Pushing Ahead:
A Progress Report on the Information Technology Program at UMass Amherst

By Bill Israel and Charlie Schweik
March 2001

Little more than a year after first formal discussion, the Information Technology program at the University of Massachusetts at Amherst is taking shape:

- the first 18 courses of the IT program are in place and being offered in calendar 2001, thanks to a grant from the Massachusetts Board of Higher Education (http://www.umass.edu/itprogram/courses.html).

- some 120 faculty and staff have participated in an interdisciplinary discussion of the needs for the program, and outlined some essentials. Many developed courses to build it.

- the staff leadership of the Board of Higher Education has pledged to support the program by seeking renewed state funding for the Commonwealth Information Technology Initiative (CITI), the measure supporting the IT program at UMass-Amherst and at the 29 campuses of the state's public higher education systems.

- an advisory committee of IT experts has convened as a group to offer suggestions to refine the program at UMass-Amherst, and help raise resources to advance it.

- the UMass-Amherst Information Technology Task Force, which guides program development, will propose a formal IT minor to the Faculty Senate this spring – and reach out to make the program still more inclusive. The Task Force also is seeking other financial support to build on the CITI grant.

The developments highlight a program seeking to help any interested student achieve comfort and a capacity to innovate using IT in any field. By improving and expanding IT teaching beyond the fields of Computer Science, Engineering and Management Information Systems, the program will address the shortage of thousands of people needed to drive the state’s new economy (http://www.umass.edu/itworkforce/documents/Brochure.html). In ambition and scope – potentially reaching the 177,000 students in Massachusetts’ three public higher education systems – the program, we believe, ranks among the state’s most important educational initiatives. Next to fully funding the state’s public education system, the program may be the single most important investment in Commonwealth economic growth available.
Courses

The offerings begin with an introductory IT "gateway" course, followed by others providing foundational skills in programming and database management (Table I; see also http://www.umass.edu/it/program/courses.html).

The program provides a suite of other courses to interest a variety of undergraduate majors. The courses range from applied use of geographic information systems, to assessing the importance of information design on the presidential ballot in Florida (http://chronicle.com/free/2001/01/2001010401t.htm). Some courses bridge fields, in an interdisciplinary spirit (Table II). Some seek to reflexively gauge IT's impact as we extend its use deeper into the disciplines. Some add depth to offerings in individual disciplines and afford students the opportunity to integrate IT skills into their majors (Table III). All seek to open students to the different ways of problem-solving and knowing through IT, and to equip them with the power to innovate in their chosen careers.

An array of support

Enthusiasm for the program has been marked since a conference in September, 1999 (where experts from other institutions encouraged program development (http://www.umass.edu/it/program/ITworkforce.pdf). Industry representatives advanced seed money to help.

Crucial to program success has been the involvement of a broad range of supporters: faculty, deans, the Provost's office, and state officials.

On campus, the extent of support became clear when more than 120 faculty, administrators and staff assembled at a workshop October 13, 2000 to discuss the program and its essential issues. Participants debated: What are the most important constituent pieces of a new IT curriculum? What is the impact of the use of these technologies? How important are they? What is the potential place for an IT minor? What is the role of various academic units in this endeavor?

Participants represented every college and school, and most of the disciplines. The discussions spawned a clear interdisciplinary sharing of ideas. In the words of Stephen Gehlbach, Dean of the School of Public Health, "It was an outstanding effort. A rare instance of bringing the campus together to discuss real academic matters." Provost Cora Marrett underscored the importance of the IT program as central to the University's educational and research mission. "We are the public university for the state. We're charged with advancing the commonweal. The people of the Commonwealth are depending on us."
Judith Gill, Chancellor of Higher Education for the Commonwealth of Massachusetts, outlined her board's enthusiasm for the initiative. The $1.68 million Commonwealth Information Technology Initiative (CITI) grant awarded to support the new courses and an array of other efforts was limited to fiscal 2001. But Gill said the board supports extending the grant for at least two more years (see: http://www.citi.mass.edu) and will ask state officials to fund it.

