

Technological Leadership

Inside:

ISE: Capstone project helps improve quality of water6

MOT: BAE Systems invests in alumni8

Welcome New Faculty 10

CENTER FOR THE DEVELOPMENT OF TECHNOLOGICAL LEADERSHIP / INSTITUTE OF TECHNOLOGY



A Window to China

Established and Emerging Technologies

A Window into China's Emerging Technological Leadership

During the past year, the Center for the Development of Technological Leadership (CDTL) resumed its long-standing connections to China to explore technology development and management in China, as well as the possibilities for future collaborations with Chinese governmental, industrial, and educational institutions.

As part of a University of Minnesota delegation to China in fall 2005, CDTL director and H.W. Sweatt Chair in Technological Leadership Massoud Amin met with Chinese educational, business, and technology leaders, and R&D innovators. Amin, in partnership with Hong Yang, director of the University of Minnesota's China Center, and Kelvin Willoughby from CDTL, also laid the foundation for the

2006 international Management of Technology (MOT) project in China.

CDTL launched the MS in MOT program in 1990, and became a pioneer in offering international MOT residencies to Asia (*see related story*). This year's residency marked the return of MOT students to China.

To put CDTL's activities with China into a global context, Amin notes "27 years after embracing science and

technology and market mechanisms in 1979, the nearly 3,800-year-old Chinese civilization has been emerging in its global impact in leveraging technology and innovation to grow businesses and its economy."

He points out that "although China's investments in S&T development began long before the current highest tier in the Communist Party came to power, for the first time ever, all nine members of China's elite Politburo Standing Committee, are engineers." These leader engineers face several fundamental challenges, he says,

- Can a booming economy that is networked globally and driven by technological revolution be sustained without intellectual property rights and free speech, particularly now with the Internet?
- Assuming that in the next decade or later when China reaches toward its aspirations and achieves its economic goals, can its citizens drink the water and breathe the air?

"During the last three decades, China has gone from a nearly third-world or developing communist economy to a dynamic growing competitive market," says Amin. "The country's science and technology vision and policy has driven a historically unprecedented economic growth. Overall, the Chinese economy has grown nearly 10 percent per year for the last 10 years."

The growth is clearly visible in major cities, because almost one-



PHOTO BY MASSOUD AMIN

View of Shanghai from Cargill offices, October 2005

quarter of the world's construction cranes and nearly half of the world's construction crews are at work building China's infrastructure, says Amin.

"China is itself a complex dynamical system; I was excited by advanced science and technologies ranging from novel biomass and renewable energy research to emerging nanotechnology industrial applications, to fermentation processes and to efficient end-to-end high-quality manufacturing. Many are underestimating China's accelerated pace and varied technological innovations. We often think of China as a mega producer of high volume low-end or mid-level technological products and goods. While that is part of the picture, however, China has moved very rapidly into globally competitive high-tech areas."

In 1995, China formalized its commitment to science and technology through a plan calling for sizeable investments in key areas, including education. As a result, engineering graduates have doubled from 1993 to 2003, and research and development spending rose.

Amin experienced the burgeoning educational and technological emergence of China firsthand on his trip. At the Chinese Academy of Sciences, as part of the University of Minnesota delegation led by Vice President for Research Timothy Mulcahy, and Deans Steven Crouch and Robert Elde, he



Professor Massoud Amin (LEFT) with Executive Vice President, Professor Zhe-wei Zhou, Shanghai, November 2005

presented a talk on energy infrastructure security and global transition dynamics. He, together with Yang and Willoughby, visited 3M, General Motors, Cargill operations, and several smaller companies in China. In addition, he visited and explored potential partnerships in education and research with several universities, including Shanghai University, Shanghai Jiao Tong, and Fudan University in Shanghai, the Chinese Academy of Social Sciences in Beijing, the Chinese Academy of Sciences, and Tsinghua University in Beijing.

In addition to scouting opportunities for the spring international MOT project, the trip also helped CDTL increase its collaborations with Chinese institutions in diverse areas ranging from MOT to energy and infrastructure systems engineering.

