800 European manufacturing sites. A multifunctional team is a group of employees performing different tasks within a manufacturing cell. Results indicate that the use of multifunctional teams is positively correlated with elimination of waste, which in turn is related to business performance. The path through which these multifunctional teams are built is also explored.

MONDAY, 3:45 pm - 5:15 pm Room: Balboa

MA7 Title: Scheduling (4)
Chair: Frank Werner, Otto-von-Guericke-Universitat

MA7.1 Heuristic Procedures for the Machine Loading Problem with Setups, Wun-Iwa Chen, Department of Business Administration, National Taiwan University, 50, Lane 144, Sec. 4 Keelung Road, Taipei, Taiwan, ANDYCHEN@CCMS.NTU.EDUTW.

A manufacturing process with parallel, unrelated machines and multiple job types with setups is considered. The objective is to obtain the minimum makespan workload allocation, subject to the available time for each machine. We propose a Lagrangean relaxation procedure which has a lower bound as good as that obtained by the Lagrangean decomposition. Several intelligent heuristic procedures based on tabu search and genetic algorithm are then proposed. A systematic computational test is conducted and the duality gaps of the proposed algorithms are reported.

MA7.2 Heuristics to Minimize Completion-time Variance for Flow Shop Scheduling, Kasi Gowrishankar, Sunnyside, 5 Cathedral Garden Lane, Madras, 600034, India, IMG1@ITMD.ERNET.IND; G. Srinivasan, Dept. of Humanities, Industrial Engineering & Management Division, Indian Institute of Technology, Madras, 600036, India, IMG1@ITMD.ERNET.IND.

This paper provides two heuristics to obtain a near-optimal solution for a n-job, m-machine, flow shop scheduling problem. Non-regular performance measure of completion-time-variance (CTV) is the objective. The solution also yields the desired common due date. The first heuristic, primarily, aims at determining the first job. The second heuristic revolves around splitting the problem into (m-1) 2-machine problems. The minimum CTV is determined by insertion and exchange. The heuristics are validated using simulated annealing and completion enumeration (for smaller-sized problems). The heuristics will be applicable in industries to arrive at the common due date or delivery date.
MA7.3  Heuristics for Shop Scheduling Problems with Setup Times and Batch Processing, Frank Werner, Fak. f. Mathematik, Otto-von-Guericke-Universitaet, PSF 4120, 39016, Magdeburg, Germany, FRANK.WERNER@MATHEMATIK.UNI-MAGDEBURG.DE; Thomas Tautenhahn, Fak. f. Mathematik, Otto-von-Guericke-Universitaet, PSF 4120, 39016, Magdeburg, Germany.

We consider different types of flow shop and job shop scheduling problems with group technology and/or batch processing. The jobs are partitioned into groups and a setup is necessary before a job of another group can be processed. We also consider related problems where jobs of the same group can be processed together in a batch, a setup is necessary before a new batch starts and the processing time of the batch is equal to the sum or to the maximum of the processing times of the operations in the batch. As objective function, both regular and non-regular criteria are considered. For these problems, we propose and compare different types of constructive and iterative heuristic algorithms and review extensive computational results.

MA7.4  Local Search for a Traveling Salesman Problem in Manufacturing, Gerhard Waescher, Wirtschaftswissenschaften, Martin-Luther-University, D-06099, Halle (Saale), Germany, WAESCHER@MLU.WIS.WI.WI.ULM.HALLE.DE.

The author introduces a real-world problem scheduling problem from metal cutting, which is of the TSP type. Several local search heuristics (traditional 2-opt, simulated annealing, threshold accepting, great deluge tabu search) have been implemented in order to solve the problem. It is shown how these methods perform on real-world data. Also the economic benefits from their implementation are outlined.

MONDAY, 3:45 pm - 5:15 pm  Room: Regency CR

MA8  Title: Materials Management, Logistics, and Distribution (I)
Chair: Diatha Krishna Sundar, Indian Institute of Management

MA8.1  The Estimation of Reorder Points Under Uncertainty in Both Lead Time and Demand, David Munoz, Camino A. Santa Teresa 930, 10700, Mexico, D.F., DAVIDM@MASTER.STER.ITAL.MX; Sergio Garza, Camino A. Santa Teresa 930, 10700, Mexico, D.F., GARZA@MASTER.STER.ITAL.MX.

We propose a simulation-based methodology to estimate a reorder point under a (1-alpha) % service level. Both lead times and demand are modeled as random variables. Under this methodology, we propose three consistent point estimates for the reorder point and two variability estimators. We show that all six combinations of point and variability estimators give asymptotically valid confidence intervals for the reorder point. Furthermore, we discuss how to introduce control variates in this case, as a variance reduction technique. Some experiments that confirm our theoretical results are discussed.

MA8.2  Material Management in Continuous Process Industry: An Indian Experience, Diatha Krishna Sundar, Indian Institute of Management, Bannerghatta Road, Bangalore 560 076, India, DIATHA@IIBM.ERNET.IND; Gopalan M R, Indian institute of Management Banglore, Bannerghatta Road, Bangalore, 560 076, India, MRGOPAL@IIBM.ERNET.IND.

Resource planning and management is distinctly different in continuous process industry compared to a discrete manufacturing industry. The fundamental differences in planning and operations created a "we are unique" syndrome in most of the process industries. Materials management, particularly raw materials and spare parts management is studied in detail in two different continuous process industries in India One, the largest steel producer, belonging to public sector and the other in private sector involved in petrochemicals. Yawning gaps are found in existing procedures of purchase and logistics management, besides missing links in supplier (vendor) development, rating and management and benchmarking. This paper discusses the characteristic of materials management functioning, linkages between materials management and other functional areas of the organization, and approaches and action plans to breakaway from the conventional practices for better performance in the above mentioned two continuous process industries. Findings of the study can be used in teaching POM while focusing on continuous process industries.

MA8.3  Inventory Control and Replenishment Management of Spare Parts in a Multilayer Distribution System, Chingping Han, Department of Mechanical Engineering, College of Engineering, Florida Atlantic University, P.O. Box 3091, Boca Raton, FL 33431, USA; Kader Mazouz, Dept. of Mechanical Engineering, Florida Atlantic University, Boca Raton, FL 33431, USA.
This paper studies the distribution and control system for a multi-layer system. This distribution system consists of distribution centers, local warehouse, and a fleet of trucks. This problem is a combination of inventory control and transportation capacity management. A cost comparison between centralized and decentralized system has been developed for over ten thousands items. Decision are made under the following criteria: replenishment and/or delivery in emergency situations. An inventory control model in this study minimizes the total inventory of spare parts while keeping an acceptable service level. A flexible truck route scheduling method is developed to minimize the total transportation cost and meet the emergency requirements such as in the case of hurricane emergency situation.

