The News/Discussion Magazine of the Production and Operations Management Society

POMS CHRONICLE

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FIRST ISSUE 2010

IN THIS ISSUE

Upcoming Conferences

Twenty-second Annual Conference of POMS
April 29—May 2, 2011, Reno, Nevada USA
See http://poms.org/

Marshall Fisher
POMS President
The Wharton School
University of Pennsylvania

It was my great pleasure to have assumed the presidency of POMS at the May 2010 Vancouver annual meeting. POMS is a society with which I have had a long history and for which I have great affection.

I was actually present at the birth of POMS. I was President of The Institute of Management Science in 1988-89 when Kal Singhal approached us with his idea of starting a journal and society focused on operations management. At the time, TIMS was contemplating starting its own journal on operations, so to be frank we were a little cool on the idea of competition, and a little skeptical towards this 'upstart' new society. We thought "we are the 'big kids on the block'; why do we need another society?" I must say that the ensuing two decades has shown the wisdom of Kal's vision and completely laid to rest our initial skepticism.

During this period, I've had the pleasure of watching POMS 'grow up,' and helping some in this process, speaking at many conferences, publishing in the POM journal, cofounding with Ananth Raman, the College of Supply Chain Management and serving on the Board.

Today, POMS has emerged to be in my opinion the leading operations management society in the world. We have great conferences. Our 2010 Annual Meeting in Vancouver was attended by people from 45 countries and featured over 1000 presentations. POMS also co-sponsors conferences all over the world, such as the 4th World Conference on POM in Amsterdam in 2012.

Our journal *Production and Operations Management* is the only operations management journal to be listed on both the Business Week and the Financial Times lists of leading management journals.

It's been only about five years since we formed our first two colleges, on Supply Chain Management and Service Operations, and yet POMS now has 6 highly active colleges, on Healthcare Operations, Human Behavior in Operations, Product Innovation and Technology Management, Service Operations, Supply Chain Management, and Sustainable Operations. And plans are in the works for yet another College, on Humanitarian

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EDITORIAL TEAM

POMS Chronicle is published by the Production and Operations Management Society to serve as a medium of communication and to provide a forum for dialogue among its members.

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POM Journal

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Featured Associate Editor

Bo van der Rhee

Nyenrode University, Netherlands

Bo manages the "Awards" area. Please note all the awards received by our members, as highlighted herein by Bo!

Dr. van der Rhee is Assistant Prof. at Nyenrode's Center for Marketing and Supply Chain Management. His skills and interests cover multiple research methodologies, and his main research topics are Product Innovation and Supply Chain Management.

Bo won a recent teaching award at Nyenrode and has developed and taught courses such as Statistics for Business, Management Science, Operations Management, and Supply Chain Management.

Van der Rhee received a Master's of Science in Econometrics and Operational Research from the VU (Vrije Universiteit) in Amsterdam and obtained his PhD at the University of Utah (2007). His dissertation was titled "Competition and Innovation in Technology Driven Markets".

Submit articles, news, announcements, and other information of interest to the editor:
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Electronic copies of current and past issues of POMS Chronicle are available at: **www.poms.org**

FROM THE EDITOR: (HOW) ARE YOU APPLYING OP'S PRINCIPLES TO YOUR PERSONAL LIFE?

Glen Schmidt
David Eccles School of Business, U. of Utah
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When I last checked, the most-read and most-discussed article in the July-Aug 2010 online issue of Harvard Business Review was "How will you measure your life," by Clayton Christensen of the Technology and Operations Management group at Harvard. The article represents his response to the HBS class of 2010, who asked him to discuss how to apply management principles to their personal lives.

I suspect a good number of us do something similar with our students – that is, I suspect we collectively have numerous examples of how one can apply the principles of OM in one's personal life, or on a larger scale, to societal decisions.

Personally, I like to use the Newsvendor framework to motivate such a discussion. The newsvendor is all about managing the risk that an outcome ultimately exceeds or falls short of our expectation. This is commonly described in the context of customer demand coming in higher or lower than expectation.

But conceptually, I think there are many other relevant applications. For example, say we want to determine how far we should go in addressing the question of global warming (i.e., we want to determine how many units of "initiative" to stock—for example, one unit of "initiative" could be defined as replacing an average coal power plant with wind energy).

Let's say the goal is to limit the year-2100 global increase in temperature to 1.5 C (see climateinteractive.org). But the problem is that we don't know exactly how many units of "initiative" will be demanded (needed) to achieve this goal. Further, let's assume there is a very small chance that global warming is all a hoax and we can proceed with business-as-usual (zero units of initiative are needed); there is some expected (positive) number of units of initiative needed to reach the 1.5 C goal; and there is a very small chance that some huge number of initiatives (e.g., driving carbon emissions fully to zero) is needed.

We might then estimate the costs of overage and underage with regard to stocking these initiatives—that is, we would determine the cost of us doing too much to repeal global warming (this would be an economic cost to the current generation) and the cost of doing too little (reflecting a cost to future generations). We can now solve for the optimal number of initiatives.

While we can't predict exactly what will happen with regard to global warming, the Newsvendor model suggests that we might still find a way to manage the risks. Even though we can't necessarily agree on the impact of global warming, the model offers one possible way to frame the problem and determine appropriate actions.

Collectively, we might find many more examples of where the model could be used—maybe it could even help a student determine whether to ask another student out on a date!

Don Wardell of the U. of Utah offers another example of how to apply Operations principles – in this case the principles of quality management – to people's personal lives (his ideas stem in part from reading Seresketter, 2004). He asks students to identify items in their lives that they would like to improve, and asks them to find concrete ways to measure their progress on these items over time. He suggests they link their action plans to Deming's ideas, along with the concepts of Customer Focus, Leadership, Strategic Planning, and Human Resource Focus. He also insists they include some kind of data analysis in their project.

Helping students think about how to apply Operations principles to their personal lives may be one way to "sell" students on the value of our tools, which unfortunately, is a position in which I perceive we may too often find ourselves at the start of a course. If you have other examples of how you or others show the widespread relevance of our frameworks, please offer them for publication in a future issue of the *Chronicle*, or post them on the POMS web blog at POMS.org, or disseminate them in some other forum.

As evidenced by the request of the HBS class, students respond to these types of applications and examples. The more we can show the widespread relevance of our frameworks, the better off will be our students, our society, and the prestige of our profession.

References: Sergesketter, Bernard F. "Create a Better Life with Quality Tools, Quality Progress, Aug. 2004.

(Continued from page 4)

in leading professional journals.

His research has centered on the analysis of both tactical and strategic problems arising in OM. Specific areas of application have included inventory management, process improvement, production planning, supply chain management, and the use of quantitative modelling to aid in decision making.

Dr. Silver received the Operations Research Division Award of the Institute of Industrial Engineers in 1986, the Award of Merit of the Canadian Operational Research Society (CORS) in 1990, became a Fellow of the Institute of Industrial Engineers in 1995, was one of the three inaugural Fellows of the Manufacturing and Services Operations Management Society in 2000, became a Fellow of the International Society for Inventory Research in 2000, won the President's Circle Award for Research and Creativity Excellence at the University of Calgary in 2002, became a Fellow of the Institute for Operations Research and the Management Sciences in 2003, and received the Harold Larnder Memorial Prize from CORS for distinguished international achievement in the field of Operational Research in 2007. Several of his students have won awards for papers based on thesis and project work.

He has visited at the U. of Auckland (New Zealand), Ecole Polytechnique Fédérale de Lausanne (Switzerland), Stanford U, Xi'an Jiaotong U. (China), the Institute for Advanced Studies in Vienna (Austria), U. of Canterbury (New Zealand), the OR Society of New Zealand, the Tokyo Institute of Technology and Kyoto U. (Japan).

He was the President of the Canadian Operational Research Society in 1980-81 and the International Society for Inventory Research in 1994-96 and served as Chairman of the Grant Selection Committee for Industrial Engineering of the Natural Sciences and Engineering Research Council of Canada.

Congratulations to Professors Pinedo and Silver!

NEW POMS FELLOWS

(Continued from page 1)

Operations and Crisis Management, lead by Aruna Apte, Martin Starr and Luk Van Wassenhove. The colleges hold mini conferences before or after the annual conference, often with industry speakers. They provide a smaller, cozier focus group within POMS and a window on the world as to what's happening on selected issues. Membership in one college is included in your POMS membership, so if you haven't done so, please have a look at the portfolio of colleges and consider choosing one to become involved with.

And last but not least, due to monumental efforts over the last year by Wally Hopp during his POMS' presidency, executive director Sushil Gupta, and VP of Communications Christian Terwiesch, the POMS web site has been substantially strengthened to be a real resource for operations management academics and practitioners. For example, this month's OM Blog page as includes articles on topics as diverse as managing inventory by tweets to the right speed for ambulances. If you haven't done so recently, please go to www.poms.org and have a look. I think you will be very impressed.

These impressive milestones are due to editor-in-chief Kal Singhal, Executive Director Sushil Gupta, Associate Executive Director Chelliah Sriskandarajah, and a small army of volunteers who serve in many roles. Leading the list of volunteers is Wally Hopp, who has done an absolutely stellar job over the last year as POMS President; Wally will be a tough act to follow!

