

Linkages

Global Supply Chain Management

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Challenges Facing Global Supply Chains

The COVID-19 pandemic has shifted from a short-term crisis into a long-term state of the business environment. The pandemic has resulted in extremely volatile supply and demand, in many cases shifting faster than the supply chains can adjust. Given that most supply chain networks are designed for efficiency (utilizing complex and interconnected supply base, lean/JIT systems, global sourcing, supply consolidations, etc.), widespread and lingering shortages and frequent price hikes have created numerous moving bottlenecks (i.e., materials shortages, plant closures, shipping delays, port congestions, etc.) throughout the supply chain, preventing the market from reaching equilibrium quickly.

While some choke points in Asia have finally cleared, labor shortages and U.S. port congestions persist. Most experts do not expect a return to normal operations until the third quarter of 2022 at the earliest, which poses risks to growth as concerns about COVID-19 variants persist around the globe. The key is mitigating supply chain disruptions and improving supply chain resiliency without incurring exorbitant costs. Striking a balance between costs and resiliency is the key challenge.

In a recent *Inbound Logistics* podcast (January 2022), we recommend several strategies to mitigate supply chain disruptions during major emergencies without incurring exorbitant costs. To listen, visit clarkson.edu/global-supply-chain-challenges or scan the QR code.

Our interdisciplinary supply chain management programs cover a variety of critical topics to help today's professionals successfully navigate future challenges. In this issue of *Linkages*, you will read about our faculty's latest achievements and research, including applying data-driven methodologies to solve systems-related problems in manufacturing and service industries (p. 2); meet a 2021 graduate-turned-MBA student who discovered that a career in supply chain operations was the perfect way to apply his interests in optimization and programming (p. 3); follow an alumna who has put her global supply chain management degree to work in a successful career in sourcing and procurement (p. 6); and learn how one professor is applying the lens of antitrust cases to help students explore how companies interact in the supply chain (p. 7).

We hope you enjoy this issue and welcome your feedback (mahmoodi@clarkson.edu).



Professor Farzad Mahmoodi,
Joel Goldschein '57 Endowed
Chair in Supply Chain
Management and Director of
Clarkson's GSCM Program



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Improving Profit Margins Through Optimization

With low profit margins and high competition, grocery stores and supermarkets are always looking for ways to sell more products and increase their market share. One way to achieve these goals is to optimize store layouts.

That's where research by Visiting Assistant Professor Elif Ozgormus comes in.

Professor Ozgormus is an industrial engineer who applies data-driven methodologies to solve systems-related problems in service and manufacturing industries. Recently, she completed a successful multiyear optimization project for Migros, the largest supermarket retailer in Turkey.

The project grew out of her research at Auburn University, where she received her PhD in Industrial and Systems Engineering in 2015. "I developed an analytical method for solving realistic grocery store block layout problems," she says. "Encouraged by my doctoral advisor, I decided to try to implement my optimization methodology in a real grocery store."

Prof. Ozgormus, who grew up in Istanbul, decided to approach Migros. "I did some research and realized that the CEO was also an industrial engineer and had received his graduate education in the U.S.," she recalls. "I reached out to him and explained my proposal; amazingly, he responded immediately and was very receptive."

She was invited to make a presentation to the planning and supply chain departments of the company. "Afterwards, they agreed to share their data with me," she recalls.

By 2016, she was working at Pamukkale University in the industrial engineering department and collaborating with Migros to implement her grocery store layout and product shelf optimization system. "Initially, the company gave me a single store in a shopping center in Istanbul to pilot the

system, with the understanding that if I could show an increase in revenue, then they would consider implementing it in other stores."

She did just that. The data reflected a 4.5% increase in daily revenue. "Obviously, they were very happy with those results and decided to implement the system in their 2,200 stores."

To achieve this, Prof. Ozgormus partnered with computer science department professors and students at Pamukkale University to develop software for her system. And she secured a grant from the Scientific and Technological Research Council of Turkey to support the software development. A patent for the software is now pending.

Prof. Ozgormus published her research results in *Computers & Industrial Engineering*. She has recently co-authored a book chapter on her research for the forthcoming book, *Data-Driven Analytical Grocery Store Design* (Springer).

For an industrial engineer who likes improving efficiency while positively affecting the bottom line, the project was professionally rewarding.

"The best part of my work as an industrial engineer is that I have the opportunity to work with many different industries," she says. In 2021, she completed a project to help the cellphone industry improve efficiency by creating a predictive maintenance application to improve reliability and avoid breakdowns.

Last fall, Prof. Ozgormus accepted a visiting professorship at the Clarkson Reh School of Business, where she teaches Operations & Supply Chain Management, Operations Research and Project Management. "For me, the biggest challenge has been teaching in a business school. I have always taught in engineering departments. But the students at Clarkson are very engaged. I like to give them real-world problems to work on. Overall, I have been very impressed with their work.

