Erdman Center for Manufacturing and Technology Management

Manufacturing and Technology Matters

University of Wisconsin-Madison School of Business

Summer 2002

On the Road Again…

Students in the Manufacturing and Technology Management program go on a "Best Practices" trip to Texas and Mexico.

The MTM program took advantage of generous financial support from Ford during a seven-day road trip that explored "best practices" in manufacturing. We also were supported by the UW-Madison's Center for International Business Education and Research (CIBER) for this event.

Fourteen students, Urban Wemmerlöv, director and Carol Aspinwall, assistant director of the Erdman Center, traveled to Monterrey and Reynosa, Mexico and Austin, Texas, exploring a variety of production facilities. What follows is a narrative of each visit written by an MTM student.

The MTM group in Monterrey, Mexico. (Right) The display of glass products made by Vitro.

Vitro Monterrey - Glass Containers Division

Our first plant tour went to the Vitro manufacturing plant in Monterrey, Mexico. Vitro is a leading supplier of glass containers to Mexico, the U.S. and other parts of the world. The glass containers unit is one of four business divisions, including flat glass, household products and glassware. Vitro's total revenues are approximately $3 billion annually.

The Vitro Monterrey glass containers division is located at the site of the first plant, built in 1909. A walking tour took us through many of the original buildings that are still used for glass manufacturing processes today. This tour began with the introduction of raw materials to the process, followed with the forming of molten glass into bottles, and concluded with bottle labeling and packaging. Quality control measures were visible at various stages in the process. Following the plant tour, we were given the opportunity to visit the glass art museum, where various types of glass art from different periods were on display.

At the conclusion of our tour, we attended a presentation by a strategic planner and the manager of operations. They discussed the past and current strategic directions of Vitro, and how forecasting and production planning was done.

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University of Wisconsin-Madison
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Cerveceria Cauhemoc Moctezuma Brewery

Cerveceria Cauhemoc Moctezuma Brewery was one of the founding industries in Monterrey, Mexico. (In fact, Vitro glass company was founded to support the brewery with bottles.) The brewery produces such well-known beers as Tecate, Bohemian, Carta Blanca and Dos Equis, among others. Production takes place in batches, with quality control playing a key role in the production process. The brewery currently operates six production plants throughout Mexico, and exports a total of 1.7 billion hectoliters of beer, primarily to the United States. At the locations outside of Monterrey, the water is treated to ensure the taste of the beer is consistent across all facilities. Exported brands also require special bottling procedures, as 4% less volume of beer is bottled in accordance with export policies. While visiting the brewery, MTM students enjoyed samples of the company's product in its outdoor beer garden.

"The brewery offered insights into batch processing and the importance of quality control to consistently produce a uniform product." - MTM student

El Norte

In Monterrey, the MTM group also visited El Norte Newspaper (translation: The North). This paper owns another major newspaper in Mexico City, La Reforma (translation: The Change/Reform) as well as other newspapers in Mexico. As a whole, the newspaper group is the largest in Mexico. The success of El Norte comes from the fact that it offers three different versions of the newspaper according to the population segment of the city. The segmentation is the following: El Norte is aimed at the middle to high income population; El Sol (The Sun) is aimed at the lower income population; and there is a third newspaper that is aimed specifically at the middle income people. In addition to the three major newspapers, the company also offers various weekly subscription magazines aimed at different segments. This market segmentation has helped the company improve its sales and become an important player in the information arena in Mexico.

Producing a newspaper requires a detailed high-tech manufacturing process. Here the raw materials are the information, articles, pictures, etc. Meanwhile, the manufacturing process involves putting together all the raw materials and printing the newspaper (which in the end represents the final output). Seeing the newspaper production process was very interesting because it enabled us to see a different kind of manufacturing/production system.