Next steps

Buoyed by support for the program from within and without, the Information Technology Task Force has sought out the assistance of industry leaders with ties to UMass-Amherst to form an advisory board. In the first meeting, a half-dozen industry leaders offered suggestions to improve the program, increase state help, and raise new support from industry.

In the meantime, the Task Force is enlarging the advisory board, engaging new staff leadership, expanding faculty participation, exploring additional support to leverage the CITI grant, and preparing to ask the university Faculty Senate for formal approval of a new Information Technology minor.
### Table I: Information Technology Core Courses

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Course #</th>
<th>Faculty</th>
<th>Offering Department</th>
<th>Semester Scheduled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gateway IT course</td>
<td>ResEc197a</td>
<td>Caffery</td>
<td>Resource Economics</td>
<td>Spring 2001; Fall 2001</td>
</tr>
<tr>
<td>Programming</td>
<td>Cmpsci 121</td>
<td>Lehnert and Fisher</td>
<td>Computer Science</td>
<td>Fall 2000, 2001</td>
</tr>
<tr>
<td>Database Management/Information Theory</td>
<td>Cmpsci 145</td>
<td>Barrington and Verts</td>
<td>Computer Science</td>
<td>Fall 2000, 2001</td>
</tr>
</tbody>
</table>

### Table II: Courses of Interest to a Wide Variety of Undergraduate Majors

<table>
<thead>
<tr>
<th>Economics</th>
<th>Economic Issues of Contemporary Information Technology</th>
<th>TBA</th>
<th>Field</th>
<th>Resource Economics</th>
<th>Semester Scheduled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Theory</td>
<td>Information Design</td>
<td>Art 297h</td>
<td>Campos, Giloth, Zinn</td>
<td>Art</td>
<td>Spring, Summer and Fall 2001</td>
</tr>
<tr>
<td>Legal Aspects</td>
<td>Contemporary Legal and Ethical Issues in Cyberspace</td>
<td>HRTA 394E</td>
<td>Enghagen</td>
<td>Hotel, Restaurant and Travel Administration</td>
<td>Fall 2001</td>
</tr>
<tr>
<td>Management</td>
<td>Information Technology and Organizational Change</td>
<td>Educ 401/601</td>
<td>Kilbane</td>
<td>Education</td>
<td>Fall 2001</td>
</tr>
<tr>
<td>Writing</td>
<td>Information Technology and Written Communications</td>
<td>TBA</td>
<td>Nelson and Reising</td>
<td>English</td>
<td>Fall 2001</td>
</tr>
<tr>
<td>Writing</td>
<td>Writing and Emerging Technologies</td>
<td>Eng 391</td>
<td>Stores, Edwards, and Moran</td>
<td>English</td>
<td>Spring 2001</td>
</tr>
<tr>
<td>History and Critical Reflection</td>
<td>History of Electronic Media and Information Technology</td>
<td>COMM 234</td>
<td>Paredes</td>
<td>Communication</td>
<td>Fall 2001</td>
</tr>
<tr>
<td>History and Critical Reflection</td>
<td>Information Technology in Social and Historical Perspective</td>
<td>Journ 397T</td>
<td>Israel Allen, Schlesinger Paredes, Sims</td>
<td>Journalism</td>
<td>Fall 2001</td>
</tr>
<tr>
<td>Social Impact of Information Technology</td>
<td>Com 497T</td>
<td>Hanson</td>
<td>Communication</td>
<td>Fall 2001</td>
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</tbody>
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### Table III: Disciplinary Integration of IT

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<tbody>
<tr>
<td>Business</td>
<td>Introduction to Business Information Systems</td>
<td>SOM 210</td>
<td>Sorcinelli</td>
<td>School of Management</td>
<td>Fall 2001</td>
</tr>
<tr>
<td>Engineering</td>
<td>Intelligent and Integrated Design Systems</td>
<td>Mie 5970</td>
<td>Terpenny and Woolf</td>
<td>Mechanical &amp; Industrial Eng’g; Computer Science</td>
<td>Spring 2001</td>
</tr>
<tr>
<td>Public Health</td>
<td>Information Systems in Public Health</td>
<td>TBA</td>
<td>Bigelow and Puleo</td>
<td>Public Health</td>
<td>Fall 2001</td>
</tr>
<tr>
<td>Public Policy/Administration</td>
<td>Information Technology Applications in Public Policy Analysis and Administration</td>
<td>Pubp697e</td>
<td>Schweik</td>
<td>Natural Resource Conservation and Center for Public Policy and Administration</td>
<td>Spring 2001</td>
</tr>
<tr>
<td>Biology</td>
<td>Information Technology in Biology Education</td>
<td>TBA</td>
<td>Brewer and Hoagland</td>
<td>Biology</td>
<td>Fall 2001</td>
</tr>
</tbody>
</table>
PROVOST'S
OFFICE