"Clarkson's approach to learning through problem-solving aligns with my own teaching style," she says. "It's been a good fit."



Prof. Elif Ozgormus

87%
of Clarkson
students
complete
at least one
co-op or
internship
before
graduation

Streamlining Operations With Technological Solutions

For Jonathan Burbank '21, the interest in solving complicated industry challenges goes back to childhood. "My father was an industrial engineer," he says, "and I always liked the idea of using technology to improve operations and manufacturing processes."

Burbank, who grew up north of Boston, was drawn to Clarkson because of his brother's experiences as a student at the University. "My oldest brother, David '13, was an engineering & management (E&M) major here. He really liked the program and did well with it," he says. "E&M appealed to me because I wanted to learn the business side of things. I knew I wouldn't get that with a traditional engineering degree."

As an undergraduate, Burbank stoked his technological interests by adding extra classes in engineering to his already full course load. His senior year, he passed the rigorous Fundamentals of Engineering exam. "It's one of my proudest achievements," he says. "I have three older brothers – all high achievers – and I am the first in my family to take the exam."

At the same time, things were starting to click for him on the business side. "A major part of the E&M curriculum covers operations and supply chain management, which involve the kinds of problems I like to solve. Many of the applications draw on optimization methods and programming, which make great use of my skills."



Jonathan Burbank '21

As his education progressed, Burbank found himself headed in a new direction: global supply chain management. "I like the challenge of making an industrial operation more efficient by utilizing modeling to reduce costs, shorten lead times and improve customer service," he says.

Outside the classroom, he put his technical and business skills to the test by twice participating in the President's Challenge. The annual contest challenges Clarkson students to showcase their creativity by turning an idea into an actual product or business. He was a two-time winner. For one of his projects, he designed and developed Maglet, an innovative magnetic smart outlet that is safer and greener than current electrical outlets.

Following graduation and summer work as a supply chain management intern at Moog Inc., Burbank returned to Clarkson for the one-year MBA program (with a focus on global supply chain management). "I had considered working for a few years and then going back for an MBA, but I knew it would be difficult to leave industry, so instead I decided to just go for it."

It was the right move.

"The supply chain program at Clarkson is first rate and so are the faculty," he says. "As a graduate student, you get to know your professors in a whole new way. The relationships become even more rewarding."

When he finishes, Burbank will pursue a career in supply chain management or operations. "Ideally, I see myself working a management role where I can improve efficiency and tackle other challenging problems."



Burbank (second from left) and the grand prize-winning team in the 2018 President's Challenge

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Faculty Research, News and Awards



Prof. Santosh Mahapatra

Professor Santosh Mahapatra recently coauthored the article “An Assessment of Factors Contributing to Firms’ Carbon Footprint Reduction Efforts,” published in the *International Journal of Production Economics*.

Professor Farzad Mahmoodi, Joel Goldschein '57 Endowed Chair in Supply Chain Management, coauthored “Integration of Data Envelopment Analysis With Decision Maker Preference for Supplier Selection,” forthcoming in the *International Journal of Industrial Engineering*, and “COVID-19 and Health Care Supply Chain: Impacts and Lessons Learned” (with **Professor Diego Nocetti**) in the Council of Supply Chain Management Professionals’ *Supply Chain Quarterly*.

Prof. Mahmoodi also coauthored a book chapter, “Linking Supply Chain Management to Shareholder Value,” in *Global Logistics: New Directions in Supply Chain Management* (Kogan Page Ltd.).

Assistant Professor Golshan Madraki coauthored “Strategic Supplier Selection in Payment Industry: A Multi-Criteria Solution for Insufficient and Interrelated Data Sources” in the *International Journal of Information Technology & Decision*



Prof. Golshan Madraki

Making, and “Accelerating the Calculation of Makespan Used in Scheduling, Improvement Heuristics” in *Computer & Operations Research*.

She also coauthored (with **Prof. Amir Mousavian**) “Graph-Based Modeling in Shop Scheduling Problems: Review and Extensions” in *Applied Sciences*, and “A Theoretical Framework for Increasing the Efficiency of Scheduling Improvement Heuristics Using a New DAG Longest Path Algorithm in Perturbed DAGs,” forthcoming in the *International Journal of Production Research*.

Associate Professor Amir Mousavian recently coauthored several publications, including “Interconnected Smart Power Grid and Electric Transportation: A SWOT Analysis” in *Current Sustainable/Renewable Energy Reports*, and “Equilibria in Interdependent Natural-Gas and Electric Power Markets: An Analytical Approach” in the *Journal of Modern Power Systems and Clean Energy*.