Vanity Fair Rey-Mex Bra Plant

Our last stop in Mexico was a visit to Vanity Fair's Rex-Mex Bra Plant. Vanity Fair is the world's largest apparel company, with $5.5 billion in sales. Its key asset is an extensive brand portfolio including Lee, Wrangler, Eastpak, JanSport and North Face. These brands allow the company to successfully market products ranging from daypacks to jeans and intimate apparel.

The Rey-Mex Bra plant is located in Reynosa, close to the border in the "maquiladora" region of Mexico. By locating an assembly plant in this region, Vanity Fair enjoys reduced import duties and relatively inexpensive labor costs. The Rey-Mex Bra plant has 600 employees and produces roughly 1,000 units per day. About half of these garments are produced for Vanity Fair brands and the other half are produced for outside private labels, such as Victoria's Secret and Express.

During the plant tour we observed the operation of modular, team-based assembly cells. It was very educational to be on the plant floor and observe all stages of production. As one MTM student commented, "It was easy to see the advantages of the 'module' configuration with regard to inventory and quality control." In addition to touring the facility, we had an opportunity to discuss operations with the plant and production managers. Topics included individual versus team incentives, employee training and retention, and production planning.

Applied Materials

Back in Texas we visited Applied Materials in Austin. Applied manufactures systems that process chips for the semiconductor manufacturing industry. Applied has over 90 locations in 13 countries and was established in 1967. With sales over $7.3 billion, Applied Materials is the world's largest supplier of products and services to the industry. Approximately 70% of the company's product is produced at the Austin, Texas facility. At the plant, we attended a presentation by manufacturing personnel followed by a brief tour of the facilities. Because of the currently stagnant semiconductor industry, the strategy Applied is taking is investing in research for the next generation of products. Production planning is a formidable challenge during these slow times, as historically demand increases sharply upon signs of economic recovery.

"[Applied Materials] made for an excellent example in the field of supply chain and manufacturing management."

- MTM student

DuPont Photomasks Inc.

Our next stop was DuPont Photomasks Inc.'s (DPI) manufacturing facility in Round Rock, Texas. The company was founded in 1986 and until the 1990's was one of the DuPont's many businesses. It split from DuPont in 1996 and since then is a stand-alone semi-conductor company with 10 manufacturing facilities around the world. DPI is the largest manufacturer of photomasks, which are quartz plates and integral components in the lithographic process of semi-conductor manufacturing. These high-purity quartz containing precision images of integrated circuits (or chips) are used as masters by chipmakers and other industries to optically transfer these images onto semiconductor wafers. A typical IC process uses 35 to 40 masks and a set of these sells for around $500 – 800K. In addition, DPI also develops and produces photomask substrates and pellicles (protective covers). DPI's mission is to be the world's largest and premier manufacturer of photomasks through consistent development and seamless deployment of advanced photomask technology and consistently exceeding the expectations of the customers, employees and shareholders.

Dell Computer Corporation

Dell Computer was the last stop and the most highly anticipated visit. When we collected the feedback for this trip, most of the participants voted Dell as the "best visit."

Founded in 1984, it took Dell just nine years to make the ranks of the top-five computer system makers worldwide. And in the next eight years, Dell Computer ranked No.1 in global market share. As the top computer manufacturer, Dell's product line covers from desktop to laptop, from low-end workstation to high-end server. Revenue for the last four quarters totaled $31.2 billion and the company employs approximately 34,600 people around the globe. Dell's philosophy is "disdain inventory, always listen to the customer, sell direct and eliminate unnecessary touches." ("Best Plant Winner" by John Teresko, Industry Week) The company's daily operations demonstrate their rules, making Dell's American Desktop Operations in Austin an example of manufacturing and supply chain excellence.