"The visits went very well," says Amin, who also serves on the China Center Advisory Council at the University of Minnesota. "There was high interest and excitement in pursuing broader intellectual and research partnerships and collaborations in these and related areas."

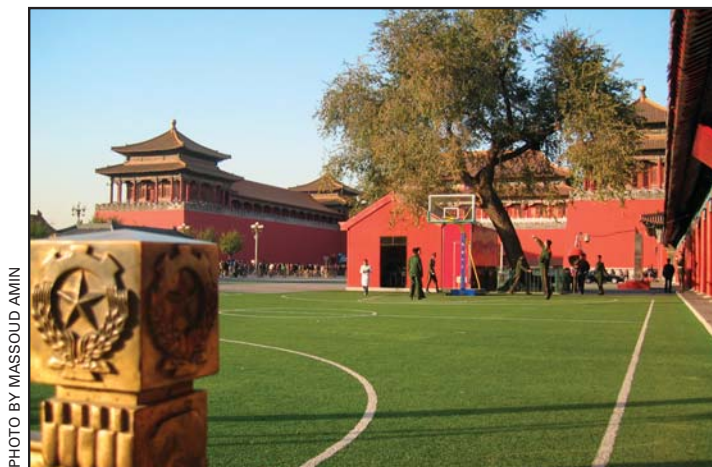


PHOTO BY MASSOUD AMIN

Palace Guards playing basketball in The Forbidden City, Beijing, November 2005



PHOTO BY GREG CARSON

MOT '06 International Project, May 2006

As a country of contrasts, China offers both examples of a nation with technological innovations and a nation with many areas that are untouched by technology or modern-day conveniences. In the United States, the images of the latter may be more widely held.

"China and India in particular are increasingly becoming S&T innovators and thus driving economic growth," says Amin.

"From the real-time traffic data monitoring and display that appear on Shanghai highways to the manufacturing capabilities at the GM facility in China, technology and the resulting

societal and business transformation are flourishing within the country. But not all is rosy; for example several issues, including sustainability, environmental footprint, human rights, and intellectual property rights and protection, as well as social and economic equity, remain as major challenges.

With its emphasis on education, technology, and business growth, China is moving rapidly as a leader in science and technology and its global market impact. While China occupies the number 10 position in total patents in the world, however, the slope of this trajectory is the fastest in

the world. On the other hand, we also look at the underdeveloped parts of China, in villages and periphery of large cities, which is critical in understanding the stark contrast within this historically and culturally rich complex part of the world."

With an understanding of China's role in the worldwide technology community, Amin sees additional opportunities for CDTL in concert with the China Center and the broader University community to work with Chinese educational and technological leaders and students.

"Dr. Hong Yang, Director of China Center, and his colleagues helped us

The Bridge: International Management of Technology Project

2006 trip to China expands world view of technology development

In May, the Management of Technology (MOT) class of 2006 embarked on a traditional path with an eye toward the non-traditional when they traveled to Shanghai and Beijing, China, for their international MOT project course.

Each year, the MOT international project committee in CDTL explores possible locations. The committee considers options to meet the planned

goals of "developing an international perspective on management of technology and contrasting emerging and established companies, countries, technology, foreign-owned versus local, and government versus private sector, among other factors, in concert with the Center's mission," says Massoud Amin, CDTL director.

"It also provides an ability to develop a coherent intellectual

structure within this region/country and an understanding of complex issues in the global management of technology. We are constantly in the learning mode, trying to find new locations, new sites to visit, and new contacts."

The MOT program enjoys a long history of international residencies to the Far East, including trips in 1996 to Singapore and Beijing, 1997 through 2000 to Shanghai and Singapore, and 2001 to Kuala Lumpur and Singapore.

MOT students heartily endorsed the trip, eager to learn more about the country's investment in technology development and its impact on U.S. business and the global marketplace (*see related story*).

