

Rutgers Business School
Supply Chain Management
and Marketing Sciences



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Newark and New Brunswick



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MISSION

To become a nationally recognized Center for Supply Chain Management dedicated to developing innovative strategies and practical solutions that address business problems encountered by the enterprise in the management of the end-to-end supply chain.

The Center builds upon the strengths of Rutgers Business School with world-class research, innovative teaching and the integration of inter-functional business disciplines. We value and actively promote a high level of collaboration between the business community and Rutgers University.

The Center for Supply Chain Management:

- Provides solutions to emerging supply chain management problems by:
 - Promoting problem solving and research between the Rutgers University faculty and the business community.
 - Serving as a ready source to the business community for leading-edge best practices in supply chain management.
- Develops and delivers executive education in supply chain management to the business community.
- Conducts periodic meetings of member companies to share best practices, identify research topics, and disseminate leading-edge thinking.
- Is supported by an Advisory Board which offers offsite learning and meaningful internship opportunities for students, and stimulates corporate research opportunities for faculty members.

TABLE OF CONTENTS

Front Cover	Graduate & Undergraduate Advisory Boards
2	Greetings From Dr. Lei Lei – Chair, Department of Supply Chain Management and Marketing Sciences
3	New Department of Supply Chain Management and Marketing Sciences
4	Top 15 ranking for Supply Chain Management & Marketing Sciences department at Rutgers Business School
5-8	<i>Recent Events</i> <ul style="list-style-type: none"> – Marketing Executive Panel – Transportation Summit – Collaboration Summit – The Supply Chain of the Future – Annual Supply Chain Management Certification Program – Rutgers Wins Annual SCM Case Competition – Rutgers Center For Supply Chain Management MBA Scholarships – Undergraduate Honors Track Scholarships – Rutgers Business School students honored at 9th Annual Services Conference – First BSY Associates Scholarship Awarded to Rutgers Supply Chain Management Student
8-13	Worldclass Research: <ul style="list-style-type: none"> The Future Of Pharmaceutical and Biotech Distribution <ul style="list-style-type: none"> – <i>New Challenges to Emergency Management of Pharmaceutical Healthcare</i> – Yao Zhao, Associate Professor in Supply Chain Management & Marketing Science – Joint Work with Katie Martino, Ph.D. candidate in Supply Chain Management Integrating Project and Supply Chain Management Research By Aaron Shenhar, Professor SCMMS Department
14	Rutgers-Supply Chain Management and Marketing Sciences Research Papers
16	Rutgers-Supply Chain Management and Marketing Sciences Faculty

"Since our department was formed over a year ago, our vision continues to become a nationally ranked, top-rated supply chain department. As you will later see in this report, we took a big step forward in being recognized by AMR Research as a top 15 ranked program. We have no plans to stop there."

– Dr. Lei Lei
Chair, Department of Supply Chain Management and Marketing Sciences



GREETINGS!

I'm pleased to introduce the Annual Report for Rutgers Business School's new Department of Supply Chain Management and Marketing Sciences. The goal of this Annual Report is to bring news, information, and resources to all of our stakeholders, including students, faculty, the university community, corporate clients and supply chain and marketing professionals throughout the world.

Since our department was formed over a year ago, our vision continues to become a nationally ranked, top-rated supply chain department. As you will see later in this report, we took a big step forward by being recognized by AMR Research as a top 15 ranked program. We have no plans to stop there. We will continue to accelerate this goal by our excellence and unique strength in world-class research, innovative teaching, and high quality service in supply chain management to client companies and industry. Our mission is threefold. First, we want to disseminate knowledge through our leading edge research in three focused areas: Sustainability, Responsiveness and Flexibility, and Risk Reduction.

Global competition, economic turbulence, the need to penetrate emerging markets, fend off new competitors, boost productivity and working capital utilization, and ensure a healthy cash flow while maintaining highly competitive operational and service performance have all contributed to the urgency for developing effective supply chain strategies. Such strategies will enable a company to stand at the top of its industry when the economy improves. Toward this end, the research fellows at Rutgers Business School's Department of Supply Chain Management and Marketing Sciences (SCMMS) and Center for Supply Chain Management have been focusing on the following three areas.

Sustainability: Identifying and adjusting your core competencies to build sustainability into your supply chain. Making better use of marketing signals and developing your own supply chain intelligence. Keep in mind that high power IT support does not mean you have an intelligent supply chain. Be proactive and do not wait until a crisis arises. Sustainability has risen to the "C" level in most corporations and our research efforts are on the leading edge.

Responsiveness and flexibility: Developing the responsiveness and flexibility to ensure we can quickly adapt to the changes, especially under the current economic turmoil. Tough times create opportunities. If you have the flexibility, you catch the opportunities which lead to business improvement and long-sustaining progress toward your company's long term goals.

Risk reduction: Reducing supply and risks by better collaboration among supply chain partners, choosing suppliers with low financial risks, knowing how to sense, respond and adapt to unknown/unplanned events are the keys to mitigating risks in your supply chain and company. The objective of the Rutgers supply chain management program is to work closely with our corporate sponsors to develop leading edge research and to conduct world class education programs for the preparation of future supply chain talent and business leaders.

Our second goal is to excel in classroom teaching of comprehensive and well-rounded programs that focus on end-to-end supply chain management and balance both theory and practice.

Finally, we want to continue our close collaboration with industry and government, with the goal of bridging the gap between academic and business practices, and creating new synergies across disciplines that promote economic development and drive leading-edge research and innovative teaching.

We are proud of the work we are doing and hope that you will join us on our journey.