Pam Everett and Nicole Holliman from Dell University Relationship Department were our hostesses for our visit to the Palmer North 1 (PN-1) facility that produces servers and workstations for the North American market. PN-1 is a very good example of cellular manufacturing. The floor is divided into two parts, one for server assembly and the other for workstation assembly. Each area works independently, except for shared common shipment space, labs and office areas. Each operation has a core cell area where machines are assembled. In each cell, there are two or three workers downloading configu-

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rations, picking up components and assembling them. The process can be described as follows:

In the kitting area, workers download orders and put all required components, along with traveler's tag, in a box and send it to the cells. The traveler's tag, bearing all information of the machine, will travel with the machine during assembly. In the cells, workers check the components with the list they download from the Data Center and continue with the assembly. Then MRB, batteries and RAMs are added in the nearby area. After that, bare machines are sent to the Burn & EMR area. After software is burned, the machines are tested for the first time and OEM parts are added. Second and third tests are then executed. Some machines may be picked out for extended test. The last step is packing, boxing and waiting for shipment. The whole system is a non-Kanban pull system. Scanner and barcode systems are widely used on the floor, serving as trigger signals and recognition tools.

"I liked visiting Dell for the following reasons: State-of-the-art manufacturing facility; I can see cells in process, which I am currently studying; I can relate to and understand their products because I am using them; and it is well-known and respected company."

- MTM student

After the facility tour, we met several UW-Madison alumni including Patrick Mihm, strategic commodity manager (Law School 1993); Seshu Anne, worldwide procurement director (Supply Chain Management 1995); Gilford Kibler, manufacturing senior engineer (Manufacturing Systems Engineering 1991). We also had lunch with other alumni of UW-Madison now working at Dell.

Summer 2002 Internship Placements

1st year students

Melissa Anderson – Harley-Davidson, Milwaukee, WI

Chia-Ping Chan – Parts Now!, Madison, WI

Jinwook Chung – Oh-Young Ind. Co., Ltd, South Korea

James Lang – Breakthrough Development LLC, Madison, WI

Qasim Munir – UW-Madison Dept of Astronomy, Madison, WI

Jian Sun – Valspar, Minneapolis, MN

Michael Wirth – Rayovac, Madison, WI

Yuri Ramirez – Independent Study for his PhD

2nd year students

Vivek Dubey (Dec. '02) – Datex-Ohmeda, Madison, WI

Joe Uhlik (Dec. '02) – Independent Study

Focus on a Faculty Member

Kathryn Caggiano
Assistant Professor
Operations and Information Management
University of Wisconsin-Madison
School of Business

Tell us about your academic and professional background.
In 1990, I finished my B.S. in mathematics at the College of William and Mary and took a position with Price Waterhouse as an information technology consultant in Falls Church, Virginia. During my three years with Price Waterhouse, I worked on system design and implementation projects for clients in a number of different industries, including transportation, telecommunications and insurance. I became fascinated with the application of mathematical models to business problems and the extent to which these models could impact the operation of a business. This interest inspired me to apply to graduate school in operations research, and in 1993, I enrolled in the Ph.D. program at Cornell University.

Although I was interested in pursuing an academic career after graduate school, I felt it was important to gain more practical experience before heading into the classroom fulltime. So, after finishing my Ph.D., I joined the PeopleSoft Supply Chain Solutions Group in San Mateo, California, where I developed planning and scheduling solutions for manufacturing clients in the semiconductor, injection-molding and high-pressure laminate industries. I eased back into academia by spending two years as a visiting scientist at the School of Operations Research and Industrial Engineering at Cornell, and in 2001, I joined the UW-Madison School of Business as an assistant professor in Operations and Information Management.

What brought you to Madison, as opposed to any other city or institution?
The weather. I was told that the winters were mild and the summers were cool – apparently I was misinformed. Seriously, when I visited the school I was very impressed with the faculty, the facilities and the students. My research and teaching interests were a good fit with the OIM group, and for many reasons I felt this was an excellent environment for professional growth. I particularly liked the fact that the Erdman and Grainger Centers provided natural ties to faculty and students in the IE department, as well as other functional groups within the business school. Very few other institutions offered the same range of opportunities and resources, and the Farmers' Markets in other towns couldn't even come close! Madison was an easy choice for me.

