SDM partnership is a success story for Ford of Mexico

By Adrian Aguirre, SDM '06

Ford of Mexico started its association with the System Design and Management Program (SDM) two years ago with just two students. Yet already this collaborative effort to learn and apply leading-edge MIT knowledge to improve the company’s product development capabilities has begun to show its first fruits—for the sponsored students, the company, and SDM.

SDM was founded in 1996 to alleviate an industry need for leaders that could seamlessly integrate both technical and nontechnical aspects of management. As such, industry partners have been at the core of the success, growth, and future of SDM. Ford Motor Company was among SDM’s founding partners, and over the past 11 years the relationship between Ford and SDM has evolved, adapting to ever-changing industry needs.

When Ford of Mexico began looking for an advanced degree program to develop high-potential engineers, it determined that SDM was the best option for several reasons: the variety of participating industries, intense industry focus, curriculum flexibility, and SDM’s career-compatible 24-month program option.

The company was particularly interested in improving product development, but it was initially unclear how SDM could support this. With the help of SDM’s faculty and by carefully analyzing lessons learned from prior Ford interactions, the company developed a three-stage approach. Its partnership with SDM would carry through the full life cycle of the program, from candidate selection, through the work performed during SDM matriculation, to the student’s ultimate reintegration in the workplace (see sidebar, page 8).

The goal of improving product development was found to align particularly well with SDM’s thesis requirements. Because the thesis is the single largest independent compendium of work that an SDM student generates, it is a key...
Welcome

Welcome to the fifth issue of the SDM Pulse. You’ll find several fascinating articles that really get behind the scenes at SDM, providing an inside perspective of what makes this MIT program tick.

In our cover story, Adrian Aguirre explains Ford of Mexico’s innovative approach to integrating a set of theses to ensure that SDM work furthers the company’s business needs. Ford of Mexico’s relationship with SDM can serve as a role model for other companies that wish to make the most of the program.

David Kim continues our exploration, offering a student’s-eye view of the SDM core course in system architecture. We also get a look at the depth and quality of SDM research through Sandro Catanzaro’s summary of his thesis, which was named the best in 2007 by SDM alumni.

January is the time of the year when the new cohort begins the program. An overview of the intense 2008 January session is provided by Pulse editor Kathryn O’Neill. A profile of the SDM Class of 2008 accompanies this look at the cohort’s first experiences.

Companies involved with SDM, whom we refer to as the SDM partners, met in October 2007 to review all aspects of the program. This meeting is part of a year-long evaluation of SDM. A short summary of the partners’ initial observations is presented in this issue. We’ve also highlighted some of the other ways partners participate in SDM’s activities: articles provide details on a recent Industry Faculty Research Forum and offer a preview of an exciting upcoming conference (sponsored by the MIT Industrial Liaison Program, Leaders for Manufacturing, SDM, and the Forum for Supply Chain Innovation) titled Strategies for Balancing Risks and Opportunities in Global Product Development.

This issue concludes with an update on MIT’s Systems Engineering Advancement Research Initiative (SEAri), which has been collaborating with Draper Laboratory. I hope you enjoy the Pulse’s news articles as much as we’ve enjoyed working with SDM students to produce them.

Best regards,

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The core of SDM: An inside look at system architecture

By David Kim, SDM ’07

System architecture embodies SDM’s programmatic philosophy by applying its signature holistic approach—“systems thinking”—to design and development. This core SDM course presents a synthetic view of the topic, including the resolution of ambiguity to identify system goals; the creative process of mapping form to function; and the analysis of complexity and methods of decomposition and reintegration.

Architects lead all the early, conceptual phases of the system development process, and they support the process through development, deployment, operation, and evolution. However, system architecture is not just about building a system. It’s about the bigger picture: the context and the complex relationships associated with the system. Which is why this course is fundamentally about a process for critical thinking. Students learn to identify problems, think about approaches, see what others have done, and synthesize the best option.