An obvious question is, given all of these accomplishments, where do we go from here? I am struck that 1) operations in the last 3 decades has become global, as companies moved their manufacturing to low labor cost regions like China, India, Africa and Latin America and 2) POMS has chapters or presence in exactly these regions, yet we don't seem to be leveraging our global footprint to study global operations issues.

President-elect Luk van Wassenhove and I are working with chapter presidents and regional vice presidents to first brainstorm ideas on how to leverage our global footprint to better understand global operations and then start to implement some of the better ideas. One obvious idea is to have more sessions at our annual meeting about global operations. These sessions could address both issues faced by Less Developed Countries such as China, India and Brazil, seeking to grow their economies through manufacturing and by companies in developed economies seeking both supply and markets in the LDC countries. Some of these sessions might evolve into special issues of our journal.

I would love to hear your thoughts and suggestions on this idea. Please send them via e-mail to poms@fiu.edu, with POMS Global Operations as the subject. Thanks and I look forward to hearing from you.

Marshall Fisher, POMS President

POMS Fellows; Michael Pinedo and Edward Silver

Designation as a POMS Fellow is the most prestigious honor awarded by the Production and Operations Management Society, and is given for life. It is intended to recognize POMS members who have made exceptional intellectual contributions to our profession and Society through their research and teaching. Although loyal service to the Society, in administrative, elected, or editorial assignments, is not by itself a sufficient qualification for this award, it can strengthen the case of a member who has also become a thought-leader in our field.

New POMS Fellows are Mike Pinedo (pictured at left) and Edward Silver (pictured below).

Michael Pinedo is the Julius Schlesinger Prof. of OM and Chair of the Dept. of Information, Operations, and Management Sciences at the Stern School of Business at New York U. He received the Ir. degree in mechanical engrg. from the Delft University of Technology, the Netherlands in 1973 and the M.Sc. and Ph.D. degrees in Operations Research from the U. of CA at Berkeley in 1978.

From 1982 to 1997 he taught in the industrial engineering and operations research department at Columbia U. He taught at the Instituto Venezolano de Investigaciones Cientificas (Caracas) from 1978-80 and at Georgia Tech from 1980-82.

His research focuses on the modeling, planning and scheduling of production and service systems.

He has authored many technical papers; the text "Scheduling: Theory, Algorithms and Systems", and coauthored "Operations Scheduling with Applications in Manufacturing and Services" and "Queueing Networks: Customers, Signals and Product Form Solutions". He is co-editor of "Creating Value in Financial Services: Strategies, Operations, and Technologies".

Over the last decade he has been involved in industrial systems development. He supervised the design, development and implementation of two planning and scheduling systems for the International Paper Company. He also actively participated in the development of systems at Philips Electronics, Siemens, and at Merck.

He is editor of the *Journal of Scheduling*, AE of *Management Science*, AE of *Interfaces* and SE of *M&SOM.* He has been an area editor of *OR* (covering stochastic processes) and DE of *IIE Scheduling and Logistics* (covering scheduling).

Edward Silver is a Faculty Professor and Professor Emeritus in the Operations Management area at the Haskayne School of Business, U. of Calgary, holding the Carma Chair in Management from 1991 until retiring in 2002. He received his Bachelor of Civil Engineering from McGill U. and his Science Doctorate in Operations Research from MIT, and taught at the College of Business Admin. at Boston U. and in the Department of Management Sciences at the U. of Waterloo.

Dr. Silver has been the lead author of three editions of the widely adopted and cited book, Inventory Management and Production Planning and Scheduling. He has published 163 articles

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SKINNER AND STARR AWARDS

The Wickham Skinner Awards are intended to encourage POM scholarship and publication, to promote significant research in the field, to reward academics who have achieved unusually high accomplishment early in their careers, and to facilitate the sharing of innovative new ideas about teaching POM.

Best paper published in *POM*

Beginning in 2010, this award is given for the best paper published in *Production and Operations Management* during the previous year. Papers are judged on overall quality with careful attention given to both relevance and rigor.

This year's winner is "Co-opetition and Investment for Supply-Chain Resilience" *Production and Operations Management* 18(6), p 583-603 by Nitin Bakshi (left), LBS and Paul Kleindorfer (right), INSEAD

This very timely paper studies the interaction between firms that need to invest into disaster mitigation strategies and agree on how to allocate benefits of such investment. The analysis highlights the shortcomings of a decentralized supply chain that faces the common threat of significant supply chain disruptions and it provides strong rationale for paying more attention to coordinating supply chains around the security or natural disaster threats they face. In addition to providing a novel application of the Harsanyi–Selten–Nash bargaining framework, the paper addresses a very timely topic of disruption management. In this sense, the paper goes outside of the usual OM boundaries to model the problem and it provides useful insights. This paper was deemed by far the most novel by the panel of judges in terms of its topic as well as in terms of the modeling approach.

Committee: Serguei Netessine (Chair), Karen Donohue, Amiya Chakravarty, Michael Lapre; Suresh Sethi; Cheryl Gaimon, Panos Kouvelis, Vish Krishnan, Christian Terwiesch; Aleda Roth, Costis Maglaras, Michael Pinedo; Hau Lee, Eric Johnson; Jay Swaminathan, Vinod Singhal, Luk van Wassenhove, George Shanthikumar, Chris Tang, Ozalp Ozer, Uday Apte, Rachna Shah.

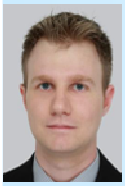
Teaching Achievement Award

This award recognizes impact and innovation in POM instruction. Judges give primary attention to evidence of: (1) pedagogical excellence, (2) creativity and/or innovation and (3) impact.

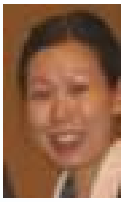
The committee selected Rolando Tomasini (left) and Luk Van Wassenhove (right) in recognition of their series of cases, articles, reports, and courses developed on Humanitarian Logistics. Together they have published 30 case studies, 15 articles, reports, and a book. Their material has been widely adopted by several schools including INSEAD, Georgia Tech, Hanken, Cranfield, Georgetown, and Dartmouth. Several humanitarian organizations like United Nations Joint Logistics Center and the International Federation of the Red Cross have adopted the material for their internal management training. As we hear of disasters in countries such as Haiti and Chili, it is gratifying to know that members of our profession are turning their skills to contribute to addressing the OM issues related to meeting humanitarian needs.

Emerging Economies Young Researcher Award

The Emerging Economies Young Researcher Award (EEYRA) has been created to establish institutional linkages to reach out to future scholars in emerging economies, and to encourage their development and connection to POMS.



One recipient, Edivandro Carlos Conforto, has a B.Sc. in Business Admin. Science (FAM) and a Master in Production Engineering at the Engineering School of São Carlos, U. of São Paulo, Brazil. He is a PhD candidate in the same institution in the product development and project management area. His PhD thesis is on the investigation of new approaches to managing innovative product development projects in turbulent and dynamic business environments and their correlation with product development management performance. His research theme also includes investigation of agile project management practices and techniques applied to innovative product development process, R&D projects, research institutes and technology-based companies. His POMS conference talk was "Agile Project Management and Innovative Product Development: Benefits and Challenges of Two Companies from São Carlos Tech-Pole, Brazil."



Ailie K.Y. Tang is a Ph.D. student in the Dept. of Logistics and Maritime Studies, The Hong Kong Polytechnic U. She received a BBA (First Class Honors) degree from the City U. of Hong Kong. Her current research interests include environmental management and retail operations. Her dissertation research in progress is "Green retailing and its success factors: construct measurement and examination of the performance contingencies on organizational capabilities."

Martin K. Starr Excellence in POM Award

Unanimously selected from among a slate of excellent candidates is Dr. Krishan Kumar, Director of Maruti Automotive Center of Excellence since 2007. He has made outstanding contributions to the performance and business growth of Maruti-Suzuki India Ltd. through his innovative ideas in improving quality, productivity and competitiveness. This benchmark automobile company is one of India's leading automobile manufacturers and the market leader in the car segment, both in terms of volume of vehicles sold and revenue earned. It is the largest automobile manufacturer in South Asia.

Please refer to http://www.poms.org/K_Kumar_CV_for_%20Program_Book_Final.pdf for complete announcement.

Left to right: Marshall Fisher, Martin Starr, Krishnan Kumar, and Sushil Gupta.

COLLEGE AND CONFERENCE AWARDS

College of Supply Chain Management, Best Student Paper

Awards were based on the students' papers and their presentations during the POMS 2010 Conference in Vancouver, BC.

1st Place: Wenjie Tang, INSEAD, "Synchronizing Global Supply Chains: Advance Purchase Discounts". This paper demonstrates that advance purchase discounts in decentralized supply chains enable self-enforcing information sharing to improve the profitability of all agents in the supply chain. The authors apply their policies to a U.S-based fashion-apparel wholesaler, yielding an excellent combination of analytics, insights and application.

Runners-Up: Brent Moritz, U. of Minnesota, "Cognition and Individual Differences in the Newsvendor Problem: Behavior Under Dual Process Theory".

Tharanga Rajapakshe, U of Texas at Dallas, "Designing Dedicated Transportation Subnetworks: Deadheading vs. Lane Sharing".

Finalists: Sripad Devalkar, U. of Michigan, "Integrated Optimization of Procurement, Processing and Trade of Commodities".

Veronica Villena, Instituto de Empresa Business School, Madrid, Spain, "The Dark Side of Collaborative Buyer-Supplier Relationships: A Social Capital Perspective."