Tell us about your teaching interests.
Since joining the UW-Madison faculty, I have concentrated on teaching the core operations management course (OIM 750) in the full-time and Evening MBA programs. In time, I also hope to teach courses in applied operations research and supply chain management. I enjoy teaching immensely, and my consulting experience has been extremely helpful in bringing a practical perspective into the classroom. I try to use a variety of teaching methods in my courses, including lectures, discussions, group exercises and experiential learning. Each method plays an important role in the learning process -- the trick is finding the right balance!

Perhaps the hardest fact that I have had to accept as an instructor in a technical field is that it is not really possible to "teach" another person to think, organize and reason analytically. These are skills that each individual develops in his or her own time, and in his or her own way. The most that an instructor can do is provide a student with the motivation, the tools, and a learning environment that enables and facilitates this process. Having said this, I do believe there are three fundamentals that are key to delivering a course effectively, regardless of the course content: careful preparation, enthusiasm and relevance of material. When

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I was a student, these were the elements that made a profound impact on my own learning experience, and these are the things I focus upon now as an instructor. I believe that if an instructor can excel in these areas, student preparation, enthusiasm and contribution will naturally follow.

In your view, what are some critical skills that students interested in manufacturing management need in order to be successful in a manufacturing business?
Most of the decisions manufacturing managers make are based upon understanding and quantifying the tradeoffs among capacity, inventory, costs and customer service. In addition to basic analytic and modeling skills, I think that a successful manager must also have:

(1) The ability to identify and manage sources of uncertainty. Far too often, decisions are made based upon "average" values (average demand, average job processing time, average shipping time, etc.) without regard to the true nature of the process in question.

(2) The ability to collect and interpret relevant data. For instance, product cost information held in accounting systems typically includes a large fraction of allocated costs. Using these "unit cost" numbers in decision models without understanding their source can lead to poor decision-making.

(3) The ability to create a feasible and effective implementation plan. Understanding what must be done is important, but equally (if not more) important is knowing how to get the job done.

Have the above skills changed in the last 10 to 15 years and if so, how?
In my view, no, the skills themselves have not changed – it is the environment in which the skills must be honed and applied that has changed markedly. The expansion of information technology and the movement of companies toward creating a global marketplace have shortened the timeframe for managerial decision-making and have also broadened the scope of its impact.

What is the current focus of your research?
My current research focuses on developing practical mathematical models and solution approaches to assist managers in making decisions in large-scale manufacturing and distribution systems. Within the past few years I have worked on several industry-sponsored projects in the area of service parts management, focusing primarily on tactical and operational decisions (as opposed to strategic ones). Tactical decisions answer questions like "How should I set target inventory levels throughout the distribution network to meet customer service levels in a cost-effective way?" and "Which locations should be responsible for servicing which customers?" Operational decisions answer more immediate questions, like "What parts should I repair today?" and "What orders should I ship today?"

In many environments, these questions have traditionally been answered using simple, myopic rules that do not consider the current state of the system and often have costly consequences. Our goal is to develop tractable models that overcome these deficiencies and lead managers to make better decisions.

Focus on a Board Member

Dr. Tom Evans is the Vice President of Operations, Promega Corporation in Madison, WI

Tell us about your background and specifically how your professional experiences have led you to Promega?

I am vice president of operations for Promega Corporation, a global leader in applying biochemistry and molecular biology to the development of innovative, high-value products for life sciences research and industrial applications. Promega Corporation is a privately held company with over 750 employees worldwide. I have functional responsibility for manufacturing, global distribution, information systems and our subsidiary company located in California. At Promega, I have held positions such as director of fermentation and director of bulk production. Prior to joining Promega Corporation, I held process development positions at The NutraSweet Company and Baxter International, where I developed process technology for the large-scale production of amino acids and various biomolecules. I have a Ph.D. in Microbiology from the University of New Hampshire. In my free time, I enjoy hiking and camping in Montana.