MIT professor of aeronautics and astronautics and engineering systems Ed Crawley, who teaches the class, emphasizes the need for holistic thinking and creativity. The course cites the importance of both top-down and bottom-up approaches, balances both simplicity and complexity, and is open enough to be flexible and creative but sufficiently structured to be organized and consistent.

Throughout the course, different methods are used to convey the architecture concepts to students. Lectures teach principles, tools, frameworks, processes, and real-world applications. Plus, students learn by doing, working on “opportunity sets” that require them to architect and critique real-life systems. Throughout, students learn through collaboration with team members. And, the course effectively encapsulates the whole SDM curriculum by connecting the dots of all the other courses offered throughout the year.

Unlike most MIT classes, this course starts in January, takes a break through the spring and summer terms and resumes in the fall. The intensive January session introduces fundamental theories and teaches students to analyze architecture. The fall term focuses on application: processes upstream and downstream of architecting, holistic frameworks, and approaches to creativity, ambiguity, and complexity. Numerous guest speakers expand on class topics. Lectures last term addressed software architecture, commonality, platforms, legacy systems and reuse, and supply chains. The class studied real-life examples of system architecture, including flexible design in Boeing’s Blended Wing Body airplane, embedded software architecture at Xerox, and robustness, platforms, and modularity at BMW Munich.

SDM students have applied system architecture in various contexts, both in industry and in research. System architecture principles have proved to be immensely helpful in the development of various technical systems, both hardware and software (including information technology). One SDM student even applied system architecture in a political context to understand, analyze, and recommend an architecture for a territorial dispute resolution system.

System architecture is truly universal. We live in a world in which any entity is a subsystem of a greater entity and complexly related to countless other entities. Personally, I am looking forward to putting the principles of system architecture to use on future projects, and then some.

A system’s architecture is developed through an iterative scheme that identifies how the system is divided into a set of functional elements, as well as how these elements interact with one another and with the external environment to satisfy the overall system objective. Iteratively defining the decomposition, the interactions, and the integration of system elements can affect not only the system’s health but even the health of the overarching enterprise.
When we develop a product, whom do we develop it for? How should we go about choosing the right design when different groups present conflicting requirements?

I got the chance to tackle this real-world challenge as part of a team chosen by NASA to create the architecture for a multi-decade program that would include exploration of the moon and Mars.

The team, composed of professionals from MIT and Draper Laboratories, had knowledgeable experts on space hardware, astrodynamics, and other aspects of space exploration. Yet, the question of how to select the “best” set of options remained elusive for two reasons: the project benefits were delivered to many constituencies and were not necessarily monetary.

I decided to study the problem, and the work became my SDM and aeronautics and astronautics thesis, which was awarded the SDM Best Thesis Prize in October 2007. The challenge was similar to a multi-stakeholder problem, yet we did not have the advantage of clear representatives from each stakeholder group or clear need statements to solve, thus we were unable to use traditional multi-stakeholder analysis tools. Instead, we created a new framework, one that could perform a quantitative analysis of multi-stakeholder problems.

We soon discovered that the problems we were grappling with were hardly unique. A properly developed model can be directly applied to product design, allowing us to evaluate the impact of architecture decisions: one design might maximize shareholder profits but stress the relationship with suppliers and increase carbon emissions; another could provide a more balanced view of suppliers relationships and cut emissions but reduce profits. The generic nature of a model should apply to problems as diverse as a country’s foreign policy or a business’s financial strategy.

We sought to formulate a model that could provide guidance in a broad range of circumstances where a system needs to satisfy multiple constituencies with nonaligned objectives. The model we prepared is based on three principles.

1) Any Value Creating System (VCS), including the specific NASA program, receives resources from its stakeholders, which receive value in return. While different stakeholders have different and sometimes conflicting needs, the more satisfied each stakeholder is the more resources that specific stakeholder is likely to supply. Since each of the alternative architectures satisfies different needs, the architecture selected by the VCS will affect the resources that the VCS receives through a feedback loop. Some architectures will increase the amount of resources provided to the VCS and thus allow it to grow faster.