Sincerely,

Dr. Lei Lei
Professor and Chair, Department of Supply Chain Management and Marketing Sciences
Director, Rutgers Center for Supply Chain Management

NEW DEPARTMENT OF SUPPLY CHAIN MANAGEMENT AND MARKETING SCIENCES

Effective last year, a new Department of Supply Chain Management and Marketing Sciences (SCMMS) was formed. This newly established Department, expanding on the overwhelming success of the Rutgers Center for Supply Chain Management, exemplifies the mutual advantage of a vital collaboration between Rutgers Business School (RBS), private companies, and public entities that bridges the gap between academic and business practices.

Rutgers SCMMS is conveniently located in the middle of the nation’s major air, sea, and rail transportation hubs. Nationally recognized as a leader in industry collaboration, the SCMMS department fills a crucial need for businesses competing in a global economy that face rising logistics, outsourcing, and security challenges.

This collaboration is helping companies with complex logistics to succeed by improving efficiencies and effectiveness in the end-to-end supply chain cycle.

“The Center for Supply Chain Management at RBS is widely viewed as an excellent source of supply chain expertise and a forum for networking with colleagues within various industries,” said Lei Lei, PhD, Professor and Chair of the Department of Supply Chain Management and Marketing Sciences. “Over the past few years, the center has developed into a knowledge hub that is an excellent resource to industry professionals.”

RBS’s vision is to become a nationally ranked, top-rated supply chain department. “We are accomplishing this goal through our excellence and unique strength in world-class research, innovative teaching, and high quality service in supply chain management to client companies and industry,” said Rutgers Business School Dean Michael R. Cooper, PhD.

New Rutgers Business School Building at One Washington Park



OUR ADVISORY BOARD MEMBERS:



“The new Supply Chain Management and Marketing Sciences department plays an important role in delivering to students the business, science, and technology credentials demanded by today’s leading corporate employers.”

– **Michael R. Cooper, PhD**
 Dean and Professor
 Rutgers Business School
 Rutgers,
 The State University of New Jersey

100% Placement Rate For Rutgers MBA Supply Chain Students

Even with the very tough economic environment, the MBA Class of 2010 students with a concentration in Supply Chain Management at Rutgers Business School had a 100% placement rate for summer internships, for the second year in a row. Rutgers MBA students interned in companies like:

- Johnson & Johnson
- Novartis
- MetLife
- Well Point
- International Flavors and Fragrances
- Schering Plough
- Converge
- CargoNet

Internships ranged from procurement to supply chain optimization to customer facing activities, providing students with a broad choice to choose for their career path forward within the vast supply chain arena.



TOP 15 RANKING FOR SUPPLY CHAIN MANAGEMENT & MARKETING SCIENCES DEPARTMENT AT RUTGERS BUSINESS SCHOOL

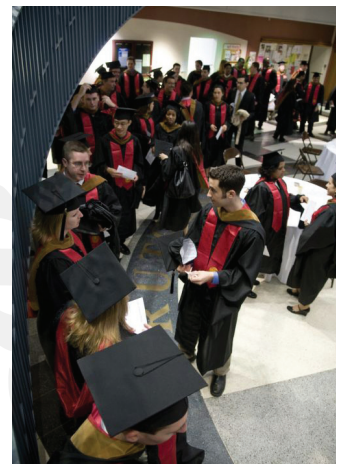
The department of Supply Chain Management and Marketing Sciences (SCMMS) at Rutgers Business School (RBS) was recognized as a top 15 program in a 2009 report issued by AMR Research Inc., which assessed leading U.S.-based university supply chain programs. The report looked to match industry needs with a university program's capability to deliver the quality and quantity of supply chain management professionals, and Rutgers Business School was ranked 8th in "depth of program" and 10th in "industry value." Overall the strength of SCMMS's program was ranked 11th, comparing similarly to programs at Syracuse University and the University of Michigan.

The research cited Rutgers Business School as one of the bright spots in the next tier of programs after the top five. "Rutgers University is another growing program, with an undergraduate program being added this summer to build upon a strong group of professors." The report also highlighted the strength of RBS's research in risk management and sustainability.

One of the keys to the department's success is the high regard the industry has for professor Lei Lei, PhD, chair of the Department of Supply Chain Management and Marketing Sciences. "Professor Lei has developed a vision for the supply-chain management program that drives a high level of competency, generates employment success for the students, impactful results for the hiring companies and builds upon the reputation of Rutgers University," said Roy Anderson, vice president of Global Procurement at MetLife.

"In addition to being a supply chain subject matter expert, Professor Lei is a consummate professional and a leader who is well respected by students, academics, administrators and business professionals in every interaction," added William D. McLaury, CPIM, Executive Director, North American Pharma Supply Chain, Novartis Pharmaceuticals Corporation. "She is one of the main reasons that Novartis Pharmaceuticals continues to actively support the RBS Center for Supply Chain Management."

As the results of the AMR Research study demonstrate, RBS is becoming a nationally ranked, top-rated supply chain department. "The new Supply Chain Management and Marketing Sciences department plays an important role in delivering to students the business, science, and technology credentials demanded by today's leading corporate employers," said Rutgers Business School Dean Michael R. Cooper, PhD.



Graduation is the culmination of the students' education at Rutgers Business School.

NEW UNDERGRADUATE PROGRAM IN SUPPLY CHAIN AND MARKETING SCIENCES

Rutgers Business School has recently introduced a new Undergraduate Supply Chain Management and Marketing Sciences (SCMS) major. This new SCMS undergraduate program offers students comprehensive knowledge and technological skills in order to prepare them for employment in today's competitive business environment. The requisite knowledge and skill sets extend over all supply chain echelons and functional areas, from strategic sourcing, global procurement, contract management, business performance improvement, supply chain technologies and six sigma, pricing analysis, channel coordination and brand management, new product development and supply chain alignment, retail management, to sales and distribution management.