Left to right: Brent Moritz, Verónica Villena, Tharanga Rajapakshe, Wenjie Tang, and Sripad Devalkar.

Award Committee: Mike Fry and Srinagesh Gavirneni (co-chairs), Enno Siemsen, Gil Souza, and Greys Sosic.

College of Sustainable Op's, PhD Proposal Award

The winner is: "Last Mile Vehicle Fleet Management in Humanitarian Operations", by Alfonso J. Pedraza Martinez (picture at right), advised by: Luk N. Van Wassenhove, both at INSEAD.

Award Committee: Vedat Verter (chair), Charles Corbett, Mike Ketzenberg, and Joe Blackburn.

College of Healthcare, Best Student Paper

The winner is: David Dobrzykowski (picture at left), with co-author/advisors: T.S. Ragu-Nathan & Mark Vonderembse), all from the University of Toledo.

Committee: Paul Gemmel, Gino Lim, and Anita Tucker.

College of Healthcare, Best Full Paper

The winners are: Roy Stratton (left), Nottingham Business School & Alex Knight (right, QFI Consulting)

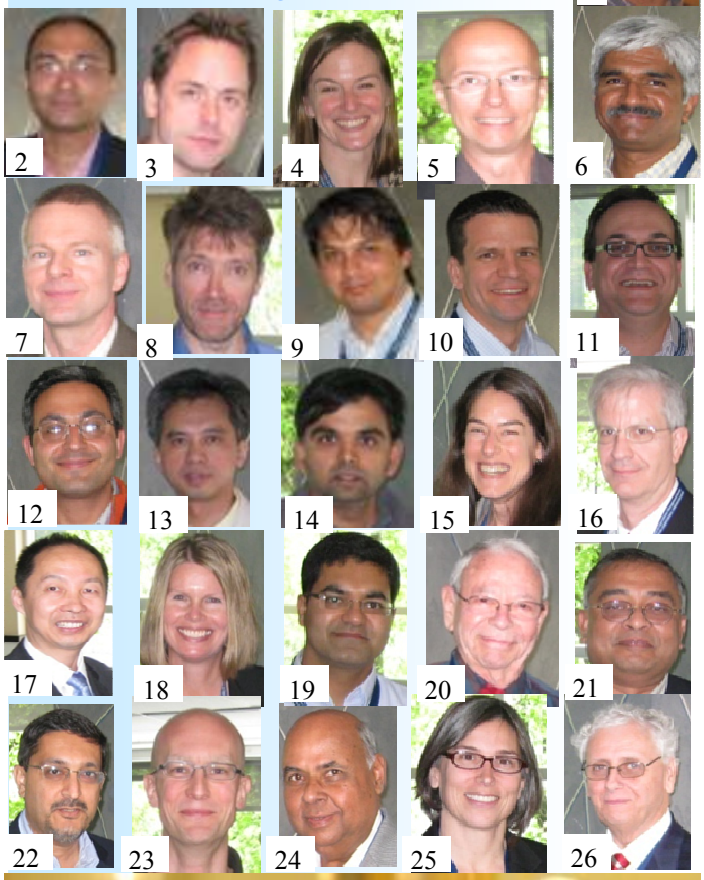
Award Committee: Vikram Tiwari, Mark Vonderembse, Anita Tucker, Gino Lim.

POMS Conference organizer Awards

Perhaps not "awards" in the traditional sense, but these are some of the people who made the POMS Annual Conference happen! There are too many to name, but go ahead and browse the pictures to see if you are in one of them, and see if you can name everyone!

In fact, let's start here what will hopefully become a new tradition in the Chronicle—a competition. The first person to correctly name all 26 people below will receive a prize (e.g. a 1-year POMS membership?) Send to b.vdrhee@nyenrode.nl. Good luck!


1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POMS COLLEGE OF PITM AWARDS AND NEWS

College of Product Innovation and Technology Management (PITM)

Submitted by Jane Davies

Judge Business School, Cambridge University

Events held in conjunction with the POMS Conference in Vancouver were as follows.

A "Meet the Editors" session, jointly sponsored with the College of Sustainability, highlighted three upcoming *POM* special issues: 1) Integrating Innovation in Distributed Environments edited by Edward Anderson and Geoffrey Parker; 2) Technology Commercialization and Startup Operations edited by Nitin Joglekar and Moren Levesque; and 3) New Product Development, Innovation and Sustainability edited by Mark Ferguson, Glen Schmidt, and Gilvan Souza. Editors highlighted their visions and timelines for each issue, followed by an interactive discussion with the audience. The importance of both theory building and providing managerial insights were highlighted, as well as an openness to a variety of methodologies for submissions to the special issues.

"Fellows lectures" were given by the 2008 PITM fellow Cheryl Gaimon (Georgia Tech) and the 2010 fellow Christoph Loch (INSEAD).

First Cheryl Gaimon provided a retrospective of the field through her 30-year career in technology management. Emphasizing that technology choice is an important endogenous decision variable in achieving competitive advantage, Cheryl described how management of technology had evolved as a discipline. She highlighted some of the important contributions technology management research had made including; understanding the dynamic issue of how the cost and price of technology change over time, recognizing the need to focus on profit maximization and pricing strategies rather than just cost minimization, and identifying the important function flexible technology plays when making investment decisions. She also emphasized the need to consider technology within the broader set of resource capabilities, particular the impact technology changes and upgrades have on the workforce both in terms of disruptions and skill enhancement. Management of technology provides opportunities for research from multiple disciplines utilizing multiple methods as demonstrated by the variety of articles published by the Management of Technology department of the POMS journal. From her experience, Cheryl stressed the importance of personal interests in choice of topic and how her own research interests had been driven by her knowledge from working first hand with companies.

Christoph Loch continued to emphasize the importance of personal experience as he took a forward looking view of the field of innovation. He stressed the need to identify practical problems when defining the context for research. The recognition by companies of innovation as a lever for competitive advantage had been increasing, however, the community of innovation scholars, although growing, had not kept pace with the need for supporting research. Christoph identified a number of reasons for this gap. First, innovation research is harder than other areas of operations because of the complex, ambiguous nature of translating ideas to a recipe for production. Secondly, it is multi-disciplinary in nature, needing to draw from the fields of marketing, organizational behaviour and strategy as well as operations.

Finally, there is often a lack of data and a need to use multiple methods in innovation research. Christoph noted though that this offers an opportunity to look at some exciting problems that companies actually want answers for. OM scholars are well positioned and have the capabilities to address these problems, but he noted this would involve collaborative research with a consideration of literature in other fields, the application of multiple methods and keeping companies in the feedback loop.

PITM Fellow

Christoph Loch was recognized as the 2010 PITM Fellow (shown here with Award Committee Chair Cheryl Druehl). Christoph is the GlaxoSmithKline Chaired Professor of Corporate Innovation and Professor of Technology and Operations Management at INSEAD.

Professor Loch has been crucial in building the New Product Development community through his contributions as a pioneer, a distinguished researcher, a devoted mentor and a link between academics and managers. He has repeatedly broken new ground and redefined his research topics, such as behavioral operations, using psychology, emotions and status to explain the behavior of the people involved in NPD and R&D. He has published over 50 papers and 7 books.

Professor Loch should also be recognized for his tremendous contribution to our field through his service. He has held several editorial positions, including Department Editor for New Product Development, R&D and Project Management at *Production and Op's Management,* Department Editor for Technological Innovation, Product Development and Entrepreneurship at *Management Science*, and Senior Editor for *Manufacturing & Service Op's Management.*

The Award Committee consisted of: Cheryl Druehl, George Mason University, Chair (on the left); Stylianos Kavadias, Georgia Tech; and Jürgen Mihm, INSEAD.

This was followed by the announcement of the newly elected officers for 2010-11. Outgoing president, Nitin Joglekar, gave a special message of thanks to the outgoing team of Thomas Roemer (UCSD), Geoffrey Parker (Tulane), Cheryl Druehl (George Mason), Glen Schmidt (Utah), and Stelios Kavadias (Georgia Tech) for their work and achievements during the last two years.

The new slate of officers is:

President: Glen Schmidt (University of Utah)

Treasurer: Cheryl Druehl (George Mason University)

Secretary: Tyson R. Browning (Texas Christian University)

VP-Honors and Awards: Jürgen Mihm (INSEAD).

VP-Meetings: Raul O. Chao (University of Virginia)

VP- Special Events: Enno Siemsen (University of Minnesota)

COLLEGE OF SERVICE OP'S AWARDS AND NEWS

Rich Metters, College President

The 5th conference of the POMS College of Service Operations was held in conjunction with the main POMS conference in Vancouver. However, our venue was the Segal Graduate School of Business, Simon Fraser University, a short walk from the conference hotel.

Award Winners

Two people were given the "Lifetime Achievement Award" for research in Service Operations.

Chris Voss, London B-School, has published over 50 journal articles and done path-breaking work in the design of service experiences and international services. Chris is at the right in picture at left, receiving the award from Rich Metters, College President.

Sheryl Kimes, Cornell U, has also published over 50 journal articles, all in service operations, with over 30 articles on revenue management. Sheryl was teaching the day of the award ceremony, so her colleague Rohit Verma put on a Sheryl Kimes "mask" to accept the award in her honor (photo at right).