2) These loops can be represented as a tiered multi-attribute decision analysis model, with the VCS needs on the top. We can see that the flow is actually composed of many individual loops, passing through one specific resource, one specific stakeholder, and one specific need. Now, we can take advantage of the fact that VCS participates on every loop and group the needs that feed into the VCS. Then we can group the suppliers of each of these needs, simplifying the problem into several tiered multi-attribute decision analysis models. The top layer would be populated by the resources needed by the VCS, the second layer will include the stakeholders supplying those resources, the third will have the relationships between stakeholders, and the fourth will contain the needs of each stakeholder.

These multi-attribute functions can be combined and operated using standard matrix operations, and thus the tiered multi-attribute model can be evaluated by simply multiplying matrices.

3) The use of a stochastic model to propagate uncertainty. Since our model analyzed a social system, certainty was impossible. By using a stochastic model, we captured the information provided by the lack of agreement.

Based on these three principles, we assembled a model that worked as a feedback flow of vectorial quantities, using standard matrix math. The model produced two main results:

There is a tradeoff between growth and stability

By focusing on satisfying a few stakeholders that control the most critical resources, a VCS can maximize the flow of resources back to itself and achieve faster growth. This is what we called a “leadership” strategy, which alienates...
several stakeholder groups but rewards the ones with most power and provides a higher “value feedback” to the VCS.

Alternatively, the VCS can use strategies that keep a larger number of stakeholders satisfied, even if those strategies do not maximize the flow of resources back to the VCS and thus its growth. These are what we called “consensus” strategies, which we deemed more stable, since a shift in power among stakeholders affect in a lesser way the flow of resources to the VCS.

This tradeoff between growth and stability is in our understanding the basic diagram of political decision-making. Leadership-oriented strategies aim for short-term results, and thus “bootstrap” the value creation process before a shift in stakeholder power happens, but risk failure. Consensus-oriented strategies look for stability through broad support, but risk not delivering results to any group, and thus not generating enough value to continue operating.

Uncertainty is valuable as information
In some instances, the model will not distinguish between alternatives. I believe that making the decision-makers aware of the lack of information is in itself valuable, since it will signify the need for additional information or further study of the parameterization used to develop the model.

In conclusion, by using three simple principles, we formulated a mathematical construct that shows a tradeoff between short-term growth and long-term stability. Further interesting work could explore the accumulation of resources at the VCS and the indirect propagation of value through interaction between stakeholders.

Our work was supported by a NASA grant and received invaluable input from MIT faculty members, including Jeffrey Hoffman, Ed Crawley, and Pat Hale, as well as from fellow students from SDM and the MIT Department of Aeronautics and Astronautics.
Every January brings a new cohort of fellows to the System Design and Management Program within MIT’s School of Engineering and MIT Sloan School of Management. Sixty new graduate students will spend the next 13 to 24 months completing this unique interdisciplinary curriculum. The SDM experience they will gain during this time is one that integrates core courses in system architecture, systems engineering, and system and project management, as well as engineering electives and specially designed management courses.

Already 27 out of the 60 students have earned at least one master’s degree in such disciplines as electrical engineering and applied computer systems management. Some students are on their way to earning a third. Of the group’s previous areas of study are mechanical and electrical engineering and computer science.

Although SDM studies are customized to individual educational and professional goals, the cohort overall gains a cohesive and holistic perspective of systems engineering—and managing technical teams and projects—through shared experience. Students participate as on-campus, commuter, or distance learners through digitally integrative classrooms and work groups throughout the program.

The 2008 cohort of SDM fellows benefit not only from their varied educational experiences, but from cross-cultural learning as well: more than half of the fellows are international students. Whether joining the program in Cambridge, MA, or participating at a distance, they come from more than 15 countries, including Costa Rica, Israel, and the Philippines. For example, Shailendra Yadav, SDM ’08, grew up in the foothills of the Himalayas in Kathmandu, Nepal. He joins the program after several years of genomic medical research, both at the Broad Institute and at the Whitehead Institute, where he was involved in the Human Genome Project, www.genome.gov.