They realize the importance of China to technology businesses. So do Minnesota companies such as Cargill and 3M, which are increasing their involvement with China.

In 2004-05, Minnesota rose from 18th to 8th among states in the export of goods to China, says Amin. "The preliminary report and follow up analyses from the Governor's 2005 mission to China shows that China



PHOTO BY TROY NELSON

MOT '06 class in China, May 2006

immensely to identify and connect with Chinese scholars and leaders. In particular, I am grateful for the efforts of Dr. Kelvin Willoughby at CDTL, Dr. Hong Yang, Ms. Joan Brzezinski, and several colleagues who made it possible to resume our timely collaborations.” Amin added: “We look forward to developing growing collaborations on multiple fronts with colleagues in China—joint programs, research, and courses, as well as the international MOT residency.”

Recommended resources

Interested in learning more about China and its impact on technological development? CDTL Director Massoud Amin says: “The more I learn about China, I am humbled by how little I know about this very complex and interesting society.” For a start, he recommends the following resources as an introduction to the topic.

- ▶ *The New Business Normal: The Peril and Promise of New Global Realities* by Michael W. Wright and Walter J. Ferguson, 2005
- ▶ *The World Is Flat [Updated and Expanded]: A Brief History of the 21st Century*, by Thomas L. Friedman, 2006
- ▶ *Why Globalization Works*, by Martin Wolf, Yale University Press; 2New Ed edition, 2005
- ▶ “Balancing Act: A Survey of China,” *The Economist*, March 25-31, 2006 (www.economist.com)
- ▶ “China’s Tech Revolution: How technology is driving the country’s economic boom, and what that means for the world,” by Jean Kumagai and Marlowe Hood, special issue of the *IEEE Spectrum*, June 2005 (www.spectrum.ieee.org/jun05/1231)

has now replaced Japan as the number three international recipient of Minnesota exports,” he says. “The top four Minnesota trading partners are Canada, Ireland, China, and Japan.” As a result, it becomes even more important for students to visit China.

“Many companies are already doing business in Asia and have offices in China,” says Amin. “To be able to see and experience that firsthand knowledge of a country undergoing tremendous technological and economic growth is a real advantage. Another advantage is to see ‘old industries’ including car manufacturing, consumer goods, and electronics side by side with innovations in ‘emerging industries’ such as optical communications, information technologies, and energy resources including plans for 30 advanced nuclear power plants by 2020.”

The trip offered students the opportunity to learn about issues in the development and internationalization of new technology and industries in China; to understand basic aspects of Chinese culture and their impact on technology development; and to encourage future interaction and

cooperation between Minnesota and Chinese people and industries.

Before leaving, students researched an aspect of technology development in China, reviewing trends and analyzing issues. They completed a paper on their topic after returning home, integrating the lessons learned while in China and implications of strategies for U.S.-based companies.

The MOT class explored an overall theme in its visits: China’s emerging role as a source of technology-related intellectual talent. The theme allowed students to systematically investigate China as a growing source of technological talent as opposed to primarily a place for cheap labor and exports.

The class looked at public policy that impacts technological development, government influences, intellectual property, technology commercialization trends, the strategies of domestic Chinese technology enterprises, and the strategies of foreign technology enterprises.

Professor Jin Zhouying, director of the Center for Technology Innovation and Strategy Studies at the Chinese Academy of Social Sciences, hosted

the MOT study group. The group’s travels took them to:

- Shanghai University for lectures and seminars on commercial, industrial, economic, and technological development in Shanghai, as well as a presentation by Cargill
- Entrepreneurial technology companies in Shanghai
- 3M China Laboratories
- Zhong Guancun Science Park and Zhong Guancun Incubator and Companies
- Samsung headquarters
- Chinese Academy of Social Sciences for discussions and lectures
- Tours of key cultural locations, including the Great Wall of China

The international MOT project plays an important role in preparing students to assume greater leadership responsibilities in the global market and it lays a foundation for students to tap throughout their careers.

