

1/13/06

## **Technology and Information Management 5-year Plan: 2006-2011**

### **Program Overview**

The domain of this program is the management of technology and innovation, with emphasis on analytic methods and information systems and services. Management of the development and commercialization of technology is a continuing challenge to successful enterprises in competitive “high-tech” businesses. To rapidly respond to changing markets, executives and engineering managers must have an understanding of technologies as well as the analytical skills to develop viable solutions that may be theoretically sophisticated but can be implemented in a timely fashion.

Designing and managing complex systems in technology contexts requires a range of skills that includes knowledge of the relevant technologies and an understanding of the operational, financial and marketing dimensions of the business enterprise. In addition, managers must develop leadership skills and skills in human interaction, including the skills to communicate with and manage individuals from different backgrounds and cultures and in diverse (and geographically distributed) teams; and the skills to market new ideas and developments within the organization.

Traditional management (MBA) programs typically do not prepare their graduates to deal with this new technology effectively. TIM program strives to fulfill this critical gap and need faced by the industry today.

### **Building and Maintaining Excellence**

As a new program, Technology and Information Management (TIM) is committed to maintaining and building excellence over the next five years and beyond. Our program emphasizes interdisciplinary teaching and research, with the aim of producing graduating students who will have a deep knowledge of engineering analytics, as well as the broader knowledge of how to use these analytics to solve problems and create value in today’s fast changing technology and business climate. This distinctively interdisciplinary mission, combined with our program’s world-class faculty and our proximity to all the innovative high-technology businesses of the Silicon Valley, position us well to achieve excellence and impact in our research, as well as to graduate outstanding researchers and practitioners.

Our strong and growing faculty strength will be the key for our program to build maintain excellence in our new program in the next five years. Today we have 4 ladder-rank faculty and 1 adjunct faculty member developing our program of teaching and research, and in the next five years the number of ladder rank faculty will grow to eight. Our current diverse faculty have graduated from internationally renowned institutions in US, India, China, and New Zealand including Berkeley, Stanford, CMU, I I Sc (Bangalore), and Tsinghua University (Beijing). We have 4 male and 1 female faculty and we are

committed to building excellence through diversity. Currently our program is directed by a senior Computer Science faculty member and steered by a senior Computer Engineering faculty member which helps us to build close ties with these two departments.

In addition, we benefit from the close involvement and collaboration of many other faculty in the School of Engineering (Nanotechnology, Biotechnology, Applied Mathematics and Statistics) and Division of Social Sciences (Economics, Psychology, Sociology, Environmental Science, Anthropology), and Sciences (Biology).

We expect that our proximity to Silicon Valley can be instrumental in our program's plans for building excellence. Our faculty has several years of industrial experience with resulting in a number of funded research projects. Further strategic well-planned investment in Silicon Valley Center will be critical in establishing longterm corporate relations with industry that is likely to benefit campus as a whole. These relationships will enable us to attract working professionals into our graduate degree program, help build summer internship programs and research collaborations, and industry-sponsored funding.

### **Future Opportunities for Investment in New Endeavors**

With the unabated off-shoring of manufacturing, IT, and engineering jobs, it becomes critical to maintain US productivity through innovation. TIM program is a solution to U.S. loss of jobs and pre-eminence, in a service and knowledge economy-based world. This provides future teaching and research opportunities for TIM.

The teaching opportunity is to produce enterprise leaders/managers who would utilize information systems and technology resources to manage enterprises in the knowledge economy. Our students should be able to act as bridging people who can speak more than one language (business, technology, social-organizational change, deep industry knowledge, IT solutions knowledge, etc.). To achieve this goal, TIM will enrich the current curriculum by covering more areas through collaboration with other departments in UCSC as well as industry leaders. More specifically, TIM will keep on bringing deep industry knowledge onto campus by inviting leading experts, such as current and ex executives in high tech companies in Silicon Valley, to give seminar talks or as join as adjunct faculty.

TIM faculty will carry out cutting edge research in business intelligence, service engineering, knowledge engineering, risk engineering, new product development, innovation management, enterprise integration, and application of knowledge and emerging technologies to business enterprises. More specifically, we have identified service science and knowledge engineering as the most exciting opportunities for the near future. Our prior research work and on going collaboration with silicon valley companies, such as Cisco, IBM, Yahoo, HP, have given TIM a major advantage in business knowledge engineering. We will sustain our excellence in this area, especially in the context of service economy.