To: School and College Deans
Robert G. Helgesen, Vice Chancellor for University Outreach
John F. Dubach, Associate Chancellor for Information Technologies

From: Cora B. Marrett, Provost

Subject: October 13 Information Technology Workshop

Date: August 11, 2000

I invite you to join me on Friday, October 13 to plan for a vital, cross-campus information technology (IT) curriculum that may re-shape higher education in Massachusetts. The idea for an IT curriculum emerged last September when we hosted a conference to consider workforce shortages in information technology and model academic programs in IT (see: http://www.umass.edu/itworkforce/). Since then, a campus task group has developed the outlines of a minor and a major, and discussed how they might be tailored across the disciplines to benefit all students (see: http://www.umass.edu/itworkforce/documents/Brochure.html). The great opportunity of the new curriculum is to recombine the distinguishing strengths of UMass with information technology across the disciplines, to help reach that potential. To do so requires a new curricular framework, and offers us the opportunity to lead.

Thanks to members of the campus task group, I am optimistic that the campus may receive funding from the Board of Higher Education to develop and teach IT courses. This is hoped to be the first stage in developing a curriculum that will reach across the higher education system of the Commonwealth.

Any undergraduate curriculum dealing with this topic is, of necessity, cross-disciplinary. It is critical for us to work with the faculty to plan how to implement an effective program.
August 11, 2000

Accordingly, on Friday, October 13, I am sponsoring an all-day workshop on the development of minors and the major. I ask for your attendance and participation. I will introduce the workshop and participate in the discussions throughout the day. I ask that you moderate and/or participate in one of several panels, and lead some of the discussions (particularly in discussions that relate to your academic unit) throughout the workshop. In addition, I ask that you identify key faculty members to be included. The planning committee for the workshop will gather the names of those faculty and I will invite them to participate. A member of the planning committee will follow up with you soon. You may wish to share this letter with some faculty now.

I would appreciate your gathering your list of prospective faculty in the next few weeks, and reserving October 13 on your calendar. I look forward to a successful workshop and to the launch of an important, new interdisciplinary program for the University.

CBM/kag

CC: Department Heads and Chairs
Chancellor’s Executive Advisory Council
Formulating a UMass Response to the Information Technology Labor Shortage

A Workshop at the University of Massachusetts Amherst

September 13-14, 1999

Workshop Report and Recommendations—A Call to Action

October 18, 1999

On behalf of the Workshop Planning Committee

W. Richards Adrion
Kevin Aiken
Leslie Ball
Wendy Cooper
Joseph Goldstein
Stephen Levey
Charles Schweik
Joan Stoia
Harlan Sturm
Acknowledgements

The IT Task Group would like to thank Provost Cora Marrett for asking the right questions of us early in the planning process, and for her active participation in several workshop activities. We would also like to thank Chancellor David Scott for convening the program on the second day and, in his remarks, locating the activity in the context of regional and national priorities. We wish to thank our panelists, many of whom traveled a great distance to share their valuable insight and experience with the campus: Ms. Mary Ellen Condon, U.S. Department of Justice; Professor J. Michael Dunn, Indiana University; Mr. Don Haile, Fidelity Systems Company; Professor Paul Harrington, Northeastern University; Vice Provost Gregory Hughes, Rensselaer Polytechnic Institute; Mr. Joseph Infinger, Raytheon Corporation; Professor Joseph Lambert, Pennsylvania State University; and Professor Ronald Larsen, University of Maryland.

