



The CORS Bulletin

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In This Issue

Dear CORS Members,

This is the pre-conference issue. Manish Verma is making final preparations for the CORS 2011 conference, to be held in St. John's at the end of May. For more information, please visit <http://www.busi.mun.ca/cors2011/>. To take advantage of conference rates, remember to book your rooms at the Delta St. John's by April 26th. The conference features plenary lectures by Larnder Award winner Prof. Edward Coffman from Columbia University and by Prof. Vedat Verter from McGill University as well as tutorials conducted by such distinguished speakers as Bernard Gendron, Michael Carter and Dionne Aleman.

Taraneh Sowlati describes how online meeting tools can be used as a way for members in less active sections to join seminars and talks offered by other sections or as a means to boost participation at the local level. Profiles of your future CORS Council officers are also provided. The issue features a fascinating article on the successful operation of a H1N1 Mass Vaccination clinic in Louisville, KY submitted by Prof. Sunderesh Heragu and Aman Gupta; Diane Bischak explains the emerging field of behavioural operations management including applications; and Aaron L. Nsakanda explains the supply chain of loyalty rewards, which I am sure you collect.

We are having a great response from our membership in form of contributions. Please keep them coming. See you in St. John's.

Sincerely,
Chirag Surti,
Bulletin Editor

Editor

Chirag Surti

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THE 2010 - 2011 COUNCIL

CORS Council is made up of the Officers of the Society, four Councillors, the Immediate Past President, a representative designated by each local section of the Society, and the Standing Committee Chairs. Contact information for 2010-2011 Council representatives is provided below. For a complete listing go to www.cors.ca.

President	Armann Ingolfsson, University of Alberta, armann.ingolfsson@ualberta.ca
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Winnipeg	Currently vacant
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Toronto Student	Jonathan Y. Li, University of Toronto, jli@mie.utoronto.ca
Waterloo Student	Bissan Ghaddar, University of Waterloo, bghaddar@uwaterloo.ca

PRESIDENT'S MESSAGE

Dear CORS Members,

When you receive this issue of the Bulletin, it will be about a month until our 53rd Annual Conference—the first one to be held in Newfoundland. From 1959 to 1969, all CORS Annual Conferences were in Montreal, Ottawa, or Toronto. The 1970 Conference was in Vancouver. Since then, we have had conferences in Alberta, Manitoba, and Nova Scotia, in addition to various locations in Ontario and Quebec. During the 10-year period from 2002 to 2011, CORS had three conferences in Western Canada, three in Ontario, two in Quebec, and two in Atlantic Canada. I think we are doing pretty well at reaching out to our members across Canada.

Our Annual General Meeting will take place during the Annual Conference, on Tuesday May 31st. I encourage you to attend and to participate in the governance of your society. We will summarize the work that CORS Council has done over the past year and update you on the society's finances.

During the Conference, several worthy individuals will receive awards from CORS. Prof. Edward G. Coffman will receive the Harold Larnder Prize and deliver the Larnder lecture. Also to be revealed during the conference are the winners of CORS Service Awards, the CORS Award of Merit, the CORS Practice Prize, and the CORS Student Paper Competitions (open and undergraduate categories).

CORS Council has recently been discussing the various awards that CORS offers, prompted in part by feedback from last year's member survey. I believe that we should recognize outstanding achievements of people within our field. The beneficiaries of the awards are the recipients and the operational researchers that are inspired by the achievements of the winners. Furthermore, the image of CORS is enhanced through association with the many distinguished winners of our awards. Looking at the list of previous winners of the CORS student paper competition, I see many people who later served on CORS Council—and those who have not yet served are on my list of people to contact next year, when we issue a call for nominations for open positions on Council!

In my opinion, the effectiveness of an award—acknowledging the achievements of the winner, inspiring others, and enhancing the stature of CORS—depends primarily on the award's reputation. I'd like to share with you a few “guiding principles” that I believe should be used in reviewing the awards currently offered by CORS:

- The award should have a clearly stated and relevant purpose.
- The selection criteria should reflect the award's purpose and the selection process should be fair.
- For prizes where nominations are solicited, the call for nominations should be circulated widely in a timely manner to anyone who may wish to submit nominations.
- The award ceremony should be highly visible at the Annual Conference.



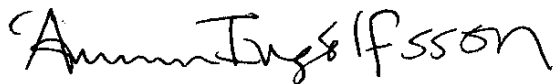
Armann Ingolfsson

- Information on the award winner and the award criteria should be publicized widely immediately after the Annual Conference. These materials, including a formal citation and appropriate photographic images of the award recipient and presentation, should be made readily available to individuals and organizations wanting to publicize the award.
- Logistics, including preparation of award certificates and processing of expenses for recipients, where applicable, should all be completed in a timely manner.

I welcome your feedback on these principles. Is there something you think should be added or removed? Do you think any of the current CORS awards falls notably short on one of these dimensions? Do you think CORS should offer more awards? Can you provide a brief description of an additional CORS award that you believe should be offered?

I look forward to receiving your feedback and I hope to see many of you at our conference in St. John's.