“It gives them an important perspective on the management of technology,” says Amin. “It helps them in a systematic and integrated manner to see and investigate the impact of a strategic global vision.”

Infrastructure: An Investment with Many Returns

Every week in fall, winter, and spring for two years, Alan Fogarty and Ken Ramondo made the four-hour trek from Bemidji, Minn., to the West Bank classrooms of the Master of Science in Infrastructure Systems Engineering (ISE) program. ■ The two earned the distinction of logging more miles than their fellow students, but the commute was well worth the extra hours of travel both for their organization, the Indian Health Service (IHS), and for each of them personally.

ISE Master's students, Fogarty and Ramondo focused their capstone project on an issue of great importance to the IHS, the quality of drinking water on reservations in Minnesota, Michigan, and Wisconsin, the three states that the Bemidji-area organization serves.

When federal legislation set new standards to reduce the levels of arsenic allowable in drinking water, IHS began exploring solutions to bring several sites into compliance before the federal deadline of January 2007. Fogarty and Ramondo saw an opportunity to apply their knowledge and skills from the program to the challenge of finding the best solution for these communities.

"We are working in rural and remote areas with an underrepresented population of Native Americans," says Fogarty. "Money is tight. We wanted to find an effective method to evaluate the alternatives for rural-based communities without many resources."

What they needed was a tool that could help them sort through the technology applications that were already identified as possibilities.

The technology is available, but the more relevant issue for Fogarty and Ramondo was determining ways to assess the effectiveness and cost efficiencies of options for their circumstances.



Alan Fogarty (LEFT) and Ken Ramondo

"We looked at a lot of great technologies, but they were geared toward larger systems," says Ramondo. "We wanted to look at what works best for smaller systems in rural-based areas."

In their capstone, they developed a scorecard to help them make better decisions on water treatment technology options. The scorecard takes into account key factors, including total life cycle costs, product effectiveness, maintenance requirements and operational costs, operator requirements, training needs, and replacement costs, among others. Fogarty and Ramondo identified these key factors and designed scoring criteria.

They applied the scorecard to a pilot study of available filter media techniques for arsenic removal, which helped them assess short-term and long-term advantages of a given technology. It also helped them confirm the overall benefits of their pilot choices.

"What we did in the capstone offers engineers a more complete way to look at the impact of choices and options," says Fogarty.

As Fogarty and Ramondo share the scorecard, it also has the potential for

"This tool gives smaller communities, which are developing new or changing existing water systems, the ability to make the most of their resources."

broader impact at the 11 other Indian Health Service areas nationwide.

"This tool gives smaller communities, which are developing new or changing existing water systems, the ability to make the most of their resources," says Fogarty.

They also are using their scorecard in other applications beyond the water treatment realm.

Fogarty and Ramondo both assumed new positions since their capstone. Previously an environmental engineer for IHS, Ramondo now works as facilities manager for Red Lake Hospital and Ponemah Clinic. The scorecard can be used in decision-making about key purchases, he says. Fogarty moved from engineering to information technology, and as chief information officer, also is seeing ways to use the results of the capstone project.

Fogarty and Ramondo both received their bachelor's degrees in civil engineering at North Dakota State University. As Fogarty considered graduate programs, he naturally talked

to his colleague and friend, who agreed in merits of the idea. IHS was also supportive of the pursuit.

The ISE program attracted their attention with its broad look at all aspects of civil engineering and its emphasis on understanding integrated infrastructure systems. "It wasn't just one area of civil engineering," says Fogarty.

With its practical approach, the program made it possible to learn and apply knowledge, says Ramondo. In addition to the capstone, he found it easy to use what he learned in the classroom to make on-the-job improvements. "I just enjoyed the whole program," he says.

Their experience in the program helped prepare them to assume greater responsibilities, they say.

A master's degree is important in moving to the management level, says Fogarty, and the ISE program helped him reach that level. "I really do believe the program does prepare civil engineers to move into management."

