In 1989, the University of Minnesota became the first public university in the country to offer a master of science in the Management of Technology (MS-MOT) degree. The first class graduated in 1992.

The students who entered the first MS-MOT classes benefited from the support of their organizations. In a survey of program alumni from 1992 to 1999, 75 percent reported that their organizations provided 100 percent funding.

In recent years, with the decline of the economy and rising tuition, organizations are finding it more difficult to provide full tuition support. In 2005, about 25 percent of the current MS-MOT students received 100 percent funding, according to a recent CDTL survey.

So why does enrollment in the MS-MOT program remain strong despite economic conditions? The answer is simple and one that program alumni know well. The MS-MOT degree helps students advance in their careers and helps them make even greater contributions to their organizations.

The Center for the Development of Technological Leadership (CDTL) acknowledged the importance of financial assistance for MS-MOT students as part of its strategic plan in 2004. In December 2004, the center announced an Annual Campaign for Technological Leadership and Management to fund scholarships.

**Invest in talent**

In December, the Center for the Development of Technological Leadership (CDTL) launched an Annual Campaign for Technological Leadership and Management to fund the following scholarships for students.

Tax-deductible contributions can be made at any time. For information, contact:

Connie Garrahy, CDTL Associate Director of Finance and Administration, 612-626-1611 or cgarrahy-cdtl@umn.edu
“The scholarships will help talented students take full advantage of the benefits of the MS-MOT program,” says Massoud Amin, CDTL director. “The program plays an important role in training the community’s high-technology leaders.”

The campaign, “Strong Foundations, Promising Futures,” also offers CDTL a way to pay tribute to CDTL founding director and former H.W. Sweatt Chair, Yechiel “Jack” Shulman, and to former holder of the W.R. Sweatt Chair, Rias van Wyk, who taught in the program for more than a decade. Two of the four scholarships are named in tribute to Shulman and van Wyk (see related story).

“I feel honored and gratified that my colleagues and students saw fit to launch this scholarship fund and to name it after me,” says Shulman.

“I see it as a validation of what I and several visionary people started 16 years ago. Those people include Jim Infante, former Institute of Technology dean, and the trustees of the Honeywell Foundation who provided the funds that made it possible to launch the MS-MOT program. I would like to take this opportunity to thank them publicly for their foresight and for their support.”

Shulman endorses the growing need for scholarship support. “It is very important, as MOT tuition has increased over the years to such a level that employers are reluctant or unable to pay the whole amount, making it difficult for some students to attend the program.”

The timing was right for the scholarship campaign, says Amin. Tuition costs remain a concern—and in some cases—a barrier for students in pursuing their education. At the same time, CDTL has succeeded in increasing its reach in the technical community, and the MS-MOT program has impacted an impressive list of organizations throughout Minnesota and the nation.

A 2002 CDTL study looked at the program’s effectiveness and value over its first 10 years. Findings show that the MS-MOT program helps alumni fulfill their job responsibilities, especially in the areas of strategic management, leadership, critical thinking, general management, and collaboration. Overall, the program has been critical in preparing high-tech professionals to assume leadership roles.

“There is no doubt that the careers of these young people have advanced way beyond what would have been expected of them had they not obtained the MS-MOT degree,” says Shulman. “I hope that the scholarships will make it possible for the MS-MOT program to successfully continue its valuable work while maintaining its very high standards.”

Amin agrees on the significance of the scholarships. “We are confident that the scholarships help us in attracting technical talent, in increasing our impact, and in further building our community,” he says. For information about making a contribution, see the related story.
In the 1980s, with a desire to keep its competitive edge, the Minneapolis-based Honeywell Foundation turned to the University with a significant challenge—develop an educational option to transform its most promising scientists and engineers into effective technological leaders. The University responded with an innovative solution and, in 1990, welcomed the first class of the newly minted Master of Science in Management of Technology (MOT) program.

What began in that first MOT class took root quickly, and this year, the MOT program at the University of Minnesota and the College of Science and Engineering has reached a new milestone: The 20-year anniversary of the nation’s first management of technology (MOT) degree program at a public university.

“The Master of Science in MOT was launched to help transform working professionals into leaders of technology-intensive companies,” says Massoud Amin, director of the Technological Leadership Institute (TLI), which administers the MOT degree, Honeywell/Harold W. Sweatt Chair in Technological Leadership, and professor of electrical and computer engineering. “The MOT program’s emphasis is on harnessing the potential for innovation and technology-based growth with a focus on the business of technology.”