There are several future opportunities for investment in new endeavors including

- 1) Robotics for business
- 2) Knowledge engineering in health system or biology
- 3) Information Management in Social Networks
- 4) Managing Innovation

These new endeavors provide significant opportunities for interdivisional collaborations with many departments within School of Engineering and Division of Social Sciences. We are extremely well poised to take advantage of campus schemes to promote interdivisional collaboration.

### **Synergistic Graduate Programs**

UC Santa Cruz's Technology and Information Management (TIM) program is being developed as an interdisciplinary program with strong ties to computer science, computer engineering, electrical engineering, applied mathematics and statistics, biomolecular engineering, economics, psychology, sociology, anthropology, biology and environmental sciences. We have submitted a proposal for MS and PhD degrees in TIM with an expected launch date of Fall 2007. Students in TIM can take classes from all of the above programs, and the program faculty are also engaged in interdisciplinary research across these program lines. The graduate programs in TIM have an emphasis on technology management, analytical decision making, information management, and can benefit significantly with synergistic collaborations with many social sciences programs that are likely to result in new degree programs after the TIM graduate degrees are approved. The new degree programs will contribute to the other campus programs in the above related fields, creating valuable synergy across multiple disciplines. TIM expects to be a significant partner providing the vital innovative content of information, knowledge, and technology management that is revolutionizing the field of traditional management disciplines that are inadequate to meet the challenge of the 21<sup>st</sup> century information technology. TIM is engaged in the feasibility study for a school of management at UCSC, and is poised to provide leading partnership opportunities as a graduate management program is developed.

### **Plan for Faculty FTE**

We have grouped our hiring into three categories: Essential (2006-2011), High Priority, and Priority.

1. Essential: It is critical that we make a minimum of four hires in the next five years to develop our strength broadly in the technology management area, and to be able to offer a viable program. Key areas include :
  - a. Financial engineering, especially with a technology emphasis, where feasible,

- b. New Product and Services Design, Development, and/or Management,
- c. Innovation Engineering and Management (including products, services, processes, systems),
- d. Knowledge Services and Management (including data mining, text mining, and search, with potential implications for internet marketing and business process outsourcing)

Because these are emerging areas, with very high salary premiums, we will continue to pursue a strategy of hiring the best who possess the necessary skills and industry exposure, or have demonstrated an ability to span area boundaries and are fast learners. Depending on an outcome of a current search, we expect to hire one or two faculty (one full professor and one associate professor) during AY2006-2007, one (assistant professor) during 2007-2008, and one (assistant professor) during 2009-2010.

TIM will also be using industry-savvy adjunct faculty, as needed, to deliver the promise of Silicon Valley Center of recruiting working professionals as graduate students and establish research collaborations with the industry.

- 2. High Priority: It is important that we support current faculty through 4 additional faculty hires immediately after building the foundation. One of the high priority areas is Mechanism Design. This quick follow through will be necessary to build and maintain significant industry relations that will be helpful not only to TIM but to other campus programs.
- 3. Priority: To develop TIM program as truly interdisciplinary, TIM has a high priority to build divisional and inter-divisional collaborations. We propose development of campus-incentive programs where  $2/3^{\text{rd}}$  faculty FTE is housed in one department while  $1/3^{\text{rd}}$  FTE is housed in TIM or vice-versa. If this program is floated, TIM is extremely keen in having a total of 3 to 5 FTE depending upon campus plans, for example, offering  $1/3^{\text{rd}}$  FTE to 9 departments. Possibilities include computer science, computer engineering, biomolecular engineering, electrical engineering, applied mathematics and statistics, biology, psychology, economics, sociology, anthropology, environmental policy.

### **Plan for Enrollment FTE**

The graduate program (both M.S. and Ph.D.) in TIM is scheduled to be launched in fall 2007. Already there are several classes being offered by TIM faculty, and several students engaged in research under their mentorship. The initial offerings of graduate classes will focus on the core TIM areas, while later classes will branch into more specialized research classes. The enrollment projections are presented in the table below.