Best regards,



Armann Ingolfsson
CORS President

Nominees for 2011-2012 Council Positions

Vice President and President Elect: Elkafi Hassini

Elkafi Hassini is an Associate Professor of Management Science at the DeGroote School of Business, McMaster University. He holds PhD and MASc degrees in Management Sciences from the University of Waterloo. In his research, he uses mathematical models and techniques to solve business decision problems. His current research focuses on pricing and costing in supply chains. Elkafi's involvement with CORS goes back to 1996 when he was the president of the University of Waterloo CORS Student Chapter. Since then he has served CORS in different capacities such as the CORS Bulletin Editor (2002-2005) and the National Treasurer (2005-2009). He was awarded the CORS service award in 2009 and will be chairing the 2012 CORS annual conference in Niagara Falls.



Treasurer: Navneet Vidyarthi

Navneet Vidyarthi is an Assistant Professor in the Department of Decision Sciences and Management Information Systems at the John Molson School of Business, Concordia University, Montreal. He holds a Ph.D. degree in Management Sciences from the University of Waterloo, a master's degree in Industrial Engineering from the University of Windsor and a bachelor's degree in Mechanical Engineering from the North Eastern Regional Institute of Science and Technology, India. His research interests can be broadly categorized as strategic design and tactical planning in supply chain management with methodological interests in large-scale optimization, simulation-based optimization, and meta-heuristics. His works have appeared in *Transportation Science*, *IIE Transactions*, and *International Journal of Production Research* among several others. His teaching interests are in the area of Operations Management, Supply Chain Management, and Operations Research. He has won awards including the NSERC Post Doctoral Fellowship (PDF) and NSERC Alexander Graham Bell Canada Graduate Scholarship (CGS). He has also received honourable mention in the 2007 Canadian Operational Research Society (CORS) student paper competition. He is a member of CORS, POMS, INFORMS, and the Waterloo Management of Integrated Manufacturing Systems (WATMIMS) research centre. He has organized the 2007 South Western Ontario Operational Research Day (SWORD) at Waterloo. Navneet has served as CORS Treasurer since May 2009.



Secretary: Dionne M. Aleman

Dionne M. Aleman is an Assistant Professor in the Department of Mechanical and Industrial Engineering at the University of Toronto, where she is also cross-appointed to the Department of Health Policy, Management and Evaluation. She received her Ph.D. in Industrial and Systems Engineering from the University of Florida in Gainesville, FL. Her research interests are medical applications of operations research, specifically, radiotherapy treatment optimization, pandemic outbreak planning and organ donor-recipient matching. Prof. Aleman is the director of the Medical Operations Research Lab (morLAB) at the University of Toronto. She is also the past Chair of the INFORMS Health Applications Section, the Chair of the INFORMS Junior Faculty Interest Group and Secretary/Treasurer for the INFORMS Section on Public Programs, Services and Needs. She has previously served as the Vice-Chair and Treasurer for the INFORMS Health Applications Section, the Vice-Chair and Treasurer of the INFORMS Junior Faculty Interest Group, and the co-Chair of the 3rd Annual INFORMS Data Mining in Health Informatics Workshop.

**Councillor 2011-2013: Jennifer Percival**

Dr. Jennifer Percival is an Assistant Professor & Director of Graduate Studies in the Faculty of Business & Information Technology at the University of Ontario Institute of Technology. Dr. Percival's research interests include complementarities in innovation and technology, management of technology, supply chain networks, and network optimization. Her current research focuses on complementarities in the implementation of advanced manufacturing technologies, as well as complementarities between business strategies and world-first innovations. Dr. Percival has a BMath in operations research and a minor in computer sciences from the University of Waterloo, and a PhD in Management Sciences from the University of Waterloo.

**Councillor 2011-2013: Louis-Martin Rousseau**

Louis-Martin Rousseau (Ph.D. Université de Montréal) is an associate professor at Polytechnique Montréal in the department of Mathematics and Industrial Engineering. His main research topics deal with solving complex routing problems, personnel rostering problems, as well as integrated decision problems in the area of forestry, healthcare and service industry. To address these he puts forward hybrid methodologies based on constraint programming and classical operations research. Louis-Martin Rousseau is an Associate Editor of INFORMS Journal on Computing since 2009, he serves as the president of the Montréal chapter of CORS since 2007 and has been a co-organizer of several conferences in last and coming years.



Notice of a Proposal for a Dues Increase

A proposal for increasing the annual membership dues from \$75 to \$110 for regular members, from \$35 to \$55 for student members, and from \$37.50 to \$55 for retired members will be discussed at the CORS Annual General Meeting (AGM), to be held on Tuesday, May 31st, in St. John's. We hope that you will attend in order to discuss this important issue. Please see the February issue of the Bulletin for an article about the proposal. Members will vote on the proposal after the AGM by mail ballot, in accordance with the CORS constitution.

CORS Financial Committee
Samir Elhedhli, Vice President
Armann Ingolfsson, President
Vinh Quan, Past President
Navneet Vidyarthi, Treasurer

Don't Forget to Renew Your CORS Membership!

If you haven't already renewed your CORS Membership for the 2011-2012 membership year please do so using one of the following methods:

Online

Go to the CORS website www.cors.ca and renew your membership on-line using your VISA[®] or MasterCard[®] credit card.

Mail

Mail your credit card information or a cheque payable to the Canadian Operational Research Society, along with the completed upper portion of your invoice notice to: Wendy L. Caron, CORS Membership Services, 3661 Charlevoix Ave., Windsor, ON N9E 3B4. Payments by mail will also be received if sent to CORS-SCRO, Box/C.P. 2225, Station D, Ottawa, ON K1P 5W4.

