Reversing Declining Enrollments:
Introducing Minors to Reach New Student Markets within the University Community

Daniel Farkas
Information Systems, Pace University
Pleasantville, NY 10570, USA
dfarkas@pace.edu

Narayan Murthy
Computer Science, Pace University
Pleasantville, NY 10570, USA
nmurthy@pace.edu

Abstract

There is a lot of debate regarding the causes of declining enrollment in the computer and information sciences. Many believe the apparent loss of jobs in the information technology sector can be blamed for the dramatic decline in enrollments departments have experienced. While the issues of dot-com implosions and offshore outsourcing make the headlines, it is not clear that there is a shortage of jobs. This paper describes a way to revitalize enrollment by creating curricula attractive to students who are not computing majors. Two minors in Internet technology are described which can be taken by students with either strong technical interests or by those whose interests are more related to organizational support (e.g. marketing, web design, etc.). Enrollments in these minors resulted in increasing the number of non-majors taking computing courses.

Keywords: Enrollment, web development, internet, e-commerce, web programming, minors

1.   Introduction

Many institutions are experiencing declines in enrollment in Information Systems and Computer Science programs (Hensel, 1998; CRA, 2004, Hoffman). The authors believe that the polarization of both Information Systems and Computer Science, and the overall broadening of employment opportunities in different job categories in the information technology field, operate at conflicting purposes. According to the Bureau of Labor Statistics (2004), information technology specialists (software developers, network and communications managers), are still the in the top 10 fasting growing occupations. Driven by accrediting concerns, CS and IS departments offer narrow curricular paths to employment. Employment opportunity is better served by broadening Information Technology educational offerings. Outside the traditional departments, trends in information technology and informatics curricula are beginning to address this and Computer Science and Information Systems departments in institutions who are dependent on enrollment (as opposed to research funding), are having serious problems in maintaining enrollment goals.

The authors believe that by offering minor concentrations to non-majors, it is possible to revitalize departments by attracting students from different majors and from many different parts of the University community. Furthermore, enriched by a diversity of majors, these students may find greater employment opportunity than traditional CS or IS majors.

A recent announcement by U.S. Small Business Administration states that lack of technical expertise and lack of qualified IT employees are two of the major E-Commerce obstacles facing small firms. It makes sense that a first approach to reaching out to the broader student community is by offering minors in Internet technology. With this in mind, the School of Computer Science and Information Systems of Pace University has developed two minors in the area of Internet technologies and Web development. The development of Internet Technology curricula for CS and IS departments has been reported by other institutions (Chung & Mclane, 2002; Harmeyer, Beck & Sorken, 2003; Harmeyer, Tupper, Beck, & Sorkin, 2001; Hufford, 2001; Kumer, Hufford, Hicky, Bergin, &

Wilkens, 2001; McCubbery, 1999; Sorken, Tupper, Beiderman, & Harmeyer, 2003).

The *Web Media* program involves client-side Web development. It does not require programming but focuses on development using various multimedia tools. The *Internet Technologies* program focuses on server-side development. It includes programming in several Internet languages—Java, JavaScript, and Perl.

2.   TheUndergraduate Minor in WEB MEDIA

The *Web Media* minor is designed for students without a computer programming background. This is an ideal program for non-computing majors who would like to learn about Web development from a marketing, project management, or content development point of view. This program focuses on the *client-side* development of Web sites, specifically using the Web as a tool for commerce and communication, that is, developing the Web site from the point of view of the user/customer.

The minor consists of a sequence of 5 courses in which students will learn all aspects of client-side development including HTML, design process and principles, Web authoring tools, and multimedia. In the last course, which is project-based, students develop a completely functional e-commerce or communications Web site. The courses in this minor include:

IT 150 Introduction to Web Media and Web Authoring

IT 152 Technical Overview of Web Media and the

Internet

IT 154 Multimedia

IT 156 Web Design Principles

IT 160 Web Media Project

3.   A special note on IT 160 Web Media Project.

IT160 is a capstone course in Web Media minor. By design this minor is for non-programmers. One cannot develop a functional e-commerce Web site without programs running in the background on the server. We have come up with a creative solution to this problem. In order to assist Web Media students, the instructor will write all the server side programs and let the students know how to create links to these programs from their pages. In the capstone course, the Web Media students develop a complete front-end for an e-commerce Web site and link to these programs on the server. This makes the Web site completely functional.