R. John Milne, Neil '64 & Karen Bonke Associate Professor in Engineering & Management, is a coauthor of three articles forthcoming in 2022:

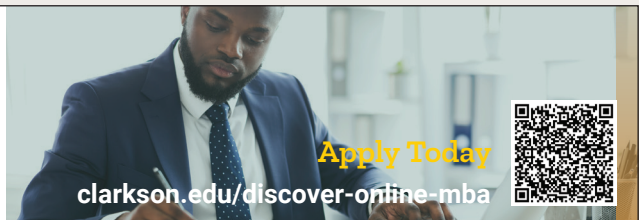
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"Social Distancing in Airplane Seat Assignments for Passenger Groups" in *Transportmetrica B: Transport Dynamics*; "Minimizing Health Risks as a Function of the Number of Airplane Boarding Groups" in *Transportmetrica B: Transport Dynamics*; and "Grey Clustering of the Variations in the Back-to-front Airplane Boarding Method Considering COVID-19 Flying Restrictions" in *Grey Systems: Theory and Application*.

Professor Milne also served as the special issues editor for the Jan./Feb. 2022 issue of *INFORMS Journal on Applied Analytics*, which contains papers from the 2021 finalists for the Franz Edelman Award for Achievement in Advance Analytics, Operations Research and Management Science. This is the 10th issue of the Edelman papers for which he has served as editor.

Associate Professor Dennis Yu has been invited to serve as chair of the Marketing and Operations Management track at the Production and Operations Management Society's 32nd Annual Conference in April 2022.

Assistant Professor Chester Xiang recently completed a weeklong training boot camp with SAP University Alliances. The training will facilitate the transitioning of the curriculum from the old SAP R/3 to the new SAP S/4HANA system and updating SAP exercises in his Operations and Supply Chain Management course.



Prof. R. John Milne



Prof. Chester Xiang

Applying Supply Chain Methodologies to Other Fields

Assistant Professor Guoyu Lin's research applies supply chain technology and textual analysis to analyze accounting data. "Big data enables accountants and accounting researchers to identify and analyze accounting data in a more effective way," he says.

Prof. Lin and **Assistant Professors Anna Brown** and **Wentao Wu** are the authors of the article "The Effect of Unionization on Firms' Earnings Management and Employee Compensation: Evidence from a Regression Discontinuity Design," which is under late-stage review at the *Journal of Business, Finance & Accounting*. The paper employs a regression discontinuity design to show that unionized firms manipulate earnings to reduce the transfer of wealth to employees.



Prof. Rohan Crichton

Assistant Professor Rohan Crichton is co-author of the article "Clearing Up the Benefits of a Fossil Fuel Sector Diversified Board: A Climate Change Mitigation Strategy," which appeared in a recent issue of *Business and Society Review*.

Prof. Crichton and his colleagues examined the role, structure and benefits of a nontraditional fossil fuel sector board of directors in operational decision-making, including organizational supply chain management practices.

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*U.S. News &
World Report,
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The Right Fit

Clarkson alumni salaries are in the **TOP 2%** of highest salaries in the nation

PayScale College Salary Report



A degree in global supply chain management from Clarkson gave Kendra Kimball '13, global team lead, projects procurement, at Honeywell International, the return on investment she needed to launch and pursue a successful career in sourcing and procurement.

"I was always aware of Clarkson," says Kendra Kimball '13. The Massena, New York, native grew up just 20 miles down the road from the University. When it came time to apply to colleges, Clarkson was on her radar, but so were many other schools.

"I applied to – and was accepted by – 16 universities," she says. "Through all of the application processes, open houses and campus tours, Clarkson stood out to me as being very 'outcome driven.' That appealed to me."

What finally sold Kimball on Clarkson was a prospective student open house she attended in her senior year of high school. "There was a panel of School of Business students ranging from freshmen to seniors. What impressed me was that, regardless of their individual backgrounds, you could see the growth and development that occurred as they progressed in their education."

Kimball came to the Reh School of Business as an undeclared major. Smart, hardworking and driven to succeed, she quickly began to assess where the best opportunities and career prospects lay. "I was excited by the marketability of the global supply chain management (GSCM) major. It was clear to me that a supply chain major had a high return on investment (ROI) with a good starting offer after graduation."

That ROI is built on the GSCM program's standout reputation among corporate recruiters. "It also helps that Clarkson's large engineering student population attracts companies that supply chain majors can leverage as well," she says.

These same companies also hire Clarkson students for co-ops and internships. Kimball got her first co-op, at GE Aviation, following her first year. "In all, I had the opportunity to intern and do co-ops at four *Fortune* 100 companies: GE, Boeing, Walmart and Alcoa."