TUESDAY, 8:30 am - 10:00 am  Room: Miramar North

TA1  Title:  Operations Strategy: Empirical Research
Chair: Jack Meredith, Wake Forest University

TA1.1  Achieving External Validity in Research Studies, Jack Meredith, Babcock Graduate School of Mgt., Wake Forest University, P. O. Box 7659, Winston-Salem, NC 27109, USA, JACK_MEREDITH@MAIL.MBA.WFUEDU.

This paper will explain the dilemma of how to generalize our research findings to new situations and populations. The process entails issues of inference, sample size, validity, reliability, and generalizability.

TA1.2  Strategic Alignment of AMT and Operations Strategy, Sayed Elsayed-Elkhoudy, Department of Management, Hofstra University, 134 Hofstra University, Hempstead, NY 11550, USA, MGBSME@HOFSTRA.EDU.

This study investigated the impact of advanced manufacturing technology on operations strategy decisions categories and the competitive advantage of business. Our survey was used to collect data on the manufacturing strategy and competitive priorities using AMT elements, such as: flexible manufacturing technology, group technology, and computer integrated manufacturing. Five industries were chosen (n=112). MANOVA and factor analysis were used to analyze the data. The results indicate that strategic alignment model can be a useful tool for integration to make AMT strategy more successful.

TA1.3  Determinants of Competitive Advantage for Subcontracting Firms in the Aerospace Industry: The Case of Canada, the U.S. and the U.K., Elisabeth Lefebvre, Ecole Polytechnique, P.O. Box 6079, Station Centre-Ville, Montreal, Quebec H3C 3A7 Canada; Louis A Lefebvre, Ecole Polytechnique, P.O. Box 6079 Station Centre-Ville, Montreal, Quebec H3C 3A7 Canada; Jean Harvey, University of Quebec at Montreal, P.O. Box 8888 Station Centre-Ville, Montreal, Quebec H3C 4R2, Canada

The paper examines the differential importance of home-based determinants of competitive advantage, such as factor conditions, demand conditions, characteristics of industry structure and government intervention, to the overall performance of subcontracting firms in the aerospace industry. Empirical evidence gathered from 432 subcontracting firms located in Canada, the USA and the U.K. reveals that issues related to labor and, more importantly, the difficulty of obtaining venture capital are considered as crucial among the factor conditions. Further, in terms of demand conditions, the difficulty of predicting contractor’s demands and the weakness of the domestic market are prime issues in all three countries. Subcontracting firms are also greatly concerned with industry structure and firm rivalry. These findings mainly point to the pressures exercised in an industry that is becoming increasingly transnational.

TUESDAY, 8:30 am - 10:00 am  Room: Miramar South

TA2  Title:  Production Planning and Control Systems: Theory of Constraints (I)
Chair: J. Brian Atwater, Utah State University

TA2.1  Applying TOC to Guide Quality Improvements in a Job Shop, J. Brian Atwater, Utah State University, 3510 University Blvd., Logan, UT 84322, USA, BATWATER@B202.USU.EDU; Satya Chakravorty, Kennesaw State University, 1000 Chastain Road, Kennesaw, GA 30144, USA, SCHAKRAV@KSCMAIL.KENNESWA.EDU.

The Theory of Constraints (TOC) continues to grow in popularity. Ironically, one of the major reasons for its appeal is also a primary source of criticism. A basic maxim of TOC is that all systems have very few constraints and that decisions concerning system improvement should be based on their impact on those constraints. Many managers, particularly in job shop environments, argue that their systems have several constraints rendering TOC useless. A recent study showed that while bottlenecks can shift in job shops a predominant one will typically emerge. This study utilizes simulation research to determine if TOC can be used to identify improvement projects in a shifting bottleneck environment.

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TA2.2 **Wandering Bottlenecks: Identifying the True Causes**, Simon F. Hurley, Department of Production Technology, Massey University, Palmerston North, New Zealand, S.F.Hurley@massey.ac.nz.

"Wandering bottlenecks" occur when no one resource appears to consistently be the bottleneck. In this situation, rather than limit buffering to one major bottleneck resource, a production manager may buffer each work station seen as a potential bottleneck. This results in more buffers of work than are strictly necessary, and consequent increase in lead times and inventories, and reduced responsiveness. These "wandering bottlenecks" are usually attributed to changes in the product mix, which place different loadings on the various work stations. This paper asserts that the appearance of "wandering bottlenecks," in fact, tends to be caused by operating policies, particularly staffing and job-sequencing policies. A simple model is developed to illustrate how these operating policies cause wandering bottlenecks, and approaches to alleviate their effects will be illustrated.

TA2.3 **An Experimental Model to Integrate JIT and TOC in the SMEs**, Sergio L. L. Gusmão, PPGA/UFRGS, Av. João Pessoa, 52 sala 11, CEP 90040-000 - Porto Alegre - RS - Brazil, PPGA@VORTEX.UFRGS.BR; Antonio D. Padula, same, PPGA@VORTEX.UFRGS.BR.

This paper suggest a model for manufacturing management in small and medium industrial enterprises, trying to coordinate some of the techniques of the main paradigms of production management -- JIC, JIT and TOE. More specifically, an analytic model was developed to integrate just-in-time and the theory of Constraint. In order to fit the implementation of this model to the SMEs context, we have considered their operational aspects and the fundamental concepts of JIT and TOC.

**TUESDAY, 8:30 am - 10:00 am**  
**Room: Castillian**

TA3 **Title:** Total Quality Management: Statistical Process Control  
Chair: John Flanagan, University of Wollongong

TA3.1 **Identifying Most Likely Causes of Poor Quality**, Ali Jenzari, University of Tampa, 401 West Kennedy Blvd., Tampa, FL 33606, USA, ALI.JENZARI.1@RESNET.FMHL.USP.EDU.

This paper describes a new method for identifying most likely causes of poor quality. We begin with a cause-and-effect diagram, which identifies all possible causes of a quality problem. Then we model the probabilistic dependence between these possible causes and their respective sub-causes using belief networks. A belief network is a directed acyclic graph where nodes represent variables and directed arrows represent probabilistic dependencies between these variables. We describe an algorithm to compute the conditional probability of every possible cause being present given the problem of poor quality. Then we choose the cause with the highest conditional probability to investigate and test first.

TA3.2 **Improving the Accuracy of Shewhart Control Charts in Teaching and Practice**, John Flanagan, Department of Management, University of Wollongong, Wollongong, NSW 2522, Australia, J.FLANAGAN@UOW.EDU.AU.

