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Forces for Change in the New IS 20xx Curriculum

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Abstract: With the maturing of the Information Systems (IS) profession and incoming students being more IS savvy, it is time to reexamine the discipline as it relates to the current and projected professional work environment. Finding the direction for the new IS model curriculum requires an understanding of the current external forces affecting the very core of IS education. These forces include the changing student demographic; students are entering university programs at an older age and most bring computer and workplace experience. They expect to be positioned to move up on the IS career ladder when they return to the workplace - a career ladder that increasingly includes managerial positions. The amount of data is increasing at an extreme pace; learning to understand the significance of information as a key business asset has become indispensable within the organization. The threat of outsourcing to IS jobs continues to increase; IS graduates must be prepared to take advantage of the areas where outsourcing lacks. Legislative directives such as Sarbanes-Oxley have increased the data services required within an organization; IS graduates must be able to understand how to implement the systems to assist management in meeting their legal requirements. To assist curriculum designers to adapt to these forces, a common business tool called a SWOT (Strengths, Weaknesses, Opportunities, and Threats) is used to propose curriculum changes. The key recommendation is future IS curricula need a stronger business focus, therefore the inclusion of applied management principles into IS learning is critical.

Keywords: IS curriculum, external forces, outsourcing, non-traditional students, data mining

EDSIG activities include the publication of ISEDJ and JISAR, the organization and execution of the annual ISECON and CONISAR conferences held each fall, the publication of the Journal of Information Systems Education (JISE), and the designation and honoring of an IS Educator of the Year. • The Foundation for Information Technology Education has been the key sponsor of ISECON over the years. • The Association for Information Technology Professionals (AITP) provides the corporate umbrella under which EDSIG operates.

Forces for Change in the New IS 20xx Curriculum

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Abstract

With the maturing of the Information Systems (IS) profession and incoming students being more IS savvy, it is time to reexamine the discipline as it relates to the current and projected professional work environment. Finding the direction for the new IS model curriculum requires an understanding of the current external forces affecting the very core of IS education. These forces include the changing student demographic; students are entering university programs at an older age and most bring computer and workplace experience. They expect to be positioned to move up on the IS career ladder when they return to the workplace - a career ladder that increasingly includes managerial positions. The amount of data is increasing at an extreme pace; learning to understand the significance of information as a key business asset has become indispensable within the organization. The threat of outsourcing to IS jobs continues to increase; IS graduates must be prepared to take advantage of the areas where outsourcing lacks. Legislative directives such as Sarbanes-Oxley have increased the data services required within an organization; IS graduates must be able to understand how to implement the systems to assist management in meeting their legal requirements.   To assist curriculum designers to adapt to these forces, a common business tool called a SWOT (Strengths, Weaknesses, Opportunities, and Threats) is used to propose curriculum changes. The key recommendation is future IS curricula need a stronger business focus, therefore the inclusion of applied management principles into IS learning is critical.

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1. INTRODUCTION

Getting the right information to the right people at the right time is a necessity in the competitive business environment. That means that IS professionals have to understand which information is of value and to whom, and then configure the technology accordingly. This has been called "valued information at the right time" abbreviated VIRT (Denning, 2006). Without a comprehensive understanding of what data must be retained, knowing the importance of accurate and detailed financial statements with supporting documentation, and the ethical implications of achieving compliance, the IS manager could place not only the organization at risk but also place the CEO and CFO at personal risk (Techrepublic.com, 2007). Because of legislative directives such as Sarbanes-Oxley, good IT management and good data stewardship are needed more than ever and understanding this is essential for today's IS professionals.   The accoun-

tants are responsible for the care of financial assets in an organization; the human resource managers are responsible for the care of the human assets; likewise, good stewardship of the IS function is a key business asset. Yet, how do IS graduates learn the importance of providing information at the right time if they have limited understanding of the role of managers in using that information in critical business decision making?

The understanding of management and how it is a core competency for any organization is important for all within that organization, including the IS staff. The career ladders for IS professional in the current organizational climate leads to management positions. No one successfully moving through a career in a business organization can avoid management and administration. Those who are interested in promotion to managerial positions will find that study in not only technical but also professional and administrative subjects is recommended (King and Skakoon, 2007). IS professionals perhaps do not innately possess the natural talents associated with good management and good leadership. Those personality characteristics which would enable a person to succeed as an IS professional --- a preference for working alone, orientation to detail, logical and unemotional – are not the traits desired in a manager who must spend a majority of the workday involved in interpersonal relationships. Although personality certainly plays an integral role in management and leadership, the skills needed to be effective in directing an organization can be learned and developed (Northouse, 2007). Though many leadership qualities are inherent to specific personalities, these qualities can be developed over time with the right insight and coaching (Andriole, 2007). A number of studies have established that the competencies of communication, interpersonal skills, self-control, "play a far larger role in superior job performance than do cognitive abilities and technical expertise" (King & Skakoon, 2007). Communication skills are vital to explaining technology in layman's terms so business managers understand that IS professionals are saying what they mean (Andriole, 2007). Understanding how good management may have more impact on profitability and success than good IS is critical for IS professionals who eventually will

be asked to assume a managerial role in the organization. IS professionals increasingly are becoming business technology leaders and as such need to have a firm understanding of the spectrum of business challenges, including the technology trends that matter to business (Andriole, 2007).