Your membership in CORS demonstrates your interest and support of Operational Research in Canada and the Society's efforts to promote and safeguard the existence of a vital Canadian OR community. Your continued involvement is both welcomed and encouraged. If, however, you do not wish to remain a member of CORS, please contact Wendy L. Caron at caronwendyl@sympatico.ca and request your name be removed from the database.

Taraneh Sowlati
Chair, Membership Committee

CORS SECTIONS NEWS

Calgary

On Friday, February 18, 2011 the Calgary Section held a Professional Development Seminar. The topic of the presentation given by Maurice Elliott, Husky Energy Inc. was *Using a Simple Simulation to Support Pipeline Contamination Estimates*.

Abstract:

This talk describes how a simple simulation program has been incorporated into a large scheduling workbook in order to estimate flow volumes when batches of different products are received via a common pipe that serves a number of tanks containing different blended products. The major physical problem is that the valves that need to open and shut to direct the incoming batches into their proper tanks take time to swing, so some contamination is inevitable. Furthermore, there is considerable linefill volume in the pipe itself. On the other hand, customers need to have forecasts of how much product volume they will lose or gain as a result of this contamination before the events occur, and we need to be able to estimate the volumes, too, because we cannot meter them directly. The simulation model had to be kept relatively representative but also simple enough that it would not slow down the calculation speed of the workbook too dramatically. This talk discusses the physical configuration of the pipe and tanks, and describes how it was represented in the workbook and the Visual Basic code behind the scenes.

About the Speaker:

Maurice Elliott earned a Bachelor's degree in Applied Mathematics, and a Master's Degree in Operational Research before emigrating to Toronto in 1970. There he worked for Massey Ferguson for ten years, then moved to Calgary to join Dome Petroleum in 1980. During the 80's, Maurice and his group were responsible for implementing a number of OR applications for Dome Petroleum, until it was taken over by Amoco Canada in 1989. In 1993, Maurice left Amoco to run his own O.R. consulting company. After a few years, he won a contract with the pipeline group of Husky Energy Inc., where he has worked ever since. After interviewing Husky for seven years as a consultant, he decided to become a full-time employee. At Husky, he has been responsible for providing business knowledge for the development of a major business administration system, for maintaining and upgrading a very large workbook used daily by a group of pipeline schedulers, and for implementing a wide variety of smaller applications.

Vancouver

On March 31st, 2011 in Room 293 of the Henry Angus Building at the University of British Columbia, the Vancouver CORS Section held a seminar meeting featuring two presentations on OR applications in supply chain management:

1. Simulation of Agricultural Biomass Value Chain for Cellulosic Ethanol Production in Prince Albert, Saskatchewan.
2. Supply Chain Modelling for Forest Products Industry: an Agent-Based Approach

Talk 1: Simulation of Agricultural Biomass Logistics System for Cellulosic Ethanol Production in Prince Albert, Saskatchewan

Speaker: Mahmood Ebadian, Ph.D. Candidate, UBC

Abstract:

In spite of abundant availability of biomass in Canada, high uncertainty associated with logistics costs and high risk with the delivery of adequate feedstock to the ethanol plant are among the main barriers to the development of this industry. To boost the ethanol production in Canada, estimation of delivered agriculture feedstock to the ethanol plant and related logistics costs are of importance. In this regard, all the operations involved in the agricultural feedstock logistics system from farms to the gate of conversion facility should be taken into account. In this study, a simulation model was developed. The developed model was applied to the analysis of supplying mix of agricultural feedstock to a proposed cellulosic ethanol facility near Prince Albert, Saskatchewan, Canada. The plant would produce 70 ML/y of ethanol from approximately 750 dry metric ton of wheat straw per day. Three wheat varieties including spring wheat, durum wheat and winter wheat are considered as feedstock mix. Wheat straw would be purchased from a supply area with 160-km radius from the ethanol plant.

About the Speaker:

Mahmood is currently a Ph.D. candidate in the Department of Wood Science at the University of British Columbia (UBC). He received his B.Sc. and M.Sc. in Industrial Engineering from Amirkabir University of Technology and the University of Tehran, Tehran, Iran. As a member of Biomass and Bioenergy Research Group (BBRG), he has been working on Simulation and optimization of agricultural biomass logistics system for cellulosic ethanol production. His doctoral research at UBC elaborates on the analysis of supplying mix of agricultural feedstock to a proposed cellulosic ethanol facility in The Prince Albert, Saskatchewan in close collaboration with Agriculture and Agri-Food Canada (AAFC). His research interests include biomass and bioenergy, supply chain management, operations research and lean manufacturing. Mahmood has published two books concerning lean manufacturing, five journal papers, and presented his research at several national and international conferences. Besides teaching experiences, he has worked as supervisor and technical expert in TUV NORD Iran Company, Pars Electric Company and HEPKO Company. He has received several awards from the University of Tehran, UBC and Canadian Operational Research Society (CORS).

Talk 2: Supply Chain Modelling for Forest Products Industry: an Agent-Based Approach

Speaker: Saba Vahid, Ph.D. Candidate, UBC

Abstract: To regain competitiveness, British Columbia's (BC) wood products industry can greatly benefit from the concept of Supply Chain Management. Agent-based simulation has been used frequently in recent years to model complex supply chains. Representing Supply Chain members with autonomous agents offers more flexibility compared to traditional simulation and optimization models. Such a flexible model would be an ideal tool for a variety of what-if analyses.