Flanagan showed that significant errors can occur in the calculation of control limits for Shewhart control charts where normal approximations, justified by appeal to the Central Limit Theorem, are used. Cases discussed were restricted to those where a long history of stable production allows accurate estimation of the parameters of the underlying distributions. This paper extends the analysis to cases where parameter estimation is based on a smaller sample of historical data. The possibility of improving the accuracy of teaching examples and industrial practice, using widely available computer software such as Microsoft Excel or Mathematica is explored.

TA3.3 **Application of Statistical Process Control in Services**, Emeka Samuel Duku, P.O. Box 344, Normal, Al. 35762, USA, AAMDUN01@ASNAAM.AMU.EDU; Hossein Jamshidi, Management & Marketing Dept., P.O.Box 429, Normal, Al. 35762, USA, HHJAMSHIDI@ASNAAM.AMU.EDU.

The increasing dominance of service in the economy has increased attention on service quality. Statistical process control (SPC) which revolutionized quality in manufacturing can certainly do so in services too. In this study we present the results of a survey of service organizations regarding the use of SPC for quality improvement in services. We discuss some of the issues organizations can expect to deal with in order to successfully apply SPC in services.
TA4 Title: Operations and the Environment
Chair: K. Ravi Kumar, University of Southern California.

Operations managers are directly or indirectly charged with the responsibilities for the design of the products, processes and packaging; the layout of the facility; the maintenance of the equipment; the logistical activities; the purchasing function; the processing operations; and the health and safety of the employees. The discharge of these awesome responsibilities, if not done properly, can seriously affect the environmental performance of the organization. The purpose of this paper is to discuss the decisions that operations managers must make in regards to the above responsibilities. By making the right decisions, operations managers can minimize the waste and pollution generated, the energy used, and the number and frequency of accidents and illnesses caused by the workplace. No other functional area in an organization has such an impact.

TA4.1 The Operations Manager: Focal Point for the Environmental Performance of the Organization, Jerry L. Huxell, Maastricht School of Management, P.O. Box 1203, 6201 BE, Maastricht, The Netherlands, HUXELL@MSM.NL.

TA4.2 Simulating Reverse Distribution for the Product Upgrade Process, Jonathan Linton, 348 Roselawn Avenue, Toronto, Ontario, Canada; David Johnston, FUNDATEC, School of Business, York University, Toronto, Canada.

Reverse distribution is a concern for firms that are recalling project, upgrading defective and obsolete product in-field, or preparing to respond to emerging environmental laws and agreements. Reverse distribution is an area requiring study due to its current high cost. A multimedia reverse distribution simulation was developed to assist in planning in-field product upgrade of telecommunications products. The simulator explores how variations in quantity and timing of supply affect manufacturing capacity requirements and ability to fulfill market demand. The scenario analysis planning tool offers useful lessons about reverse distribution. Findings through simulator use are discussed.

TA4.3 Assessing Life-Cycle Environmental Impact of Discrete Part Manufacturing: Management Methodology and Tools to Spur Design of Greener Products/Processes, K. Ravi Kumar, Executive Director, PRIME Program and Professor of Operations Management, University of Southern California; Arvind Malhotra; Dongwon Lee.

This research proposes to develop a comprehensive methodology for capturing the life-cycle impacts of environmental unfriendliness in discrete part manufacturing. The output of this research is a means by which businesses can obtain the life-cycle impact (measured appropriately) of their products/processes. The environmental life-cycle impact status of a particular product line produced by current physical processes could be visualized as a vector of measurable attributes, categorized under the taxonomy of human impact, ecological impact, and socio-economic impact, that are aggregated at the finished product level. The implementation of such a methodology would allow the managers to visually appraise the status of operations vis-a-vis environmental friendliness. Given such a product impact status, the managers can quickly prioritize among the various products, action items to improve environmental friendliness.

TA4.4 Product and Process Innovation in the Textile Industry of the State of Santa Catarina - Brazil, Edvaldo Alves De Santana, Dept. Economia-UFSC, Campus Universitario FPOLIS-SC, Brazil; Mauricio Fernandes Pereira, Rigal Bittencourt 127 APTO 116, FPOLIS-SC, Brazil; Myriam Cunha, RIDOM Becker, 22/305, BL B FPOLIS-SC, Brazil, MSCUNHA@PRODAU.UFSC.COM.BR

This paper deals with product and process innovation, with emphasis to those regarded environmentally clean, in the textile industry of the State of Santa Catarina-Brazil. Initially, we survey the main concepts related to product and process innovation and to environmentally clean technologies (Sustainable Development). Next, we attempt to assess the extent the textile companies in the region are updated to these new technologies. At last, the paper is included with recommendations that would reduce the gap between the current product and process technology and a environmentally clean one.

TUESDAY, 8:30 am - 10:00 am Room: Valencia East

TA5 Title: Production Planning and Control Systems: Policies for Improvement
Chair: Roger W. Schmenner, Indiana University

TA5.1 Throughput Time Reduction: Taking One's Medicine, J. Doug Blocher, IU School of Business, 10th Fee Lane, Bloomington, IN 47405, USA, OBLOCHEM@INDIANA.EDU; Richard W. Garrett, IU School of Business, 10th Fee Lane, Bloomington, IN 47405, USA, GARRETT@INDIANA.EDU; Roger W. Schmenner, Indiana University, 801 W. Michigan Street, Indianapolis, IN 46202, USA, SCHMENNER@INDIANA.EDU.
Using a situation from Eli Lilly and Co., this paper examines influences on throughput time reduction. In particular, the paper explores how various production planning and control policies have affected the throughput time for lots of tablets and capsules over a 15-month period. Actual data are compared against both theoretical considerations and a simulation model. The role of different sequencing regimes for throughput time and service levels are examined in some depth.

**TA5.2 General Rules for Seasonal Demand**, Richard Metters, Owen Graduate School of Management, Vanderbilt University, Nashville, Tennessee 37203, USA, METTERRD@CTRX.VANDERBILT.EDU.

A fundamental problem for make-to-stock producers of seasonally demanded goods is the allocation of limited production capacity. Three important decisions must be made: (1) how early in the low demand season to produce at full capacity in anticipation of high demand later, (2) the product mix to manufacture when producing in anticipation of later demand, and (3) when capacity is insufficient to make all that is desired, how to allocate capacity among products. Here, simple rules are generated for solving these problems by analyzing optimal policies.