The award for "Most Influential Service Op's Paper in *POM*" went to Larry Menor and Aleda Roth for "New Service Development Competence and Performance: An Empirical Examination in Retail Banking." *POM*, 17(3), 2008, 267-285. Larry is shown receiving the award from Rich.

Conference Presentations

Our focus was to hear from practitioners. Jim Spohrer, Director, IBM University Programs spoke to the group about the IBM initiative, Service Science. Graham Kee, VP, Olympic Operations, Port Metro Vancouver, talked to us about the planning involved in bringing the Olympics to Vancouver.

Rohit Verma, Cornell University, spoke on a program at his school to link scholars with practitioners: "Effectively Connecting Academic Scholars with the Industry – Some Ideas from the Cornell Center for Hospitality Research". An academic from Services Marketing, Stephen Tax, University of Victoria, spoke on "Breaking Free From Services Marketing."

The afternoon sessions were populated solely by practitioners. Joanne Stan and Ann Brown, Change Initiatives, Providence Health Care, talked about the difficulties of creating operational change in health care.

Finally, we adjourned from Simon Fraser University to the Fairmont Hotel to get a walking, high-touch tour of the back rooms, tunnels, kitchens, and other areas of the Fairmont that customers just don't see. A focus of was the commitment the Fairmont has to sustainable operations.

Next Year: Ithaca, New York

The 2011 conference will not be at the same site as the annual POMS conference. Instead, the School of Hotel Administration, Cornell University, will host our conference June 2-5, 2011 in Ithaca.

(Continued from page 19)

Accounting Review
Administrative Science Quarterly
American Economic Review
Harvard Business Review
Information Systems Research
Journal of Accounting Research
Journal of Business Ethics
Journal of Consumer Research
Journal of Finance
Journal of Financial Economics
Journal of Marketing
Journal of Marketing Research
Management Science
Marketing Science
Operations Research
Production and Operations Management
Review of Financial Studies
Strategic Management Journal

MORE PATIENTS ARE COMING: SOMEBODY MAKE MORE DOCTORS!

Serhan Ziya
Department of Statistics and Operations Research
University of North Carolina
Chapel Hill NC

No matter where you stand on the new healthcare bill signed into law in the United States, there is one thing we can all agree on: *demand for healthcare services will not be going down anytime soon*. This seems to be a no-brainer but in case you need empirical support for this conjecture, there is one.

As most of the readers might know, before the passage of the bill, the state of Massachusetts already had a mandate on its residents to have health insurance. The law was enacted in June 2006 and within six months approximately 114,000 additional people were enrolled for health insurance. This number jumped to 408,000 by June 2009, which corresponds to an increase of approximately 8% within three years (Health Care in MA, 2009).

Now, surely making healthcare available to a larger pool of people is an excellent outcome, but there is no denying that the sudden jump in demand significantly increased the operational burden, given inadequate supply [8]. (I am not sure how big or small 8% sounds to you, but it is important to remember that its operational effects are probably not linear. Just to get an idea, remember the average waiting time expression for a stable M/M/1 queue.)

What MA lived through will be more or less replicated all around the US... a huge demand particularly for primary care.

I do not think it takes a major leap of faith to conjecture that what Massachusetts lived through will be more or less replicated all around the United States over time once the new legislation that makes it a federal requirement to obtain health insurance is enacted. According to the estimates of the Congressional Budget Office, the number of insured will increase by about 32 million by 2019 and this will create a huge demand particularly for primary care within the next decade.

The problem of course is that it is unlikely that the physician supply will catch up with this new patient demand since reports published within the last few years have already indicated severe shortages that are expected to get worse even when the 32 million additional patients are ignored (Arvantes, 2007, Blumenthal, 2004, Cauchon, 2005, York, 2007). Furthermore, one of the most problematic specialties is primary care and the problem appears to be more significant in rural areas. Just go online and search the words "physician shortage" together with the name of your state and you are more likely than not to come across a report or a news article that discusses the physician shortage problem in your state.

So, here is a problem that no doubt deserves a lot of attention. We have a service capacity that is already insufficient at least in certain regions because of the non-homogeneous distribution of physicians across the United States and we have demand for this insufficient capacity that is projected to increase significantly and gradually within the next decade. The fundamental question is the following: How can we ensure that the 32 million newly insured people will have proper access to healthcare, and not just health insurance? How can we ensure that people who already have proper access will continue to do so?

The answers to these questions will likely be one of two types: we can do things that will increase physician supply or we can do things that will better utilize the available capacity. To increase supply, there should probably be efforts to produce more doctors, incentives for more doctors to choose primary care as a specialty, and also choose to reside in rural areas. But even when the right incentives are there, it would probably be years until the desired outcomes are realized and even then I believe it is safe to assume that physicians will not be in ample supply. This means that the question of how to efficiently use the available capacity is here to stay.

We, as OM scholars or practitioners, have a lot to contribute to the efforts in improving access to healthcare. For example, we can use queueing theory together with simulation to understand the effects of increases in patient demand and to estimate the capacity needed to meet future demand. We can use the theory on facility location to help determine the optimal location of new healthcare facilities. We can use queueing theory and/or dynamic programming to design new appointment scheduling systems or devise new algorithms for scheduling appointments.

There is already a vast literature on most of these problems but there is also a lot more to work on. There is a need to develop more realistic models which can lead to results and methods that are more relevant to practice. As scholars, we also need to do a better job in making the available theory more accessible to practitioners.

Areas that I am relatively more familiar with (because of my research interests) are capacity analysis and appointment scheduling, which have a lot of potential for practical impact. The appointment scheduling literature dates back to 1950s, but there appears to have been a renewed interest in the topic in the last few years and a number of interesting articles have appeared recently.

One important fact that researchers have recently started to incorporate in their models is that a very high percentage of patients do not show up for their appointments and their chances of showing up highly depend on their appointment delays, i.e., number of days between their call for an appointment and the appointment day. This is an especially important issue considering that clinics are very likely to face increasing demand levels in the coming years. Because there will be more demand, appointment delays will be longer, which in turn will result in higher no-show rates and a waste of the physician's time.

Appointment delays will be longer, which in turn will result in higher no-show rates.

To minimize no-shows and provide timely service to their patients, in the last few years, many clinics have adopted a new paradigm, which is called Open Access or Advanced Access, and which essentially calls for seeing today's pa-

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SOMEBODY MAKE MORE DOCTORS! (CONT.)

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tient today and avoiding scheduling appointments for a future date except under some special circumstances.

But by doing away with appointments for future dates, there is no mechanism to smooth out the load on the clinic, and as a result there can be significant variability in the daily patient load. In order to avoid going beyond the daily capacity frequently, doctors need to choose their panel sizes (i.e., the number of patients each doctor commits herself or himself to providing services for as they need it) carefully.

That is of course no simple matter, but Green, Savin, and Murray (2007) and Green and Savin (2008), propose two different formulations that can be used to estimate the ideal panel size for Open Access implementations. They do not provide a magic formula that can work perfectly for all clinics. After all, the estimates come from a mathematical model that is built on certain assumptions, which cannot be expected to be universally true. However, their work is a very important step forward and appears to have generated a lot of interest from hundreds of clinics which contacted the authors for help in using their model. The authors now have a website (www.panelsizer.com) to support the use of their model.

Hundreds of clinics contacted the authors for help in using their model. (www.panelsizer.com)

The work of Green and Savin (2008) is an excellent example for the type of research we need to be doing in order to meet the capacity challenges we will be facing in healthcare delivery, but there are many remaining questions for us to investigate. One important issue is regarding whether it would be feasible for all clinics to implement Open Access in the first place. Considering the increasing patient demand, this may not be likely. It might simply be impossible for some clinics to limit their panel sizes at the suggested levels and this might push them to schedule appointments into the future.

Coming back to the example of Massachusetts, Sack (2008) talks about a particular doctor in Amherst, MA, who had a panel size of 3,000, well beyond what is widely accepted to be ideal, and a waiting time for a physical of more than a year. This certainly does not look like a desirable situation. Simply pushing work into the future does not really solve the problem, but Open Access does not seem to be an option for this particular doctor either. Thus, it is important to develop appointment scheduling algorithms that will find the "right" balance between scheduling appointments too far into the future and seeing today's patients today. Perhaps, for some clinics, it is better to implement an Open Access-type policy that has more flexibly by adopting the policy of seeing patients within 5 days as opposed to one day. Liu, Ziya and Kulkarni (2010) investigated some of these issues and proposed some policies, but more work is needed, particularly to incorporate the non-stationary demand patterns that are typically observed in healthcare.

Looking at the rapidly increasing number of sessions on healthcare at POMS and INFORMS conferences every year and the newly established "Healthcare Operations Management" College at the POM journal, I have a hunch that I am not the first to say that healthcare provides many opportunities for our field to make an impact. We are already equipped with the right tools. It is now time to use them on something that definitely needs improvement.

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Endnote

Parts of this article were extracted from "Bargaining Chains" by W.S. Lovejoy, a University of Michigan Ross School of Business working paper that has been submitted for publication.

REFLECTIONS ON THE STATE OF OM

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I was recently asked by Elliot Bendoly to reflect on our area. As an emeritus professor one has the time and perspective to look both at the state of Operations Management (OM) today and its development over the years.

When my father, who was a physician, retired, he commented on the fact that when he started, he covered all the specialties required for pathology; when he retired these needed four or five specialists. I see the same in OM today, the field has many areas and OM professors frequently specialize in a narrow field of focus and methodology. Such trends in medicine or OM can lead either to fragmentation and rivalry, or to cohesion and collaboration. As I will discuss later, I am not sure in which way OM is moving.