The SCMS students are prepared for positions such as procurement/sourcing manager, logistics planner, supply management analyst, acquisition project analyst, marketing analyst, or sales/distribution manager. All industries, especially pharmaceutical and healthcare companies, are investing heavily in creating and supporting supply chains that achieve new heights of efficiency and productivity. The new generation of business school graduates who are competent and well-prepared, with solid knowledge in both supply chain management and marketing/sales management, are in high demand across all industries.

The new undergraduate major in Supply Chain and Marketing Sciences (SCMS) has been enthusiastically embraced by the business community with confirmed industry scholarships and internships dedicated to the new RU-SCMS major.

RECENT EVENTS

Marketing Executive Panel

Rutgers Association of Marketing & Strategy (RAMS) hosted an executive panel with speakers from various companies who shared with students their career experiences, challenges, and advice, as well as their opinions on the obstacles facing the global economy. Panel speakers included:

- **Heidi Fleischer** – *Global Account Director in the Strategic Partnership Marketing Group at The Coca-Cola Company*
- **Mark Miller** – *US Brand Advertising for MetLife*
- **Talib Morgan** – *CEO – Actuan LLC*
- **Timothy Platt** – *Marketing Specialist – Communications & Marketing Department, Rutgers Business School*
- **Karen Tibbals** – *Director, Global Market Research at Schering-Plough*

Discussions ranged from Web 2.0 techniques to viral marketing as well as the latest changes, challenges and trends facing marketing professionals. A dinner and networking opportunity followed the panel, allowing students to gain tremendous insight from the marketing industry professionals.



Speaker panels such as this allow the students to learn from and network with working professionals.

Undergraduate Honors Track Scholarships

The newly introduced supply chain honors track had 10 scholarship recipients at the undergraduate level this year. The scholarship awardees and the companies providing the scholarships are as follows:

- Felicia Cheng
Bristol Myers Squibb
- John Dever
PSE&G
- Phillip Geltman
International Flavor & Fragrance
- Roman Kahn
Astra Zeneca
- Joyce Kong
Novartis
- Eitan Levine
Johnson & Johnson
- Ankit Munjapara
Novartis
- William Stopa
L'Oreal
- William Van Emburgh
Panasonic
- Alice Wong
International Flavor & Fragrance

Phillip Geltman has also been awarded a grant by the Council for Supply Chain Management Professionals to attend their national convention.



Students enjoy numerous educational opportunities through the department of SCMMS.

Transportation Summit

A Transportation Summit was hosted at Traves Hall, Douglass Campus Center, with esteemed speakers like Karen E. Kelly (North America Trade Compliance Leader/Global Transportation, Becton Dickinson), William A. McLeod (Program Manager, Department of Homeland Security, Immigration and Customs Enforcement), Michael Palermo (Federal Task Force Officer, Federal Bureau of Investigation), and David A. Pollard (Managing Director, FedEx Solutions, FedEx Corporate Services, INC.). Various panels in the summit included The Ins and Out of Supply Chain Security, Vulnerabilities in the Supply Chain, and Supply Chain Risk Mitigation and Business Continuity.

Collaboration Summit

The Center jointly hosted a conference with the Council of Supply Chain Management Professionals NJ Roundtable on Driving Results through Collaboration in the Supply Chain. The event took place on the Rutgers-Douglass campus in New Brunswick, NJ. Speakers included Larry Monaghan (Director, Transportation and Logistics, LG Electronics), Joel Childs (Vice President, Marketing, FedEx Custom Critical), Dr. Aaron J. Shenhar (Professor, Rutgers Business School), Sarah Polworth (Director, Vendor Relations & EDI, Saks Fifth Avenue), Mike Slattery (Director, Customer Service Operations, Campbell Soup Company), Ron Keegan (Director, Information Systems & Telecommunication Business Support, Arkema Group), and Pam Cheng (Vice President, Supply Chain Management, Merck & Co., Inc).

Topics at this very successful summit included Creating Trust, Openness, and Honesty with Supply Chain Partners to Drive Exceptional Results, Well-Executed Project Management in Collaborative Initiatives in the Supply Chain, and Meeting and Exceeding Metrics and Goals Through Cooperation with Customers and Vendors, and Through Internal Group Effort.

The Supply Chain of the Future

Today's supply chain leaders are challenging themselves to determine "what is next" as they creatively find ways to meet business demands. CEOs and CFOs recognize that their competitive success is linked to the performance of their supply chains.

From the pressures of conducting business in a global market place to a look towards the supply chain of the future, the recent Rutgers University summit highlighted discussions on various topics and challenges facing those in the industry. The program agenda included:

- **Leonardo DeCandia**, PE, Supply Chain Consultant/Advisory Board Chairman, Rutgers Center for Supply Chain Management/and Adjunct Professor, Rutgers Business School: Current & Future Manufacturer Challenges in the Pharmaceutical/Health Care Supply Chain.
- **Bob Boucher**, Vice President, Global Customer Service & Logistics, Colgate-Palmolive Company: The 2016 Future Supply Chain
- **Dr. Mahender Singh**, Research Director, Supply Chain 2020, Center for Transportation and Logistics, Massachusetts Institute of Technology: Supply Chain 2020: A Future Forward-Thinking Framework

Over 90 attendees enjoyed the educational program and networking opportunity, with many commenting that the event highlighted new and different ways of looking at the future of supply chain management.

