Developing an Employment Friendly Curriculum for the MIS Discipline

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Abstract: Knowledge acquired while earning a business degree is a valuable tool for preparing college students to enter the workforce upon graduation. In order to add extra value to business degrees the curriculum should reflect that graduates have a breadth of understanding in core areas and a depth in specific areas needed by employers. Three very important goals in developing any curriculum are meeting the requirements of accrediting bodies, aligning the curriculum with national recommendations, and meeting the needs of industry. All of this has to be accomplished with a limited number of credit hours available and while still keeping the requirements attractive to students. This paper chronicles the development of an industry friendly high quality information systems curriculum at a Midwestern University and offers suggestion regarding how to balance the needs of key stakeholders to develop a flexible high quality curriculum

Introduction

Information Systems (IS) have become an essential part of most businesses. Whether IS should be considered a source of competitive advantage (Tapscott, 2001; Metcalfe, 2004; and others); just a tool that should be used

as part of a competitive strategy (Carr, 2003; Porter, 2001; and others); or as some combination of the above (Grove, quoted in Hof, 2003) is still open for debate but there is a broad agreement that IS performance is critically important for a firm's survival. Even those who believe that IS is mature and no longer offers a source of competitive advantage recognize that it still has to be done well to stay competitive. For example, as Carr (2003) puts it, "Today, an IT disruption can paralyze a company's ability to make its products, deliver its services, and connect with its customers, not to mention foul its reputation."

An adequate supply of IT professionals is essential for companies to be able to provide high quality IS services. In order to help fill this demand universities should be concerned both with rigorously teaching students the underlying theory of the field and how to be continuous life-long learners. These goals should be accomplished within a curriculum that provides students with relevant skills and knowledge that are needed in today's workforce. The technology field is in a period of tremendous change. According to futurist George Gilder (2002) the amount of technical knowledge is doubling every two years and it is expected that the pace of growth will continue to increase. Because of this rate of rapid change university departments that offer degrees in the information technology fields will have difficult choices to make regarding how their curriculum should be structured but business schools will have to be willing to adapt quickly to the needs of their key stakeholders in order to remain viable (Fleming, 2008). Developing an IT curriculum that is both rigorous and relevant will be difficult. Some scholars even question whether it is possible for business schools to adequately prepare their graduates for the workforce given the current structure of the schools (Mintzberg, 2004; McKenna, Cotton, and Van Auken, 1995; Bennis and O'Toole, 2005; McNamara, 2006). It is our belief that the curriculum described in this paper offers a way to meet the needs of industry at a low cost.

In order to design a curriculum that is aligned with the needs of industry and academia Tye, Poon, and Burn(1995) called for educators and practitioners to strengthen their channels of communication so that they can work together to meet the challenges in the IS field. This will require that the educational institutions adjust their curriculum to meet the needs of the IS world. The paper suggests a method that balances the stability of common core with the ability to respond at the speed of business to better serve all key stakeholders.

Criteria Used

Following the curriculum development model advanced by Noll and Wilkins (2002) we conducted a review of the current environment. This included expected skills for the future, technology advances, other IS curriculums, and position announcements. We also worked to identify the needs and expectations of stakeholders. Our key stakeholders included recruiters of program graduates, industry executives, and recent alumni.

Expected skills for the future

According to Agrawal, Tenkorang, Agrawal, & Taylor (2009) the need for IS professionals will become more wide spread but will take two different paths.

Specialization in software development will lead to demand for IS software development professionals at IT development shops. At the same time, the demand for IS generalist will expand across organizations as more business functional units start to more fully utilize the power of their IS systems through the use of business intelligence. This paradigm shift is facilitated by technology advances in both hardware and software. As storage costs have plummeted date storage has become prolific. This trend along with the fact that processing power available has been increasing exponentially enables data to be analyzed quickly and easily. The client-server architecture that is present in almost all organizations of any nontrivial size has facilitated the exchange of information to allow for centralized and decentralized data processing depending on which is appropriate for the given task. Software developers have responded by building software that is powerful and easy to use thus enabling businesses to adopt a more data analytic approach that requires new skill sets across functional units. Tasks that would previously have taken a trained data professional hours or weeks to perform can now be performed by end users at their desktop with little or no programming required. As business intelligence, including data mining other data analytic techniques, enter the main stream there is an increasing need for people who with a broad understanding of business and of technology to be able to perform these functions. Students with a degree in Information Systems will be prime candidates to fill these positions. While there will always be a need for programmers they will represent a smaller share of the knowledge worker workforce as application development is largely either shifted to end users or outsourced.

Also as part of the curriculum development process the curriculum at 14 peer institutions, 4 competitive institutions, and 4 aspirational institutions were collected and analyzed to get an idea of current IS curriculums. This was used in conjunction with the IS 2009 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems (Topi et al., 2009) to help determine what an ideal curriculum should look like. Considerably more weight was given to the IS 2009 guidelines since they were developed as a guide for what a curriculum should look like whereas the current curriculum in use represents what a curriculum currently looks like. Three of the four aspirational schools used an “emphasis” or “track” system that added a focus area to a common core. This type of curriculum was also advocated in the IS 2009 Guidelines.