Additional thanks go to the representatives from business, government and education, listed in Appendix C, who attended the Workshop and contributed their time, energy and expertise to the discussions.

The Workshop Planning Committee would also like to express our appreciation to Wendy Cooper, Jane Martel, Annie Kelley and Nancy Kahn, for handling all of the logistical aspects of this event.

Additional copies of this report may be obtained by contacting Annie Kelley, Isenberg School of Management, University of Massachusetts, Amherst, MA 01003

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Introduction

This report summarizes the proceedings of "Formulating a UMass Response to the Information Technology Worker Shortage: A Workshop" conducted on September 13 and 14, 1999 at the University of Massachusetts at Amherst. The workshop was organized by members of the UMass Amherst Information Technology Task Group (see Appendix A) to gather information and advice on the subject from over thirty business leaders, government officials, educators in the field of information technology, and members of the campus community. Together, we explored the following questions:

1. Is there an IT labor shortage, and if so, is it likely to continue? Are Massachusetts employers having difficulty filling IT jobs? If so, how can UMass prepare its students for careers in IT?

2. What can we learn from other IT programs across the country? Are their elements of their programs that we might wish to replicate here? How would industry respond to a new program at UMass? What would employers like to see in a UMass program?

3. Is IT a valid academic discipline?

4. What is our action plan? What is our current capacity in the area of IT education? Do we have a sufficient foundation upon which to build a new program?

Our report is presented in four parts and synthesizes information gathered from panelists and participants over the two days. It includes a set of recommendations which we have fashioned into a preliminary plan for the development of a new academic program in information technology here at the University. The Workshop program and list of participants appear as Appendix B and C.

Background on the IT Workshop

The Information Technology Workforce Task Group was formed in 1998 by faculty and staff of the Amherst campus who were also members of a President's Office Information Technology Workforce Development Taskforce, one of several taskforces established to foster linkages between the UMass system and the state's key industries. Our group expanded to include representatives from a number of academic units. At the suggestion of Dean Joseph Goldstein of the College of Engineering, we took up the subject of IT education at the undergraduate level. Our initial inquiry revealed three things:

- There appears to be a serious shortage of trained IT workers both nationally and internationally
- Four year colleges are the primary source of IT workers
• A number of peer institutions have already launched new academic programs to address the problem in support of both their local industries and/or the country as a whole.

Given that we are located in Massachusetts, which has a high concentration of industries that either develop or utilize information technology, it seemed to us incumbent upon UMass Amherst to craft an appropriate response of our own.

Summary of the IT Workshop Findings

Based on information gathered at the Workshop, we can summarize what we learned as follows:

• There is a shortage of college graduates with skills in information technology

• This shortage transcends all disciplines which requires professionals to have a minimum literacy in IT and, more frequently, a more comprehensive set of IT skills

• This shortage will continue over the next several decades

• Other universities are aggressively pursuing a variety of IT programs, some offering certificates, undergraduate degrees, and/or graduate degrees.

• The University of Massachusetts Amherst, while offering a number of IT courses and degrees in a variety of academic units, is behind and will fall further behind without a comprehensive IT program.

• Upon graduation, our students are at a decided disadvantage without proper grounding in IT

• There is strong support from several academic units on campus for defining and pursuing the development of an IT program

• Our industry partners are willing to contribute advice, significant participation, and resources toward the development of that program

• We can, and should, position the University so that it can pilot a comprehensive IT program that will satisfy the needs of students and employers by September, 2000. It is clear from a review of recently emerged IT curricula, several of which are located at comparable land grant universities, that a collective and supportive partnership between the University, the Commonwealth, and industry partners needs to be established and nurtured for a UMass program to be successful.
I. Is There An IT Labor Shortage? If So, Is It Likely To Continue?

Contributors: Keynoters—Paul Harrington, Economist, Center for Labor Market Studies, Northeastern University, and Mary Ellen Condon, U.S. Department of Justice; panelists—Don Haile, President, Fidelity Systems Company; Gregory Hughes of Rensselaer Polytechnic Institute, and Joseph Infinger, Vice President and CIO, Raytheon Corporation.