The disadvantage of a load-based work-order release rule is that idle time might occur. A possibility to reduce this unnecessary idle time is to allow the load in the shop to occasionally exceed the load limit. In this way a work order waiting to be released should be released, irrespective of the load in the shop, if the first operation of the work order needs a work center that has become idle. We call this a work center pull strategy. In this study we investigate the effects of using such a work center pull strategy on the delivery performance.

**TA5.4 Algorithm for Deciding the Material Request Date in MRP Systems for Flexible Manufacturing Industries**, Carlos Augusto Alcantara Gomes, Universidade Federal do Rio de Janeiro, Almirante Cochrane, 56302, Rio de Janeiro - RJ - Brazil, CAUGUSTO@IND.UFRJ.BR; Assed Haddad; Claudia Morgado.

This paper presents a case study which shows the power of the pt-temporized Petri Nets wherein data supplied to the flexible manufacturing industries that make use of MRP stock control through the MRP. The proposed algorithm is based on the pt-temporized Petri regarding the needs of resources to be utilized in the manufacturing technologies. These needs can be expressed by the request date in MRP systems.

**TUESDAY, 8:30 am - 10:00 am ** Room: Madrid

**TA6**

**Title: Process Improvement: Innovations**

Chair: Robert H. Burgess, Georgia State University

**TA6.1 Implementation of Mass Customization Using Process Improvement**, Robert H. Burgess, Department of Management, College of Business Administration, Georgia State University, P.O. Box 4014, Atlanta, GA 30302, USA, RBURGESS@GSU.EDU; Cheryl Gaimon, DuPree School of Management, Georgia Institute of Technology, Atlanta, GA 30332, USA, CHERYL.GAIMON@MGT.GATECH.EDU.

This paper explores mass customization strategy and its effect on production and operations. Particular emphasis is placed on using process improvement as the technique for achieving the maximum amount of customization possible out of existing facilities. Also a discussion of the design of new facilities to maximize the amount of customization and the competitive effects of such a design is presented.

**TA6.2 Relationships Among Different Types of Innovations - A Conceptual Model**, G.N. Mohan Babu, Department of Humanities and Social Sciences, Industrial Engineering and Management Division, Indian Institute of Technology, Madras, 600036, India, IMGIT1@IITM.ERNET.IN; L.S. Ganesh, Department of Humanities and Social Sciences, Industrial Engineering and Management Division, Indian Institute of Technology, Madras, 600036, India.

The causes and consequences of different types of innovations have been studied earlier. However, there seems to be little research on the relationships among different types of innovations including institutional, technological, administrative, financial and marketing. This paper presents a conceptual model that integrates earlier research on different types of innovations and proposes several hypotheses of their relationships. An understanding of these relationships over the life cycle of a technology would help firms to not only prepare for changes, but also to plan their strategic efforts and allocate scarce resources effectively.
A single standard tool is used to rough, coconut shell with a unique geometry through interpolation, eliminating the expense, regrinding and inventorying of special form tools for each feature. Proprietary carbon steel tools are used to produce fine short fibre. Flush fine technology blast out chips. This process is ideal for carpet that will be commonplace on the house of tomorrow, as well as many of the home parts produced today. (Research and Development financiers are adopting the forecasting models because of its flexibility. Ultimately, however, such widespread adoption limits financial support system designs for R & D projects. The problem stems from the cost of money levels. A model generates only part of the financial needs, depending upon reflections to boost cost levels.)

TUESDAY, 8:30 am - 10:00 am     Room: Balboa

TA7       Title:  Scheduling (S)
           Chair: Lawrence Fredendall, Clemson University

TA7.1     Sources of Variance in Job Shops: A Theoretical Model, Lawrence Fredendall, Department of Management, Clemson University, Clemson, SC 29634, USA, FLWREN@CLEMSON.EDU; Gargaya Vidyaranya, UNC - Greensboro, Greensboro, NC 27412, USA, GARGEYAV@AGO.UNCG.EDU.

McKay, Safayena, and Buzacott stated (but do not describe) that they have identified sixteen different sources of variance in the job shop. However, there are no papers in the literature which carefully delineate all the sources of variance in the job shop. This paper identifies the different sources of variance in the job shop based on the current academic and practitioner literature and presents a theoretical model linking the different sources of variance to shop performance. The model also looks at the interactive relationships between the different types of variance which in turn affect local and global shop performance measures.

TA7.2     Response Times for Service Industries: Setting Due-Dates and Job Sequences in a Dynamic Environment, Susan A. Slottick, W. A. H. School for Management & Policy, SUNY- Stony Brook, 317 Harriman Hall, Stony Brook, New York 11794, USA, SLOTTOMICK@PEGASUS.HAR.SUNYSB.EDU; Subimal Chatterjee, W. A. H. School for Management & Policy, SUNY- Stony Brook, 314 Harriman Hall, Stony Brook, New York 11794, USA, CHATTERJ@FAC.HAR.SUNYSB.EDU.

On-time delivery promises are becoming an important marketing tool for service firms in increasingly competitive markets. To answer questions about how to set response times in order to satisfy customers and maximize profit, we develop a model that incorporates customers' expectations, penalties for late completion and dynamic arrivals and departure. We use computational studies to examine the tradeoffs between response-time strategies that weight customer preferences and those that emphasize the profit of the firm. We also consider different rules for sequencing orders that are waiting to be serviced. Our results show that service managers need to consider market conditions (competitiveness), shop conditions (congestion) and the nature of the service offered (urgency) when setting response-time guarantees.

TA7.3     Active Learning of the Principles of Job Shop Scheduling, Brad Meyer, Drake University, Des Moines, Iowa 50311, USA, BM4111R@ACAD.DRAKE.EDU.

This paper describes software for active learning of the concepts of job shop scheduling. The user drags and drops blocks of work time in Gantt charts to observe the effects of scheduling strategies on performance measures such as average throughput time and average job lateness. The software is designed for the introductory operations management class. The user will develop an intuitive grasp of concepts such as dependent events, average throughput time, schedule induced idle time, and scheduling heuristics. The software is available for both the WINDOWS and Macintosh environment and is also soon to be available on the Internet.

TUESDAY, 8:30 am - 10:00 am     Room: Regency CR

TA8       Title:  Materials Management, Logistics, and Distribution (2)
           Chair: Powell Robinson, Department of Business Analysis, Texas A&M
TA8.1 A Dual Solution for Capacitated, Coordinated Replenishment, F. Barry Lawrence, Department of Business Analysis, Texas A&M, College Station, TX 77843, USA, FB-LAWRENCE@TAMU.EDU; E. Powell Robinson, Dept of Business Analysis, Texas A&M, College Station, TX 77843.