Over time, OM has built on its roots in many areas in engineering and the early days of *Operations Research* (*OR*) (see the special issue of the *Journal of Operations Management*, 2007 (25)2). Over time it has been strongly influenced by a wide range of disciplines including mathematical modeling, strategy, economics and most recently behavioral science and ethics.

All have helped to build up the area. It is natural that we have both specialization and collaboration. In parallel it has moved from its original base in manufacturing to include services, project management, supply chain and logistics.

A second important area of diversity is in research methodologies. OM from its foundation has been a mixture of many quantitative and qualitative; modeling and empirical methodologies. All have contributed to the growth of theory and practice of OM. I delight in the richness and contribution of the area.

However, I see symptoms that cause me to worry. The first is the separation of much research from practice. In 1984 I published a paper on the "lot size algorithm industry", where I analyzed and commented on the stream of papers on this topic that continued even after the arrival of JIT had led to massive reductions of batch sizes and thus in practice, the problem was becoming trivial (Voss 1984). Even today the European community continues to produce lot size papers, with the *European Journal of Operational Research* publishing five papers in 2007, four in both 2008 and 2009 and two in the first four months of 2010. Plus ça change!

In the US things are better, POM published just one in 2003 and 2007 and Management Science published three papers on lot/batch sizes in 2004 but none since. Such separation of research from practice is not confined to any one research tradition. Too often I see a survey of a trivial area or a model of very narrow problem, neither of which has the potential to influence practice no matter how rigorous the method or elegant the solution. Editors and reviewers of all leading journals do their best to prevent this, but it still happens too much.

The second symptom that I see that causes me to worry is the growing separation of different research groups and the efforts of one to potentially gain ground over the other. At its simplest it can be seen as competition between modelers and empiricists, though this is an oversimplification. Indeed, the annual conference on empirical research at Wharton effectively seeks to bring people together. All research traditions have their strengths and weaknesses and have contributed greatly to OM. For example almost everything that is worthwhile about JIT and lean production has come from empirical research. On the other hand almost everything that is worthwhile in revenue management has come from modeling and optimization methods. The development of areas such as supply chain management and performance management has received equal contribution form both fields and increasingly from behavioral OM.

So, is one approach better than the other? Clearly not; but from the perspective of a long established and a European OM researcher I see much fighting for position.

What triggers this is uncertain. I have been told that one trigger might be some schools cutting back on OR courses and forcing their professors to teach OM… and then claim that they are OM researchers. I have no evidence of the former, but I increasingly see research that would have been called OR being called OM.

> *I increasingly see research that would have been called OR being called OM.*

The main evidence of competition rather than collaboration seems to be in the area of promotion and tenure. If one group seeks to gain ground over another in academia then this is the area in which it is easiest to do so. The mechanism whereby this happens is through journal rankings. Many schools, though interestingly often not the very top ones, rely on various lists of top journals. Committees should be able to evaluate the work independently of the medium of communication. However, people on tenure committees from outside OM use often use rankings as proxies for quality. From a European perspective I see this as the area where the forces for fragmentation and rivalry are battling against those for cohesion and collaboration.

Increasingly business schools have broad based departments with a wide variety of names such as Supply Chain, OM, Management Science and Operations Research. These departments, such as the one I belong to, contain people from a wide variety of disciplines such as OM, OR and Systems Dynamics. In addition the OM researchers may come from a wide variety of research foci from field research to behavioral modeling. This naturally creates a difficult question as to how to evaluate the quality of journals that these diverse groups choose to publish in. An obvious solution is to select a set which is both high quality and allows for diversity. The widely used UT Dallas list does just this. It contains *Management Science* (MS), *Operations Research*, *Journal of Operations Management* (*JoM*), *Manufacturing and Service Operations Management* (*M&SOM*) and *Production and Operations Management* (*POM*).

Unfortunately a list such as this is often perceived as too long and schools seek to reduce it. To do so they look at published rankings. The problem with this is asymmetrical views of journal

> *To reduce journal lists, schools look at rankings. The problem is asymmetrical views of journal quality.*

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REFLECTIONS ON THE STATE OF OM (CONT.)

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quality. For example, most empirical researchers in OM today will have a strong math and modeling training, whereas most OR and modeling oriented researchers will not have a strong training in empirical methods.

Thus when asked to rank journals, empiricists will rate journals such as MS and OR as being of high quality as well JoM and POM. However the reverse is not true, modeling and OR researchers will not rank empirically oriented journals highly. This occurs in journal ranking studies.

This is compounded by many OR researchers seeing themselves as OM researchers and thus adding further asymmetry to rankings. This was very apparent in a recent study of factors affecting journal rankings (Theoharakis, Voss, Hadjinicola & Soteriou, '07).

If we take the UT Dallas list and use their data to see how OM modelers and OM empiricists rate the OM journals we see this pattern. Whilst both groups rated the quality of *MS* and *M&SOM* highly, modelers gave lower ratings to journals with heavier empirical content, *JoM* and *POM*.

Theoharakis et al. (2007 p 94) state "it is clear that top journals for empirical research are not necessarily the same as those for modelers. This information must be considered by the various stakeholders, including business schools and tenure committees".

Unfortunately the pressures are for the reverse. In the context of limiting the number of journals, too many schools neglect the diversity of their OM/MS/OR groups. The asymmetric perceptions of journal quality and the combining of OM with OR groups naturally leads to journals ranked for promotion and tenure being drawn just from INFORMS and OR journals.

I see this as a potential threat to the future of OM. First, there is a real danger of OR being seen as the same as OM. A core OM course, and possibly a core supply chain course, can easily be taught by one from a variety of intellectual backgrounds. However the future of OM lies in its research as well as teaching.

The second threat is the narrowing of the research base of OM. An assistant professor will naturally focus on those outlets seen as important for tenure by her or his department, and conversely the department will seek to recruit those who can do so. In many schools I this see as a twin threat, the squeezing out of OM researchers by OR researchers who can teach but not research OM, and the squeezing out of empirical researchers by modelers.

I see this as a twin threat, the squeezing out of OM researchers by OR researchers who can teach but not research OM, and the squeezing out of empirical researchers by modelers.

This is of course an oversimplification of a complex problem. However at its root lies the choice between fragmentation, narrowness and rivalry or breadth, cohesion and collaboration. Although at heart I am mainly a qualitative, empirical researcher I believe in the need for diversity in our approach to OM research. Indeed, I am or have recently collaborated with a math modeler, a survey researcher, a case researcher and a systems dynamicist.

There are many different foci and methods each of which has its strength and weaknesses. Even within empirical research there are at least four dominant approaches with different methods; objective data with econometric methods, psychometric based survey methods; field and observational data using methods such as case research and experimental and lab methods. Each of these approaches is of value with major strengths but also has weaknesses.

OM has played and continues to play a major and creative contribution to management in manufacturing, services, health care and logistics. It has done so through evolution into new fields, embracing new approaches and methods. It has also done so by interacting with other fields from economics, behavioral science and marketing to OR.

However there are forces which if not balanced may threaten both the level and diversity of research in OM. Some have said to me that this is part of a campaign by INFORMS to dominate OM. I have no evidence to support this and the growth and success of POMS to a certain extent counters this.

In summary, I identify in this article two critical issues. First, the asymmetric views on journal and research quality which in turn has led in many institutions to a narrowing of criteria for tenure. Second the growth of combined OM/OR or OM/MS departments that see all of their work as OM.

To counter these problems it is crucial for departments and tenure committees to recognize the diversity of approaches, to recognize that the high quality outlets for empirical research are not the same as for modeling and OR research. Second, it is important that schools and departments recognize that OM is a distinct research area and not a subset of OR or MS. Third, individuals should recognize and celebrate this diversity.

Circulation of an earlier version of this to the Academy of Management OM group has led to a number of interesting responses. I would welcome further comment, and if appropriate I will write a summary of these for a future edition of the *POMS Chronicle*.

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FOCUS ON MARGINS—NOT COSTS

Go after the soft $3 outside the factory

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Focusing on production costs has thrown many manufacturers in rich countries into a vicious cycle. To reduce costs, they move production to lower-cost countries or outsource it altogether, and in the process they shrink the workforce and reduce new investments in their factories in rich countries; that results in further atrophy of valuable skills and tacit know-how, and diminishes the capabilities of these factories, justifying their further reduction of production.

Some suggest that this is the inevitable future of manufacturing in rich countries. They believe that the difference in prices of production factors between high and low cost countries pose an insurmountable disadvantage for factories in the West, especially for those in its more advanced regions.

They would be right if cost efficiency were the only indicator of a factory's viability. But a factory can create value in other ways. This is a fundamental point that managers and policy makers must appreciate when they plan the future of their factories in rich countries. They should look beyond comparison of production costs.

As Victor Fung, President of Li & Fung Ltd., succinctly stated, production cost of many products is often less than a quarter of their delivered price to final customers: a product costing $1 ex-factory is often sold for $4 to final customer, the difference being what might be called the "soft $3". In fact, the accounting measure for *value added* in a typical factory—i.e., the ex-factory cost minus purchased materials and services—is often less than 10% of the final price.