Annual Supply Chain Management Certification Program

In June of this year, the Center for Supply Chain management hosted its eighth annual certificate program in supply chain management for business professionals, which has had over 200 graduates to date. The program covers major aspects of supply chain management, including strategy, sourcing and procurement, logistics, operations management, inventory management, and organizational alignment. Led by Rutgers Business School faculty and top senior executives from local corporations, participants learn how to execute a supply chain management plan that is grounded in today's business needs for competitive effectiveness and operations efficiency. The program has consistently received outstanding evaluations from its attendees and was a major success this year with over 29 attendees.

Rutgers Wins Annual SCM Case Competition

The Rutgers Center for Supply Chain Management hosted its annual case competition on the Rutgers-Livingston campus in Piscataway, NJ, for masters students from distinguished schools in the Northeast region, including:

- College of Engineering, New Jersey Institute of Technology
- Martin J. Whitman School of Management, Syracuse University
- P.C. Rossin College of Engineering and Applied Science, Lehigh University
- School of Business, Rutgers University

Student teams competed before a panel of industry judges from companies such as DP&C Enterprises, L'Oreal USA, MetLife, Novartis Pharmaceuticals, PSEG, Schering-Plough, and Schindler Elevator Corporation. The student teams were judged on several key areas, including analysis of critical business issues, quality of solutions, articulation of ideas, presentation style, and responses to the judges' questions.



Winning Team: Som Ming Leung, Ishma Sharma, Sarika Tandon, and Li Yin

According to Dr. Lei Lei, Professor at Rutgers Business School and Director of the Rutgers Center for Supply Chain Management, "The competition is an excellent opportunity for students to showcase their business skills before a panel of senior industry executives. And the business executives also enjoy the chance to see top students in action."

Rutgers Business School students honored at 9th annual ISM Services Conference

Three Rutgers Business School students were named 2008 Institute for Supply Management™ (ISM) Services Group Scholarship winners at the 9th Annual ISM Services Conference at The Ritz-Carlton in Phoenix, Arizona. They are Joseph Campbell, David Myung Han, and Ankit Munjapara.

Scholarship recipients exemplify the very best in educational achievement and future of the supply management profession. Each received \$2,000 plus sponsored registration and travel allowance to attend the ISM Services Conference that took place in Phoenix, AZ.

The conference was hosted by (ISM)'s Services Group. The ISM Services Group is one of several groups comprised of ISM members with common interests in education and networking in various topics. Members are either in service industries or supply management professionals who buy services. The Services Group's University Relations efforts focus on four main areas: mentoring, internships, scholarships and on-site activities.

Rutgers Center For Supply Chain Management MBA Scholarships

The Rutgers Center for Supply Chain Management Advisory Board awards scholarships annually to full time MBA students pursuing the supply chain management concentration. This year the following four students were awarded scholarships:



Peter Hogan



Disha Kundra



Sarika Tandon



Li Yin



First BSY Associates Scholarship awarded to Rutgers supply chain management student

The Containerization & Intermodal Institute (CII) has selected Disha Kundra, a Rutgers Business School MBA candidate, to receive the first-ever BSY Associates Inc. Scholarship of \$1,500. The scholarship is funded by BSY Associates Inc., a marketing and public relations company in Holmdel, New Jersey.

Kundra is in the MBA class of 2010. She is a member of the Supply Chain Student Initiative Club and the Finance and Investment Club at Rutgers Business School. She was awarded the scholarship at the annual Connie Awards Luncheon at the Newark Club.

The collaboration with both corporate and nonprofit organizations is an integral part of Rutgers Business School programs. "By furthering scholarship advancement in specialized areas of business, our programs have a multidisciplinary edge – delivering research and graduates that have the business, science, and technology credentials that today's employers demand," said Dean Michael R. Cooper, PhD. "We are proud of Disha and our Supply Chain Management and Marketing Department, and honored that the Containerization & Intermodal Institute selected Rutgers Business School to find their first scholarship recipient."

The scholarship was established to award an MBA student pursuing a degree in supply chain management or logistics at a New Jersey college. The institute reached out to Rutgers Business School's Supply Chain Management and Marketing Sciences Department to find a deserving student. The opportunity was open to all students working toward a graduate degree in supply chain management. Applicants were required to submit their resume and a brief essay explaining their career plans after completing the MBA program.

RESEARCH: NEW CHALLENGES TO EMERGENCY MANAGEMENT OF PHARMACEUTICAL/HEALTHCARE SUPPLY CHAIN DISRUPTIONS

S. Graves¹⁰⁰, L. Leib^b, B. Melamed^b, M. Pinedoc^c, L. Qi^b, Z.J. Shen^d and X. Xu^b

^aSloan School of Management, MIT, ^bDepartment of SCMMS, Rutgers Business School, Rutgers University
^cDepartment of IOMS, Stern School of Business, NYU, ^dDepartment of IEOR, UC-Berkeley

The continuity of operations in pharmaceutical/healthcare supply chains is vital to human welfare and the span and quality-of-life of patients. This is particularly important when the population is confronted with a massive health problem, such as a breakout of a pandemic (e.g., a deleterious mutation of the swine flu H1N1 virus), an industrial accident (e.g., the release of a massive dose of toxic material in a dense urban area), or a terrorist high-consequence event (e.g., a massive explosion, dirty bomb, or the release of a pathogen into the environment). The continuity of operations could also be affected by data security breaches, demand variability and supply fluctuations.