In the coordinated replenishment problem, a major setup cost is incurred each time one or more times in a product family are jointly produced, and a minor setup cost is associated with each time replenished. Coordinated replenishment problems are common in both production and distribution systems where an item group may share a common supplier, a common mode of transportation, or the same production equipment. Motivated by a real problem faced by a chemical manufacturer, we propose to solve the capacitated version of this problem. While the uncapacitated version has been solved in the literature we are unaware of any solution to the capacitated problem. We use Lagrangian Relaxation of the problem and develop heuristics to solve the subproblem.

TA8.2 How Does Carrier Transit-time Affect Logistics Cost and Service?, Amy Zeng, Dept. of Prod. & Dec. Sciences, Cameron School of Business, UNC at Wilmington, 601 South College Road, Wilmington, NC 28403, USA, ZENGA@UNCW.EDU; John Tyworth, Dept of Business Logistics, Penn State University, 509F Business Administration Building, University Park, PA 16802, USA, JET@PSUVM.PSU.EDU.

Joint determination of a transportation mode and an optimal inventory control policy is important in supply chain management. This paper refines the currently-used transportation-inventory models and demonstrates a new method of estimating the effects of carrier transit-time performance on logistics and service. In particular, the modified model relaxes the conventional assumption that the freight cost is a linear function of order quantity and treats transit time as a segment of lead time. The new solution method allows more flexible probability distribution of demand and transit time. The effects of carrier transit time are examined by a sensitivity-analysis matrix.

TA8.3 On the Use of Break Quantities in Distribution Networks, Romain Dekker, Econometric Institute, Erasmus University Rotterdam, P.O. Box 1738, 3000 DR, Rotterdam, The Netherlands, RDEKKER@FEW.EUR.NL; Kleijn Marcel, Econometric Institute, Erasmus University Rotterdam, P.O.Box 1738 3000 DR Rotterdam, The Netherlands, MKLEJN@FEW.EUR.NL.

It is difficult to buffer against high variations in order size at an inventory point. In such a case we propose to deliver orders larger than the so-called break quantity from a higher echelon in the distribution network, either being an American/European distribution center or the producer. In this contribution we focus on the economic evaluation of such a rule and on methods to determine the optimal break quantity. We take both inventory, handling and transportation cost into account as well as rebates for the longer delivery time. Finally, some case studies will be discussed.

TA8.4 Smoothing Methods in Sales Forecasting, Tej Dhakar, New Hampshire College, 2500 North River Road, Manchester, NH 03106, dhakar@ix.netcom.com; Schmidt, Charles, Department of Management Science and Statistics, The University of Alabama, PO Box 870226, Tuscaloosa, AL 35487, cschmidt@alston.cha.ua.edu; Miller, David, Department of Management Science and Statistics, The University of Alabama, PO Box 870226, Tuscaloosa, AL 35487, dmiller@procr.cha.ua.edu.

Winter’s exponential smoothing results in lopsided weights particularly in case of seasonal factors which are smoothed only once during a seasonal cycle. For example, the weights with a smoothing constant of 0.2 with four data work out to 0.2, 0.16, 0.128, 0.512. As can be seen, the oldest data is weighted more than the other data. The paper presents a new smoothing technique to correct this situation. The new smoothing technique is compared with the standard exponential smoothing using actual data.

TUESDAY, 10:30 am - 12:00 noon Room: Miramar South

TB1 Title: Production Planning and Control Systems: Theory of Constraints (2)
Chair: Jake Simons, A.F. Institute of Technology

TB1.1 Simultaneous Versus Sequential Scheduling of Multiple Constraints, Jake Simons, A.F. Institute of Technology, 3585 Woodgreen Dr., Beavercreek, OH 45434, USA, JSIMONS@AFIT.AF.MIL; Michael Stephens, A.F. Institute of Technology; Wendell Simpson, 4027 Col. Glenn Hwy, Dayton, OH 45431, USA, 102232.2746@COMPOSER.COM
THE GOAL. SYSTEM implements a drum-buffer- rope (DBR) approach to production scheduling. Earlier versions of the software were only capable of building schedules for multiple constraints sequentially. A new version, which can build multiple constraint schedules simultaneously, was evaluated using benchmark problems created in previous research. The new results were compared to solutions produced by the sequential algorithm and solutions which optimally minimize maximum tardiness. The simultaneous algorithm was found to slightly reduce maximum tardiness but performed worse with respect to average flow-time, percentage of jobs tardy, and total days late.


Recognition of differences and variability of the complexity levels along several manufacturing structures known, as well the variable permeability to changing and innovation in companies, lead these companies to search for hybrid solutions for the manufacturing questions. This work presents some criteria for solving these puzzles, considering the scale and volume, the complexity and manufacturing lead-times variations through the manufacturing structures. Within the using of MRP II systems and just-in-time elements, V-A-T classification is used as analysis tool, besides buffer management, from Goldratt’s Theory of Constraints, in order to allocate buffers conveniently. Finally, is presented an example of a hybrid model design for a manufacturing system, with the benefits and limitations of this approach for the specific case shown.

TB1.3 Fuzzy Logic Applied to the Management of Productin Buffers, Simon F. Hurley, Department of Production Technology, Massey University, Palmerston North, New Zealand, S.F.Hurley@massey.ac.nz; Jeffery Foote Department of Production Technology, Massey University, Palmerston North, New Zealand, JEFFERY.FOOTE.1@UNIMASSEY.AC.NZ; Adrian Evans, Department of Production Technology, Massey University, Palmerston North, New Zealand, A.N.IVANS@MASSEY.AC.NZ.

Buffers of work in a manufacturing facility are critically important to the facility’s effective operation. Although buffer management has been researched for over 35 years, few examples exist of implemented methodologies. Using the Theory of Constraints approach to production control as the base model, this paper outlines a fuzzy logic-based approach which determines the buffer size from upstream variability and protective capacity. The method is both robust and practical.

TUESDAY, 10:30 am - 12:00 noon  Room: Castillian

TB2 Title: Applications of Software Engineering Tools in Operations
Chair: Mesbah Ahmed, University of Toledo

TB2.1 An Application of Neural Network Methodology in Estimating Die-Making Time, Mesbah Ahmed, ISOM Department, The University of Toledo, Toledo, OH 43606, USA, FAC00166@UOFTOLUTOLEDO.EDU; Amol Kolhatkar, ISOM Department, The University of Toledo, Toledo, OH 43606, USA, Sangita Gupta, ISOM Department, The University of Toledo, Toledo, OH 43606, USA.

