

**A Proposal for On-line and Interactive Learning  
in the  
Master of Science for Management of Technology Program**

DRAFT

March 14, 2001

Wentworth Institute of Technology respectfully requests that the Davis Educational Foundation consider a grant of \$365,000, over two years, to implement and integrate on-line and interactive, or “computer-mediated,” technology in a pilot program in the new Master of Science in Management of Technology degree program at Wentworth. The computer-mediated teaching and learning technologies will be supported by the Davis Center for Advanced Graphics and Interactive Learning.

**Introduction**

In academic year 1996-97, Wentworth received funding from the National Science Foundation and the Bell Atlantic Corporation to assist the Institute in developing and testing on-line interactive learning technologies for its undergraduate programs. In 1998, GTE Telecom International provided Wentworth with a grant to begin the development of a part-time Master of Science degree program in the Management of Technology for working professionals.

As of November 2000, the M. S. in Management of Technology has been approved by the Wentworth Board of Trustees. The next step, which we are currently conducting, is to seek approval from the Massachusetts Board of Education to implement the degree in the fall of 2002. Central to the mission of the program is the objective of having 40% of its course delivery via the web. Further, after using the proposed graduate program as a pilot program for testing and refinement, Wentworth will be able to apply the developed computer-mediated technologies to many of its existing undergraduate programs.

**Need: Management of Technology**

The relative decline in the international competitiveness of U.S. industries has become a major focus of national debate. The symptoms are increasingly clear — record trade deficits, poor productivity growth, loss of technical leadership in a growing number of high-technology industries — but cures are difficult and complex. Many proposed solutions focus on economics and trade policy; others emphasize basic technology and education. One potential solution that is often overlooked lies in

improving how Americans manage technology development and implementation.<sup>1</sup>

So states the 1987 report of the Task Force on Management of Technology for the National Research Council. A focus of this report was on the general lack of programs aimed at education in the management of technology.

At Wentworth, the Master of Science degree in Management of Technology is intended to assist engineers and scientists, such as Wentworth alumni, to prepare for mid-career changes and personal advancement. It also will provide needed management training to corporations seeking to upgrade their technological workforce.

The program will focus on the knowledge and skills areas to be successful technical managers in the areas of Construction Management, Facilities Management and Project Management (in design, engineering, high technology prototype firms). It will be designed to allow students, who learn and work at the same time, to utilize some of their current experiences as case studies in their course work. Presently, there are three institutions within the Northeast region that offer graduate programs in Construction Management as a minor to the discipline of Civil Engineering. There are no programs offered in Facilities or Project Management. Two Management of Technology programs are also offered as minors to existing MBA structured programs. In each of these cases, the emphasis is on the management of information systems. MIT also offers a similarly named program for those in manufacturing firms. Wentworth plans to offer its graduate program to those in the professions of architecture, engineering, interior design, construction management, facilities management, management of technology and project management and high-tech prototyping firms.

### **Need: Distance Learning**

During the past two years, Wentworth's Graduate Program Committee has had much success in identifying both a number of technological advancements used in nationally recognized graduate programs and some innovative curricular structures for part-time learners. As part of the Graduate Program Committee's early investigations, it determined that if Wentworth could incorporate computer-mediated instructional technologies as part of its overall delivery system that this would

1. greatly enhance learning and communication in a part-time degree program and
2. offer benefits to regional companies.

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<sup>1</sup> Management of Technology: The Hidden Competitive Advantage, National Academy Press, Washington, D.C., 1987.

Wentworth recognizes that using emerging computer-based technologies can offer many advantages. We have experimented with a variety of types of computer-mediated instruction at the undergraduate level, and we agree with Zane Berge and Mauri Collins who write that computer-mediated technologies “allow for a more interactive, integrated learning environment” and “encourage discussion and long-distance collaboration by providing a learner-centered approach.”<sup>2</sup>

Using computer-mediated technologies can be optimal for “distance learning” environments as well, such as those utilized by a corporate employee who is seeking a part-time advanced degree. Some advantages for the company can include reducing the costs associated with lost time for employers supporting employee part-time educational needs. Further, in their report, the National Research Council recognizes that “small and medium-sized companies are at a distinct disadvantage because they often cannot afford or are unable to offer this type of education, or any other professional-level education, in-house.”<sup>3</sup> Finally, these are emerging communication technologies, and as students gain experience in the use of these technologies, they develop an understanding of how the technologies can and should be used to manage global organizations.