Throughout the last 20 years, the MOT program has made its mark on its students, alumni, and their organizations and, through student and alumni contributions, the economy of Minnesota.
“To date, more than 33 percent of the 561 MOT alumni are executives, and another 50 percent are senior managers, and they represent more than 280 organizations in Minnesota and throughout the world,” says Prof. Amin. In a 2009 survey—in addition to executive duties increasing to 33 percent compared to 9 percent at program start—alumni said that their job satisfaction jumped from 65 percent before the program to 77 percent after the program.

Dr. Thomas Dohm, director of the University’s Office of Measurement Services and senior research psychologist, worked closely with the MOT alumni survey. “As an outsider looking in, I see success stories throughout the MOT alumni survey results. There is clear evidence supporting the MOT program’s positive impact to the personal and professional lives of its alumni. The development of technological leadership talent has a ripple effect on the State, national, and worldwide economy and to all who benefit from the products of technology-based leaders’ work and the people they lead.” Prof. Amin said of the survey results, “The MOT program is flourishing beyond expectations today, thanks to the early visionaries who developed the program over 20 years ago and to the high-tech leaders who continue to support it. The staff, alumni, TLI Board, and faculty contribution to the excellence of the University’s MOT program is, of course, essential. As the MOT program leads the way into the future, maintaining these high standards of staff, faculty and student excellence is both the challenge and key to the program’s success.”

Pioneering efforts

It was that leap—from technical expert to effective technological leader that Honeywell founders—including then-President James Renier—had in mind when they began discussions with the University. Willing to provide the endowment for such an endeavor, Honeywell wanted an educational option for its promising engineers and scientists that bridged the gap between business and engineering.

“Providing more management competence for engineers and scientists is critical to ensuring our next generation of industry leaders,” said Clinton O. Larson in the early 1990s. Then corporate vice president of operations at Honeywell, he added that the program “provides the critical knowledge needed to help them...”
bridge the difficult step from performing technology to managing technology.”

The University received a $2.7 million endowment from the Honeywell Foundation to create four endowed chair faculty positions and establish the Center for the Development of Technological Leadership (CDTL), now known as TLI. Building the new program required collaboration among business leaders and faculty from throughout the University, particularly from the University’s College of Science and Engineering and Carlson School of Management.

For companies like Honeywell, 3M, IBM, Medtronic, and many others, the technology aspect of the organization takes on a role of great significance, says Carl Adams, information and decision sciences professor at the Carlson School of Management. With an undergraduate degree in physics and doctorate in management sciences, Prof. Adams had the background needed to be one of the two chief architects of Minnesota’s first management of technology curriculum. “They were basically saying that the MBA degree just didn’t quite provide enough in terms of supporting innovation in a technology-driven company,” says Adams. “They also told us that they needed employees who had the ability to manage in that technology-rich environment.”

While an adjunct professor in the mechanical engineering department, Yechiel “Jack” Shulman received an intriguing invitation from Richard Goldstein, then mechanical engineering department head. Goldstein knew that Shulman’s background included both wide executive-
level experience in technology-based companies and broad academic experience. He wanted Shulman to serve as interim director of the new center and co-director of the fledging MOT program. In 1989, the University appointed Shulman as acting director and a year later as the first CDTL director, director of the MOT graduate program, and Honeywell/Harold W. Sweatt Chair in Technological Leadership.

Decisions, decisions

Shulman and Adams faced the daunting task of creating a new degree program in a little over a year. As a start, Shulman turned to his educational roots for inspiration.

He received his Sc.D. in aeronautics and astronautics from the Massachusetts Institute of Technology (MIT), which in 1981 launched the nation’s first management of technology program, and his business master’s from the University of Chicago Booth School of Business Executive MBA Program.

He visited MIT and the University of Chicago to learn more about the details of their programs. “Armed with that information, Carl and I started mapping out the MOT program,” he says.

First the two outlined the content for the curriculum, which involved a combination of modifying existing courses to focus on the needs of technology-driven organizations and developing new offerings.

“About two-thirds of the content was more or less the traditional management kind of courses, but positioned to be relevant to management of technology firms,” says Adams. “About one-third of the content was new courses that were appropriate for technology firms.”


In addition, the program featured a capstone project—a final project that offered students “the chance to tackle a real-life topic of their choice with the supervision and approval of the faculty,” says Shulman.