Rather than focusing on the cost inside, factories should go after reducing the cost outside—where the "soft $3" can be impacted. This is especially true for factories that are located in rich countries; they are in an advantageous position to reduce these costs for the prosperous customers who live there.

Doing that requires focusing on increasing the *margins at the point of delivery to final customers* instead of worrying about *ex-factory costs*. This is not easy. It requires a new mindset for many managers both inside the factories and at the headquarters, and drastic changes in the way many factories are set up and managed.

These changes pose serious challenges but they constitute a promising direction for the future of manufacturing in rich countries. In the long run, they are likely to be more effective than trying to fill the gap in cost efficiency by automation, or worse, by resorting to protection through tariffs and other trade laws, political maneuvers, or evoking national pride (see endnote 2).

Shifting the mindset from focus on costs to focus on margins

Shifting the focus from reducing the production costs to increasing the realized margins requires devoting more attention to what goes on *outside* the factory. There are three general, complementary, approaches for doing that:

1. *Increase the factory's responsiveness*

This requires a fundamental shift in the direction of improvement efforts in many factories. Rather than chasing economy of scale, they should go after making small batches less costly; instead of demanding longer horizons for planning production schedules, they should increase the factory's ability to react to sudden and unforeseen changes in demand; they should continuously increase the proportion of products they produce to order relative to what they produce to stocks.

This goes also for their suppliers. Instead of choosing them for their low costs, they should pick out those that are reliable and responsive, and help them become even more responsive (e.g., by sharing their own production plans and forecasts).

Inditex, the Spanish clothier that owns Zara and nine other brands follows this approach. Zara produces about half of its products in its own 22 factories in Europe, many of which are in Spain. The highest priority for these factories is to *serve Zara's retail shops*. If needed, they should produce a small batch, rush a new product through the factory quickly, make the product "rack-ready" (iron the pieces that need ironing, put the labels--including prices for shops in different countries, do the final quality check), and so on.

Zara runs most of these factories normally one shift to leave ample room for kicking in additional capacity during peak seasons. It outsources simple products with more predictable demand, and makes complex, time-sensitive products with unpredictable demand in-house.

All this reduces the cost efficiency of these factories, but Zara's success is a testimony that making the factories focus beyond their walls can be profitable.

2. Exploit proximity to final customers (or end-users)

For customers in Europe, the factories there are in a much better position to customize products than those in China, India, Brazil, Malaysia or many other countries. These factories are in even a better position to bundle services with their products—services like repair, upgrade, refurbish, recycle, and quickly replace if needed.

Geographical proximity and ease of doing business with customers who share similar language, customs, currency, and regulations give them this advantage, and allows them to charge a higher margin. This is true also within different regions of Europe: factories in the Western Europe have an advantage over those in eastern or central Europe when dealing with customers in their region.

One of the reasons why in 2001 BMW chose to locate a plant in Leipzig was to be able to use this approach. There are many innovations in design of this €1.66 billion factory, one of which is the ability to customize the car very late in the production process.

The customers, especially those in Europe, want quick delivery and the possibility of changing their orders *after* they have placed them. What they usually want is to add more optional equipment—a very high margins and lucrative business for BMW. The Leipzig plant is designed to do both reduce delivery lead time and increase the possibility of modifying the order after the car is actually put into production.

This plant also enables BMW to use the first approach mentioned above (i.e., take advantage of being responsive to

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FOCUS ON MARGINS—NOT COSTS (CONT.)

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changes in the market). The plant itself is very flexible, and there is also a large building for its major suppliers to set up shop within walking distance of the assembly line. This proximity allows the suppliers to react quickly to changes in the production schedule.

A sophisticated IT system connects the factory to its suppliers, distribution channels, and BMW sales offices and dealers to keep everyone abreast of the latest changes. The goal is to reduce the lead time for customers in Germany to 10 days and allow them to modify their orders even within that period.

3. Exploit proximity to R&D and highly skilled workers

Manufacturing can make critical contributions to the R&D process—from helping in the design process of the next generation of flash memories, solar panels, and medical equipment to the next generation of cars, fast trains, planes, and plastic toys. Its role is even more critical in the R&D of many industrial products—things like new materials, lubricants, biological and bio-medical products, and so on. A factory can provide not only vital input about manufacturability of the design, but also, later, help introduce the new product in the market faster by producing it quickly. Moreover, working closely with R&D also increases the factory's ability to produce customized products.

While several large American and European multinationals—like IBM and GE—are currently moving some of their R&D to Asia, the loin's share of R&D for many western multinational manufacturing companies is still done in their centers in Europe and US. where there are many other R&D labs and universities in close proximity.

The geographical, cultural (including language), and administrative proximity of factories in Europe and US give them an opportunity to excel in this dimension. These factories can become centers of advanced production know-how, turning themselves into valuable strategic assets for the company. Besides already mentioned contributions to the design process and expediting introduction of new products, such factories can offer valuable help to other factories in the firm's global production network. They can complement—rather than substitute or compete with—the factories in lower-cost countries. They can do this in several ways:

- They can be the first producer of new products, when production processes need to be debugged, before moving the product to factories in lower cost locations
- They can be responsible for producing special orders, customized models, slow-moving items, spares (especially for discontinued models), or other items that would otherwise disturb the efficiency of the firms' other factories that are designed for mass production.
- They can specialize in the more complicated steps in the production process. For example, a pharmaceutical company can produce a more complicated active ingredient and ship it to other factories for mixing and packaging. This approach also provides an added layer of protection against leakage of the firm's intellectual properties.

BMW's Leipzig plant, mentioned above, also practices many of the above. Oticon's plant near Copenhagen (a world-class manufacturer of hearing aids), BASF's coating division plant in Dusseldorf, and many pharmaceutical plants in Basel are other examples of manufacturers that use this approach fully or partially.

Implications of maximizing margins vs. minimizing costs

A factory focused on maximizing margins is built and managed very differently from one focused on minimizing costs. These have contrasting policies on make or buy, capacity of key equipment, range of products to be produced, new process technologies, work organization, job design, order fulfillment processes, production scheduling and inventory management, interface with distribution and procurement, interface with research and development, and perhaps most significantly, key performance indicators. Table 1 shows a stylized summary of some of the starker differences.

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Table 1. Contrasting policies of factories focused on costs versus margins

	Focus on minimizing production cost inside the factory	*Focus on maximizing margins at delivery to final customer*
Primary key performance indicators	***Factory Efficiency*** • Production cost • Capacity utilization • Labor and machine productivity • Return on capital employed in the factory	***Responsiveness & Service*** • Lead time and reliability of filling orders • Proportion of made to order and customized output • Total inventory in downstream supply chain • Contributions to R&D and other factories in the firms' network
Machinery & equipment	• Ensure high level of utilization (Highly specialized with just enough capacity)	• Ensure presence of ample buffer capacity (Versatile with generous policy on capacity)
Outsourcing	• Outsource production of complex and risky models with unpredictable demand (especially if they involve use of untested production techniques)	• Outsource production of simple models with predictable demand • Produce in-house the complex, risky models with unpredictable demand
Workforce	• Highly specialized, generally with narrow set of skills	• Multi skilled, generally highly qualified (production steps requiring low-skilled labor are subcontracted)
New process technologies, automation	• Investments justified primarily by impact on reducing production costs	• Investments justified primarily by impact on acquisition of new capabilities and responsiveness to market

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The sharp contrast in the key performance indicators explains why these factories would tend to follow different policies. Focus on costs and efficiency inside the factory, logically, leads to policies that maximize labor and machine productivity, and they, in turn lead to conservative approaches for choosing the capacity of equipment and acquisition of new and untested technologies.

A rational plant manager in such a factory would resist policies that risk the efficiency of its operations—things like producing small batch sizes, frequent changeovers, special or non-standard orders, "idle" capacity, risky technologies, and so on.

However, these are exactly the kind of things a factory should be willing to do if it wants to produce products with high margins. In such a factory, a rational plant manager would be willing to forgo pursuit of local cost efficiency if it allows the factory to build the capability to go after orders that yield higher margins—those with time-sensitive deliveries, rushed orders, customized products, new products, and so on.

Of course these factories should also pursue measures to improve their cost efficiency, but in doing that, they should be careful to balance their effects inside the factory with the costs and benefits in the rest of the supply chain. They should pay explicit attention to performance measures outside the factory—metrics like the total inventory in the chain, stockouts and service levels in upstream and downstream operations, batch sizes and throughput times at different steps in the chain and, in general, how those decisions impact the expensive "bullwhip effect" before and after the factory.

This is not an easy task, even if the right mindsets are in place. It is almost impossible otherwise. A factory that is constantly struggling to cut production costs would find it difficult to incur additional cost itself to save cost elsewhere.

To summarize, the future of most factories in rich countries lies in looking beyond the factory walls. They should focus on how to cut costs and increase the benefits in the *extended supply chain*–where the "soft $3" is—and not inside the factory–where the typical value-added is less than ten percent of the selling price.

I suggest the right way to galvanize this effort is to go after increasing margins at the point of delivery to final customer. This means that factories in rich countries should not only *make the stuff*, but play a bigger role in both *designing it* and *selling it*, and whenever possible also *servicing it* after it is sold. They should also help the other factories in the firm's global production network. All this may be more than "manufacturing"—but let's not worry about semantics.