A supply chain disruption occurs when continuation of supply is interrupted. Such disruptions take place when either the nominal supply capacity of a business process is greatly reduced for some period of time, or a sudden surge of demand manifests itself, or both. Disruptions in pharmaceutical/healthcare contexts upset the continuity of providing for patient needs, and can have particularly severe consequences. Indeed, when other supply chains are disrupted, companies typically merely lose revenue and potential market share, whereas disruptions to pharmaceutical/healthcare supply chains can put the lives of large numbers of men, women, children and senior citizens in jeopardy. Under the all-hazard approach, DHS is tasked with handling major emergencies and disruptions regardless of cause, including natural disasters, terrorism, pandemics, etc.

Current practices and future trends in pharmaceutical industries have actually enhanced the vulnerability of their supply chains. First, as in other industries, outsourcing has become an important strategic issue for pharmaceutical companies due to increasing competitive pressures to reduce cost and time-to-market. In addition to outsourcing traditional non-core functions, such as manufacturing and clinical trials, pharmaceutical companies increasingly outsource upstream functions, including drug discovery, biotech R&D, and even clinical research. In fact, some companies, such as Astra Zeneca, have announced plans for 100% outsourcing within the next 10 years. Unfortunately, these outsourcing trends render pharmaceutical supply chains longer, more complex, and reduce their visibility.



The 3rd floor deck gives students a place to relax while the state of the art trading room puts students in a real world trading environment.



One Washington Park gives students a comfortable learning environment with all the modern amenities.

Secondly, sales and distribution of pharmaceutical products depend heavily on third party distributors who fully own and control inventories once they leave the manufacturer's site. The involvement of additional parties in pharmaceutical supply chains increases their complexity and the odds of malfunction.

Third, the globalization of the pharmaceutical industry increases the risk of supply chain disruptions by adding even more complexity and geographical scope to supply chains that are already overburdened. To wit, foreign companies manufacture as much as 80% of all ingredients used by American drug makers. Potential regulatory hurdles and shipping uncertainties along the distribution network, from foreign companies to drug makers, greatly complicate coordination in supply chains and are deleterious to their reliability.

The aforementioned emerging trends in pharmaceutical supply chains are giving rise to a host of new issues, challenges, and research topics that impact the management of emergencies and disruptions. These can be classified into the following two categories:

1. PHARMACEUTICAL/HEALTHCARE SUPPLY CHAIN RESILIENCE

Following is a list of challenges to maintaining a resilient pharmaceutical/healthcare supply chain:

- **Risk measurement and evaluation.** Analytical and/or empirical studies should be carried out to measure and evaluate the risks associated with potential partners and candidate facility locations before companies make major decisions concerning sourcing, subcontracting, inventory management or facility location.
- **Sourcing mitigation.** Recent research suggests that sourcing mitigation (e.g., dual sourcing, supply options, etc.) is increasingly favored over inventory mitigation as supplier disruptions become less frequent but longer. There is a need for studies that evaluate and compare these two mitigation strategies.
- **Supplier quality assurance.** The efficacy of pharmaceuticals can be compromised in complex supply chains with a variety of storage facilities and long lead-times. Quality assurance is particularly important when managing high-consequence events with severe health implications (e.g., pandemics and releases of toxic materials and pathogens). Research on supplier evaluation that includes quality assurance under supply chain disruptions is needed.
- **Location analysis of distribution centers.** In practice, planning of distribution centers in the pharmaceutical industry has not typically included disruption as a major issue. Consequently, joint optimization of locations and sizing of distribution centers has rarely been undertaken by collaborating teams of distributors and manufacturers aiming to minimize the negative impact of disruptions. Remediating this situation calls for the development of appropriate facility location models that consider the impacts of potential disruptions on transportation networks and distribution centers.

Student Profile:



Kristin Lettini

Name: Kristen Lettini

Level of Study: RBS MBA 2010, Pharmaceutical Management & Supply Chain Management

Internship Employer: Johnson & Johnson Procurement Leadership Development Program

Internship Projects:

- Design & Implement a Metrics System to evaluate CROs (Clinical Research Organizations)
- Determine root causes for variance in on-site monitoring time for current clinical trial & offer suggestions for improvement
- Assist in developing RFP standardization templates FT

Employer: Johnson & Johnson Procurement Leadership Development Program

Career Objectives: I plan on obtaining my Lean Six Sigma Green Belt and CPSM Certifications in the next year or two, as well as further exploring procurement and supply chain in the pharmaceutical industry.





Students often relax in the park across the street from One Washington Park.

- **Backup facility capacity planning.** In addition to safety stocks, the availability of a level of standby capacity at each echelon of a supply chain would further increase supply chain reliability. However, increasing the standby capacity entails additional costs as well as FDA approval. This presents a new optimization problem that must trade off supply risks and additional costs subject to various constraints.
- **Economic impact of port disruptions.** The bulk of imported pharmaceuticals as well as raw material and intermediate compounds arrive in the U.S. via maritime ports. Disruptions of port operations can have a severe detrimental effect on pharmaceutical supply chains, since limited shelf life and storage requirements of many pharmaceuticals can affect their medicinal efficacy. Thus, management of port disruptions must plan for alternate maritime transportation routes and take into account the increased lead times stemming from the rerouting of cargo vessels.
- **Continuous quality management.** Chemical compounds for pharmaceutical products are provided by suppliers dispersed across multiple regions. Small pharmaceutical companies often partner with contract manufacturers to produce their pharmaceutical products, and many parties contribute to product safety. Preventive and emergency procedures have to be developed for assuring raw material quality and final product safety. Multiple parties have to collaborate with one another on product safety issues in order to reduce quality disruption risks in the supply chain.