UMass Moderators: W. Richards Adrion, Department of Computer Science; Kevin Aiken, Director, Division of Continuing Education; Leslie Ball, Associate Dean, Isenberg School of Management; Stephen Demski, Vice Provost for University Outreach; Joseph Goldstein, Dean, College of Engineering; Ethan Katsch, Department of Legal Studies; Stephen Levey, Director, Video Instruction Program and Coordinator of Distance Learning; Cora Marrett, Provost, UMass; Charles Schwelk, Center for Public Policy and Administration; Harlan Sturm, Associate Dean, College of Humanities and Fine Arts

Formal presentations and break-out sessions provided the following insights into the IT labor shortage and the types of training and educational strategies participants consider most important:

Is there a shortage of IT workers?

- Massachusetts faces a number of challenges which have the potential to slow economic growth: the continuing outmigration of younger workers; virtually no labor supply growth; high housing costs; the uneven distribution of growth industries around the state (i.e. Eastern and Western Massachusetts), and low enrollments in post-secondary technology-related curricula as compared to other disciplines.

- However, one of the state’s chief assets is a large education sector. Education, particularly higher education, has played a major role in growing and sustaining new technology-based industries in the state. Four-year college degrees offer significant earnings advantages to our citizens, particularly when those degrees are in science, engineering, and other technical disciplines. However, Massachusetts residents who do not prepare themselves for jobs and careers in the new knowledge/technology-intensive economy face a sharply proscribed set of occupational choices with significantly lower earnings potential.

- Although the numbers vary, several recent reports place the number of programming and systems jobs in Massachusetts companies of over 100 employees at 345,000. Demand for skilled IT workers will increase by 95,000 positions annually through 2005. Because IT is difficult to define, it is not clear whether these estimates include jobs where employees use information technology within the context of another discipline.

- In addition to dramatic growth in the number of new hires in IT and related jobs, the size of IT departments within organizations has increased relative to other business units. At
Fidelity Systems Company, for example, the IT workforce has increased by 19 percent vs. a 17 percent growth rate for the company as a whole. Fidelity’s experience also demonstrates the importance of IT to the state’s important financial services sector.

- Employer needs span all ages and educational backgrounds, from community college and vocational school graduates who can “hit the ground running” and can be paid less, to four-year graduates. Certificate programs and outsourcing are popular strategies. Employers want better articulation between four-year institutions and community colleges. One example is the Information Systems and Applied Technology program at James Madison University.

- Public sector employers have different needs. The organizational and policy context and the incentive structure distinguish public sector IT employment from that of the private sector, along with a greater emphasis on managing contracts, processes and expenditures. There is a greater need for IT “generalists” who understand the technology well enough to explain it to non-technical policy makers.

- While public sector IT workers need a fundamental understanding of IT, their ability to problem solve, work in teams, think critically and learn on the job may be more important. Retooling of the existing workforce should be a priority across the board, but nowhere is this more imperative than in the public sector. For the current and prospective workforce in government and the non-profits, IT must be taught in the context of other disciplines, for example, natural resource management and environmental policy.

- Employee turnover is a contributing factor to labor shortages, particularly among younger workers. While the turnover rate for the industry is between 15-20 percent, the rate among younger workers can be as much as 25 percent.

- Current immigration law may be working against IT employers. One expert suggested that government policy makers re-examine and adjust immigration policies to make it easier for foreign students to remain in the U.S. after graduation and work for IT companies.

- Employers predict that IT will only grow in importance. In the private sector, that means a long-term demand for engineers, systems professionals and other IT workers. In the government and not-for-profit sectors, the demand will continue to be for college graduates who can use IT to analyze issues and solve problems.

- Whether the recent experiences of employers constitute a classic labor shortage or could be better described as a “maladjustment,” developing new curricula which ultimately provide more of our graduates with access to IT jobs is a positive step for UMass Amherst, which has lagged behind other institutions in this endeavor.

What would employers like to see in a UMass IT program?

- The need for IT training and education go beyond standard computer science and engineering. Because the field is so incredibly broad, all types of programs might be
considered appropriate, from the advanced graduate level to majors and minor for undergraduates, and short-term certificate programs for “spot” training and re-tooling. An integrative, cross-disciplinary approach and the use of distance learning are important considerations.

