Establishing a Software Development Track in a Computer Information Systems and Technology B.S. Degree

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ABSTRACT

As IT organizations continue to grow and the demand for IT professionals continues to grow, the need for IT software developers also continues to grow. The purpose of this track is so students can focus in the area of software development on many platforms including the Web. In this paper, I will discuss the history of this track, its current state and even possible future areas in which it will specialize.

WHY THE TRACK STARTED

The Software Development Track actually grew out of a discussion with the department faculty over several years. On a regular basis, our department looks at industry needs and trends in order to make the necessary changes to keep our program as one of the leading programs in the nation. It also came about partly after discussions with a major computer company to confirm our ideas. The people involved in this later discussion included key faculty in the department who taught software development courses and software developers and project managers from the company. Our industrial advisory board also supports this new track.

Still another reason for the software development track is the growing need for such specialists in the computer industry. This growing need is documented in a recent article in Computerworld (Rosencrance, 2001). It is also documented by the US Bureau of Labor Statistics in the following two documents: the first document is Table 3 from Occupational employment projects to 2010, the second document is the Occupational Outlook Handbook for the 2002 and 2003 (Hecker, 2001, table 3, p79; see also "Bureau of Labor Statistics", 2002). In the first document, it stated that the number of positions available for software engineers, applications is expected to grow 100% through the year 2010(Hecker, 2001, table 3, p79). In the second document, the position Software Engineer is expected to be the fastest growing occupation over the 2000-2010 period. ("Bureau of Labor Statistics", 2002).

There also has been greater interest from students to actually specialize in the area of software development.

EVOLUTION OF THE TRACK

The Computer Technology Department (CPT) at Purdue University was established in 1978. Its primary focus was on information systems (IS). Over the life of the department, there became three (3) areas of concentrations: 1) end-use computing, 2) database, and 3) systems analysis and design. While software development was a part of the curriculum, there was not specific area of concentration for it alone.

During my tenure in the department, the following areas have been covered in areas of software development. Mainframe development included COBOL, and CICS online applications. PC development included COBOL, with and without GUI, Delphi, and Visual Basic. PC development also included Java. We also offered elective courses in C and C++. As to Web development, we have courses that covered HTML, ASP, XML, JSPs and Java Servlets. The timeline for these courses is discussed in the following paragraphs.

In 1988, when I joined the department, the focus in software development was mainframe based. Our software development courses at that time included two COBOL courses. The first course was an introduction to COBOL and the second was a COBOL course that covered files.

In 1993, we moved to a COBOL course for developing online applications using CICS (Customer Information Control System). This was implemented in a PC environment since we had no access to a mainframe environment in which to run CICS.

In 1997, we moved to Windows software development course with a new course windows development course that used Delphi. Later in 1997, this was expanded to two windows development courses: an introduction course and a more advanced course that covered data structures, files and databases.

In 1999, we move the windows courses to the Visual Basic platform. In 1998, we started teaching our first OO programming course with Java. In 2001, we added an advanced internet development course using Java.

Other courses that were only short term included: software engineering, modern COBOL Programming (Y2K), and software redesign with COBOL

Now, we will look at our new software development track and the areas in which courses are being planned.

THE NEW SOFTWARE DEVELOPMENT TRACK

The key areas of new software development track include the following: GUI development, OO development, web development, enterprise development, and wireless development. The reason for these areas as well as more details about them are discussed in the following paragraphs.

First, we chose to start students out in programming in the GUI environment. This was done so the students will have the opportunity to see that developing software can be rewarding and fun (Kyle, 2002, p. 3). We decided totally against the "sink or swim" model (Kyle, 2002, p. 3). The topics to be covered include: problem solving and algorithm development, programming standards, variables, data types, operators, decisions, repetitive structures, modularity, arrays, sequential files, programming with objects, user interface construction, and software testing and debugging.

As to web development, it was decided on because of the industry move to the web for key business areas (Kornblum, 2001). The topics covered here include: client-side scripting, server-side scripting, and their appropriate use.

As to OO development, it was decided on because it teaches good programming habits (Kyle, 2002, p. 2). The topics covered here include: object-oriented design, encapsulation, object interfaces, inheritance, aggregation, abstract classes, polymorphism, data structures and exception handling,

Enterprise development was decided on because of so many of today's software applications run on multiple platforms or at least communicate across multiple platforms. Topics covered here include: component development and reuse, distributed object technologies,

multi-tier applications, data marshalling, transaction processing, concurrency problems and resolutions, load balancing and tuning, and application installation and deployment issues.