This research modifies and extends an existing agent-based model (CAMBIUM), with the aim to determine optimal locations for possible new sort yards and mills. In this extended model, sort yard agents, which were previously absent from CAMBIUM, are included and their optimal locations are identified from a set of predefined potential sites. Although this model can be used in any geographic area, it is currently being fit to the Coastal BC industry profile. The resulting model is a strong decision support and policy analysis tool for BC's forest industry. In this presentation an overview of agent-based modelling and CAMBIUM model is presented along with a simulation demo using generic publicly available data.

About the Speaker:

Saba is currently a PhD Candidate in Department of Forest Resources Management at Faculty of Forestry in UBC. After completing her B.Sc. program in Industrial Engineering at Sharif University of Technology (Tehran, Iran) she moved to Vancouver. She received her M.A.Sc. program in Faculty of Forestry at UBC. Her current research interests are supply chain modelling and simulation, and application of OR in modelling the environmental impacts of manufacturing industries.

Participating in CORS section events from a distance

As indicated in the CORS 2010 members' survey, some CORS members, especially those in less active sections, expressed their interest in participating in professional activities to interact and network with their colleagues. Although some sections are less active, there is a great opportunity for the members in those sections to join seminars and talks offered by other sections through webinar and teleconferencing. The CORS Council supports interactions between local sections and encourages them to collaborate in organizing and providing online meetings throughout the year.

The CORS Vancouver Section had two joint webinar events with the INFORMS Pacific Northwest chapter in 2010. Each webinar event included two OR presentations for CORS members in Vancouver and INFOMS members in Vancouver, Seattle and Portland. CORS Vancouver Section offers free seminars, each including two or more presentations, during the year. Our next event which will include two presentations on supply chain management in forestry will be on March 31st. We would be glad to share our seminars with CORS members in other sections across Canada and invite those who are interested in participating in our seminars or those sections interested in offering joint events with us to contact Taraneh Sowlati at taraneh.sowlati@ubc.ca.

Meeting online is a growing trend and can occur in a variety of ways. GoToMeeting and Webex are fee-based services for online meetings, but they do have a free trial period. There are also some free platforms that can be used for online meetings to give presentations and share documents online, such as AnyMeeting (for more information visit <http://www.anymeeting.com/>). Skype can also be used as it is a software application that allows users to make free calls over the internet and offers new features such as video conferencing. To participate in CORS section events from a distance, free applications such as those mentioned above can be used by members. We hope to see more interactions between our sections and members through the use of these free online tools.

Taraneh Sowlati
CORS Councillor and President, Vancouver Section



CORS 2011 Annual Conference

DELTA St. John's, NL, May 30 –June 1, 2011

Schedule

Monday May 30:

- Larnder Award Plenary Lecture
- Scientific Program
- CORS Council Meeting
- Opening Reception

Tuesday May 31:

- Plenary Lecture
- Scientific Program
- Practice Prize Competition Session
- Student Paper Competition Sessions
- CORS Annual General Meeting
- CORS Banquet

Wednesday June 1:

- Scientific Program
- CORS Council Meeting

Confirmed Speakers

Larnder Award Plenary Lecture:

Prof. Edward Coffman
Columbia University
“Fifty Years of Modeling Dynamic Resource Allocation”

Plenary Lecture:

Prof. Vedat Verter
McGill University

Tutorial Speakers:

Bernard Gendron, Université de Montréal
“Combinatorial Optimization for Healthcare Personnel Scheduling”

Michael Carter, University of Toronto
“Applications of Operations Research in Healthcare Policy Decisions”

Dionne Aleman, University of Toronto
“Optimization application in radiation therapy”

Scientific Program

Over 50 confirmed sessions, including:

- Energy Models
- Finance
- Financial Engineering
- Forestry
- Health Care: Modeling, Applications, & Optimization
- Location Models
- Logistics & Transportation
- Manufacturing
- Mathematics & Medicine
- Military Applications
- Multicriteria Decision Making
- Operations Management
- Optimization
- OR/MS in Education
- Pricing and Revenue Management
- Queueing
- Risk Management in Transportation
- Scheduling
- Stochastic Programming
- Supply Chain Management
- Vehicle Routing

Registration Fees

	March 22 to May 24, 2011	After May 24, 2011
Regular (CORS member)	\$525	\$575
Regular (CORS non-member)	\$600	\$650
Student (CORS member)	\$125	\$175
Student (CORS non-member)	\$160	\$210
Retiree (CORS member)	\$260	\$310

All credit card payments will be in Canadian dollars.

Accommodation

Special rates are available at the Conference Hotel:

- DELTA St. John's.
- Use the dedicated URL: <http://www.deltastjohns.com/gbcors511>.
- Please remember to book your rooms by April 26th, 2011.

If you need additional information about the conference, please contact Manish Verma (mverma@mun.ca).

OR@WORK

Drive-through mass vaccination in Louisville, KY, USA

Editor's Note: This article was contributed by Sunderesh Heragu and Aman Gupta, Department of Industrial Engineering and Ruth Carrico, School of Public Health and Information Sciences at University of Louisville, Louisville KY USA.