Ten women are members of the SDM ’08 cohort—the largest number of women in one cohort since the program’s start in 1996. Their experiences are as rich and varied as their male classmates’. From automotive engineering to biotechnology research and service in the U.S. Army and Navy, these women will add depth and perspective to the collaborative program. Cynthia Munoz, originally from Trujillo, Peru, says she applied to SDM hoping to complete a holistic program that will bridge the gap between the technology and management fields. Another student, Marcia Azpeitia Camacho from Mexico City, says she wanted to be a part of SDM, “to broaden my knowledge in systems design, improve my leadership skills, and have a unique chance to work and study abroad. These skills will help me become a key member of my organization and widen the scope of the contributions I can make through my work.”

The new cohort began the program on January 3. For more information about their first month at MIT, see the story on the January session on page 7 in this issue of the SDM Pulse.
January ‘boot camp’ starts SDM off at a fast pace

By Kathryn O’Neill, editor of the SDM Pulse

1 month
2 design challenges
42 hours of workshops
74 hours of academic class time
Countless sleepless nights

They don’t call it “SDM boot camp” for nothing.

MIT’s System Design and Management Program begins with an intense month on campus that, like Army boot camp, builds strong and lasting bonds.

SDM draws students from around the world—and many attend classes primarily at a distance. In January, however, full-time, part-time, and distance learners all come together for the entire month. These students will be working together again and again throughout the program, and this is their opportunity to get to know each other face-to-face.

“We bring together smart, motivated individuals with strong technical backgrounds and several years of industry experience. Then we throw them in at the deep end of the pool,” said Pat Hale, director of the SDM Fellows Program. “What they’re able to accomplish is amazing.”

The bond forged in each cohort, reinforced with one-week business trips to campus each term, is one of the most important benefits of SDM. These are talented mid-career professionals—many already have advanced degrees, global experience, and leadership roles. The connections they build in SDM—to each other and to MIT’s world-renowned faculty—will serve them throughout their careers.

“The cohort is a diverse mix of people in culture, academic background, gender, industry and personality,” said Jaime Devereaux, SDM ’08, a senior systems engineer at Raytheon. “This diversity lends itself to finding many approaches to the same problem.”

This year’s class of 60 met for the first time on January 3 and was immediately split into teams for the first design challenge: building robots to compete in a mini olympiad. Some events were competitive (archery, tug-of-war), while others required cooperation (relay race, synchronized dancing). They had a week to do everything—assign tasks, form strategies, build, program, prototype, test—plus manage the uncertainty introduced by changing requirements.

They had a week if you don’t count time spent on coursework (see sidebar). Fortunately, SDM keeps everyone running with catering; SDM students often cite “free food” as one of the many program “bennies.”

Design Challenge 1 ends with a lot of team spirit and dancing robots. But there’s not much time to celebrate; it’s time for Design Challenge 2. Week-old teams are disbanded and new ones are formed. Students take the measure of a few more people and then get to work devising solutions to global warming or the twin problem of global malnutrition and U.S. obesity.

This second challenge is intentionally difficult and ambiguous. Each team needs a 5- to 10-year plan to solve their problem. Deliverables include a one-minute “elevator” pitch, a 20-minute presentation, a business plan and a timetable. They’ve got two weeks.

Who can say how they do it, but every year another SDM class pulls it off. “It’s improved my confidence a lot,” said Anil Rachakonda, SDM ’08, a senior design engineer at Analog Devices. “It’s really surprising the rate at which ideas unfold.”

Just imagine what these people will bring back to their companies.

So much to do, so little time

Design challenges are just part of the workload during the January session. SDM students spend about 119 hours in classes and workshops over a period of 19 workdays—not including homework.

System architecture, one of SDM’s three core courses, meets three times each week in January, then continues throughout the program. The class teaches students to structure and lead the early, conceptual phases of the development process (see story on page 3). Other January courses include: probability and statistics; the human side of leading technology; and technology leadership. Workshop topics include conflict management, presentation skills, and career development.