On the Move

Management of Technology

Mary Jo Abler (MOT '98) moved from product development manager to business director at 3M Co.

Scott Hautala (MOT '01), formerly operations manager at Minnesota Power, is now a project manager with Lakehead Constructors Inc.

Kevin Helmer (MOT '01) is now area general manager, North Central Region, for Essilor Laboratories of America Inc.

Kurt Korkowski (MOT '01), formerly at AEIOMed Inc., is now design engineering lead at Seagate Technology.

Kevin Ley (MOT '96), formerly engineering manager at Medtronic Inc., is now the director of spinal programs at Zimmer Spine.

Randy Logan (MOT '01) moved from engineering manager for Donaldson Far East Ltd. to program manager at Donaldson Company Inc. in Pennsylvania.

Christopher Manrodt (MOT '02), formerly marketing manager at

ev3, is now senior product planning manager at Medtronic Inc.

Peter Ness (MOT '07), formerly with Enpath Medical, joined St. Jude Medical Inc. as a research and development engineer.

Venk Reddy (MOT '04) left Compuware Corp. to become LPEA unit head for Mayo Clinic in Rochester, Minnesota.

Srini Sathyamurthy (MOT '06), formerly a business analyst for Syngenta Seeds Inc., is now a business intelligence architect/developer at St. Jude Medical.

Paul Sjogren (MOT '97) is now president of Ovation Science Inc. in Chanhassen.

Professor Kenneth Roering is starting his phased retirement at the University of Minnesota's Carlson School of Management. He has taught Marketing Management for Technology-based Organizations (MOT 8111) to every MOT class since the program's initial launch in 1990. Our sincerest gratitude to Prof. Roering for his outstanding contributions to this important field of study.

A Company with a History in Management of Technology

BAE Systems enjoys a long-standing relationship with the Center for Development of Technological Leadership. Through the defense contractor's name and ownership changes, commitment to the Master of Science in Management of Technology (MOT) has remained constant over the past 15 years. ■ As a result, in BAE's large complex, MOT alumni make an impact on the company daily. How does the M.S. degree drive these professionals and their organizational performance?

Surpassing expectations

As part of his capstone project, Ernesto Navarro took on a challenge that an engineer without an MOT degree would prefer to avoid. He completed a financial analysis on product pricing factors.

"The analysis simplified a process that was taking many man hours for every item that we needed to price," says Navarro. "Being an engineer and doing a financial analysis, for me it was different, and I was able to do it because of the MOT program."

For Navarro, the capstone was really just the beginning of applying his MOT degree at work. "I'm always using different aspects of MOT depending on what I'm working on," says Navarro. As a senior project engineer, he leads a group of eight engineers and regularly taps what he learned in class into project management, team dynamics, communications, technology forecasting, and marketing.

Navarro began the program as an engineering divisional manager. A year after graduation he received a promotion. Navarro enrolled in MOT to gain a better understanding of the business side of the company, as well as to improve his project management and leadership skills. The MOT program more than met his expectations.

"Overall I thought my MOT experience was my best college experience that I can remember, and I would certainly recommend it to anyone."

A new perspective

Deepak Bazaz received his bachelor's degree in mechanical engineering, but knew he would eventually return to school to pursue a master's degree. He was completing a master's degree in mechanical engineering when he learned of the M.S. in Management of Technology program from a mentor at BAE Systems.

The MOT program offered him the right mix—a leadership development program that built on his experience and goals. "At that point, I had started making the turn toward the management path," says Bazaz, mission module product team lead. "I had the engineering skills, but I still wanted the technical component as I learned and practiced management skills."

The courses covered important analytical tools and sometimes unfamiliar ground to Bazaz.

"For me, two of the most significant classes were Marketing and Operations. They allowed me to see the user perspective and to really understand the different aspects of business that aren't typically taught in engineering programs."