- **Disruptions at contract manufacturers.** The general approach to enhancing the reliability of the manufacturing echelon in a supply chain is to construct a portfolio of manufacturing sources, including contract manufacturing and in-house manufacturing. This issue is of particular importance to the pharmaceutical industry in view of its increasing reliance on outsourcing, and the specific time constraints and quality requirements of many drugs. Consequently, managing disruptions at contract manufacturers calls for entering into a business relationship with a set of alternate contract manufacturers.

2. RESPONSE AND RECOVERY FROM PHARMACEUTICAL/HEALTHCARE SUPPLY CHAIN EMERGENCIES AND DISRUPTIONS

Following is a list of issues pertaining to response and recovery actions in the wake of an emergency or significant disruption of a pharmaceutical/healthcare supply chain:

- **Dynamic demand estimation and forecasting.** The course of an infection process (e.g., a pandemic, such as a virulent swine flu) will strongly influence decision making. In such cases, accurate forecasts of the demand (for vaccines and drugs) to treat severely ill patients are essential to controlling the outbreak. Epidemiological studies are needed to model the spread of infection in time and space (using population density data across geographical regions) in order to forecast demand for pharmaceuticals. Such models will likely make use of additional parameters, such as seasonal weather conditions, specific social network structures, etc.
- **Dynamic allocation of resource.** The outbreak of a pandemic would dramatically increase demand in pharmaceutical (including hoarding), thereby creating supply chain disruptions. Given limited amount of resources, we need to determine where and how much to distribute them to different infected areas (with different number of infected people and density, etc.). Is it better to proportionally allocate resources to different areas (might be politically correct) or maybe it is better to make sure we control the possible spread of virus from the largest infected areas? Given that we have forecasts on the future supply of resources and demands, the dynamic version of this problem is even more complex and interesting.

- **Inventory positioning for short shelf-life products.** In general, adequate safety stocks can protect a supply chain against potential disruptions, and improve customer service levels. However, in the pharmaceutical industry, pharmaceuticals have a limited shelf life, with many drugs having a short expiration date. This fact imposes severe constraints on safety stock management, thereby increasing management complexity. In addition, stock visibility is often hampered when third-party distributors control substantial inventories. Research is needed on effective inventory positioning (locations and quantities) as well as ways to enhance supply chain visibility, in order to support optimal response to the emergency/disruption management problems.
- **Information sharing and collaboration.** Information sharing and collaboration among all supply chain echelons, such as suppliers, contract manufacturers and pharmaceutical companies, are critical to managing recovery processes from supply chain disruptions. Information sharing is especially critical in first-response activities following a high-consequence event. Consequently, incentive policies, and mechanisms as well as business models for information sharing and collaboration among all supply chain echelons should be studied and designed.
- **Developing business models for minimizing counterfeiting.** In recent years, pharmaceutical supply chains have been attacked by increasingly sophisticated criminals who divert, counterfeit and adulterate patient medications. As compared to other industries, the pharmaceutical industry is under severe pressure to further enhance supply chain security, while simultaneously reducing costs and maintaining service levels. The industry also faces a growing challenge in the form of an expanding plethora of state regulatory requirements, as well as new challenges stemming from unregulated Internet drug sales and personal importation. Counterfeiting attacks many elements of the chains, from packaging centers, shipping, Internet sales, and distribution networks. Any disruption of the chain can create a tremendous opportunity for counterfeiters who step in to fill pent-up demand with bogus or substandard pharmaceuticals, thereby imperiling patient health. There is a pressing need to develop cooperative business models, where supply chain partners work together to minimize counterfeiting opportunities. Published academic research on tackling such issues is essentially nil.

RESEARCH FINDINGS: THE FUTURE OF PHARMACEUTICAL AND BIOTECH DISTRIBUTION

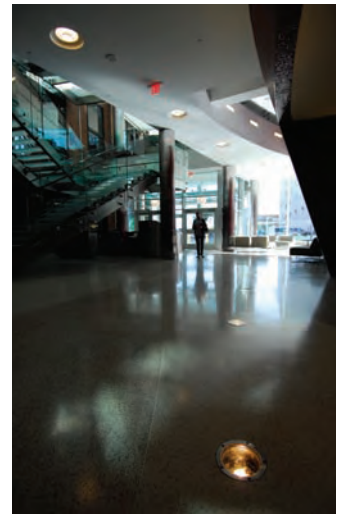
*Yao Zhao, Associate Professor in Supply Chain Management & Marketing Science
Joint Work with Katie Martino, Ph.D. candidate in Supply Chain Management*

DISTRIBUTION IN THE PHARMACEUTICAL INDUSTRY: A BACKGROUND

Professor Yao Zhao, Associate Professor in Supply Chain Management & Marketing Sciences, was inspired three years ago by real world events to begin research on the contracts and distribution mechanisms in the pharmaceutical industry. Prior to 2004, the pharmaceutical industry followed a buy and hold contract (BNH) in which distributors would buy drugs at wholesale acquisition cost (WAC) and then sell them to pharmacies after a markup. The prices of brand drugs would increase every year around January and thus investment buying (forward buying) became a common tactic, which allowed distributors to earn 85% of their profits. Distributors under the buy and hold contract would purchase products before the increase in price and stock up on inventory to make profits a few months later. However, some of the obstacles arising from such a practice include counterfeit drugs, accounting scandals, and excessive inventories in the channel.