In this paper, we develop and test artificial neural network (ANN) models in estimating die-making time. Manufacturing companies often use various software, such as Computer Aided Source Estimating program in estimating die-making time. These packages do not always provide satisfactory results. In this study, we explore alternative neural computing methodologies to improve the estimates. The models are trained using real world data from two plants in a Midwestern area manufacturing firm. Back propagation neural network model on selected data have shown encouraging results.

TB2.2 Computer Assisted Design - Dynamic Data Exchange - A Retrospective Study, John Russet, 1050 Tyler Street, Hollywood, FL 33019, USA; Alan Lerner, 13831 SW 59th St., Miami, FL 33183, USA; Iraj Mazjab, Florida International University, U.P. Campus, Miami, FL 33199, USA, MAZJUBL@FIU.EDU

Computer Assisted Design (CAD) graphical user enhancements such as Dynamic Data Exchanges (DDE) and Object Oriented Data (OOD) have allowed designers and managers to electronically link graphic drawing objects to multiple data bases. DDE and OOD enhancements were the impetus for various innovative computer based management system applications such as Microsoft Windows, Product Data Management (PDM) and Computer Assisted Facilities Management (CAF). A review of the literature reveals CAD-DDE/OOD technology has had a 75% building design industry penetration, while acceptance has been low by non-design professionals because of a lack of multidiscipline application strategies and non-CAD managerial tool application.
The Group Technology (GT) concept has been introduced to simplify the production scheduling. The scheduling in the GT context is called Group Scheduling. That can state as: identification of an optimal schedule for a set of n jobs family assigned to a manufacturing cell of m machines. Based on the simulation approach and the expertise of peoples, a Knowledge Based System (KBS) has been designed for group scheduling. Many schedules are generated by the simulation module using different scheduling rules and the knowledge module now evaluates the generated schedules, compares to each others and finally, classifies these potential solutions in priorities of the production goals and constraints. An optimum schedule satisfying the best production compromise may be then identified. The proposed system is developed for microcomputer applications using the EXSYS' knowledge based system. A case study will be presented in detail to demonstrate the potential ability of the designed system and to show how the system can work.

TUESDAY, 10:30 am - 12:00 noon  Room: Valencia East

TB3  Title: Linear Programming Applications in Operations
Chair: Steve Zanakis, Florida International University

TB3.1 Solving Location and Clustering Problems Using Branch-and-Price, Anuj Mehrotra, Dept. of Management Science, University of Miami, 417K Jenkins Building, Coral Gables, FL 33124, USA, ANUJ@UUMIAMI.EDU; Michael Trick, Graduate School of Industrial Administration, Carnegie Mellon University, Pittsburgh, PA 15213, USA, TRICK@MATT.SIA.CMU.EDU.

We present a branch-and-price technique for solving facility location and clustering problems. Branch-and-price is an effective technique for solving integer programming problems where the linear programming relaxations are solved implicitly at each node of the branch-and-price tree using column generation. Working with restricted formulation, we show how special branching rules can be used to develop an effective method for solving a variety of location and clustering problems. Computational results and implementation details are presented.

TB3.2 Models for Planning Fish Landings and Daily Production Runs in a Vertically-Integrated Industrial Fishery, Harvey H. Millar, Finance & Mgt. Science Dept., Saint Mary's University, 923 Robie Street, Halifax, Nova Scotia B3H 3C3, Canada, HMILLAR@MADELEINE.STMARYS.CA.

Typically, a vertically-integrated fish-processing firm with a fleet of vessels will deploy a fishing plan. The plan will attempt to satisfy demand for raw material at processing plants at minimum cost. Once deployed, the daily catches for the fleet will usually differ from the actual plan. Consequently, both the landing and processing decisions must now be reconsidered in the light of current information. We present two mixed-integer linear programming formulations of the decision problems and present computational results for a set of test problems. We discuss issues relating to the quick real-time implementation of these decision models.

TB3.3 Minimization of Long-Run Cost for Electric Power Expansion, Majid Jaraiedi, Dept. IMSE, WVU, P.O. Box 6107, Morgantown, WV 26506, USA, JARAIEDI@CEMR.WVU.EDU; Earl Jaie Wang, IMSE, WVU, P.O.Box 6107, Morgantown, WV 26506-6107, USA

A realistic long-run cost minimization model for electric power expansion by using a mixed integer programming approach is presented. Providing sufficient and reliable power basic responsibilities that utilities must focus on. These responsibilities should be based on (1) minimizing the sum of production and capital costs and (2) avoiding the long-run disadvantages due to short-run myopic view for electric expansion. This research is based on providing multi period planning approaches and implementing the long-run optimization model for electric power expansion. Factor that will affect expansion planning such as features of power plants, cost components, reserve margin and reliability are included in the model.

TB3.4 Modeling and Solving of Continuous-Time Production Planning Problems, Stephane Daucere-Pere, Dept. Automatique et Productique, Ecole des Mines de Nantes, 4, Rue Alfred Kastler - La Chantrerie-B.P. 20722-F44307, Nantes Cedex 03, France, DAUZER@EMN.FR; Marc Sevaux, Dept. Automatique et Productique, Ecole des Mines de Nantes, 4, Rue Alfred Kastler - La Chantrerie-B.P. 20722-F44307, Nantes Cedex 03, France, SEVAUX@EMN.FR.
In classical production planning problems, the goal is to minimize a cost function over a discrete horizon divided into equal length periods. In continuous-time planning problems, we consider demand and production rates instead of quantities. The objective is then to minimize the cost over the whole horizon. Assuming that the production and demand rates are piecewise constant, we briefly present several models for this problem: Non-Linear, Mixed-Integer-Linear and Linear Programming. In the latter, we study the problem of finding the best switching times, i.e., times at which production rates are allowed to change. Various procedures are discussed, together with some numerical experiments.

TUESDAY, 10:30 am - 12:00 noon  Room: Valencia West

TB4  Title: Cost Management and Control  
Chair: Tamas Koltai, Technical University of Budapest


Nowadays, enterprises are facing an environment of high competitive level. Global market competition and the use of new technologies have changed the structure of modern companies. Nevertheless, these changes are frequently not incorporated in their cost evaluation and control systems. For this purpose, a cost management system was designed to provide information required for this new competitive environment, supporting and evaluating management principles and operational techniques. That tool uses mapping and measurement methods that describes the business environment in terms of costs and added value. It helps to define the processes' contribution to improve the performance of the company.


The design of a cost management system requires the knowledge of the system to be evaluated and controlled. It requires also the definition of performance parameters to be monitored, permitting determination of a target to be followed. In this paper it will be constructed a conceptual basis to design cost management system. It will be presented a process-based management, including mathematical modeling and design of control systems. It will be also discussed the use of performance indicators to evaluate process detailing the principal costing systems applied for this purpose.