“There’s so much knowledge here,” said Jorge Amador, SDM ’08. “It’s very intense.”
opportunity to link academic knowledge to a company’s business needs.

There was, however, a major challenge. Although work of significant quality was being conducted within thesis projects, the overall impact to companies sponsoring those theses was difficult to measure.

Ford of Mexico wanted a critical mass of knowledge that could improve operations. Therefore, it decided to sponsor a series of integrated theses directly linked to this need. Each would address one aspect of the problem and then be added to the others to provide a complete picture of the larger, more complex issue.

To achieve this, the first two theses focused on establishing a framework—one as an umbrella thesis that defined the problem’s architecture and a second to establish the means to track the project’s progress. The umbrella thesis would provide guidelines for thesis topics in the near to mid term and guiding principles to serve as integration elements. In this way a central concept and a thread to guide it were created for Ford of Mexico’s SDM work.

MIT faculty were key to the plan’s success, providing an outside perspective on the organization’s problems and needs. In addition, the experience and academic excellence of MIT’s faculty ensured students would have the management trust required for the work at SDM to become a driver for organizational change.

Keeping thesis work aligned with the company’s business objectives is critical. Therefore, each student is assigned a senior-level company mentor, in addition to the MIT thesis advisor, to help with any business issues that arise. The mentor also provides the student with direction and coaching within the company.

Assigning mentors who have seniority gives students rich lessons in management and the company context for the thesis. This strategy also validates the SDM work to the rest of the organization and provides for quick implementation of changes. In addition, all mentors are linked to a project champion, ensuring that SDM work is strategically directed to help solve the larger problem at hand. To date, faculty views of thesis requirements and those of company thesis mentors have been in complete alignment.

Managing an ambitious, interactive program such as this is never easy, but the benefits to the company can be enormous. Ford of Mexico has remained on track with its plan and now has the umbrella thesis and the first in-depth thesis in hand. The second and third theses are due to be completed this year. In addition, two new Ford of Mexico students joined SDM in 2008 and will continue to further the program’s goals by contributing to an increased understanding of the challenges faced by Ford of Mexico.

Note: Theses may be viewed by SDM partners at sdm.mit.edu, or by special request to SDM. Theses are also available through the MIT Libraries, libraries.mit.edu.

A lesson in aligning goals

Ford of Mexico’s interaction with the SDM program is a model for others to follow, says John M. Grace, SDM’s industry codirector.

By partnering with SDM from the beginning, Ford of Mexico ensures that appropriate candidates are enrolled, that SDM coursework and thesis research further company goals, and that their SDM graduates return to work ready and able to propel the company forward.

There are three key steps: Selecting candidates. SDM faculty and Ford management work together to jointly evaluate candidates, then Ford chooses several to complete the SDM admission process. SDM staff evaluate each candidate’s qualifications and share their unbiased assessment with Ford. Ford makes the final selection from among the candidates who meet SDM’s and MIT’s admissions requirements.

Aligning academic and business goals. SDM coursework is integrated with meaningful work experiences to provide students with opportunities to apply their new knowledge immediately. Employment at Ford during SDM matriculation provides students with access to new technical areas selected for their growth potential and alignment with business objectives. Thesis work is focused on an identified company need, directed by an MIT faculty member, and monitored by a company mentor. The mentor links the student and faculty member with the business, ensuring visibility for the thesis work within the company and aiding with pertinent technical and business information.

Creating a reintegration strategy. Reintegrating students into the workplace after graduation from other degree programs has been difficult for several companies. To learn from their experience, Ford of Mexico planned a reintegration strategy for its SDM students from the onset. This strategy centers on creating opportunities for students to develop and providing them with significant work challenges toward the end of their studies at MIT.
The System Design and Management Program held a meeting for industry partners in October as part of SDM’s five-year review process. At that meeting, companies that have or anticipate ongoing relations with the program were asked to provide input on SDM’s content, methods, and direction.