**Table 1. Projected Enrollments in the Proposed Graduate Program in TIM**

<b>Grad Enrollment</b>	<b>2005-06</b>	<b>2006-07</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>	<b>2010-11</b>
Faculty FTE	4	5	6	7	7	8
Adj. Faculty	1	1	2	3	4	4
M.S. in TIM	5	7*	11	18	26	29
Ph.D. in TIM	6*	9*	15	22	26	29
Total	11	16	26	40	52	58

- Students enrolled in other programs performing research with TIM faculty

**Undergraduate Program:** The ISTM department currently has approximately 66 undergraduates.

We are currently engaged in an intensive undergraduate outreach program that includes both junior colleges such as De Anza, Foothill, and Cabrillo as well as colleges within UC Santa Cruz. Our program promotion consists of four parts: (1) information dissemination to a large body of relevant influencers and decision makers (e.g., college faculty and students) (2) presentations to college deans, faculty, and advisors, (3) meetings with faculty, advisors and counselors, and (4) meetings with students. We hope that this promotion effort will lead to a compound 10-15% increase in enrollment over the next 3-5 years.

We would like to increase our service offering in several ways over the next 2-3 years. Currently, our core faculty is engaged in offering the basic required TIM courses mostly for TIM students, and also engaged heavily in administrative tasks due to very small size of our current program. Our basic undergraduate course offering, ISM 50, is extremely popular among the business management economics students, and we hope to increase our service offerings next year to increase the overall course enrollment in our program.

Last year (2004-2005) we had a very successful internship program with Seagate Technology, the world leader in disc drive technology. Out of approximately 16 students who did internships at Seagate, six were offered permanent positions. We intend to maintain an active internship program with Seagate and other leading companies as an important experience for our students as well as an important feature to attract prospective students to our program.

### **Plan for Extramural Research Support**

The five TIM faculty is actively engaged in seeking extramural research support. With only 1 senior faculty (mostly tied up with administration and service) and 3 junior faculty with average time at UCSC being less than 1 year, and 1 adjunct faculty (who is teaching 4.2 classes a year and shouldering several responsibilities including undergraduate directorship and SVC infrastructural development and outreach), we believe TIM has made excellent progress. Successful funding in the past couple of years include two NASA projects funded through UARC competition, and research projects funded by HP and Cisco.

2003-2004 was the first year for TIM with Professor Ram Akella being the only faculty with the mission of building the program and no extramural funding was obtained this year. During 2004-2005, Professor Ram Akella has obtained \$64,000 from HP, \$15,000 from Cisco, and \$132,000 from NASA for a total of \$216,000. During this period, Prof. Kevin Ross obtained \$31,958 from NASA/UARC funding. Thus, the total funding received by the TIM program during 2004-2005 was \$243,000 approximately. Prof. John Musacchio joined in January 2005 and Professor Yi Zhang has joined in Fall 2005.

TIM faculty is engaged in writing a NSF CAREER grant, 2 or 3 collaborative NSF grants, grants in collaboration with CE and Economics faculty. We have also submitted a grant to Samsung in collaboration with the SOE Dean. TIM is interested in participating in IGERT grant and is looking to campus leadership to articulate some principles (such as no more than 2 chances to one group) so that every group can get a fair chance of participating in these grants which are limited to 2 per institution. TIM faculty is actively pursuing several industry contacts with many companies including IBM for research funding.

Campus funding for seed projects involving interdivisional collaboration will also prove very useful to TIM faculty.

### **Measures of Success**

Traditional quantitative measures of success used at the School of Engineering, UCSC, UC System, and the State level are enrollment and extramural funding. Qualitative measures of success include publications and citations.

Technology and Information Management (TIM) is an area that develops principles and concepts that impact managers and executives, rather than engineers alone. Consequently, TIM is an area where the following measures of excellence are appropriate:

- Placement of Undergraduate and Graduate Students;
- Alumni Support (an area that school of Engineering must build and emphasize; we like to nurture our undergraduate and graduate students through active mentoring; many of them are likely to hold executive and managerial positions down the road);
- Impact of executive courses on industry to be evaluated through evaluation questionnaires,

- Impact of our research on industry practice and executive impact to be evaluated through industry survey on a long term (for example, five-year) time scale.