TB4.3 The Evaluation of Operations Management Decisions with the Help of Activity Based Costing, Tamas Koltai, Associate Professor, Technical University of Budapest, Department of Industrial Management, H-1111 Budapest Muegystem rkp. 9. T. Bld., koltai@vvg.bme.hu.

As a consequence of the development of technology, production systems are more and more flexible in terms of what to produce or how to produce a certain product in the same facility. All this increases the importance of the POM decisions. Good scheduling may increase throughput, proper production planning may lead to higher capacities, etc. Activity based costing may help to measure the effect of certain operations management decisions on the production cost. The paper shows how the “goodness” of certain production planning and control decisions can be analyzed and how alternative production systems can be compared with the help of ABC.

TUESDAY, 10:30 am - 12:00 noon  Room: Madrid

TB5  Title: Process Improvement: Simulation  
Chair: Edward Baker, University of Miami

TB5.1 A Simulation Planning Model for a University Shuttle Bus, Edward Baker, Department of Management Science, University of Miami, Coral Gables, FL 33124, USA; EBAKER@UMIAMI.EDU, Pilar Romero, Dept. of Management Science, University of Miami, Coral Gables, FL 33124, USA.

An animated simulation model was developed for the shuttle bus system at university of Miami using the Arena/SIMAN V software package. The model employed data collected by the operators as well as by the researchers. The model was most useful in understanding the data and operational requirements necessary to improve the efficiency of the system. Various operational scenarios are presented.
TB5.2 Buffer Management in Practice, and Experimental Design: Marriage, Co-habitation, or Divorce?, Willem Selen, Vesalius College-Free University, Pleinlaan, 2, B-1050, Brussels, Belgium, WISELEN@VUB.AC.BE.

Buffer management to reduce cycle time is an issue under investigation at Opel Belgium, a major automobile manufacturer of General Motors International Operations. A pilot study of the "underbody front" - automated assembly cell, using simulation, indicated potential improvements in average daily output through management of buffer sizes at key buffer locations within the cell. Many practical applications of animated computer simulation, however, stop at the modeling and displaying of the process under study. Simulation as a tool for process reengineering or enhancement can only reach its full potential if incorporated in a comprehensive statistical study, involving enough replications of the simulation to attain statistically significant results. While the pilot study generated interest from management through the reporting of promising confidence interval estimates of average daily output, this study extends the analysis to the development of a more comprehensive statistical design in which multiple parameter settings of the buffering will be investigated. The paper will also report on the reactions of, and issues raised by management as the experimental design methodology is implemented as a tool for process enhancement and productivity improvement. This may shed some light on whether theory and practice for this type of problem are comparable, and may even become partners for life.

TB5.3 Performance Improvement of Production Line Manufacturing Several Products, Walid Abdul-Kader, Department of Mechanical Engineering, Laval University, Quebec City, G1K 3P4, Quebec, Canada, AWALID@GMC.U.LAVAL.CA; Daoud Ait-Kadi.

The performance of manufacturing systems, expressed in terms of costs, delays and availability, is often affected by random failures of machines. Several arrangements have been considered to reduce the frequency of accidental breakdowns and minimize the duration of service interruptions. In order to attenuate the dependability of successive workstations in the production line, intermediate buffers can be deployed. A large number of papers dealing with buffer location/allocation have been published. Most of the approaches used for this purpose consider one type product and are based on Markov chains, Queuing theory, Simulation and Reliability techniques. In this paper, we intend to examine the most recent works published on the subject and to present an alternative approach for a line making several products. This approach combines linear programming model and the analysis of variability created by accidental breakage. Numerical examples describing the proposed approach will be presented and extensions for modeling this type of production system will be discussed.

TB5.4 The Hidden Factory Revisited: Misperceptions about the Impact of Contingent Workers on a Manufacturing System, Jeff K. Stratman, Kenan-Flagler Bus. Sch., UNC-Chapel Hill, Campus Box 3490, Carroll Hall, Chapel Hill, NC 27599, USA, JSTRATMA@INTERNEX.NET; Akela Roth, Kenan - Flagler Business School, UNC - Chapel Hill, Campus Box 3490 Carroll Hall, Chapel Hill, NC 27599-3490, USA, ROTHAB@MHS.UNC.EDU.

A simulation model based on the manufacturing environment of a Fortune 500 company is used to examine the impact of contingent employees on the total factor productivity of an assembly operation. This research will provide insights on the strategic decision process which defines the level and capability requirements of the contingent workforce. It will also indicate methods of increasing the overall line throughput, and lead to more accurate predictions of the capacity of the assembly operation during times of workforce fluctuation. Moreover, Miller and Vollmann's "Hidden Factory" can be revisited in terms of the transactions generated by high contingent turnover.

TUESDAY, 10:30 am - 12:00 noon Room: Balboa

TB6 Title: Project Management and Scheduling
Chair: Scott Swenseth, College of Business, University of Nebraska,

TB6.1 Analyzing Projects with Simulation, Scott Swenseth, College of Business, University of Nebraska, Lincoln, NE 68588, USA, SSWENSET@CHMAIL.UNL.EDU; Ronghua Shan, College of Business, University of Nebraska, Lincoln, NE 68588-0491, USA, RSHAN@UNL.INFO.UNL.EDU.

The use of simulation has grown tremendously with the recent advancements in software. However, while many systems have been improved, applications for project managers have lagged behind. This lag is due primarily to the inability to identify proper distributions. Data on previous projects is of limited value for estimating parameters for distributions in current projects. Further, when distributions are identified, they have been shown to generate results that differ significantly from traditional PERT calculations. The general acceptance of PERT results, therefore, creates skepticism in the project manager. The purpose of this study was to identify proper/acceptable distributions for modeling projects.
TB6.2  **Project Schedule Delays and Cost Overruns: Myths and Facts**, Mehdi Kaighobadi, Dept. Decision & Info. Systems, Florida Atlantic University, 220 SE 2nd Avenue, Ft. Lauderdale, FL 33301, USA, KAIGHOBA@ACC.FAU.EDU; Qing Hu, Dept. of Decision & Information Systems, Florida Atlantic University, 220 SE 2nd Ave, Ft. Lauderdale, FL 33301, USA, QHU@ACC.FAU.EDU; Larry Smith, Dept. of Dec. Sci. & Info. Systems, Florida International University, Miami, FL 33199, USA, LARRY7507@AOL.COM.