Partners reviewed curriculum; cohort formation, including the benefits of the January session (see page 7) and business trips to campus; thesis; and recruitment, retention, and integration in the workplace.

The meeting included an overview of the program’s requirements, a presentation on course content, and a discussion of the goals set for the Engineering Systems Division, which encompasses SDM, by new ESD Director Yossi Sheffi. Throughout the day, company representatives were given opportunities to comment and to critique the program, as well as to make suggestions for future SDM efforts.

Dan Frey, associate professor of mechanical engineering and engineering systems, led the discussion on the SDM thesis and ways that this research—by both company-sponsored and self-sponsored students—can benefit companies.

SDM partners shared best practices for recruiting program participants, interacting with students in the program, and integrating graduates back into the workplace. The experience Ford of Mexico has had partnering with SDM—aligning thesis work with strategy, and reintegrating graduates—were discussed with interest (see related article on page 1).

In discussing courses, partners expressed their interest in a full life-cycle perspective, economics, and global issues in design. They wanted coursework to address cultural issues and advocated for a stronger link among all SDM courses. The curriculum review begun at the meeting will continue via WebEx sessions. Partners interested in more information may contact John M. Grace, SDM industry codirector, jmgrace@mit.edu, 617.253.2081.

As a follow-up to the partners meeting, SDM plans to review the needs of partner firms with an eye toward pairing them with interested faculty members and students. SDM is also investigating ways to make partner firms more aware of SDM thesis activities.

Partner review SDM program

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LFM/SDM Industry Faculty Research Forum

Fifteen MIT faculty members shared their research with industry leaders at the fall Industry Faculty Research Forum sponsored by MIT’s System Design and Management (SDM) and Leaders for Manufacturing (LFM) programs.

Managers and executives from 25 companies attended the forum held November 8, 2007, at the MIT Faculty Club. The annual event is intended to match up industry and faculty research interests as well as to develop structured internships for LFM students and thesis projects for SDM students.

Presenters covered a wide range of engineering and management topics, including process variation, safety management, recycling, and revenue management. Professor Warren Seering, codirector of the Leaders for Manufacturing and System Design and Management programs and the Weber-Shaughness professor of mechanical engineering and engineering systems, led off with a talk titled “Lean in Product Development.”

In addition, Debbie Nightingale, professor of the practice of aeronautics and engineering systems, spoke on “Lean Enterprise Transformation: Strategies for Success”; Associate Professor Olivier de Weck of aeronautics and astronautics and engineering systems gave a talk titled “Strategic Engineering: Designing Evolvable Systems and Product Platforms”; Professor Roy Welsch, professor of statistics and management science and engineering systems and director of the Center for Computational Research in Economics and Management Science, spoke on “Visualizing Data”; and Stephen Graves, the Abraham Siegel professor of management and professor of engineering systems and mechanical engineering, discussed “Capacity Planning in a Supply Chain with Option Contracts.”

The daylong forum also included a working lunch during which attendees broke into groups to discuss strategic sourcing, lean in product development, and the lean enterprise.

For a full list of forum speakers and talk abstracts, visit esd.mit.edu/HeadLine/calendar/2007/110807.html.
Conference to explore strategies for balancing risk, opportunity

By Kathryn O’Neill, editor of the SDM Pulse

Industry leaders and experts from MIT will discuss ways to manage uncertainty at an upcoming MIT conference: Strategies for Balancing Risks and Opportunities in Global Product Delivery, to be held March 11-12, 2008.

“We’ve invited some of the best risk-based decision makers in several industries to describe how they use risk data to make good product decisions,” said Pat Hale, director of the SDM Fellows program. Speakers include leaders from such well-known companies as IBM, Velcro, Xerox, and the U.S. Navy.

The conference is cosponsored by MIT’s System Design and Management Program, Leaders for Manufacturing Program, Forum for Supply Chain Innovation, and Industrial Liaison Program.

Attendees will learn about the latest research in the field. “Our faculty speakers have deep expertise in quantitatively modeling risk and the effect it can have in every stage of product development,” Hale said. “They can help you move from intuition to data-based decisions that will help you make critical decisions for measurable reasons—and become far stronger in winning the product development race.”