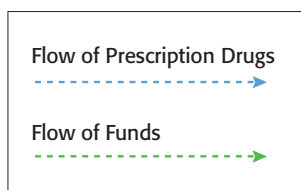
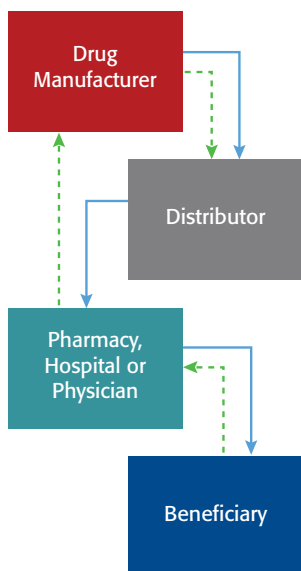
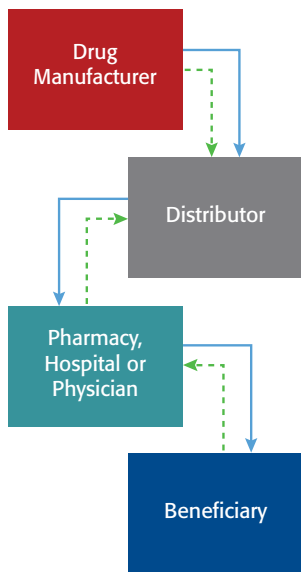
In 2002 U.S. Congress passed the Sarbanes-Oxley Act, which curbed the investment buying practice and only allowed distributors to stock up inventory for a maximum of three months. In response to the new legislation, distributors introduced the fee-for-service (FFS) contract, which asked the manufacturers to pay a fee for their service to make up for the lost profit. In return, distributors promised to provide added services, such as the 852 (point of sales) and 867 (inventory levels) data.

Manufacturers' responses to the fee-for-service contract were mixed. Many of them were not happy to be paying for services which were previously free. Furthermore, they also did not know how to use the 852 and 867 data and thus, many of them have been actively looking at alternatives, such as 3rd party logistics (3PL) services.



The modern lobby and trading room highlights Rutgers Business School's investment in One Washington Park.

MONEY AND DRUG FLOW UNDER THE FFS



A 3PL does not own the inventory but instead just provides the logistics service (similar to the postal service); 3PL is paid for the logistics while the sales directly go back to the manufacturers. The Fee for distribution contract (FDD) removes incentives for forward buying and eliminates many of the previous obstacles while simultaneously streamlining the supply chain. Not only is channel inventory minimized but manufacturers also have the opportunity to interact and satisfy retail demand, which was not possible earlier. While none of the 3PLs have an infrastructure that can compete with that of the largest three distributors – AmerisourceBergen, Cardinal Health and McKesson, the fee-for-distribution contract is generic, meaning that manufacturers can sign it with distributors.

RESEARCH QUESTIONS

Which contract is better, FFS (before) or FFD (after)? For who (manufacturer, distributor, entire supply chain)? By how much? And why?

RESEARCH FINDINGS

First starting with a mathematical model in order to quantify and find the answers to the questions above, Professor Zhao tried to predict the behavior of each of the parties under each contract. Their findings and research led to the conclusion that the fee-for-distribution (FFD) contract is a win-win strategy through which the pie for the whole supply chain would grow. Indeed, FFD achieves the global optimal for the pharmaceutical supply chain by minimizing channel inventory and streamlining operations of the manufacturer and the distributor. Using real world examples, they found that FFD improves the total supply chain profit by about 3.7% relative to FFS contract. For one brand drug example, this represents about \$10 million more profit in a two-year period. The FFD is also flexible because it allows the manufacturer and the distributor to negotiate a split of the increased total profit in any way they like. Finally, FFD is implementable because no matter what FFS contract is currently in place, there is always a FFD that improves the profitability for both the manufacturer and the distributor.

INTEGRATING PROJECT AND SUPPLY CHAIN MANAGEMENT RESEARCH

By Aaron Shenhar, Professor SCMMS Department

Projects are the drivers of innovation and change in organizations. No initiative, no idea and no strategy can become a reality; and no organization can survive in the long run without projects. Projects are becoming more and more important to organizational success, based on accelerating market demands, shorter product lifecycles, and increased investments in complex supply chains and IT. Yet, ironically, in spite of their growing importance, most projects are not completed on time and within budget and many achieve only moderate business success. Different studies have shown that over 50% of all projects result in disappointing results. Our research during the last 15 years has focused on understanding the reasons for this weakness and what can be done to improve the rate of project success. We have recently expanded our studies to include the area of supply chain management and the integration of projects and supply chain management. Below we describe some of these studies and research directions, including major findings and contributions.

ADAPTIVE PROJECT MANAGEMENT

The first direction was based on the realization that one size does not fit all projects, and for better project success, project managers must adapt their management style to project type. The well-established classical standards in the profession assumed that all projects are alike and managing them requires a universal set of techniques and tools. There was also not much theory to guide research in the field. Using concepts from classical structural contingency theory, we developed a framework for identifying project differences along several dimensions such as Novelty, Technology, Complexity, and Pace. Using data from over 600 projects, our research teams went beyond the theory to build empirical-based new rules of how to identify project differences and adjust management to each type of project. This work suggested a new “flexible and adaptive approach” to project management or as it is called “The Diamond Approach.” It offered a new language for assessing project risks and challenges and for communicating these assessments between teams and executives. It helps select the right management approach during the project initiation, put a troubled project back on track, or explain in retrospect a project failure. The results of this study were published in the book: *Reinventing Project Management: “The Diamond Approach to Successful Growth and Innovation”* by Aaron Shenhar and Dov Dvir, Harvard Business School Press, 2007.