Other key decisions involved format and faculty for the new degree program. With busy working professionals as the target student, Shulman modeled the format, with all-day classes on alternate Fridays and Saturdays, after that of many executive MBA programs. Adams and Shulman also tapped top faculty from the Carlson School and the College of Science and Engineering for teaching duties in the new program.

The significant last step was the effort to recruit and enroll students for the inaugural MOT class. Shulman began meeting with technology-based companies throughout the area, explaining the role of the new program and asking companies to consider sending several candidates to the program.

“We needed that kind of buy-in from companies,” says Adams. “We were able to put together a critical mass of students.”

Sails up

The first MOT class—with 36 students—arrived in fall 1990. “We got off to a great start,” says Shulman. “It was an outstanding class of very good students, and they set the tone for the classes that followed.”

After the launch, there was no question of its continued success. “It was an idea whose time had come,” says Shulman.

With MIT and Minnesota leading the way, more management of technology programs began to emerge. Before MIT launched its program in 1981, only 32
engineering and technology management programs existed, all outside the U.S. By 2002, the number of programs grew worldwide to 269, and currently there are more than 325 management of technology programs.

The International Association of Management of Technology (IAMOT) brings together management of technology administrators and faculty, and it was at an IAMOT meeting where Shulman met Rias van Wyk, then a professor at the University of Cape Town in South Africa.

Van Wyk's efforts to develop a universal structure of technology knowledge fit well with the program's focus, says Shulman. “His work helped lay the foundation for the theoretical basis for the management of technology,” he says.

Van Wyk was invited to give a presentation at the University, “Towards Corporate-Wide Technological Literacy,” as part of the Honeywell/Sweatt Distinguished Lecture Series. After the lecture, Shulman asked van Wyk to teach in the MOT program. Van Wyk later became the William R. Sweatt Chair in Management of Technology (MOT).

“We thought that students who come to the program had to have a grasp of the entire spectrum of technology,” says van Wyk. “We provided that overview in Strategic Technology Analysis. We were the first university in the U.S. to teach that.”

As a unique degree, management of technology offers knowledge in four key areas, says van Wyk. They include knowledge of technology, such as pivotal technologies and the universal structure for technologies; technology-linked management topics, such as project management and technology forecasting; general management topics, such as marketing and finance; and supporting disciplines, such as economics and statistics. It also provides a focus on strategic application.

With the program’s foundation firmly in place, Shulman retired in 2000. “I spent 10 years with the program, and I feel it was my best achievement ever.”

“About two-thirds of the MOT program content was more or less the traditional management kind of courses, but positioned to be relevant to management of technology firms. About one-third of the content was new courses that were appropriate for technology firms.”

–PROF. CARL ADAMS, Information and Decision Sciences, Carlson School of Management

“We thought that students had to have a grasp of the entire spectrum of technology. We provided that overview in Strategic Technology Analysis. We were the first university in the U.S. to teach that.”

–PROF. RIAS VAN WYK, former William R. Sweatt Chair in Management of Technology, TLI

“The MOT discipline and degree has a unique role, and yet it is incredibly critical for sustainable growth of organizations that are what I call technology intensive.”

–PROF. LOCKWOOD CARLSON, James J. Renier Visiting Land Grant Chair in Technological Leadership, TLI

“The early students in the MOT program have been successful so they have made it known to other people. There is a reputation for quality.”

–PROF. ALFRED MARCUS, Edson W. Spencer Chair in Strategic Management, TLI and Strategic Management and Organization, Carlson School of Management

“Management of technology is no longer a collection of separate courses. The MOT curriculum now leverages an ever-expanding box of business technology analytical tools.”

–PROF. DENNIS POLLA, William R. Sweatt Chair in the Management of Technology and current MOT Director of Graduate Studies, TLI
Core strengths

The MOT program continued to mature and grow, in large part by building on its core strengths, continuing to invest in high-quality faculty, and listening carefully to students and industry.

With the goal of continued involvement from industry, CDTL formed an advisory board in 1996. Lockwood Carlson, who was then heading 3M’s Corporate Enterprise Development division, was asked to serve as chair.

Carlson first discovered the MOT program while at 3M, when he supported students in the program. “I hadn’t heard of anything like it that was a master’s program, and I thought it was ideal,” he says.

In 2002, he taught his first course in the program, and throughout the years saw the growth—both in terms of the diversity of students, who now came from a broader range of companies, and in the students themselves.