The H1N1 virus was expected to be much more aggressive than seasonal flu with higher risk of death. On June 11, 2009, the World Health Organization (WHO) declared H1N1 a global pandemic and raised the worldwide pandemic alert level. The Centers for Disease Control and Prevention (CDC) provided large quantities of vaccine to counter the potential threat. The city of Louisville sought University of Louisville's (UofL) assistance in vaccinating a large part of community at no charge. The project was commissioned by the Louisville Metro Public Health and Wellness department (LMPHW) in cooperation with three units at UofL - the Environmental Health and Safety department, the School of Public Health and Information Sciences (SPHIS) and the Logistics and Distribution Institute (LoDI).

A walk-through and an adjacent drive-through vaccination clinic were chosen as the medium to administer more than 19,000 vaccines. UofL had more than 15 years of experience with drive-through vaccination clinics for the seasonal flu. The seasonal flu clinic occurred twice a year and vaccines were administered only to adults. Furthermore a fee was charged for the vaccination service. On average, in two 12-hour shifts, approximately 2,500 people could be vaccinated. Because UofL had been carrying out this vaccination since the mid 1990's, much knowledge was present on how to organize and plan such an event.

A preliminary plan and a layout to administer the vaccines were developed by UofL's School of Public Health and Information Sciences and Department of Environmental Health and Safety, the Louisville Metro Public Health and Wellness department (LMPHW) wanted assurance that there would be a smooth and orderly flow of people and vehicles with minimal wait times. This led to a number of questions related to the logistics of the clinic including, the number of healthcare, law enforcement workers and the number of lanes required for effective operation.

The research work included collection and analysis of the input data from a seasonal flu clinic, the design of the simulation model, analysis of the output data, validation of the model and fine-tuning the solution. Researchers at the UofL's Logistics and Distribution Institute (LoDI – see www.louisville.edu/lodi) developed a discrete-event simulation model to study the initial layout and suggest changes to the layout and the vaccine administration process so that key performance measures of alternate configurations of the drive-through clinic. For example, average vehicle wait times, point of dispense (POD) utilization, number of vehicles per lane could be estimated and the configuration providing the best values for the performance measures could be adopted. Additionally, the simulation model served as a visual and persuasive tool that ensured management's buy-in.



During the one-and-a-half day event, 19,079 vaccines were administered with 12,613 (66.1%) being administered via a ten-lane drive-through. The average wait times were approximately 30 minutes per vehicle, as estimated by the simulation model. Citizens who utilized the drive-through clinic expressed overall satisfaction with the clinic.

For more information contact Sunderesh Heragu at s.heragu@louisville.edu

https://louisville.edu/speed/faculty/heragu/in-the-media/Courier-Journal_%20ArchivesHeraguSimulation.pdf

<http://thenihs.org/success-stories/pandemic-planning-and-preparedness-project-h1n1-influenza-mass-immunization>

Behavioural operations management: an introduction and a sample of applications

Diane P. Bischak
Operations Management Area
Haskayne School of Business
University of Calgary

Behavioural operations management is a relatively new field that “explicitly considers the effects of human behaviour in process performance, influenced by cognitive biases, social preferences, and cultural norms” (Loch and Wu 2005). The innovative aspect of behavioural OM research lies not in its focus on human behaviour, since, for example, the importance of cooperation among workers in the performance of production systems is mentioned in the writings of OM pioneers Frederick W. Taylor and Henry Gantt. What is novel is that behavioural OM attempts to find explanations for worker behaviour and managerial decision making that deviates from assumptions made by traditional OM models.

Typically, behavioural OM research originates with an observation that some operational phenomenon is not well explained by OM models. Researchers then develop a model (mathematical or descriptive) that has a foundation not just in OM but also in a theory of human behaviour drawn from industrial and organizational psychology, cognitive psychology, social psychology, or behavioural economics. Hypotheses that follow from this model can be tested through experimentation in a lab or out in the field. The results of the experiments may increase our understanding of the phenomenon in question and suggest adjustments or enrichments to the OM model.

The following three applications of behavioural OM provide an overview of ways in which human behaviour can be examined experimentally in order to understand performance results in various operational settings.

Just-in-time (JIT) production management: In JIT production, only small inventory buffers are allowed between workstations in order to reduce inventory costs and improve quality. OM models predict that such low-inventory production lines will have lower throughput than high-inventory lines because of variation in processing times that creates blocking and starving of workstations. However, Schultz et al. (1998, 1999) set up an experimental production line and found that in a low-inventory condition workers adjusted their processing speeds to avoid “starving” the next worker, so that the resulting throughput was not significantly different than in the high-inventory condition. Behavioural theory suggests that the immediate feedback provided by low inventory increases peer pressure and interdependence among workers. As a result, and in contrast to OM modeling assumptions, processing times are non-independent and are affected by the buffer size, the speed of co-workers, and the observed amount of nearby inventory.

Single-period inventory management: In the single-item, single-period “newsvendor” inventory problem, a manager must determine the quantity to order before demand for the item is known. The profit-maximizing order quantity can be determined from an OM model if the probability distribution of demand, the wholesale and retail prices, and the salvage value are known. In

laboratory experiments with subjects who were given this information (Schweitzer and Cachon 2000), the order quantity actually chosen was typically on the correct side of the mean demand (above for high profit items, below for low-profit ones) but not far enough from the mean. One explanation of this behaviour from cognitive psychology is that subjects use a biased heuristic: their choices are anchored (at the mean) and insufficiently adjusted for demand uncertainty (away from the mean). However, a number of alternative explanations have also been put forward by other researchers.