What is your relationship to the MTM program?

I joined the Board in 1998 and have supported MTM students with internship and fulltime opportunities. One of my employees just completed her MS in MTM and another is contemplating her Ph.D. in MTM.

In your view, what are some critical skills that students interested in manufacturing management need in order to be successful in business? Have these skills changed in the last 10-15 years?

Key skills are ability to define strategic initiatives, involving all levels of the organization in defining goals that support attaining those strategic initiatives and removing barriers that limit individual and organizational effectiveness. These skills have not really changed in the last 10 to 15 years.

May & August 2002 Graduates:

Nate Blair – National Renewable Energy Lab, Golden, CO

Patrick Kirsop – Wisconsin Department of Natural Resources, Madison, WI

James Liang (August 02) – Epic, Madison, WI

Ernest Nicolas (August 02) – General Motors, Janesville, WI

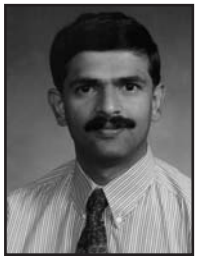
Leo Preza – Fresco Group Americas, El Salvador, South America

Sanjay Rao – Lands' End, Dodgeville, WI (internship)

Weiqi Sa – Breakthrough Development LLC, Madison, WI (long-term project)

Arun Sharma (August 02) – Datex-Ohmeda, Madison, WI (summer project)

MTM Alumni - Where Are They Now?



Shyam Bhaskar, 2000

Manager
i2 Technologies
Bangalore, India

What is your current job including title, responsibilities?
I work as a manager at i2 Technologies, Bangalore, India. i2 is a leading supply chain management software provider. I have been with i2 Technologies since I graduated from the UW. Initially I was in the consulting group at Dallas. That work took me to various places – Detroit, Tokyo and Seoul. Subsequently, I moved to the Solutions Group, and I am now working from our Bangalore, India, office. My primary responsibility is to provide 'template-based' supply chain management solutions for the automotive and industrial sectors worldwide.

Let me explain what a template-based solution is. Every industry sector has its own peculiar supply chain problems. For example, each player in the highly capital-intensive automotive sector aims to maximize his/her capacity utilization. But the winners are those who hold a very lean inventory. The challenge then is to provide a solution that addresses both these conflicting objectives. There are other aspects like demand forecasting, specific scheduling rules, dealer allocation rules and material constraints that need to be understood to provide a holistic solution. What goes into our template is a combination of both industry domain knowledge (what the industry needs are, how to translate the tacit business knowledge into an explicit problem that can be solved, etc.) and product knowledge (functionalities our products can offer, deciding on the right fit between our products and the clients' problems.)

Some of the advantages with template-based solutions are, first, we can talk the talk of the customer. That makes the customer more receptive as he/she perceives that we understand their problems. Second, we can be more proactive - instead of the client explaining all their problems to us, we provide a list of problems that a typical customer in that industry faces. The client's role is now to merely validate this and add any specific problem he/she faces. This saves a tremendous time in the problem definition phase. Finally, implementation becomes a lot easier and faster as we leverage the solutions we already have.

What major project have you been working on?
Currently we are enhancing our templates with the aim to reduce time to value. We are focusing on three areas: (1) design, (2) implementation and (3) actual use. The smarter your design is, the faster the value will come. The problem-definition phase of an implementation takes a lot of time – especially when you have newer problems to solve. We are now adding functionalities to our templates to minimize the gaps in our offerings.

i2's software utilizes our customers' existing infrastructure, like databases. While there are obvious advantages, the disadvantage is that the time to implement our template is longer than what we hope for. Linking to third party software, setting various parameters, etc., are potential points of human errors that makes the time to implement longer. We are undertaking efforts to minimize these errors.