- Curriculum planning for undergraduates should take into account at least three group of students – those who want a distinct program in IT, those majoring in other disciplines who need IT competency to solve problems and those who need to acquire basic literacy across the board.

- There must be balance between training and education. Graduates must be flexible problem solvers with broad-based skills such as critical thinking, teamwork, communication and project management. Future professionals must be self-starters and quick learners.

- An IT program should “nurture flexibility” while retaining academic rigor through a core set of courses offering a balance of breadth and depth. Core courses should be continuously evaluated and allowed to evolve with technology and society. Technological aptitude testing, already being done in other states (i.e. Virginia), was suggested.

- Employers would prefer a single point of interface for IT.

- UMass should demonstrate leadership in statewide education by communicating the need for IT training to secondary and middle schools. Several participants stressed the importance of partnering with high schools as a way of increasing IT-related enrollments in college; others made the specific recommendation that IT be included in the K-12 curriculum.

- The development of the so-called “soft skills” must accompany any program in IT across educational levels; the IT industry needs people with good communication, project management and teamwork skills.

- Business and government must be consulted continually on matters of curriculum, professional practice and lifelong learning.

- Employers and universities can benefit from the collaborative development of co-ops and internships. These experiences attract students to the firms, help them develop the skills and behaviors necessary for occupational success and may, in fact, inspire more of them to pursue professional/technical careers.

- At the same time, employers and higher educational institutions should develop re-training programs for older workers and women who are re-entering the labor force to help increase the supply of IT workers. Worker re-tooling is a major issue, particularly in the public sector.

- Maintaining current programs, while developing new ones which cross disciplinary boundaries, will require additional resources and collaboration between education, government and industry. For example, it was mentioned that James Madison University
raised $100 million with help from the Virginia Economic Development Council and the Virginia Technological Council. State government should invest in the development of statewide skill sets and competency standards; Massachusetts can find working examples of this in Washington, Texas and over 20 other states.

Overall Recommendation: That the University integrate Information Technology across all disciplines.

II. What Can We Learn From Other IT Programs?

Chief among the experts we invited were representatives of four programs developed by other universities. These included a regional effort to increase IT graduates called the Maryland Applied Information Technology Initiative (MAITI); an effort to provide breadth and depth in IT along with depth in a traditional discipline at RPI; and two efforts to create a new IT discipline—one at Penn State which is more traditionally technical and one at Indiana University which is highly multi disciplinary and human centered:

Indiana University: Calls their program A School of Informatics with a Director reporting to the Provost; split-time (with other colleges) and affiliated faculty coordinated across Bloomington and IUPUI/Indianapolis campuses. The emphasis is on both the technical and human dimension of information systems research and education (Mathematical Foundations, Distributed Information and Collaborative Computing, Human computer Interaction, Social and Organizational Informatics, and New Media). The Representation; Mathematical Foundations; Social Informatics; Organizational Informatics; Human Computer Interaction; Multimedia Arts; Distributed Systems and collaborative computing and degree programs (major, minor, certificates, M.S.) for students admitted by schools. The first majors will be admitted beginning Fall 2000. Funding was obtained via a state request and a related Lilly Foundation grant of $29.9M. The School of Informatics was established in 1999 following two planning committees' reports.

Maryland Applied Information Technology Initiative: A program designed to coordinate IT education and double the number of IT graduates of the University of Maryland at College Park, Johns Hopkins University, University of Maryland Baltimore, University of Maryland Baltimore County, Towson State University, Morgan State University, Bowie State University, and the University of Maryland University College. Another goal of the Initiative is to strengthen IT research and development activities at Maryland's higher education institutions, enabling them to serve the R&D needs of existing Maryland IT companies and attract new IT companies to the State. No new curriculum or degree programs were developed. Rather the emphasis is on coordinating current programs. MAITI is funded by the state of Maryland ($1.32M), with additional funds ($9M) for individual campuses from corporations and donors. MAITI was established in 1999 following a recommendation of the MAITI Board of Directors.