Wentworth is now seeking additional assistance to incorporate appropriate uses of computer-mediated instruction at the graduate level and with part-time adult learners from technical professions. The following is an overview summarizing key elements of this curriculum development proposal.

### **Program Description**

Unlike many masters of business administration or information technology, which historically prepare persons for general management or information systems positions, Wentworth’s program will emphasize knowledge and management skills necessary to lead teams of technical specialists as well as utilize their available resources more efficiently. Wentworth’s program will allow practitioners to learn and work while utilizing their current technical and managerial experiences in their course work. The degree program has been designed to allow completion of the M. S. in two years (6 continuous semesters), part-time.

The programs’ interdisciplinary curriculum is designed to provide working professionals with the best methodologies and practices for integrating technology and management in a complex and changing environment. To compete in the information age, the program stresses the

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<sup>2</sup> Berge, Zane and Mauri Collins. Computer-Mediated Communication and the Online Classroom in Distance Learning. Computer-Mediated Magazine, Volume 2, Number 4, April 1, 1995, p. 6.

<sup>3</sup> Management of Technology: The Hidden Competitive Advantage, National Academy Press, Washington, D.C., 1987.

development of entrepreneurial skills and abilities necessary to recognize opportunities that provide a competitive advantage to an organization. Students will be prepared for professional advancement by gaining a broad understanding and practical experience in strategic planning, leadership, managerial decision-making, communication with internal and external audiences, project design and implementation, evaluation of technology, systems thinking, negotiation, and legal, ethical and social responsibilities of organizations.

During the current semester, Wentworth continues to develop an overall curricular structure, course outlines and other electronic self-study materials related to admission and graduation standards and governance of the M. S. program. Supporting this continuing effort are five activities associated with this proposal:

1. During the spring and summer of 2000, members from the Graduate Program Committee identified specific courses that would significantly benefit from selected off-the-shelf computer-mediated instructional technologies. A training consultant familiar with use of portal technologies will greatly assist current faculty in this effort. Portal technology is the consolidation of information in a web-based environment where the end user can customize the way the information is accessed to their specific needs. This would include course management systems, links to specific information on the Internet/Intranet, conferencing, e-mail, and scheduling.
2. In the summer and fall of 2001, four participating faculty will develop pilot courses with the help of a consultant to integrate the selected computer-mediated and portal technologies. This activity will be based on the previously identified measurable learning criteria developed from survey information already gathered. These piloted courses will include a sampling of the program's first-year core courses and second-year specialty courses in project management, facilities management and construction management.
3. Faculty members would then test courses and the technology in the spring of 2002 with existing adult learners from Wentworth at their sites of employment.
4. An assessment of this process by the Graduate Program Committee would be conducted during the summer of 2002.
5. Based on the assessment outcomes, additional members of the Graduate Program Committee would then develop other courses in the curriculum in preparation for the first entering class in the fall of 2002.

## **Organization**

A Graduate Program Committee comprised of designated core/specialty level graduate teaching faculty will oversee the Management of Technology Program. This Committee will be chaired by the program's chair (a full-time faculty member). The program chair and Committee will report directly to the Division Head of Professional and Continuing Studies for program administration. The Division Head and Wentworth's Provost will be ex-officio members of the Graduate Program Committee. This Committee will be responsible for program assessment, curricular design, faculty peer review, evaluation and recommendation of graduate program policies and procedures, admission and graduation requirements, student advising and the selection of candidates for the program.

## **Funding Request**

Requested Davis grant dollars will be used to support Wentworth's Davis Center with the appropriate technology to develop course content for dynamic delivery over the Internet. In addition, the development of an on-line learning environment would be created to support graduate course delivery and management through portal-based technologies. A virtual (on-line) community would be created where students could gather to meet with instructors. Students will interact and collaborate with each other on various projects via the Internet and from their home or work site.