Finally, customers can get value only when our solution is an integrated part of their workflow. For this, the solution should have minimal re-work, good user-interfaces, effective solutions and fast execution of results.

What are your future goals?
Success comes not just by setting goals but also by having a plan and executing it. My future goal is to focus on the execution part.

I was inspired by the Japanese brilliance in execution. As an example, compare Amtrak, Indian Railways and Japan Railways. The trains in the US are notoriously late. There can be many "valid reasons" (excuses) for train delays. Trains in India are the same. In some cases, they overcome this by padding times in the schedules. The scheduled travel time between the last two stations for some trains is around 30 minutes for a mere 5 km distance!! Let us to turn to Japan. Japan Railways operates some of the fastest trains in the world. Even then, you rarely see a train missing the scheduled arrival. I read a brochure on the famous Shinkansen that states that the average lateness of these bullet trains is a mere 0.6 minutes – averaged over an entire year, including all delays – even ones caused by earthquakes. How do they execute – not just once, but repeatedly? Think about the Toyota Production Systems. There is another brilliant piece of execution. This is where I want to focus my efforts in future.

How do you think MTM helped you in your career success? Any particular class you want to mention? Projects? Internships?

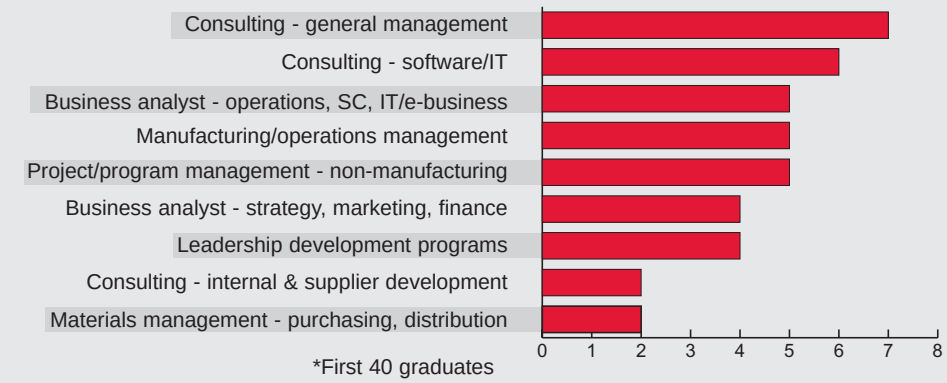
MTM is a carefully thought-out program. It gave me the flexibility in the choice of courses, but at the same time, forced me to take a structured path. Prof. Wemmerlöv's "T" in education message is simple but yet, very powerful. As you climb up the ladder of an organization, you will be taking many tasks that are not of your core competence. Yet, the organization relies on you. This is where your education and your experience come to your rescue. MTM provided me that foundation. I had an opportunity to work in the Center for Quick Response Manufacturing and I learned a great deal while working on QRM projects.

Knowing what you know now, what advice do you have for your fellow MTM students?

Gone are the days when any Tom, Dick or Harry was able to rule the roost. We are now back to fundamentals. Recruiters are giving prime importance to practical experience. My sincere advice is – gain as much practical knowledge as you can. Work in industry projects, do internships, read articles, implement some ideas on your own and do whatever you can. Try to enrich yourselves with practical experience. MTM provides you many opportunities. Capitalize on these.

MTM Students: Where Have They Gone?

Career fields of MTM Graduates*



*First 40 graduates

The MTM Curriculum

The MBA in MTM

This MBA degree requires 20 credits of business foundation courses, 14 credits of advanced business courses, and a minimum of 24 credits beyond the foundation and advanced courses – for a minimum of 58 credits. At least 6 of these credits must be taken outside the School of Business.