Supply chain management. In a supply chain consisting of a retailer and supplier, if the supplier determines a wholesale price first and the retailer then sets a retail price in response, they typically set prices that do not maximize profit, resulting in what is known as “double marginalization.” Loch and Wu (2008) showed through an experiment based on concepts from social psychology that in an induced “relationship condition,” in which players playing the “supplier” briefly met their “retailer” partner and were then told to imagine that they had a good relationship, suppliers offered a low price and retailers offered a low price in response, resulting in higher profit for both. In a “status condition” in which the person earning a higher profit than his/her partner was declared to everyone to be the “winner,” suppliers offered a high price and retailers responded with a high price, resulting in lower profit for both. Thus these weak manipulations of subjects’ social preferences had a major effect on their decision making, which in OM models is assumed to be independent of such interventions.

In conclusion, aspects of human behaviour such as social preferences and cognitive biases seem to matter in operations management contexts. An awareness of their effects could improve the results when OM models are implemented in practice.

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Reward Loyalty Programs Industry – a mine for OR/MS applications

by

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Have you ever held or offered a reward credit card (e.g. CIBC, RBC, ScotiaBank, etc.) or a customer loyalty membership card (e.g., Aeroplan, Air Miles, Sears Club, HBC, Marriott Rewards, ESSO Extra, Petro Points, Shoppers Optimum, etc.)? Welcome to the swipe, earn, repeat, and redeem business world, also known as the Loyalty Reward Programs (LRPs) industry! LRP are marketing programs aiming at rewarding customers for repeat purchasing of a product or a service. These programs have been recognized as one of the innovative business practices to build and nurture long-term relationship with customers, better allocate marketing budgets, and derive as much revenue as possible from customers over a lifetime period. Hence, more and more companies are implementing a LRP program, restructuring their existing one, or partnering with existing ones. A number of existing LRPs have structured themselves around a supply chain (i.e., with their own networks of cross-industry commercial partners), shifting the competition nowadays between supply chains (i.e., one network of partners against another). For instance, in the airline industry alone, more than 130 companies currently have a LRP, and 163 million people throughout the world are enrolled in their programs¹. In the Canadian market settings, a study⁽¹⁾ sampled in 2005 more than forty LRPs across a spectrum of industries. Canada's premier loyalty program, Aeroplan® reports in its 2009 annual report² a total of over 4 million active members with attractive demographics enrolled in the program, joint ventures with more than 75 partners representing more than 150 brands, and cost of rewards of about \$1,169 million in the last two years (2008-2009). In the 2006 annual report, these latter figures were 60 partners representing more than 100 brands and cost of rewards of about \$863 million in two years (2005-2006). Air Miles®, LoyaltyOne's loyalty reward program and a primary competitor of Aeroplan®, reports that approximately 10 million members actively collect reward miles from over 100 leading brand-name partners representing thousands of retail and service locations across Canada³. A study by its research unit Colloquy reported in an article published elsewhere⁴ states that 85% of Canadians participate in at least one LRP, while the average Canadian household is active in more than nine programs. A National Post special article⁵ featuring loyalty programs reports that according to Visa Canada Association, more than 25 million VISA cards are in circulation in Canada and about 78% of all card holders belong to one or more LRPs..

Although different types of LRPs exist today across a spectrum of industries (travel, hotel, retail, telecommunication, banking, gasoline, etc.), most of the modern systems have their roots from AAdvantage®, the loyalty program introduced by American Airlines in 1981 (also called frequent flyer program in the airline industry). Consumers in these systems are given incentives or rewards for repeat business, which in turn serve as motivation for them to continue buying a

¹ "Funny Money," *The Economist*, Dec 24, 2005, pp 102-103.

² <http://www.groupeaeroplan.com/pages/InvReports.php> (accessed on October 27, 2010)

³ <http://www.loyalty.com/WhatWeDo/Airmiles.aspx> (accessed on October 27, 2010)

⁴ "Swipe, save, repeat," *The Globe and Mail*, October 11, 2010, pp B7.

⁵ National post newspaper article on Loyalty programs published on October 7, 2005.

product or service. In general, these systems involve at minimum a promotional currency (e.g. points or miles); single or multiple reward tier(s); a comprehensive database of individual consumers' demographics and detailed transaction information; and an advanced technology to manage the program (e.g. redeem rewards directly or through internet), operate the contact center, and to analyze the members' database. Hence broadly, in a typical LRP, customers become members of the program, earn points (based on some specified "accumulation scheme") on their purchases of products or services throughout the network of LRP's commercial partners. These points can be redeemed based on a "reward chart" pre-established by the firm that owns the LRP (i.e., host firm). Points that are not redeemed are saved in the customer's account (under some conditions, e.g., being active) and constitute the LRP outstanding balance ("liability"). Points earned by customers during a given period (e.g., a year) constitute the LRP issued points ("accumulation"), whereas points redeemed by customers for rewards during a given period (e.g., a year) constitute the LRP redeemed points ("redemption"). Therefore, a LRP company or department incurs its main operating costs when points are redeemed as it has to purchase the pre-determined product or service from its commercial partners. For a profit center LRP firm, it derives its revenue primarily from the sale of points to commercial partners.