The grant would also be used to supplement some of the experimentation and testing costs between Wentworth and those students participating in the testing phase at their off-site locations. The proposed budget for this curriculum development is as follows:

### **Davis Educational Foundation Contribution (Two years)**

|   |           |
|---|-----------|
| 1. Curriculum Consultant / Course Content Designer                          | \$25,000  |
| 2. Technical Support (Technician/Co-op: \$40,000.00 per year)               | \$80,000  |
| 3. Portal Environment (software: \$55,000 per year)                         | \$110,000 |
| 4. Hardware — Development workstations, peripheral equipment and networking | \$150,000 |
| Total   | \$365,000 |

### Wentworth's In-kind Contributions

Technical support and use of faculty research labs from Wentworth's Davis Center for Advanced Graphics and Interactive Learning.

One course release time for participating faculty (4) during the regular academic year and summer semester.

### **Assessment**

Wentworth intends to use surveys, interviews, and other assessment tools determined by the consultant to evaluate the use of computer-mediated technologies in the areas of student learning, faculty teaching, and cost effectiveness.

### Student Learning

- Evaluate the effectiveness of computer-mediated tools on student learning in the following areas: strategic planning, leadership, managerial decision-making, communication with internal and external audiences, project design and implementation, evaluation of technology, systems thinking, negotiation, and legal, ethical and social responsibilities of organizations.
- Evaluate the success of using computer-mediated technologies to develop state-of-the-art information technology skills.
- Determine whether computer-mediated technologies aid in achieving the program's goal of providing working professionals with the best methodologies and practices for integrating technology and management in a complex and changing environment.
- Assess the effectiveness of computer-mediated technologies in increasing individual performance and leadership potential as a vital team member in solving technological problems and in delivering innovative products and services to the marketplace.
- Determine computer-mediated technology's effectiveness in evaluating and developing the requisite skills in writing, using the Web for instruction and research, computer technology, understanding the use of basic financial tools, and accounting principles and terminology.
- Include an evaluation of computer-mediated technologies used in each student's *Student Outcomes Assessment Portfolio*.

### Faculty Teaching

- Ask faculty to compare the delivery of instruction through traditional seminars/lectures, project assignments, and case studies versus utilizing computer-mediated technologies.
- Determine whether computer-mediated instruction is better suited to some disciplines targeted (architecture, engineering, interior design, construction management, facilities management, management of technology and project management in high-tech prototyping firms) more than others.
- Evaluate the success of computer-mediated technologies in teaching students to apply learned experiences (both theoretical and applied) and address significant and comprehensive issues associated with their respective disciplines.
- Assess the effectiveness of on-line tools in developing the Directed Studies Project portion of the curriculum.

### Cost Effectiveness

- Compare out-of-pocket costs for adult learners using the technology versus traditional delivery systems.
- Evaluate the time effectiveness of delivery via computer-mediated technologies.

Ask students and employers about effectiveness of using computer-mediated technologies to allow them to learn and work at the same time.

### **Impact**

First, the technology and methodology developed from this initial pilot program will eventually be integrated into Wentworth's undergraduate program.

Second, the methodologies and applications developed would be made available to the Colleges of the Fenway consortium through a series of seminars and on-line discussions. This would assist other institutions of higher learning in their endeavors to implement new learning technologies in their curricula.

Ultimately, experiences learned from this development, testing and implementation will be published on Wentworth's web site so that other educators nationally and worldwide may learn from Wentworth's experiences. They may also seek complimentary and supplementary

technology applications to the traditional classroom experience at the undergraduate and graduate level.

### **Summary**

A grant from the Davis Educational Foundation would be instrumental to Wentworth Institute of Technology achieving two important objectives: establishing a graduate degree program in Management of Technology, and piloting the delivery of key components of that program using state-of-the-art computer-mediated technologies. Wentworth has the opportunity to fill a void and provide a degree program that will allow working professionals to better manage technology development and implementation in the fields of Construction management; Facilities Management; and Design, Engineering and High-Technology Prototype Project management. At the same time, we can envision the promise of using state-of-the-art on-line and interactive technologies in the successful delivery of the Management of Technology program and their potential for use throughout the curriculum.

Wentworth Institute of Technology hopes the Davis Educational Foundation will join us in responding to these exciting opportunities.