A survey of a number of colleges and universities offering CIS degrees at the four-year level reveals that many of programs do not require a Management or Business course, though some recommend a course as an elective. As IS is so pervasive throughout organizations, and the issues that businesses deal with on a daily basis are so entwined with IS, it seems that an injection of management theory into the CIS degrees would be automatic. Even in the Guidelines for model curriculum in undergraduate CIS programs, the IS 2002 curriculum, it is stated that "IS professionals must have a broad based business and real world perspective" (Gorgone et al, 2002). Yet, there is no business course required in the curriculum core.

2. FORCES FOR CHANGE TO THE CURRICULUM

In 2002, the IS curriculum was updated from its 1997 version to reflect changes within the CIS field (Gorgone et al, 2002). However, the changes, after a five year period of dramatic change in the IS field, consisted of two previous courses being merged into one, and a new course in e-business architecture and design was added. Since 2002, the IS field and academia have been grappling with the speed of technology changes and threats of outsourcing as a microcosm of the impact of global business. It would seem to be time to adjust the IS model curriculum again to reflect these new pressures on the IS field to appropriately prepare the graduates and plan for future curricula. Colleges and universities need to examine their IS curriculum to ensure that students are being properly prepared for current and future job trends (VanLengen, 2003).

Though there are many external forces putting pressure on curriculum designers to modify the IS 2002 curriculum to meet current challenges, the focus of this paper will be to discuss five specific external forces. The nature of the student body is changing;

non-traditional students now outnumber traditional students. Student background, experiences, and expectations have changed as a result of the new demographic. CIS degree programs have prepared students to enter the workforce immediately after graduation from a baccalaureate institution. Do these degrees still guarantee entry into the workplace, or is continuing education required to obtain IS positions in a competitive and progressive field? The increasing amount of data which is available and which needs to be stored, managed, and utilized presents a challenge to IS professionals who must have an understanding of the business uses of the data and the importance of its safety and security. Outsourcing looms as a threat to IS professionals; the level of jobs being outsourced continues to rise; IS professionals need to understand which types of jobs are routine and therefore likely to be outsourced and those that are critical to an organization and therefore will most likely remain within the organization. Finally, legislative directives such as Sarbanes-Oxley and the Freedom of Information Act (FOIA) place a continual burden on those who handle and store data to ensure the organization stays within the law and abides by all the new regulations. Following is a discussion of each of these five forces.

3. TRADITIONAL VERSUS NON-TRADITIONAL STUDENTS

According to the U.S. Census Bureau, in the year 2005 there were over 215 million Americans age 18 years and older. Of those 215 million, 8.3%, or almost 18 million, was enrolled in college or graduate school. Of the 26 million of the population who were 18-24 years old in 2005, 35%, or just over 9 million, was enrolled in college, meaning that the other 9 million enrolled in college were above the age of 24. That's 50% of college students who are over the age of traditional students. Three quarters of today's college students are non-traditional in some way (Yankelovich, 2005). These students enter the university with different backgrounds and work experiences from the traditional student who is a recent high school graduate. The non-traditional students are older, perhaps attend part-time, are working, and in many cases have families. They are returning to school to earn a degree to change careers or move up within

their chosen career as they understand that as the country moves from an industrial economy to a knowledge-driven economy, post-secondary education will be required for promotion (Lunsford, 2003) They are not expecting to re-enter the workforce in an entry-level position. Therefore, is the current curriculum mandating courses covering subject matter that has already been learned in a practical setting by these non-traditional students?

4. DISCIPLINE OR CAREER?

Should the new CIS curriculum focus on discipline knowledge itself or should it focus on the career ladders for their graduates? With increasing numbers of BA and BS students continuing their education into Master's and doctoral programs, has earning the bachelor's become just a waypoint or is it still an exit point to careers? Should the curriculum adapt to student needs or technology needs? As the field of IS rapidly changes, and the curriculum adapts to those changes in technology, so must the curriculum adapt to changes in IS's place in the organization and reflect that in the curriculum.