In this paper, we present some of the significant findings of a survey on project management. Our results indicate that most project managers agree that the leading cause of project schedule delays and cost overruns is the change of project specifications after one has started. While many believe that accountability of the project managers and cost/schedule estimators is a critical factor in project success, less that 11% of the respondents reported some kind of penalty policy for project managers in their organizations, and less than 6% reported this kind of policy for the estimators. It is concluded that the persistent schedule delays and cost overruns could be reduced only if a formal and systematic project planning and control mechanism is implemented in organizations.

TB6.3  **Modern Project Management**, Larry A. Smith, Applied Management Associates, 9611 Conchshell Manor, Plantation, FL 33324, USA, LARRY7507@AOL.COM.

Project Management in the 90's is significantly different than previous generations. With the rapid change of technology, globalization, new organizational structures and cultures, the adoption of project management as a methodology to help implement change has become a popular approach in corporate America. The paper will discuss the reasons for the changes that have taken place in the 90's and the role of project management as a change agent. The paper will also address the changing definition of project management in the 90's and the new definition of project management as it is evolving. There will be discussion of the research in the field as well as the author's experiences as a sponsor and champion of modern project management in corporations.

TB6.4  **Project Management Implementation**, Larry A. Smith, Applied Management Associates, 9611 Conchshell Manor, Plantation, FL 33324, USA, LARRY7507@AOL.COM.

The new philosophy of Project Management has been embraced by organizations of the 90's as a methodology of managing projects and programs effectively and efficiently. However, the commitment to using project management tools and concepts does not always translate into success in implementation. This paper addresses the requirements necessary for the successful implementation of project management tools and techniques. The paper explores the behavioral, organizational, and technical prerequisites for success. The presentation consists of the current research in the subject of implementation as well as the author's experiences in the field. Practical examples, issues, and cases will be presented and discussed.

**TUESDAY, 10:30 am - 12:00 noon  Room: Regency CR**

TB7  **Title:** Lotsizing Decisions  
**Chair:** Jaesun Park, Management Department, University of North Dakota

TB7.1  **Teaching on Lot-Sizing Decisions: An Integer Programming Approach**, Jaesun Park, Management Department, UND, P.O. Box 8377, Grand Forks, ND 58202, USA, JPARK@PLAINS.NODAK.EDU.

Determining the lot-size for materials with lumpy demand is a common subject in POM teaching. Among the more frequently taught methods are EOQ, POQ, and PPB approaches. All these methods do not necessarily generate optimal results. In this paper, a 0/1 mixed-integer programming teaching method in addition to the above methods, is proposed. This methodst always yields the optimal results, and therefore seems enhancing the understanding of the lot sizing decisions. The formulations are pretty straightforward, and software, such as LINDO, are readily available for use.

TB7.2  **A Tabu Search-Based Heuristic for the Multistage Lot-Sizing Problem**, Regina Esther Berretta, University of Campinas, C. P. 6101, FEEM, DENIS, 13081-970, Campinas - SP - Brazil; Paulo Moretto Franca, FRANCA@DENISES.FEE.unicamp.br, Vinicius Amaral Armentano.

We present a heuristic for solving the multistage lot-sizing problem with capacity resources and non-zero lead times. This problem deals with setting of a production plan for end item and its components in order to meet the forecast demand in each period of a planning horizon. The production plan should minimize the sum of production, setup and inventory costs. Resources are limited and setup times are considered. Our heuristic incorporates a Tabu Search procedure with diversification techniques. For small problems we compare our results to the optimal solution and for large problems to a lower bound.
TB7.3 Lotsizing Models for Rolling Horizons, Hartmut Stadler, Technische Hochschule Darmstadt, Institut fuer Betriebswirtschaftslehre, Fachgebiet Fertigungs- und Materialwirtschaft, D-64289 Darmstadt, Germany, STADTLER@BWL.BWL.TH-DARMSTADT.DE.

It is well known that an optimal solution to the dynamic single-level lotsizing problem (SLISP) is only a heuristic when applied in a rolling horizon environment (like in MRP II systems). Consequently, optimal solutions obtained by the Wagner/Whitin algorithm may be inferior to myopic lotsizing rules - like the heuristics of Silver/Meal and Groff. The main reason for the inferiority is attributed to the fact that optimization over a fixed planning horizon may lead to a suboptimal initial lotsize when a rolling horizon procedure is considered. The idea to circumvent this effect is based on a compensation for lotsizes which probably will cover demand beyond the planning horizon. Computational tests have shown that the Wagner-Whitin algorithm extended in this way now outperforms myopic lotsizing rules. Furthermore, we will demonstrate how general lotsizing models - like the (MLCISP) - can be extended to become insensitive to planning horizon effects.

TUESDAY, 10:30 am - 12:00 noon  Room: Regency CR

TB8  Title: Panel Discussion on Using Mastery Learning to Deliver the Core Course in POM  
Chair: Diane H. Parente, University of Mississippi, DPARENT@OLEMISS.EDU

Following a brief introduction to the concepts of mastery learning and competency-based grading, a course syllabus and guidelines will be created. The workshop will be conducted using active learning techniques. Attendees may use materials provided or bring their own syllabus from which to work.
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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 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 publishes high quality articles in its journal *Production and Operations Management*, holds annual meetings; facilitates communication among its members for sharing ideas that impact teaching, research and practice through the newsletter - *POM Chronicle*, E-mail, HOME page, and local level seminars and colloquia.

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 also publishes special issues on topics of current interest. It published two special issues on Total Quality Management in 1994 and 1995; and a special issue on Manufacturing Strategy in 1996. Another special issue on Global Supply Chains will be published in 1997.

Annual Meetings: POMS' annual meetings provide a forum to POM professionals for interaction on topics of importance to the POM field. The meetings include contributed papers, workshops, plenary sessions, tutorials, and panel discussions. The meetings have also benefitted from the participation of many executives.

Newsletter/Electronic Bulletins: *POM Chronicle* is the official newsletter of the Society which is published three times a year to serve as a medium of communication and to provide a forum for dialogue among its members. POMS started two e-mail bulletins on continuous placement service and funded research grants in 1996. In addition a new e-mail bulletin on POM teaching is planned in 1997.

Membership: POMS membership spans over 41 countries across the world. US members account for about 75% of all members.

For information, contact: Professor Sushil K. Gupta, Past President and Executive Director - POMS, PC 543, Florida International University, Miami, Florida, 33199, USA. Phone: (305) 348-1413. Fax: (305) 348-1908. E-mail: POMS@FIU.EDU.
Production and Operations Management Society
Florida International University
University Park, PC 543
Miami, Florida 33199
USA