Wireless development was included because of the growth of wireless devices such as phones, PDAs and pocket PCs (Kornblum, 2001). Topics included here include the different development environments and how to develop for each of the different type of devices.

Other areas that are covered in track include the internet, information technology and architecture, database fundamentals and development, systems software and networking, systems analysis and design including OO discovery and modeling, software development methodologies.

All the areas are then put together in a senior software development project. This project then integrates all the software technologies and technique, taught in the prior courses.

The actual courses and descriptions can be found in Table 1 at the end of the paper.

Lastly, did we review any other curriculums to come up with track? The answer is no. We based it on what I stated above and on our professional experiences.

FACILITIES

As to our facilities, we currently have two labs associated with software development. Both support the most current tools in software development. These tools include: MS Visual Studio (C, C++ and VB), SDK 1.3, and Borland JBuilder 4.0 enterprise edition. We also just received a new hardware in one of these labs to support up to date ecommerce development. The new hardware is as follows:
- IBM Intellistation Pentium IV 1.7Ghz.
- 1GB RAM
- 30GB Disk
- CD
- 250MB Zip disk
- Sound
- 10/100 NIC
- Dual 15 LCD Monitor connector to a Matrox G450 Dual-head adapter with 32MB RAM

In addition to the new hardware, we are also receiving up to date ecommerce software from IBM that included WebSphere Studio 4.0 and Visual Age for Java 4.0. We also have the software mentioned in the technologies part of the course descriptions.

FACULTY

An important note about our entire faculty is that they all have industrial experience and maintain that industrial experience continually through consulting. They also are continually upgrading their skills through additional training and education. In fact all of our software development faculty have industrial experience in at least some of the following areas:
- Windows Development with Visual Basic
- Software development technologies
- Software testing
- Enterprise application development
- Web Development
- E-Commerce
- OO programming with Java
- Web development using Java
- Programming with C and C++
- Database concepts
- Database development

FUTURE DIRECTION

In addition to what has already been said, we are also looking to the future of software development. Some of the specific areas we area considering are as follows: Microsoft .Net (C# and J#), other software development platforms such a UNIX and Linux, and the use of design patterns (Vijayan, 2000)

CONCLUSION

In conclusion, this software development track is a new venture for our department and only the future will tell whether or not it is successful.

The goal of this new software development track is to prepare graduates for careers as software developers, computer programmers and software engineers. This will be done by providing our students

Table 1: Course names and their descriptions

Course Name	Course Description
Introduction to Computer Programming	This course introduces fundamental computer programming concepts. Microsoft Visual Basic
Internet Foundations and Technologies	This introductory Internet course explores the history, architecture, and development of the Internet and the World Wide Web XHTML, XML, and Microsoft FrontPage
Introduction to Application Development	This course introduces the development of information systems through the use of a database. Microsoft Access, Visio Enterprise
Information Technology and Architecture	A conceptual and technological survey of the structure of distributed information systems architectures, operating systems, networking operating systems, data management systems, application development environments, peripheral technology, and user interfaces.
Programming for the Internet	This course introduces programming techniques used to develop dynamic internet and intranet applications. ASP, VBScript, JavaScript, and JSP
Database Fundamentals	A study of relational database concepts. Oracle, VMWare, ERWin, VB, Web
Systems Software and Networking	Introduction to a wide range of topics in the data communication field including: vocabulary, hardware issues, trends, network protocols, networking operating systems, and directory services.
Systems Analysis and Design Methods	Comprehensive introduction to information systems development. Popkin's System Architect
Object Oriented Programming	This course focuses on using object-oriented programming languages in the development of modern business applications. Java, JSP, Java Servlets
Database Development	This course explores some of the programmatic extensions to SQL supported by today's leading RDBMS vendors. Oracle
Requirements Discovery and Modeling	This course is an advanced study of systems analysis and design focusing on object-oriented methods, techniques, and tools. Popkin's System Architect or Rational's ROSE
Software Development Technologies	This course explores methodologies and practices commonly used in contemporary software development project.
Wireless Programming	This course explores the different wireless environments and the actual development of applications for those environments. MS Visual Studio and Java (J2ME)
Enterprise Application Development	This course explores advanced application techniques in a large enterprise-wide setting. MS Visual Studio Enterprise Edition on Workstations, MS, SQL, MS, MTS, and MS IIS
Senior Software Development Project	This capstone course integrates the software development technologies and techniques taught in prior courses.

with extensive hands-on experience developing business-oriented, distributed applications, using the latest internet, object-oriented and client/server technologies.

As seen in our goals, we have a lot of work ahead of us. The next step in my writing is to measure and see what level of success we are accomplishing from this new track and share those measurements and results.

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