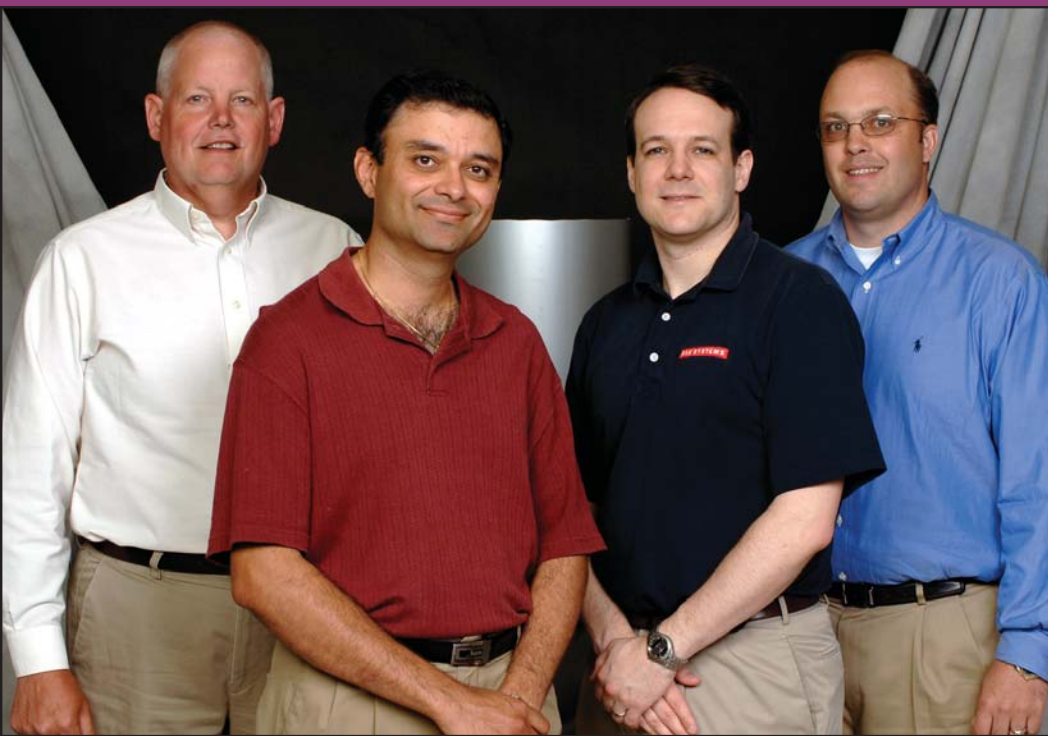
Bazaz continues to make use of his master's degree experiences. He drew from the organizational strategy concepts and tools that he gained from the program to contribute to a leadership seminar at BAE. The MOT opened new perspectives on problem solving and improving performance, and made a difference as Bazaz assumed additional management responsibilities. "It really shapes you," he says. "Those two years were great for my personal development. I wouldn't trade them for anything."

The first year in MOT

Brandon Engle just finished his first year in the MOT program. He was taking project management classes and he asked one of his senior managers about the value of pursuing additional classes. His manager suggested the MOT as the best option.

Engle, who received his master of science degree in aeronautics and astronautics from Stanford University, was ready to explore new territory. And already that territory is helping him. "The communication techniques are very useful to me," he says. "It has always been my weakness. The techniques and exercises in class were very helpful for me."

As a senior staff engineer, he also benefits in other ways from the MOT experience. "It has allowed me to



Arnie Johnson, Deepak Bazaz, Brandon Engle, and Tim Carlson (not pictured: Ernesto Navarro)

understand many of the issues of other parts in the company that I work with." Armed with that knowledge, Engle can make decisions with the broader perspective in mind.

Engle is interested in expanding his management responsibilities and knows that this degree is an important milestone in achieving his next career steps. It also has increased his connections within BAE. "Since I started the program, I know of more MOT graduates at BAE," he says. "There are a lot of others who I can turn to for advice."

Excellent experience

After Tim Carlson wrote a report on the F-14 Tomcat, his ninth-grade teacher asked if he knew about aerospace engineers. Soon he was on his way to earning his bachelor's degree in aerospace engineering and mechanics.