The prevalence of LRPs, their economic impacts, and the increase of the complexities faced by firms in managing them have opened up new application and research areas for management science/operation research techniques. LRP practitioners are more and more being challenged by ever-higher customer expectations, increasingly operating costs and risks, management issues resulting from the increases in the diversification of customer sources for collection of points and the diversification of reward offerings. Opportunities abound on, among others, developing aggregate and disaggregate predictions of redemption, liability, and accumulation to support short, medium, and long term planning and operational decision-making; developing and testing planning models for rewards supply to maintain a balance between customer service level and overall costs of rewarding customers; developing models for assessing the growth of the program and the risk level associated with this growth; setting up long term contracts with partners and selecting the types of contracts; developing promotion plans that seek for better management of redemption demand between peak and off-peak periods; and exploring how revenue management methodologies can be applied to reward loyalty programs operating as profit centers, in particular how the rewards allotment budget (i.e., reward capacity or levels) and the reward mix (i.e., pricing) can be dynamically managed to meet the customer requirements while controlling the overall redemption costs and risks associated with a considerable increase of the overall liability. These issues and many more call for management science and operations research methods to contribute to improving the efficiency and the effectiveness of LRPs and provide new and important insights into the workings of a major economic sector that involves a very significant portion (millions) of the Canadian population.

MEETINGS AND CONFERENCES

CORS Business Meetings

May 29, 2011	CORS Council Meeting, St. John's, NL
May 30, 2011	CORS Council Meeting, St. John's, NL
May 31, 2011	CORS Annual General Meeting, St. John's, NL
June 1, 2011	CORS Council Meeting, St. John's, NL

CORS Annual Conferences

May 30 – June 1, 2011	CORS Annual Conference Delta Hotel, St. John's NL http://www.busi.mun.ca/cors2011/
2012	Joint CORS-Multi Objective Programming Goal Programming (MOPGP) Conference Niagara Falls

Other Conferences

2011 April 10-12	INFORMS Conference on Business Analytics and Operations Research http://meetings2.informs.org/Conf/Practice2011/
2011 April 14-16	2011 Northeast Decision Science Institute Annual Meeting, Montréal http://www.nedsi11.org/
2011 April 29-May 2	22nd Production and Operations Management Society (POMS) International Conference, Reno Nevada http://www.pomsmeetings.org/ConfEvents/016/
2011 May 20-22	The Interdisciplinary Conference of AHLiST (Association of History, Literature, Science and Technology), Houston, Texas www.nebrija.es/~cmalagon/Mmedis/conferences.html
2011 June 13-17	21st International Conference on Multiple Criteria Decision Making (MCDM2011), University of Jyväskylä, Finland https://www.jyu.fi/en/congress/mcdm2011
2011 June 15-17	15 th Conference on Integer Programming and Combinatorial Optimization (IPCO XV) Yorktown Heights, NY http://ipco2011.uai.cl/
2011 June 20-22	INFORMS Healthcare 2011, Montreal (Co-Sponsored by CORS) http://meetings2.informs.org/healthcare2011/

2011 June 20-23	Mixed Integer Programming Workshop, Waterloo http://www.math.uwaterloo.ca/~mip2011/
2011 July 2-5	Administrative Sciences Association of Canada (ASAC 2011), Montreal, http://asac2011.uqam.ca/
2011 July 10-15	IFORS 2011, Conference on World OR : Global Economy and Sustainable Environment, Melbourne Australia www.ifors2011.org
2011 July 18-20	International Symposium on Transportation and Traffic Theory (ISTTT), Berkeley, California http://www.isttt19.org/
2011 July 24-26	2011 World Congress on Mathematics and Statistics (WCMS'11) Cairo, Egypt http://infomesr.org/en/scientific-research/conferences/2011-conferences/48-wcms11
2011 Sept. 19-23	15th Austrian French German conference on Optimization (AFG'11) Toulouse http://www.math.univ-toulouse.fr/afg11/
2011 Nov. 13-16	INFORMS 2011, Charlotte, NC http://meetings.informs.org/charlotte2011
2011 Nov. 19-22	2011 Decision Sciences Institute Annual Conference. Boston, MA http://www.decisionsciences.org/Annualmeeting/default.asp
2012 Oct. 14-17	INFORMS 2012, Phoenix, AZ

WWW Conference Listings

CORS / SCRO Conference Page: http://www.cors.ca/en/conferences/i_other.php

INFORMS Conference Home Page: <http://www.informs.org/Conf/Conf.html>

IFORS Conferences: <http://www.ifors.org/panorama/conferences/index.shtml>

Netlib Conferences Database: <http://www.netlib.org/confdb/Conferences.html>

SIAM Conference Home Page: <http://www.siam.org/meetings/calendar.php>

POMS Conference Page: <http://www.poms.org/conferences/>

CORS FUNDING OPPORTUNITIES

Graduate Student Conference Support (GSCS) Program

CORS has established the GSCS program to encourage attendance of graduate students at conferences, symposia, or workshops specifically aimed at graduate students, such as student conferences, doctoral colloquia, and conferences for junior operations researchers. CORS may provide partial funding up to \$500 per student for attendance at such events. Note that the GSCS program will *not* fund attendance at CORS meetings, because CORS has a separate program for this purpose. All GSCS funding is subject to availability of funds and the following eligibility criteria:

- Student is a member of CORS.
- Student's supervisor is a member of CORS.
- Student is enrolled in a graduate program in a field related to operational research.
- Student is studying at a Canadian university, or is a Canadian citizen or permanent resident studying abroad.