4.   The Undergraduate Minor in INTERNET TECHNOLOGIES

The *Internet Technologies* minor is designed for students who would like to learn to develop and maintain Web sites. This is a good choice for those who enjoy computer programming. Students learn several industry standard programming languages including Java, JavaScript, and Perl. Students not only learn Internet programming languages but they also learn how to create and manipulate databases, and establish database connectivity. In addition, students learn how to set up a Web server and application server, as well as how to configure and secure them.

This program focuses on *server-side* development of Web sites. Before starting to create server-side programs, students learn the basics of client-side development and the technical aspects of the Internet. The minor consists of a sequence of five courses that teach Internet programming, how to set up a secure Web site and Webmaster responsibilities:

IT 150 Introduction to Web Media and Web Authoring

IT 152 Technical Overview of Web Media and the

Internet

IT 200 Internet Programming I

IT 202 Internet Programming II

IT 204 Web Management Techniques and

Responsibilities

5.   Resources: Development and Implementation

While the Internet Technology as an academic program is relatively new, Pace University has been involved for many years in the development of technology-enhanced curriculum. The University has a strong commitment and track record in this area in non-credit programs dating back to the middle eighties. The design team for non-credit bearing program in E-commerce technology included the two authors of the paper as well as representatives from the University community involved in the development of professional websites including both front and back-end processing. A guiding objective to the program was that students should understand the context of E-commerce in the business and organizational environment and have the technical skills to build and manage websites. That is, understand how to design, build, and manage an online enterprise.

Lastly, these courses are taught by regular faculty providing an opportunity for them to grow and develop research interests in this emerging discipline.

6.   Results and Future Direction

So far the results have been very promising. Enrollment in the minor (and certificate), continues to grow. The minor attracts both students from CS and IS as well as students from other schools and disciplines in the University. Table 1 shows enrollment numbers in the first 2 courses for the 2003-2004 regular semesters. These courses are taken by students in both minors. Overall the minors in just these courses added 50 students to enrollment beyond the traditional Computer Science and Information Systems curriculum. The percentages illustrate that almost 50% of the students are not from the computing disciplines.

It is planned to continue to develop minors which are attractive to students in disciplines other than CS or IS. There are two approaches to this, in the first case we will develop minors which are consistent with the CS and IS curriculum objectives, but expanding on what can be offered in the major. These include security and networking. A further plan is to develop interdisciplinary minors which have greater involvement with other departments outside of CS and IS. These include health informatics, bio-informatics, etc.

7.   Conclusion

In conclusion, we have found one successful strategy to counter declining enrollment in the traditional Information Systems and Computer Science programs by offering minors attractive to a broader audience. The Internet Technologies minor attracts student who have a strong technical background and is drawn from students in traditional Information Systems and Computer Science majors. Most excitingly, however, the Web Media minor draws from the University at large having the potential to attract students in nursing, education, the liberal arts and business.

At present, we also find that the minors draw and expand on strengths of the School of Computer Science and Information Systems by providing outreach to non-majors, exploiting the Internet through Distance Education, and contributing to the our students' career goals.

Table 1. Enrollment Numbers 2003-2004

Course	Computing Majors	%Computing Majors	Non-Computing Majors	%Non-Computing Majors	Total Enrollment
Fall 2003					
IT150	5	56%	4	44%	9
IT152	4	67%	2	33%	6
Spring 2004					
IT150	13	46%	15	53%	28
IT152	5	45%	6	54%	11
Totals	27	50%	27	50%	54

8.   References

Bureau of Labor Statistics (2004), *The 10 fastest growing occupations, 2002-12*
Available:
http://www.bls.gov/news.release/ecopro.t04.htm

Chung, S.W., Mclane, D., 2002, *Developing and enhancing a client/server programming for internet applications course* The Journal of Computing in Small Colleges, 18 (2), pp. 79 – 91.