Carlson joined BAE Systems in 1997, and he talked about the Management of Technology program with his manager early in his informa-

tion technology career at BAE. The MOT was on his mind as he gained more on-the-job experience.

"I knew that I wanted to grow professionally and eventually move into a position of management," says Carlson. "Since I still wanted to move into engineering, I chose this route to help me make the eventual leap from IT into engineering."

It didn't take long for him to make some key moves. During his MOT program, he was promoted to the technical lead position. Recently, he accepted a new challenge as a program engineer. "The MOT has helped me prepare for this transition," says Carlson, who was able to apply his MOT knowledge while developing a technology plan and improving a software product.

Carlson still maintains the connections that he formed with other MOT students and also volunteers as a mentor to current MOT students. "The entire class was an excellent experience."

The right degree

S. Arnie Johnson's experiences as a member of the first graduating Management of Technology (MOT) class cemented his commitment to support the program. And, like many MOT alumni at BAE Systems, Johnson has encouraged other colleagues to follow in his footsteps.

In 1990, when Johnson entered the program, the University was the first public university to offer the MOT, blending components that are critical to innovation in, and prosperity of, technology-driven companies, he says.

"This program is a great enabler for staying innovative and ready for the next leap," says Johnson. It helps the organization through the practical improvements and efficiencies that alumni bring to their jobs, as well as through the unique perspective that it provides to students with a science and technology career.

"It makes you think outside of the box," says Johnson. "All of a sudden you see connections and possibilities that you never considered before."

The benefits of his MOT experience still continue. "I try to bring innovative thinking and how we can apply that thinking to meet customer needs," he says. "I still use the operations knowledge, and I graduated in 1992."

His career also progressed through several levels, and now, as chief engineer, he knows what alumni of the program can offer to his own initiatives at the company. Over the years, the experience, expertise, and contributions of MOT alumni are recognized at BAE.

"When they come out of the program, you want these alumni on your projects," says Johnson, who recently hired Timothy Carlson (*see related story*), another MOT alumnus. "It's the right pedigree."

Six Sigma to Water Resources

The Center for the Development of Technological Leadership (CDTL) welcomed several new faculty members recently. Their expertise and experience enrich both the Master of Science in the Management of Technology (MOT) and the Master of Science in Infrastructure Systems Engineering (ISE) classrooms.

Six Sigma and more

Six Sigma started almost two decades ago, driving quality in organizations to the next level. Now Six Sigma is part of the business landscape for leading companies in Minnesota, embracing data-driven processes to deliver on customer expectations.

Kevin Linderman, Associate Professor of Operations and Management Science at the Carlson School of Management, is also interested in Six Sigma and other process improvements. As part of his research, he conducted interviews with Six Sigma experts at companies where the practice has taken root, with the goal of increased knowledge of successful results.

"We want to develop definitions that help companies understand Six Sigma," he says. "We want to understand both the technical and social core to Six Sigma."

Linderman is a firm believer that decisions about operations are truly interdisciplinary ones. "You can't make operations decisions without affecting other functions," he says. "There is a strong cross-functional relationship with operations management."

He shares his philosophy and his research in Six Sigma, statistical quality control, quality management, manufacturing planning and control systems, and operations management theory with MOT students in their Operations Management class.

Linderman organizes the class into core decision areas, such as inventory and quality. Students assess an organi-



PHOTO BY TIM RUMMELHOFF

Kevin Linderman

zation's success in those core areas, identify strategies, and recommend actions to improve performance. Students nominate projects to explore, which gives them an opportunity to apply their classroom work to their organizational issues. They explore concerns of international scope, such as the complexities of supply chain management in different countries.

Students also participate in a simulation that challenges them to increase both the production and quality of the red beads in a factory. The simulation drives home an important point: "You only can improve the situation if you change the process," he says.