“The MOT discipline and degree has a unique role, and yet it is incredibly critical for sustainable growth of organizations that are what I call technology intensive,” says Carlson, Honeywell/James J. Renier Visiting Land Grant Chair in Technological Leadership. “That could be a corporation or educational institution or non-profit, and we have students from all those kinds of organizations.”

In particular, the number of students with information technology backgrounds began to increase. “They wanted to use what they learned in the program to improve their ability to contribute to their organizations,” he says.

The resulting achievements of the first groups of MOT students helped spark ongoing interest in the program. “The early students in the MOT program have been successful so they have made it known to other people,” says Alfred Marcus, Edson W. Spencer Chair in Strategic Management and professor of strategic management and organization. “There is a reputation for quality.”

As more students completed the MOT program, a community began to form. In 1995, the first MOT alumni officers were elected for the purpose of planning alumni events and to support the bonds that developed during the program among classmates.

“Students know each other extremely well as a result of this lock-step program,” says Marcus. “The interaction among students is very, very high and the motivation is very high.”

New directions: MOT DNA

In March 2003, Massoud Amin joined CDTL as its director and began a strategic plan and road-mapping process for the center that gathered insights from faculty, alumni, and industry representatives.

The resulting action plan included new activities that leveraged what Amin calls the ‘DNA’ of the MOT, which includes the key areas of strategic management of technology, technology analysis and foresight, innovation, leadership development, intellectual property and technology asset valuation, and new product and business development.

“We wanted to build on the core strength of the management of technology as a field and increase its impact and visibility locally, nationally, and internationally,” says Amin, who led a revamping of the MOT curriculum by modifying seven courses, adding two new courses, and updating content.

As a result, 24 percent of courses in the current 36-credit MOT curriculum focus on a core business foundation, 62 percent on strategic technology management, and 14 percent on leadership.

In addition, faculty also integrated the curriculum, linking its first-year core business foundation with content in subsequent strategic technology management courses.

“Management of technology is no longer a collection of separate courses,” says Dennis Polla, Honeywell/William R. Sweatt
Chair in the Management of Technology and current MOT director of graduate studies, who has taught the Pivotal Technologies course since the program’s start. “The MOT curriculum now leverages an ever-expanding box of business technology analytical tools.”

The changes translate into greater opportunities for MOT students.

“Our MOT students learn to leverage technology across all facets of business operations from research and development to successful market launch; to master the basics of finance, accounting, operations, marketing, and research and development; to lead people, projects, and processes; to map, track, and forecast existing and emerging technology trends and evaluate global opportunities and threats; and to apply what they learn and bring direct value back to their organization,” says Amin.

In October 2008, Prof. Amin was asked by the International Association of Management of Technology (IAMOT) to have the University’s MOT be one of six programs in the World (three in the U.S.) evaluated for the first-ever MOT accreditation.

“From 2009-2010, the MOT program underwent a rigorous and comprehensive internal and external review process by the MOT Accreditation Board (MOTAB) and the IAMOT, with a 360-degree evaluation of both the program and TLI. It was a huge benefit to have a fresh look and comprehensive assessments,” says Prof. Amin. “And, thanks to the committed efforts of our team, colleagues at MOTAB and IAMOT, the University’s MOT program was granted full accreditation for six years, the maximum possible.”

The acknowledged value of the MOT experience also helps explain its longevity.

“The MOT program is flourishing beyond expectations today, thanks to the early visionaries who developed the program over 20 years ago and to the high-tech leaders who continue to support it. As the MOT program leads the way into the future, maintaining these high standards of staff, faculty and student excellence is both the challenge and key to the program’s success.”

–PROF. MASSOUD AMIN, Harold W. Sweatt Chair and TLI Director

MOT Class of 2012 begin their studies, Fall 2010.

“The bottom line is that we definitely have a quality product and that quality product is recognized by the business community,” says Prof. Polla.

In 2009, CDTL was renamed the Technological Leadership Institute with the vision to be a world leader in education and collaborative research in technological leadership and management. For the MOT program, that vision translates into a continued commitment to provide a world-class, multidisciplinary MOT education and to advance management of technology science and practice in the global economy through collaborative research initiatives that align with the MOT ‘DNA.’

“The MOT program is more relevant today than ever,” says Prof. Amin. “We are proud of our legacy of the past 20 years, and we remain passionate about our vision and mission.”