"While all of my experiences were valuable, my internship at the Walmart corporate headquarters in Bentonville, Arkansas, was probably the cherry



Kendra Kimball '13

on top," she says. "Working for the world's number one retailer is an opportunity that can't be beat for anyone pursuing a supply chain major."

In the end, her hard work and strategic career planning paid off. Following graduation in 2013, she accepted an offer from another *Fortune* 100 company, DuPont, and began working as a buyer, global sourcing in indirect services, at the company's global headquarters in Wilmington, Delaware.

In 2015, she moved to National Grid, working as a senior buyer in global procurement. As a senior buyer, she supported about \$400 million in annual spending in areas that included HR services, benefits, consultancy and public relations services. At the same time, she pursued and received an MBA with a concentration in business process innovation from Widener University.

After two years at National Grid, Kimball made an unexpected – and unconventional – career move. "I took on a role in consumer communications and crisis management," she

says. "I was managing projects and developing the messaging to customers for high-priority topics. It forced me out of my comfort zone and also put to use the skills I had developed in sourcing and procurement."

One year later, a desire to move south prompted her to accept a position at Honeywell International. "Honeywell had recently relocated their headquarters to Charlotte, North Carolina," she says. "I started as a global category manager of MRO in 2019. The MRO category is anything that a plant needs to operate that doesn't go directly into product. My past category leadership experience had primarily been in indirect services, so I took the MRO role as an opportunity to stay within that area but lead a category that more closely impacted manufacturing."

Last summer, Kimball accepted a new role as global team lead, projects procurement, within Honeywell's Connected Enterprise organization.

And that year spent in customer and crisis communications paid off. "Taking a non-supply chain position was a risk at the time, but it has turned out to be a turning point in my professional development. The skills I learned have been invaluable."

Kimball still finds her way back to her alma mater. Except now, she is there to recruit, on the lookout for GSCM majors with the experience, education and skills needed to hit the ground running and with the drive to succeed.

Graduates, that is, just like herself.

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*The Princeton
Review, 2021*

Exploring How Companies Interact in the Supply Chain Through Antitrust Cases

This spring, students in Clarkson's online Master of Science in Supply Chain Management are exploring how companies interact in the supply chain through the lens of antitrust cases.

The course, Industrial Organization and the Supply Chain (EC652), is taught by Assistant Professor of Economics and Financial Studies Michael Sacks.

"We begin with a theoretical approach outlining the many ways in which companies coordinate, cooperate, contract and compete with one another," Professor Sacks says. "We then analyze cases in which the way these companies interacted was scrutinized by affected customers, competitors and antitrust authorities, such as the Department of Justice and the Federal Trade Commission.

"Each case study is written by economists who consulted as expert witnesses on the antitrust case. This approach offers unique perspectives into why companies merge or employ certain practices such as below-cost pricing, coordinated pricing or various contract restrictions; when these practices are permissible; and when they are prohibited."

The cases include the proposed Aetna and Humana merger, the proposed AT&T and T-Mobile merger,

collusion in college sports, pharmaceutical patents and paying-for-delay, and the famous case of the U.S. versus Microsoft. "These cases cover a variety of issues including mergers, predatory pricing, tying and bundling, full-line forcing and exclusive dealing."

Students then apply what they have learned to study an industry and write an economic analysis characterizing the relevant companies' behaviors, as well as why certain practices are being questioned. They also consider how their case study can inform other industries.

"The overall goal of the course is to have students understand the nature of competition and cooperation among companies in the supply chain and to be able to identify the boundaries of permissible conduct," Prof. Sacks says.



Prof. Michael Sacks

Impact of COVID-19 on North American Supply Chains

COVID-19 continues to disrupt global supply chains, resulting in material shortages, manufacturing and delivery delays, order backlogs and spikes in transportation costs.

Last November, Professor Farzad Mahmoodi, Joel Goldschein '57 Endowed Chair in Supply Chain Management and director of Clarkson's GSCM program, discussed COVID impacts on North American supply chains at a U.S.-Canadian sponsored webinar.

"Issues and Challenges Facing North American Supply Chains" was sponsored and hosted by the Fédération des chambres de commerce du Québec (FCCQ) and the North Country Chamber of Commerce. Professor Mahmoodi was one of two invited speakers; the other was Emmanuelle Toussaint, vice president of legal regulatory and public affairs in the North American Bus Division of Volvo Group.

The two discussed the factors that led to the current situation and identified actions that could be taken by both governments, as well as private entities, to mitigate the impacts on the respective economies.

FCCQ represents more than 50,000 businesses operating in all sectors of the economy throughout Quebec. The North Country Chamber of Commerce is a regional chamber serving Clinton, Essex, Franklin, Hamilton and northern Warren counties in New York state and southern Quebec.



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