1 http://www.extreme.indiana.edu/~gannon/informatics/Info_main.htm
2 http://www.onestopshop.umd.edu/MAITI/index.html
Pennsylvania State University: A new College of Information Sciences and Technology, with a separate faculty and administration coordinated across all the Penn State campuses. The new curriculum includes five core courses: Introduction; Data Organization; Networking and Telecommunications; Discrete Math; Computer Languages and “capstone,” degree programs (associate, major minor, certificates, M.S., Ph.D.), and distance education. Students are admitted by college—100 for Fall 1999 at University Park. Funded via a new state allocation of $4.5M with plans to approach government industry and other donors. The College was established in 1998 following a Strategic Planning Group and other studies.

Rensselaer Polytechnic Institute: New degree programs in Information Technology managed by the Vice Provost of Information Technology serving as Dean with affiliated faculty drawn from existing colleges. The programs emphasize grounding in information technology with in-depth studies in a second discipline (e.g. management, the arts, engineering, architecture, science, law or medicine). The new curriculum consists of 12 core courses, including Algorithms and Programming; Computer Organization; The IT Revolution; Politics and Economics of IT; Data Structures and Applications; Exploiting the Information World; Computer Architecture, Networking and Operating Systems; Human Computer Interfaces; Creativity in Human and Artificial Agents; IT Resources; IT Studio/Capstone. Degree programs include a B.S. in IT, a “double” major in IT consisting of 36 credits and another area—32 credits, and “professional” M.S. and Ph.D. programs. Students are admitted by the program; 100 majors admitted in Fall 1999. Established in 1999 with funding from RPI and input from representatives from 60 companies.

Participants emphasized the need to “listen to industry and government” in the design of programs. They called for flexible programs that produce a range of graduates from those with highly technical expertise to those who can apply IT to solving business, public policy, social and/or legal problems. Rigid and narrowly focused programs are “no solution at all.” Participants emphasized the need for a strong and continuously evolving core IT curriculum. There is a need to develop measures of success; enrollment and job placement are metrics, but not the only ones.

Participants identified a need for the core to include: a good understanding of the basic technical issues, strong analytic tools and skills, and social and legal aspects of IT. The core needs to be supplemented by in-depth knowledge in particular disciplines (science, engineering, business, social sciences, humanities, etc.). The concept of a minor in IT appealed to a number of participants, since it would address many of the needs and would be easy to implement.

With respect to the particular programs, the participants especially liked Penn State, for its multi-level approach and for introducing IT to students early, and RPI, for spreading the responsibility for IT across the University; they also liked the RPI core curriculum.

Participants called for UMass Amherst to take a leadership role in the development of IT programs in Massachusetts. They indicated that the time is now, many other universities are

3 http://www.ist.psu.edu/10-Reports_Commitees/10-Strategic_Planning_Report/Index.html
4 http://www.usnews.com/usnews/edu/college/find/comajor.htm
moving ahead with aggressive IT programs and UMass and the State system should not be left behind. IT should be a strategic priority for UMass. An IT program will need a strong champion to make it happen.

What Could We Adapt for UMass?

Having the opportunity to view several models at one time enabled us to observe themes common to all and to benefit from the experiences, good and bad, which they went through in creating their programs. The following are ideas which reoccurred in all of the small group discussion sessions:

**Broad issues**
- We need to have an infrastructure for IT education, including space, facilities and faculty
- IT is a meta discipline, involving faculty from various colleges. It can be organized either within a college or as an interdisciplinary major
- IT, or “Informatics”, or Information Science and Engineering must be an agile discipline; it is poorly defined at this time; UMass has an opportunity to participate in defining the discipline.
- An “IT champion” who can spearhead the effort
- Business and government leaders are needed who will advocate for funding for the program with the state legislature
- An IT Advisory Board composed of representatives of major stakeholder groups
- Building a new, integrated program from existing campus resources
- Allowing Continuing Education to take an active role
- Further developing industry connections and support.