Endnotes

1. An earlier version of this paper was prepared for a forum on "Future of Manufacturing in Europe" at Cambridge University, March 8-9, 2010. I would like to acknowledge support from Advanced Institute of Management Research (UK) for this research.
2. What I suggest here also has implications for public policy, especially those related to labor-relations, training, support for research and development, regulations affecting distribution channels, trade and foreign direct investment, and other areas. The discussion of these implications, however, is beyond the scope of this short paper.

Special Issue of POM: New Product Development, Innovation and Sustainability

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There is little academic literature on the interface between new product development, innovation and sustainability, from an operations management perspective (we use the term "product" here to include services). The engineering literature has several "Design for Environment" guidelines, but they are, for the most part, prescriptive formulas for designing products that are easy to disassemble, take-back, recycle or remanufacture. There is little understanding on the economic trade-offs firms face in designing environmentally-friendly products. One clear example is when the firm designs a product with superior environmental performance (e.g., low energy consumption), but that requires the use of a more expensive technology. A second example is when the firm may improve product quality by designing more robust and durable products, which may facilitate recovery and remanufacturing and reduce landfill scrap, but there is an increase in variable production costs which may actually encourage continued use of products that have become "environmental clunkers." Other areas of sustainability in which product design plays a significant role include the use of recycled materials, products certified to meet certain standards (e.g., LEED construction, energy star) and so forth. The goal of this special issue is to publish high quality and relevant research on the interface between new product development, innovation, and sustainability. We welcome papers that open/broaden our perspective on this important interface, including papers inspired by other disciplines such as engineering or environmental management. Topics of interest include, but are not limited to:

- Design for sustainability
- Cradle-to-cradle design
- Impact of recovery options—recycling and remanufacturing—on product design
- Evaluating how sustainability considerations impact the new product development process
- Incorporating environmental impacts in the product line introduction decision
- Empirical studies on design, innovation, and sustainability interactions
- Assessing how public awareness of the need for "design for sustainability" influences new product development processes
- Assessing how product design can help build public awareness of the need for sustainability

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BARGAINING MODELS IN SUPPLY CHAINS

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For over 20 years now the study of supply chains has had a central place in the operations management literature. Academic research has focused on questions of efficiency (are supply chain profits maximized?) and distribution (which firms get the money?), which inform the question, "When are we better off?" from the social and firm-level perspectives. Intuitive outcomes of this research include, for example, the loss of efficiency with incomplete contracts, and the effects of asymmetrical information.

But, to date our intuition regarding efficiency is more advanced than that for distribution, and one reason for this is the dominant modeling paradigm that we have embraced. The first movers into the analysis of decentralized supply chains adopted a principal-agent (henceforth P-A) model of interaction that, for all its strengths, is not a particularly apt metaphor for the give-and-take of many real b-to-b negotiations. So, it is reasonable to ask in which cases its predictions are sufficiently accurate to inform managers.

The P-A paradigm appropriately occupies a central place in the study of the decentralized coordination of organizations, but is most applicable when the business context naturally anoints one of the actors with the substantial powers of a principal.

The development of P-A models started in the 19th century, when neoclassical economists began attending to some of the finer points of their general theory by opening up the black box of the firm to look at how it pursues its profit maximization objective through its internal organization. In employment contracting and issues of internal firm governance, a P-A model can have high fidelity. This extends to auctions and other market exchange mechanisms in which an identifiable party has the power to define the rules by which everybody else must play (e.g., the U.S. Treasury auctioning off T-bills, the FCC auctioning off spectra, or system operators in electricity auctions).

However, in many supply chain negotiations this is not the case. When Dell negotiates with Intel or Microsoft, who is the principal? When Apple (who could not manufacture on its own even if it wanted to) negotiates with Foxconn, who also builds for Dell and Hewlett Packard, who is the principal? When Proctor & Gamble negotiates with WalMart, who is the principal?

In these situations and others, bargaining power is more evenly distributed among the parties. What then? A more accurate model of b-to-b negotiations in these contexts would feature offers and counteroffers in a search for mutually agreeable terms of trade, both parties recognizing that together they can generate positive profits but each also wanting the largest share of that profit for themselves.

The literature most attuned to this process of negotiation is the substantial bargaining literature. Yet, the intersection of bargaining models and supply chain models is currently thin (see Nagarajan and Sosic 2008 for a review, with references). Part of the reason is that, starting with Edgeworth (1881), many economists considered the bargaining problem to be indeterminate. That is, there can be many different outcomes that would support (what would become known as) a Nash equilibrium, and it is difficult to gain crisp results without choosing among them. However, crisp results alone cannot justify an unrepresentative model. Also, there are well-known bargaining models that do make choices among the many possible outcomes, and some experimental evidence that, while mixed, sheds light on this topic.

Being a poor representation of process does not mean that a model is not predictive of the outcome. That is, despite the intuitively unappealing P-A model of interaction, these popular models could support managerial recommendations if they could predict actual outcomes (the distributions of wealth resulting from negotiations).

Are P-A models predictive of distributional outcomes?

A definitive answer to this question does not exist! This shines an unflattering light on the current status of theory validation in operations management. Existing experimental evidence suggests the answer is probably negative, but more work has to be done before we know which models are appropriate for different supply chain contexts.

The field of operations management is well behind other social sciences in putting our theories to the test, a situation that is currently changing with the increase in behavioral OM and other experimental research. For now, however, we need to look for answers in the work of experimental economists. That literature is dominated by investigations of efficiency in alternative market structures (Bertrand versus Cournot, one-sided versus double auctions, open versus sealed bidding, etc.) and/or individual decision making (testing theories of individual choice). The subset of the literature devoted to bargaining is relatively small, but does contain some conclusions relevant to our questions.

See Hagel and Roth (1995) and Camerer (2003) for excellent summaries of the existing experimental literature. We restrict attention in the remainder of this section to the complete information setting, about which we know more experimentally. This is a natural first step to greater understanding, and is not an unreasonable assumption in many supply chain negotiations.

The findings with the most robust support in the literature are:

a) In small-numbers bargaining with complete information we can expect efficient outcomes.

b) In symmetrical bilateral monopolies we can expect an even division of the available surplus.

c) Non-cooperative game theoretical solutions are poor predictors of actual behaviors in simple laboratory experiments.

Conclusion (a) was anticipated by some early economists (e.g., Stigler 1942 and Fellner 1949) who departed from Edgeworth's agnosticism to claim that parties in unconstrained negotiations with complete information would reach efficient outcomes, because from any inefficient point all could see a feasible alternative in which all parties are better off. This has been validated by Siegel and Fouraker (1960), Michener et al (1979) and by an intensive burst of laboratory investigations following Coase's (1960) provocative paper, which had claims of decentralized efficiency at its core (c.f. Hoffman and Spitzer 1982, Harrison

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and McKee 1985 and references there).

Conclusion (b) is supported by Zeuthen (1930), Nash (1950), Raiffa (1953), Harsanyi (1956) and Schelling (1960) and has empirical support in Siegel and Fouraker (1960), Roth and Malouf (1979) and some of the Coase investigations. This result is often presented with an interpretation involving a sense of "fairness." Bargaining outcomes require mutual consent, so any adopted proposal must be considered legitimate by both parties. With balanced power this naturally invokes notions of equity. Indeed, it is this additional consideration that allows bargaining models to make concrete predictions where classical models, based only on self-interest, cannot. While behaviorally complex in more involved settings, fairness takes on the simple form of equality in bilateral monopolies.

Conclusion (c) derives primarily from the numerous experiments involving the "ultimatum game," a P-A arrangement in which a principal makes a single take-it-or-leave-it offer for a fraction of a known quantity of money to an agent, who can only accept (in which case the offer is enacted) or reject (neither party gets anything). The unique subgame perfect equilibrium is for the principal to take essentially all the wealth.

This never actually happens. Experimentally, offers are significantly greater than zero and in many cases the modal offer to the agent is fully half of the total wealth (c.f. Guth et al 1982, Kahneman et al 1986, Forsythe et al 1994, Eckel and Grossman 2001). These systematic and predictable deviations from subgame perfection appear to be internationally and culturally robust (c.f. Roth et al 1991 and Henrich et al 2004).

P-A models can predict (a) but only with complete contract forms in which the principal can demand all of the wealth, grossly violating (b). (c), of course, is not supportive of P-A predictions.

Is there a better alternative?

In contrast, (a) and (b) above are predicted by all well-known bargaining models (see Muthoo 1999 for an overview). So, based on the experimental record to date we would have to conclude that bargaining models are better than P-A models for distributional predictions in simple negotiations.

Care is required, however. Apple negotiating with Foxconn is a more complex context than has been tested experimentally to date. In this and similar settings there are multiple firms in both the buying tier (Dell, Apple, Hewlett Packard) and the supplying tier (Foxconn, Quanta) so each player has several potential options. No P-A model yet exists for these multi-tier, multi-firm settings (Prat and Rustichini 2003 come the closest) and bargaining theory is new (c.f. Lovejoy 2010) and so far untested. We need more theory development and experimental validation in these realistic supply chain contexts.

There may be other supply chain settings where P-A models are just fine. In addition to the reverse auctions mentioned above, at higher tiers of a supply chain the inputs to production may be substitutable commodities with many potential suppliers competing on price. In those tiers the P-A predictions may be sufficiently accurate to support actionable recommendations to management. We should not, yet, be looking for a unified theory that combines all possible supply contexts. That may come in time, but for now we should identify several important contexts and examine these individually. When we have several individually satisfying solutions in hand and validated, we can then look for unifying themes.