The day-and-a-half-long conference will feature presentations addressing fundamental challenges of innovation, execution, and delivery. The emphasis is on achieving balance through a life-cycle approach to product development—one that encompasses the diverse requirements of manufacturing, supply chain, service, maintenance, and recycling. A networking reception and an SDM-LFM student poster session are also scheduled.

Managing risk from birth to earth

Conference presenters will offer specific remarks on managing risk and opportunities using a life-cycle approach. In the first keynote address, Joan B. Cullinane, president of Velcro USA Inc., will explain how Velcro balances risk and opportunity through a system of checks and balances that not only incorporates traditional business imperatives (like new product development and supply chain design), but also new imperatives (like the environment, geopolitics, and managing a diverse workforce).

Jeffrey D. Tew, a General Motors Technical Fellow and group manager at the GM Research and Development Center, will discuss key technologies and management practices that companies can employ to protect the supply chain, business performance, and the brand at every stage of product life. And, Alfred H. Ford Jr., deputy director of submarine safety and quality assurance for the Naval Sea Systems Command, will illustrate the benefits of life-cycle thinking with a detailed look at how the U.S. Navy ensures its submarine fleet’s safety.

Olivier de Weck, an MIT associate professor of aeronautics and astronautics and engineering systems, will explore the challenges and opportunities of incorporating new technologies into existing products. “You can do a perfect job designing the wrong thing,” he said, so companies need to think strategically, work to anticipate needs, and use that information in making design decisions.

Naturally, complex systems up the ante. Nancy Leveson, MIT professor of aeronautics and astronautics and engineering systems, will describe a new approach to risk analysis that is now being successfully applied in aerospace, defense, pharmaceuticals, energy, and reduction of corporate fraud.

A whole world of risk

In the second conference keynote, Nicholas M. Donofrio, executive vice president for innovation and technology at IBM Corporation, will discuss the importance of seamlessly linking operations to create a globally integrated enterprise.

David Simchi-Levi, MIT professor of civil and environmental engineering and engineering systems and director of the Forum for Supply Chain Innovation, will outline the sources of risks in the supply chain. He will then identify strategies that can be used to manage those risks and share case studies to illustrate their impact. University of Michigan Professor Wallace J. Hopp will share research findings and his perspectives on the risks inherent in managing a global supply chain.

The conference will conclude with a talk by Stephen P. Hoover, vice president and center manager at Xerox Research Center Webster, who will explain how large companies can become big innovators: the key is to establish a culture that couples risk with its associated opportunity and manages the pair intelligently.
**SE Ari teams up with Draper Lab for more effective research**

MIT’s Systems Engineering Advancement Research Initiative (SEAri) seeks to advance the theories, methods, and effective practice of systems engineering through collaborative research. According to SEAri Director Donna Rhodes, “the most successful collaborations come from effective research engagement by the involved parties for mutual benefit.”

SE Ari pairs the research rigor and new methodologies of academia with the real-world perspectives of industry leaders to ensure that research has the maximum impact.

“Our experience is that the most effective partnerships are purposefully architected to leverage the strengths of the collaborating organizations, and a great example is our ongoing project with Draper Laboratory,” Rhodes said, referring to work on a new method for exploring design tradespaces.

“This collaboration is a unique opportunity to take a research methodology that has been developed primarily in an academic setting and validate it in the industrial setting,” said MIT research scientist Adam Ross, technical leader for the project. While MIT tests and refines the method for use in industry practice, the Draper team gains knowledge and a new approach to add to its existing portfolio of concept development methods.

A key factor in this collaboration, Rhodes said, is “connecting like-minded people in both organizations, where our methodology development research is linked to a problem the sponsor views as strategically important.”