Foundation Courses (20 credits)
Financial Accounting
Introduction to Financial Management
Leadership Effectiveness
Managerial Economics
Managerial Accounting
Motivational Effectiveness
Marketing Management
Operations Management

Advanced Credit Courses (14 credits)
Managerial Communication
Data Analysis for Managers
Business Strategy
The Strategic Management of Innovation & Technology
Managing the Legal Environment
Ethics and Social Responsibility
Corporate Strategy

Required Courses (4 credits)
Managing Technological Change in Manufacturing Systems
MTM Seminar

The **MTM seminar** typically meets in the spring semester and is required for all MTM students. It provides exposure to emerging technologies and their adoption, new ways of organizing and managing firms, and current industrial perspectives by management and labor on these issues. The seminar involves guest speakers from industry, consulting firms, and software/equipment providers, as well as field trips. A segment on oral/written presentation skills is also a part of this seminar.

MTM Concentration Area Courses (12 credits)
Transportation and Business Logistics or Logistics Strategies
Global Manufacturing and Logistics
Introduction to Quality & Productivity Improvement
Planning for Quality in New Services and Products
Reorganizing the Factory: Competing through Cellular Manufacturing
Intro to Manufacturing Systems, Design, and Analysis
Engineering Management of Continuous Process Improvement
Quality Assurance Systems
Introduction to Quality Engineering
Computer Integrated Manufacturing
Inspection, Quality Control and Reliability
Patent Law or Product Safety Law
Project Management
Production Planning & Control
Operations Research II
Seminar in Information Systems
Entrepreneurship in the E-business Landscape
E-Commerce: Technologies, Strategies and Applications

Project Course (3 credits)
Design & Analysis of Manufacturing Systems
Introduction to Quality & Productivity Improvement
Planning for Quality in New Services & Products

Free Electives (5 credits)
A variety of courses in finance, accounting, management, operations, engineering and science are available.

The MS in MTM

The MTM program also offers a Master of Science degree in Business. This track requires 11 – 13 business foundation courses and a minimum of 32 credits beyond the foundation level – for a minimum of 45 credits. As with the MBA, at least six credits must be taken outside the School of Business.

The MS degree allows for more in-depth specialization than does the MBA and is suitable for those wanting a shorter time to obtain the degree, more specialization in MTM, to acquire double majors (e.g., in business and engineering), or to pursue a PhD. Most of the courses listed above for the MBA are suitable for the MS as well.

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The Erdman Center for Manufacturing and Technology Management is the "Home of the MTM Program"

Manufacturing and Technology Management (MTM) is a cross-functional area of study concerned with strategic, operational, financial, and people-oriented issues related to the development, sourcing, production, and delivery of manufactured goods in a global environment. This selective MBA/MS niche program leverages the students' backgrounds in engineering or science in generating new skills in product/technology development, business and manufacturing process improvement, IS implementation, change management, and the strategic use of technology.

The graduates' career goals include leadership positions in operations and supply chain, product and technology management, business development, and consulting. Past graduates have assumed positions with Harley-Davidson, TRW, Accenture, Intel, Eaton Corporation, Rayovac, Deloitte Consulting, Johnson Controls, Celerant, Ford, DaimlerChrysler, Novartis, Deere & Co, i2 Technologies, Philips, Abbott Laboratories, Delphi, and others.

The MTM program is administered by the Erdman Center and guided by an Academic Advisory Board comprising faculty from the School of Business and the College of Engineering. Linked to the program is also an Industrial Advisory Board with members drawn from 20+ organizations.

For more information on the MTM students or the MTM program at the University of Wisconsin-Madison School of Business, please go to www.wisc.edu/erdman or call Carol Aspinwall at (608) 265-9171. For the MTM curriculum, see p. 10 of this issue.

The MTM Newsletter

The Newsletter is produced by the graduate students in the Manufacturing and Technology Management Program under supervision of Center Director Urban Wemmerlöv. The objective is to inform professionals, faculty and students of the Erdman Center activities and events in the field of manufacturing and technology management.

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