The fourth part of Noll and Wilkin’s model is to review position announcements. In the primarily rural area where we reside most IT jobs are not posted. To get around this limitation we interviewed many of the main employers of our graduates and worked with them to identify areas where they are expecting the most growth. This has the advantage of preparing our graduates better for the regional job market that constitutes our primary employment base. The disadvantage of this approach is that it runs the risk of producing graduates who are not prepared for competing outside of the region area. This risk is minimized by relying on the IS2009 standards and by the fact that many of our regional employers compete in global markets.

Stakeholder needs

While we do not have a formal advisory board we do have a close relationship with many regional businesses. These companies were consulted about both our current strengths and weaknesses. We wanted to know what areas were valued by employers so we could avoid making any changes that harmed our strengths. At the same time we wanted to know our areas of weaknesses so we could develop a curriculum that would address these areas where reasonable.

We found that our key stakeholders are very satisfied with the abilities of our students in the technical and academic areas we cover. Our perceived weaknesses were in two areas, soft skills and specialized courses. Soft skills, such as professionalism, can be corrected through an increased emphasis on those areas within current courses were an area where we can improve with no need for a curriculum change. Several employers also requested that specific course materials should be offered. In most cases the subject material that was requested was actually already being offered. In some cases the course title did not convey the material to be covered using terminology that employers understood. This problem was reduced by reviewing all course titles to make sure that the title used modern terminology that employers were more likely to understand. In some cases the material that employers wanted covered was taught but not in a dedicated course. In order to address this problem and for reasons discussed earlier in this paper tracks were created. This is in keeping with suggestions by the IS 2009 task force and is consistent with the curriculum at our aspirational level schools.

Tracks are designed to clearly identify for students and employers which courses best prepare students for a specific career path. Each track is limited to just three courses in addition to the core. In most cases tracks utilize two courses that are already being taught and an internship in the area of interest. Internships are an important component of most tracks because they have been shown to be valued by employers and to lead to higher salaries ((Gault, Redington, & Schlager, 2000),(Taylor, 1988),(Fang, Lee, Lee, & Huang, 2004)). Industry leaders in our area were very excited about the idea of an increased emphasis on internships. Internships offer employers a chance to "try before you buy". If an intern is a good fit for the organization they can offer the intern a job upon completion of the internship. If the intern does not fit with the organization then the organization can thank the intern for all of their hard work and end the relationship because the internship has been completed. Another advantage of internships is that graduates who have completed an internship at a business where they are hired or at a similar business will be productive faster and will thus be a more economical solution for employers.

For an example of what the MIS curriculum would look like incorporating tracks see Figure 1.

Figure 1
Career Tracks

	A	B	C
Core IS Courses			
Principles of MIS	●	●	●
Business Intelligence using Databases	●	●	●
IT Infrastructure	●	●	●
Visual Basic Programming	●	●	●
Java Programming	●	●	●
Intermediate Business Intelligence & Data Mining	●	●	●
Internet Programming	●	●	●
Information Systems Strategy & Management	●	●	●
Systems Analysis & Design I	●	●	●
Systems Analysis & Design II	●	●	●
Elective IS Courses			
Intermediate OO Programming		●	
BPR & ERP	●		●
Advanced Business Intelligence	●	●	
Software Quality Assurance			●
Internship	●	●	●

A Systems Analyst
B Developer
C Quality Assurance

Importance of business knowledge

In looking at the balance between technical skills and business content in the curriculum Plice & Reinig (2007) found that graduates who had better technical skills generally fared better when initially entering the workforce. However, as the graduates became more experienced their need for the technical skills decreased and their need for an appreciation of the business concepts learned were valued more highly. Without a solid knowledge of business concepts a graduate's ability to transition to a management role is diminished resulting in less prosperous long term career prospects.

The discussions we had with industry executives reinforced the Plice and Reinig's findings. For our particular region most job openings are looking for employees with good business knowledge and an understanding of how to make information systems work to solve business

problems. The heyday of the geek who loves working on the computer but who does not enjoy working with people appears to have ended. The importance of business knowledge was also supported by Bullen, Abraham, Gallagher, Simon, & Zwieg (2009) whose research indicated that of the top 10 (13 due to ties) client critical capabilities six were in the business domain, five were in the project management domain, and the remaining two were technical skills. Their work also indicates that a breadth of knowledge across business areas with a narrow focus in one technical area leading to a depth of knowledge is the best blend for today's IS graduate. The IS curriculum needs to stress general knowledge of business processes, critical thinking, and soft skills. Additionally, having an area of depth with some specialized project management and/or technical skills adds value.