**Undergraduate Curriculum**
- A set of core courses (five, seven, twelve) are needed which cover the essential elements of IT and assist with students’ transition into the business/working environment
- Offering the IT courses to students early in their first and/or second years so that they may apply them to their area of academic specialization later on; this might actually attract undecided students as well as provide them with the core IT skills that would be useful throughout their college careers
- Offering variations on the program to students in other disciplines, such as the humanities and social sciences through minors, certificate programs, etc.
- The University of Maryland’s “professor of practice” model to complement the teaching faculty; this is particularly important should the program involve re-tooling of the existing workforce
- Collaborative relationships with the community colleges
- The integration of math, engineering and computer science
- Less of an emphasis on higher math skills in the curriculum
- Starting with a minor or certificate program in IT and allowing our “champion” to work toward the development of a major, and possibly, a larger infrastructure
- Business, analytic and technical skills for all majors; cross-disciplinary courses
- Actively promoting internships and co-ops for all students in the program
- The idea that curriculum validation is important
**Overall Recommendation:** There seems to be a substantial and growing interest in this area.

**III. Is Information Technology a Valid Academic Discipline?**

One entire panel discussion, moderated by Provost Marrett, was devoted to the question of whether or not Information Technology is a true academic discipline, and further, if an institution were to develop a major in this area, how would IT exist among other academic disciplines?

*Key statements by panelists and small group reactors:*

- The word “technology” implies a product, not an educational activity; a change is in order
- There is a growing consensus that IT is a discipline with a set of core components
- IT, or Informatics, or Information Science and Engineering must be an agile discipline; it is evolving and poorly defined at this time.
- There are multiple constituencies who would be interested in such a program
- The discipline could be organized in a College or as an interdisciplinary major
- It must be organized across present colleges with a champion for the program and some base funding
- UMass must understand that the burden of teaching courses in the IT program is not just a Computer Science burden/problem. All schools and colleges must cooperate and contribute to the curriculum. This will require a meta-organization at UMass.

The discussion turned to more details on program substance. Major points are provided in Appendix D.

**Overall Recommendation:** UMass cannot wait until the discipline is defined, rather, UMass should be a leader in defining the discipline. IT should be established as a primary future strategic direction for UMass as it has been for a number of universities throughout the country, such as James Madison, the University of Texas, Penn State and others. We have a clear need to participate in the further development of the area and have students who can profit from that commitment of energy and resources.
IV. Action Plan

As a result of what we have learned, an action plan must be developed. To be successful, the plan must identify the appropriate resources and infrastructure, and must have significant industry involvement. In addition, it must have an identified and measurable set of goals that focus on a significant increase in the number of IT proficient graduates.

The following draft plan is proposed:

1. By December 1, 1999:
   - Submit and have approved a proposal for moving forward
   - Appoint a Program Director
   - Appoint other staff personnel

2. By January 1, 2000:
   - Appoint an IT steering committee
   - Appoint Industry Advisory Board
   - Announce initiative to the public

3. By February 1, 2000:
   - Design tentative five-year plan
   - Begin to develop first year offerings and start the approval process
   - Submit five year staffing and budget model
   - Launch funding program with parallel efforts being conducted with the University, the Board of Higher Education, industry partners, and the state legislature
   - Begin to recruit faculty
   - Launch marketing program

4. By May 1, 2000:
   - Complete development of first year offerings
   - Further refine five-year plans and funding model
   - Gain acceptance of long-term operating model (reporting relationships, financial relationships, staffing relationships, etc.)
   - Complete course staffing for Fall, 2000

5. Academic year 2000-2001:
   - Launch initial offerings
   - Design remaining offerings
   - Begin to hire for second year
   - Conduct second conference of IT Workplace issues
   - Continue to secure outside funding
6. Academic years 2001-2005

- All programs launched
- Continue to refine programs
- Continue to market programs
- Continue to secure outside funding

**Overall Recommendation:** Our efforts will be successful if we can continue to have strong commitment from key academic departments and the administration as well as from our industry partners. We currently have that support and a strong aggressive program will help us maintain it.
Appendices

Appendix A. Member List, IT Workforce Task Group, Amherst Campus

Appendix B. Workshop Program

Appendix C. List of Workshop Participants

Appendix D. Other Panelist and Audience Comments Related to IT Program Design (From the Session on “Is IT an Academic Discipline?”)