The application process is competitive. The following criteria will be used to select applications that will be funded:

- The quality of the paper to be presented at the conference, if applicable.
- The benefits that the student is likely to derive from attending the conference.
- The stage that the student has reached in his/her degree program.
- Prior GSCS funding received by the applicant (new applicants will be given preference, all else being equal).

An online application form for GSCS funding is available at:

http://www.cors.ca/en/students/i_graduate.php .

Since funding is limited, applicants are encouraged to submit their applications in a timely manner. Applications must be received at least two months before the conference date to receive full consideration. Applicants who meet this deadline will be notified of the outcome of their application at least one month before the conference date.

For further information, contact the CORS GSCS Coordinator:

Fredrik Odegaard

Tel: (519) 661-4278

email: fodegaard@ivey.uwo.ca

INFORMS Teaching Effectiveness Colloquium (For Faculty)

In conjunction with the Annual INFORMS Meetings, INFORMS hosts a Teaching Effectiveness Colloquium. CORS has funding available to partially support a limited number of faculty members interested in attending. Faculty members that are awarded funding are expected to:

- give a presentation in an OR/MS Education session at CORS National Meeting, and
- write a short article regarding OR/MS education for the CORS Bulletin.

Funding is restricted to faculty members, and not available to graduate students. For more information and instructions on how to apply please contact:

Fredrik Odegaard
CORS Education Chair
email: fodegaard@ivey.uwo.ca

CORS Traveling Speakers Program

The Traveling Speakers Program (TSP) enables local sections to bring Canadian O.R. practitioners / researchers as speakers to their local events. In order to keep costs in line while maximizing the CORS National profile, CORS sponsorship will be limited to 50% of the total expenses, up to a maximum of \$500 per speaker or \$1 000 for a single event (conference, workshop). Other expenses can be covered by the local section. The program of the event must acknowledge the contribution of CORS. Each local section must contact the TSP coordinator to obtain approval for funding preferably at least one month in advance of the event date. Payment will be made by the CORS Treasurer upon receipt of the expense report.

Vinh Quan
CORS TSP Coordinator
Tel: (416) 979-5000 ext. 7814
Email: vquan@ryerson.ca

THE NEXT ISSUE

The next issue of the Bulletin is the post conference issue and is scheduled to appear in early July 2011. Apart from the regular features and news from the local sections, the next issue will include information about the 2011 winners of CORS Awards and announce the 2011-2012 CORS Council. Contributions to this issue, especially news on the activities of local sections or CORS Members should be submitted by **June 20, 2011** to:

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The preferred method of submission is by a MS-Word attachment to an e-mail.

CORS BULLETIN ADVERTISING POLICY

Ads cost \$120 per page, proportional for fractional pages. Logos and prepared layouts can be accommodated. This fee also includes distribution of the advertisement on the CORS ListServ. Direct inquiries to the Editor.

CORS LISTSERV

As a benefit of membership, members may use the CORS ListServ to transmit messages, announcements, and job postings to the entire membership or to a targeted subgroup such as a local section. For example, you can send

- messages regarding the activities and business of the Society;
- announcements about conferences, conference sessions, special journal issues, seminars or other activities provided that these are related to operational research in its broadest sense;
- job postings of general interest to CORS members.

The ListServ is not used for commercial purposes, and all messages are vetted before they are sent out. To submit items to the ListServ, email Wendy L. Caron, CORS Membership Services at caronwendyl@symaplico.ca.

For non-members, a fee of \$60 is charged for the distribution of Job Postings and other announcements or messages of interest to the CORS membership.



Canadian Operational Research Society
Société canadienne de recherche opérationnelle

The **Canadian Operational Research Society** was founded in 1958. Its goal is to advance the theory and practice of O.R. and to stimulate and promote contacts between people interested in the subject.

Publications: A quarterly scientific journal called *INFOR* and a news *Bulletin*.

Meetings: An annual National Conference with award ceremony, occasionally organized jointly with an international society (IFORS, INFORMS), as well as numerous local events organized by the local sections.

Local Sections: CORS has twelve local sections located throughout Canada and three student sections.

Awards and Prizes: CORS presents the following annual Awards and Prizes at its National Conference:

Award of Merit for significant contributions of a present or past member of CORS to the profession of O.R.

Harold Larnder Memorial Award to an individual who has achieved international distinction in O.R.

Omond Solandt Award to an organization, private or governmental, that is deemed to have made an outstanding contribution to O.R. in Canada.

Practice Prize for the challenging application of the O.R. approach to the solution of applied problems.

Service Award for outstanding contributions of time and service to the Society.

Student Paper Competition to recognize the contribution of a paper either directly to the field of O.R. through the development of methodology or to another field through the application of O.R.

Graduate Student Funding: CORS encourages attendance of graduate students at conferences, symposia, or workshops by providing partial funding. Visit CORS website for details.

CORS Diploma: This diploma is awarded to students graduating from a university curriculum comprising several O.R. courses. Criteria and an example certificate may be found on the CORS website.

Membership Directory: An online Directory of CORS Members is available as a membership benefit.

To join CORS: Go to the CORS website (www.cors.ca) and join online by credit card using the form found under membership services or complete the PDF application form found on the CORS website and mail it with payment to the address below.

Fees: Member \$75 Retired Member \$37.50 Student Member \$35

Web site: <http://www.cors.ca>

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