Conclusion

Information Technology continues to gain in importance but many organizations still experience difficulty with hiring IS workers. George, Valacich, & Valor (2004) posited that the reduced demand for IS graduates that resulted largely from the dot.com crash and concerns over outsourcing had bottomed and that IS is starting to prosper and come back again. Their prediction seems to be accurate based on a number of recent reports, including Tomorrow's Jobs(Bureau of Labor Statistics, 2008) which predicts a growth across a range of career areas that would be likely paths for an IS graduate. Some of these include professional, scientific, and technical services (28.8% growth), computer systems design and related services (38.3 percent growth), and the information supersector (6.9% growth). This shortage of workers in the IS areas is causing universities and businesses to work together to develop opportunities that are designed to encourage more students to major in IS fields and to equip them with the needed knowledge, skills, and abilities to transition to the workforce quickly(Bailey & Stefaniak, 2002). Some organizations indicate that they would hire individuals with minimum technical skills so long as they demonstrate solid soft and business skills(Teeter, et al., 2000). This trend was also found by Simon, Kaiser, Beath, Goles, & Gallagher (2007) and extended to indicate that project management skills were highly valued.

We feel that developing a curriculum in the way outlined above has several advantages. The first is that having a common core simplifies teaching and scheduling courses. It also guarantees that the majority of the curriculum is subject matter that has stood the test of time and is not just a passing trend. By developing tracks schools are encouraged to communicate with local businesses and to offer current course offerings. In the case of our particular analysis and curriculum revision we found one course that needed to be added because of sufficient demand at several businesses. As new developments in IT change the requirements of industry IS tracks can quickly evolve to meet industry needs without impacting the slower moving more traditional core. Another anticipated advantage of tracks is that should make it easier to recruit and retain students. One of the problems experienced in recruiting IS majors is that the number of career options are so varied that it can be confusing to students. But dividing the electives into easy to understand tracks students can

have some of their decisional anxiety reduced.

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Appendix

Principles of MIS - The course provides an introduction and overview to the field of management of information systems (MIS). This course is designed to familiarize students with the critical roles of information and information systems in support of organizational operations, decision-making processes, quality management, and strategic activities. It also covers management of information systems functions and professionals, as well as relevant global, ethical, societal and legal/regulatory issues. Focus is placed on the impact of rapidly changing technologies, such as the Internet, on organizations leading to new paradigms, like e-commerce and business-to-business applications, and the subsequent reengineering of organizations.

Business Intelligence using Databases - This course provides an overview of leading technologies that are employed to deliver business intelligence to an enterprise. The importance of proper data structures and the conversion of data into information and the transformation of information into knowledge to improve business performance is stressed. Provides an introduction into how data is created, stored, and used for management decision-making.

IT Infrastructure - A study of computer organization. Topics include basic logic design, addressing modes and instruction sets, data path, memory hierarchy, Buses and peripherals, parallel processing, error detection and recovery, encryption and compaction.

Visual Basic Programming - This course is a study of advanced concepts, techniques, and applications in structured BASIC programming; includes table handling, subprograms, sequential and direct files, sorting and graphics. Emphasis is on development of applications.

Java Programming - A first course in problem solving and software development; including logic, data storage and manipulation, data types, assignment statements, standard input/output, selection control, repetition control, subprograms, parameter passage, scope of identifiers, data file input/output, simple GUIs, software classes, objects, one dimensional arrays and rudimentary software engineering techniques. Students complete programming projects using a modern programming language. Good programming techniques, object-oriented design, program clarity, style, and effective documentation are emphasized through practice in designing, coding, and debugging programs. Intended for students interested in improving their problem-solving abilities through the use of software development. Laboratory assignments develop mastery of a high-level programming language and good programming and experience in modern software development practices. Three hours lecture, two hours laboratory each week.

Intermediate Business Intelligence & Data Mining - Study of how business intelligence is extracted through data mining and used to support business functional activities. This course is designed to familiarize students with the critical role of data warehousing and data mining to organizational decision making process.

Internet Programming - Students learn the principles of system/Web-based software and build an understanding of combinations of data, network, and system/web-based software within architectural design.

Information Systems Strategy & Management - The course provides a set of practical and powerful tools to ensure the understanding of strategic, tactical, and operational responsibilities of the chief information officer (CIO). The strategic responsibilities include the strategic alignment among information technology and business functions of the organizations. BMIS 380 is recommended.

Systems Analysis & Design I - System development using the life cycle, rapid application development, prototyping, and software testing.

Systems Analysis & Design II - Students use several software packages as they work through the steps of the system development life cycle with business cases.

Elective IS Courses

Intermediate OO Programming - Structured programming concepts and principles including an introduction to data structures. Comprehensive study of a structured programming language with a variety of programming applications. An appropriate state-of-the-art language will be used.

BPR & ERP - This course provides an understanding of business processes and usage of various methods and computerized tools to redesign these processes. The redesigned processes will assist organizations in providing cost-effective quality products and services to consumers. Further, this course provides an overview of the Enterprise Resource Planning (ERP) Systems which are widely used by corporations for automation of their processes.

Advanced Business Intelligence - This course provides an understanding of advanced techniques to extract business intelligence. Neural networks and data mining tools are covered extensively.

Software Quality Assurance - The software industry has witnessed recently a dramatic rise in the impact and effectiveness of software quality assurance (SQA). SQA has become integrated into all phases of software development. This course provides an overview of various concepts/techniques such as inspection, Pareto principles, software configuration management, capability maturity models, statistical testing methods, software reliability, and software safety. It also distinguishes the variations in SQA applications for mission-critical software and commercial software.

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