What should we do?

A reasonable plan of action is to

1. Identify several important supply chain contexts
2. Understand those contexts anthropologically
3. Model them, analyze the models for conclusions and recommendations
4. Validate the models in the laboratory and in the field

Expanding on these topics:

1. Identify several important supply chain contexts: A short list of contexts may include:

(a) There are multiple firms in both the supplying and buying tier, but due to economies of scale and/or relationship costs only one firm in each tier will emerge as active for any specific product. The firms in each tier are in horizontal competition with each other to be the active firm. This situation obtains in the development of a supply chain for new products in a range of industries including high tech, consumer products and services, family and entertainment, food, furniture, b-to-b services, automotive and large complex engineered products. This situation is closest to Nash bargaining (Nash 1950) and its extensions (Lovejoy 2010).

(b) There is one buyer and multiple suppliers who supply either complementary or partially substitutable products. The essential difference between this context and (a) is that the efficient solution will likely involve multiple suppliers being active. For example, in assembly situations inputs from each supplier are required. A category manager for a big box retailer has to decide how much of which brand of a product (toothpaste, for example) to stock, knowing that if she stocks out of one product customers may buy another. Given the diversity of consumer tastes it is likely that the retailer will want to stock product from multiple suppliers, and how much she wants of product A will depend on the stocking level for product B. So, some element of horizontal cooperation, or at least coordination, is likely to be relevant. This situation is closest to cooperative games and the notion of distributive justice (c.f. Guth 1988) with Shapely values (Shapely 1953, a familiar but not necessarily recommended solution concept) being one member of that class of solutions.

(c) There is a monopolist buyer and many competing suppliers with roughly equivalent cost structures (and excess supply capacity). This is the situation in some commodity markets. Cut-throat price competition is likely to result, giving suppliers very low margins and bringing us close to the P-A predictions. Reverse auctions have already been mentioned, for which P-A models are well-suited (absent horizontal collusion). However, the real situation needs to be thoroughly understood, because some reverse auctions are really just preludes to more bargaining-like negotiations between the principal and the "winner," during which just about all features of the supply relation are revisited.

2. Understand these contexts anthropologically: While introduc-

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ing notions of fairness or equity into business dealings may seem naïve, in fact these issues are very important. It is not necessary that any one person hold a social (rather than unilateral) utility function, all that is necessary is that he or she believes that others in the business population will be willing to incur some cost to punish overly selfish behaviors. This is, in large degree, why principals in the ultimatum game make robust offers to agents. The principal need not be unselfish, all she has to believe is that the agent will reject insultingly low offers (which agents do, routinely). The notion that others will enforce behavioral norms is really just asserting the existence of a business culture, a complex of beliefs, sentiments, and assumptions that characterize the profession. What are the norms of behavior in b-to-b supply chain negotiations? Are they the same or different across countries, cultures or industries? We don't know the answers to those questions, but existing evidence suggests that behaviors are more complex than myopic self-interest. Hoffman et al (1998) speculate that deviations from individual profit maximization derive from human mental processes that have evolved over millennia to solve problems of social exchange, long before our ancestors had markets or monetary systems.

While we suspect that our currently popular models are wanting, we would repeat the mistakes of the past by choosing another off-the-shelf technology to replace them. Nash bargaining (Nash 1950), Rubinstein's alternating offers (Rubinstein 1982), Shapely values (Shapely 1953), and notions of core or stable sets (c.f. Myerson 1991) were all devised in the abstract and may or may not be appropriate for any specific behavioral context. To know what models are appropriate, we need an understanding of the context. What if anthropologists spent time studying the business culture of supply chain managers? What would they see and report? In the author's experience, issues of fairness and equity are very much on stage, and for potentially self-interested reasons. The more trust and reciprocity exists in a relationship the more one can reduce the overhead of detailed legal contracting. The better you treat your suppliers the better they will treat you if the tables turn (remember the memory shortage in the computer industry? To which firms did the suppliers allocate their scarce supply?). Yet, trust can make you vulnerable. What assumptions about your counterpart's behavior can you afford to make in the supply chain world, such that the risks of trust are balanced by the costs of not trusting? Do these boundaries vary with country and culture? I do not think we know the answers to these questions, yet, but should begin the effort of discovery. Operational anthropology should precede our modeling efforts, so we know that our models have fidelity in the world they are intended to inform.

There are at least two major hurdles to developing an anthropology of operations. First, anthropological research, in which the scholar lives in the culture, is very time-consuming. Second, there is currently no mainstream operations outlet for that brand of descriptive research, in part because as a field we are unable to evaluate such papers in peer reviews. Yet, our models would be richly informed from more institutional knowledge about the business processes and behaviors we desire to affect. The issue of time investment is also faced by market researchers, who are developing techniques for "rapid ethnography" that balance the tension between time and quality in consumer research (c.f. Sanders 2002). The key is to understand the business context as the practitioners see it, not as the analyst assumes it should be. Regarding available outlets, we will have to rely on top journals in the other social sciences or begin the process of developing Associate and Departmental Editors in our own journals who can hold such work to high standards.

3. Model the context after we understand it. Analyze the model for conclusions and recommendations: This step is self-explanatory, and well-understood in our discipline.

4. Validate the models in the laboratory and in the field: As noted above we are well behind other social sciences in validating our theories in the laboratory or the field. Behavioral laboratories, in particular, offer great promise because of the level of control over confounding factors that can be invoked. The field of behavioral operations is growing, and this a very good sign.

Another informal method of validation is a reality check by practicing managers regarding the insights and recommendations of the model. Understanding and acceptance are pre-requisites for adoption, and therefore impact.

If all we did was confirm what managers already know we have done little, yet alien concepts may be met with skepticism and resistance. To change the minds of professionals we must be able to explain our results and the logic behind them in clear, business-relevant language. If this cannot be done, it is a warning sign that either the analyst does not really understand the results beyond the mathematics of it all, or the model misses something important. The author has found Executive Education classrooms particularly useful for getting feedback on theory from practicing managers.

Conclusions

Existing supply chain models may lack representational fidelity or predictive accuracy in some important supply chain settings for which bargaining models may be better choices. The existing experimental record, although incomplete, is supportive of this substitution in some important situations. However, the appropriate bargaining model may vary with context, so the first step in moving the science forward is to know the context. This author recommends a solid understanding, using rapid ethnographic techniques, of some important supply chain settings, followed by an open-minded construction of a representational model. This may conform to existing models in bargaining or cooperative or non-cooperative games, but may not. Allegiance to the business context and problem is more important than using an existing model, and we can learn from without being constrained by the existing literature.

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POM JOURNAL ADDED TO FT LIST OF TOP 45!

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POM journal added to the *Financial Times* list of top 45

The *Financial Times* increased from 40 to 45 the number of journals used in compiling their Business School research score for both their Global MBA and EMBA rankings. *POM* was one of 7 journals added (2 were deleted). The list of 45 is shown below. For reference, the *Business Week* list is also given below.

Financial Times List of 45 Journals

1. Academy of Management Journal (Academy of Mgt)
2. Academy of Management Perspectives (AMP)
3. Academy of Management Review (Academy of Mgt)
4. Accounting, Organisations and Society (Elsevier)
5. Accounting Review (Am Accounting Assoc)
6. Administrative Science Quarterly (Cornell University)
7. American Economic Review (Am Economic Assoc)
8. California Management Review (UC Berkeley)
9. Contemporary Accounting Research (Wiley)
10. Econometrica (Econometric Society, U of Chicago)
11. Entrepreneurship Theory and Practice (Baylor U)
12. Harvard Business Review (Harvard Publishing)
13. Human Resource Management (John Wiley and Sons)
14. Information Systems Research (Informs)
15. Journal of Accounting and Economics (Elsevier)
16. Journal of Accounting Research (U of Chicago)
17. Journal of Applied Psychology (Am Psychological Assoc)
18. Journal of Business Ethics (Kluwer Academic)
19. Journal of Business Venturing (Elsevier)
20. Journal of Consumer Psychology (Elsevier)
21. Journal of Consumer Research (U of Chicago)
22. Journal of Finance (Blackwell)
23. Journal of Financial and Quantitative Analysis
24. Journal of Financial Economics (Elsevier)
25. Journal of Int Business Studies (Academy of Int Bus)
26. Journal of Management Studies (Wiley)
27 Journal of Marketing (American Marketing Assoc)
28. Journal of Marketing Research (Am Marketing Assoc)
29. Journal of Operations Management (Elsevier)
30. Journal of Political Economy (U of Chicago)
31. Journal of the Am Statistical Association
32. Management Science (INFORMS)
33. Marketing Science (INFORMS)
34. MIS Quarterly (Mgt Inf Sys Research Centre, U of MN)
35. Operations Research (INFORMS)
36. Organization Science (INFORMS)
37. Organization Studies (SAGE)
38. Org Behaviour & Human Decision Processes
39. Production and Operations Management (POMS)
40. Quarterly Journal of Economics (MIT)
41. Rand Journal of Economics (The Rand Corporation)
42. Review of Accounting Studies (Springer)
43. Review of Financial Studies (Oxford U Press)
44. Sloan Management Review (MIT)
45. Strategic Management Journal (John Wiley and Sons)

Business Week List

Academy of Management Journal
Academy of Management Review

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