Linderman understands the practical and theoretical nature of operations management. He began his career as a systems engineer with GM and also spent time as a consultant. Intrigued by the myriad of operations issues that businesses face, he decided to pursue his Ph.D. in operations research and operations management from Case Western Reserve University. He also earned master of science degrees in mathematics and management science from Miami University and Case Western Reserve University respectively.

Linderman teaches MBA students, but his first exposure to MOT students has been a rewarding one. "The MOT



Peter Willenbring

students are very good in terms of their experiences and capabilities," he says. "I enjoyed the class."

Stewardship of water

Peter Willenbring ensures that local governments make the most of their community's water resources. As a water resource engineering consultant for more than 20 years, the impact of his work extends to many corners of Minnesota.

Now he is also offering his expertise to Infrastructure Systems Engineering students as their instructor for the water resources engineering class, and, as an engineering leader in the community, it's not his first introduction to the ISE program. His involvement with the program goes back to its very start. "I was asked to offer input about the curriculum when the program began," he says.

Willenbring focuses his career on the effective management of water resources. He has developed or managed water resource-related projects or regulatory programs in most of the metropolitan area's cities or watershed districts. The sheer project numbers show the depth of his work.

He has analyzed, designed, or managed the construction of more than 1,000 projects related to storm sewer or open channel flow improvements, storm water impoundments, storm water treatment, and lake restoration. In addition, he developed and implemented Comprehensive Storm Water Management Plans for more than 50 community, watershed districts, or watershed management organizations.

On a statewide level, Willenbring assisted in the preparation of state rules for storm water management plans. He also has provided expert testimony on storm sewer design, flooding, and construction management.

After receiving his bachelor's degree in civil engineering from the University of Minnesota, he worked as environmental engineer for the U.S. Environmental Protection Agency. He then joined the consulting firm of Hickok and Associates and later OSM. He eventually decided to pursue an opportunity to branch out on his own.

With a few partners, he formed the firm of WSB & Associates. He currently manages the water resources group and serves as vice president at the firm, which has grown in size from a few to 160 professionals.

Water work offers the kind of complexities that Willenbring enjoys. "Water is an interesting medium," he says. For engineers, it's important to understand all the influences and nuances, including the impact of land development and road construction, as they develop plans that protect all resources.

Willenbring wants ISE students to gain a solid understanding of the principles of hydraulics and hydrology. He takes a practical emphasis in the classroom, using examples of projects and asking students to develop solutions and recommendations.

"I enjoy giving them that practical perspective and hands-on learning experiences that will help them as they deal with water resources issues."



Diana Cooper joins CDTL

In April, Diana Cooper joined the Center for the Development of Technological Leadership (CDTL) as manager of external relations and educational services.

Cooper received her A.B. in English from Stanford and MBA in MIS and Finance from University of California, Irvine. After a few years consulting with Accenture and managing clients for J.D. Edwards & Co., Cooper switched to a career in higher education marketing. Since then, she has marketed Executive MBA programs and led international projects, taking MBA's from University of California to China and Europe. University of Minnesota's Carlson School recruited Cooper to perform strategic national marketing and develop a program for continuous improvement for the day and part-time MBA programs from 1998-2002. She has taught at the Carlson School of Management and coaches graduate students on business communication and interview skills. Please welcome her to the CDTL team.

SAVE THE DATE!	SIXTH ANNUAL TECHNOLOGY FUTURES FORUM
	Putting Nanotechnology to Work
DATE	Thursday, November 9, 8:00AM - 4:30PM
KEYNOTE SPEAKER	Dennis Polla, Ph.D., Defense Advanced Research Projects Agency (DARPA)
FOCUS	Dr. Polla will be joined by a panel of local experts to explore and address the technological and business dimensions of nanotechnology.
REGISTRATION	Call 612-624-5747 or go to our web site, www.cdtl.umn.edu , and select "Technology Futures Forum."
<i>The mission of the Technology Futures Forum focuses on technology foresight, the various methods to map, track, forecast, and lead development of science and technology-based products and businesses.</i>	

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Alternative format available upon request.

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