THE STRATEGIC APPROACH TO PROJECT MANAGEMENT

This direction involves combining the fields of business strategy with classical project management. Traditional project management is typically focused on “getting the job done” and on meeting time and budget goals. But meeting such goals does not guarantee that the project really achieved its business results or that it supported the company’s strategy. In this research, we have looked at projects as business related processes, that are initiated to achieve business results, not just efficiency goals. The idea is to better connect project management to the business goals of the company and focus on the business aspects of project management. When adopting such approach, projects should be managed differently than those that are focused on time and budget goals only. We have built a new framework called Strategic Project Leadership® (SPL). The framework includes five hierarchical levels of project analysis and planning: Strategy, Spirit, Organization, Processes, and Tools. This framework expands the traditional view of project management, which is typically focused on the two lower levels of processes and tools. We have developed detailed guidelines on how to build a project strategy and spirit as the main strategic components of the new approach. We then summarized the approach by offering seven principles for the implementation of SPL in the company. This direction was supported by grants from NSF, PMI and NASA and was summarized in the book “Linking Project Management to Business Strategy,” published by PMI in 2007.

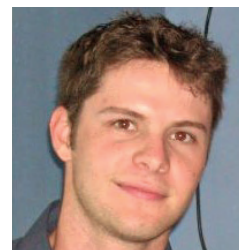
INTEGRATING SUPPLY CHAIN AND PROJECT MANAGEMENT

In this direction we are integrating the disciplines of supply chain management and project management. These areas are often perceived as two distinct scholarly fields, each with its own concepts, theory, body of knowledge, and community of scholars. However in the real world, they are hardly separable: On one hand, any company that needs to build or modify its supply chain, is typically doing so by creating a detailed project plan and managing its execution; on the other hand, most large projects and programs today rely on a complex supply chain network of vendors, subcontractors, distributors, and customers; thus managing a project requires, among other things, understanding the principles and practices of supply chain management.

Our goal in this research is to develop models for the integration of the two fields. We will use famous real life examples to look at the boundaries and common elements of supply chain management and project management, and show why organizational success depends on effective integration of both fields. One of the major directions in this research is to develop understanding on supply chain of complex development projects during the development phase, rather than the traditional manufacturing phase. Such projects are typically found in the aerospace and defense industries. For example, recent painful delays of two major aerospace programs, Boeing’s 787 Dreamliner and Airbus 380, can be attributed to failures in assessing the extent of uncertainty and complexity involved in the program and the companies’ difficulty to set up the appropriate supply chain of subcontractors and partners during development, long before the program moved to manufacturing. Our objective is to identify the right kind of supply chain to programs in development versus production and large systems versus subsystem programs.



Student Profile:



Joseph Campbell

Name: Joseph Campbell

Level of Study: Undergraduate
BS Supply Chain Management
(May 2010)

Internship Employer: 8 month
Co-op with Johnson & Johnson as
Pharmaceutical Distribution

Co-op Projects:

- Developed just-in-time inventory model for material handling supplies, reducing supply occupancy by over 50%, shrinking inventory on hand by \$54,000, and creating space for \$5,000 of new business
- Conducted in-depth time studies on all direct warehouse business processes and transformed that data into a head count model for management to project staffing requirements for up to five years in advance
- Performed budget analysis and tracking for supply management as well as occupancy reports, and cases shipped reports
- Led Kaizen implementation in distribution center
- Effectively reduced the number of box sizes used in shipping from 18 to 11, reducing costs and streamlining the shipping process
- Facilitated 5 projects, resulting in cost reductions and improved process flow and ergonomics

Current Full Time Company:

L’Oreal-Operations Management
Leadership Development Program

Career Objectives: Work in various roles throughout the supply chain to gain a robust understanding of the way L’Oreal operates in order to prepare me to become a Supply Chain Manager in the future.

RUTGERS-SUPPLY CHAIN MANAGEMENT AND MARKETING SCIENCES RESEARCH PAPERS

“From an industry perspective, corporate sponsorship on the Rutgers Supply Chain Advisory Board has provided us with a valuable opportunity to integrate and explore real-world industry challenges with academic research. The Rutgers Center for Supply Chain Management provides an excellent venue for industry to work as collaboratively as possible and to work collectively with University professors and students.”

– Comments from a Center Member

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"The Rutgers Supply Chain Management program and the affiliated Center for Supply Chain Management have delivered significant value to Supply Chain professionals in the New Jersey area. The Supply Chain Certificate programs have delivered high quality education and development to participants, the Industry Best Practices Summit meetings have facilitated information sharing and networking opportunities amongst professionals who attend, and the high quality student professionals who have graduated from the program have added much value for their respective firms."

– Comments from a Center Member

RUTGERS-SUPPLY CHAIN MANAGEMENT AND MARKETING SCIENCES FACULTY



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Assistant Professor

Expertise: marketing response modeling, quantitative discrete choice models, and empirical industrial organization-behavior



S. Chan Choi

Professor, Supply Chain Management & Marketing Sciences

Expertise: Price Competition, Competitive Product Positioning, Marketing Research, Quantitative Models



Wayne Eastman

Associate Professor, Supply Chain Management & Marketing Sciences

Expertise: Business Ethics, Agency Theory, Law and Economics



John Finn

Instructor, Ph.D

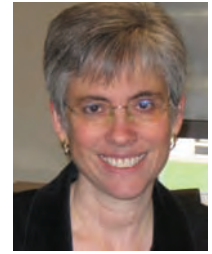
Expertise: Consumer insights, marketing, R&D, and quality management



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Assistant Professor

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