In this case, the two teams are geographically close to one another, which has made it easy for members to meet frequently. There is a weekly research team meeting for technical collaboration and a monthly meeting of the principal investigators to review technical and programmatic progress. Bimonthly meetings of the academic and sponsoring research directors ensure continued strategic alignment and collaboration effectiveness. Another important factor has been the coupling of the university research project sponsored by Draper with an internal company research and development project, creating a synergy that adds to the impact that either project would have if performed alone. While the geographic proximity of MIT and Draper offers an advantage, the approach can be applied by any team.

“Academic research can only have true impact if it is embraced by the practitioner community, and this project is helping us understand how to create more effective partnerships for this purpose,” Rhodes said.

For more information about SEAri, visit seari.mit.edu or contact the leadership team at seari@mit.edu.

**MIT events add to SDM education**

Part of an SDM education is the exposure of students to the quick-thinking, can-do culture of MIT—a place where new ideas are put into action daily. SDM students aren’t studying in isolation—virtually every day they have the chance to meet with world business and political leaders through a wide range of lectures, seminars, conferences, and other activities open to them as members of the MIT community.

“It’s exciting to be at MIT, seeing everything that happens here,” said Jorge Armador, SDM ’08, who is from Costa Rica. “We don’t have these big CEOs visiting our country.”

**Some notable examples:**

*Simple Systems and Other Myths*—lecture by Norman R. Augustine, former president, CEO, and chairman of Lockheed Martin Corporation

*NASA Challenger/Columbia Shuttle Accident: What have we learned?*—presentation by Alexander Levis, chief scientist U.S. Air Force and George Mason University professor, with Sheila Widnall, Institute professor of aeronautics and astronautics and engineering systems at MIT and a member of the Columbia Accident Investigation Board

*Process Improvement in the Rarified Environment of Academic Medicine*—talk by Paul F. Levy, president and CEO of Beth Israel Deaconess Medical Center

*Bringing Renewable Power to Nicaragua*—lecture by Mathias Craig, executive director of blueEnergy

*Systems Solutions to Real World Challenges at NYPD: The Real-Time Crime Center*—lecture by Jim Onalfo, deputy commissioner and chief information officer of the New York Police Department

For a listing of upcoming events within SDM and MIT’s Engineering Systems Division, see the calendar on the last page of this edition. For information on upcoming MIT events, please visit the MIT home page at www.mit.edu and select “events.”
SDM calendar
spring–fall 2008

If you or your colleagues are interested in attending any of the events listed, please contact SDM Industry Codirector John M. Grace at jmgrace@mit.edu or 617.253.2081.

March 11–12, 2008
2008 MIT Conference
Strategies for Balancing Risks and Opportunities in Global Product Delivery
Location: MIT’s Wong Auditorium
Open to: ILP, LFM, SDM, and FSCI members
Contact: Lois Slavin, 617.253.0812
Details: See page 10
Sponsored by: MIT Industrial Liaison Program (ilp-www.mit.edu), MIT System Design and Management Program (sdm.mit.edu), MIT Leaders for Manufacturing Program (lfm.mit.edu), MIT Forum for Supply Chain Innovation (supplychain.mit.edu)

March 27, 2008
MIT-CTL Conference
Crossroads 2008: The Next 10 Years in Supply Chain
Location: Wong Auditorium, Tang Center (E51-115)
Time: 8:30 am–5 pm
Open to: General public
Cost: $495
Contact: Nancy Martin, 617.253.1547
Details: ctl.mit.edu/index.pl?id=8684

April 7, 2008
Charles L. Miller Lecture
Details: TBA, see esd.mit.edu

June 3, 2008
SDM Information Evening
Location: Framingham Sheraton

June 10, 2008
SDM Information Evening
Location: MIT

August 19, 2008
SDM Information Evening
Location: MIT

September 16, 2008
SDM Information Evening
Location: Burlington Marriott

October 21, 2008
SDM Information Evening
Location: MIT

October 22, 2008
SDM Partners Meeting
Location: MIT

October 23–24, 2008
SDM Conference
Location: MIT

Event information includes all details available at press time. For more current event information, go to sdm.mit.edu and esd.mit.edu.