Computer Research Association (2004), *2002-2003 Taulbee Survey* [online] Available:
http://www.cra.org/CRN/articles/may04/taulbee.html

Harmeyer, K., Tupper, D., Beck, W., Sorkin, S., 2001, *Preparing students for internet and multimedia technology career*s ACM SIGCSE Bulletin , Proceedings of the thirty-second SIGCSE technical symposium on Computer Science Education, 33 (1), pp. 376-380.

Hensel, M., 1998, *The Approaching Crisis in Computing Education: Enrollment, Technology, Curricula, Standards and their Impact on Educational Institutions*. Journal of Information Systems Education, pp. 24-27.

Hoffman, A., *Computer Science Slump*, Monster.com [online]. Available: http://technology.monster.com/ print/?article=/articles/collegetech/

Hufford, K.D., 2001, *CS265 web network and web site management development of a core course in the Internet technology minor curriculum*, Proceedings of the sixth annual CCSC northeastern conference on The journal of computing in small colleges, 16 (4), pp. 142-155,.

Kumar, A., Hufford, K., Hickey, T., Bergin, J., Wilkens, L. 2002, *Internet computing in the computer science curriculum,* The Journal of Computing in Small Colleges, 17 (3), 40-45.

McCubbery, D.J., 1999, *Designing an electronic commerce curriculum* Communications of the AIS, 1 (1es).

Sorkin, S., Mento, B., Tupper, D., Harmeyer, K. , 2000, *Curriculum development in Internet and multimedia technology* ACM SIGCSE Bulletin , Proceedings of the thirty-first SIGCSE technical symposium on Computer science education, 32 (1), 50-54.

Sorkin, S., Tupper, D., Beiderman, A., Harmeyer, K., Mento, B., 2003 *Creating an internet and multimedia technology program in a computer science department,* The Journal of Computing in Small Colleges, Volume 18 (3), 32-44.

Appendix

Course Descriptions:

COMMON COURSES

IT 150 Introduction to Web Media and Web Authoring
The course covers basic concepts in Web Media and the Internet. All essential HTML tags, developing Web pages using an industry standard tool such as Macromedia Dreamweaver or Microsoft FrontPage and an introduction to the basics of XML are discussed.

IT 152 Technical Overview of Web Media and the Internet
The course introduces technical aspects of the Internet and Internetworking. Class sessions contain lectures and hands-on exercises on computers. The course covers networking concepts; network protocols; network-related hardware and software; Internet, intranet and the Web, and security and privacy issues.

WEB MEDIA

IT 154 Multimedia
This course is a practical introduction to multimedia. Multimedia applications and the underlying standards are discussed. The focus is on industry standard tools. Lab projects are used to reinforce class lectures.

IT 156 Web Design Principles
The course introduces students to the basic principles involved in structuring and organizing a functional Web site. Important success factors for Web site design, critique of popular Web sites and usability principles are covered. Design strategies to improve these success factors are discussed.

IT 160 Web Media Project
This is a capstone course for the Web Media minor. In this project-based course, students use knowledge from other IT courses to develop a completely functional Web site which includes all the features found in a commercial Web site.

INTERNET TECHNOLOGIES

IT 200 Internet Programming I
This course covers scripting languages for the client-side – JavaScript – and for the server-side – CGI scripts using Perl. JavaScript topics include embedding JavaScript codes into HTML pages, events, multimedia, form validation, and dynamic HTML (DHTML). CGI using Perl will cover basic concepts, how data is transmitted between clients and servers, processing forms, and database connectivity.

IT 202 Internet Programming II

This course will cover client and server side programs using Java. The focus is on writing applets and servlets. Applets cover AWT and Swing, events, graphics and more. Servlets include processing of client data, session handling, applet-server communication, database connectivity, introduction to Java Server Pages (JSP) and more.

IT 204 Web Management Techniques and Responsibilities
Students learn to install and configure a Web server, and an
application server, run CGI scripts and test security. Web security issues, UNIX and Windows NT fundamentals, database issues, and legal and ethical privacy topics are covered. Full responsibilities of a Web manager are discussed.