Of the 12 fastest growing occupations from 2004-2114 in the US, according to the Bureau of Labor Statistics, five are in the CIS field (BLS Monthly Labor Review, November 2005). CNN Money in April 2006 listed 2 CIS jobs among the "Best Jobs in America". Top on the list was software engineer and number seven was IT analyst. The jobs described as "best jobs" and "fasting growing occupations" above all require a Bachelor's degree or higher (Network systems and data communications analysts, computer software engineers in both applications and systems software, network and computer systems administrators, database administrators and even college professor). It has been said that IS skills tend to become obsolete even faster than ever before (Lee & Lee, 2006) If that is true, then the CIS curriculum needs to not only consider the technical aspects of the courses but also infuse those skills and knowledge bases that will be needed to adapt to changes within the field. Even with the threats of outsourcing, the U.S. technology industry added almost 150,000 jobs in 2006. Yet, the number of entering college freshmen planning to major

in CIS or Computer Science has dropped 10% since 2000 (Holahan, 2007).

Designing college curricula typically encompasses a few key areas: general education core requirements, program requirements, and elective courses from which students can choose a concentration of courses either within the major or as a complement to the major. As many professions become more focused and detailed, four year degrees may not suffice for graduates to enter the workforce within that field, i.e. psychology, history, or sociology. Some four year degrees never guarantee employment within that field after graduation; students must continue their education at the Master's or Doctoral level before exiting to a career. Some degrees prepare students for entry level positions but further study is required for promotion to mid or upper levels within that profession, i.e. accounting (an additional 30 credit hours after the Bachelor degree to sit for the CPA), and business administration (potential MBA students typically must have 3 years of work experience before being admitted to the graduate programs). But what of the IS 2002 curriculum for CIS graduates? Is the curriculum preparing students for immediate entry to the workforce? At what level? Is the curriculum preparing graduates to move up the career ladder in their respective field within the organization or is a graduate degree required for promotion? IS as a career field is no longer merely responsible for low level tasks such as programming and network maintenance. As the utilization and management of technology is no longer just a process but a "value added" component to business, IS professionals need to develop creative and innovative skills for analyzing data that serve the needs of the organization and learn the language of business so as to track technology trends that matter to business and be able to explain them in a way that management understands (Andriole, 2007). The need to inject management concepts into the curriculum to prepare graduates to position themselves on a career ladder that includes management positions becomes critical.

5. INCREASING AMOUNT OF DATA

It has been said that, "Archivists estimate that the collective sum of all printed knowledge is doubling every four years. More information has been produced in the last thirty years than in the previous five thousand." (Oppenheimer, 1996). Most recently, the number of emails is increasing drastically, with a 150% increase in emails sent worldwide from 2002 to 2005 (techrepublic.com, 2007). The International Data Corporation (IDC) estimated that over 36 billion email messages were sent in 2005 alone (techrepublic, 2007). Customer databases which influence marketing activities and media buying and affect corporate strategy continue to grow with demographic information, buying habits, and lifetime customer value. Direct mail volume is projected to increase by 25% from its 2005 levels (Schmitt, 2005).

How to manage, store, and manipulate that information is the value added by IS professionals who understand the proper use of the stored data and useful information it becomes. As the amount of information has increased, businesses have looked to IS professionals for solutions. Users of technology want faster search engines, not a smaller Web. They want to record every bit of information in case there is ever a need to use it (Denning, 2007). In the late 90s and early 2000s during the dot.com bust, those technology companies which were saved from bankruptcy were those whose databases were considered their primary asset (Baase, 2002). The data stored and the information which could be mined from their databases became the most valuable of the companies' assets. IS professionals are being forced to move away from studying technology to understanding what users can do with the technology (Shneiderman, 2007). Data mining has become an integral part of knowledge discovery in databases (Tan, Steinbach, and Kumar, 2006). Both informational retrieval and discovery of behavioral patterns become critical to managerial decision making; data mining unlocks the value of the database and provides a key business asset for the organization's managers.

6. OUTSOURCING

Outsourcing is single handedly redefining the types of IS jobs in the US economy (McAleer and Szakas, 2006). For example, in the U.S. Department of Labor's list of fastest growing occupations, 2000-2010, eight

computer related occupations were listed in the top nine; by 2004, five computer related occupations were listed in the top 12 (Department of Labor, Bureau of Labor Statistics, 2005). In the Department of Labor's list of industries with the fastest wage and salary growth, in 2000, computer and data processing services were listed as number one. In 2004, though employment was notes as growing at a pace of 2.2%, computer related employment is not on the list of the 10 fastest growing employment occupational groups (Department of Labor, Bureau of Labor Statistics, 2005). Not only are call center jobs moving overseas, more recently software development jobs have moved to places such as Bangalore, Prague, and Russia, where labor costs are lower and skilled workers abound (Holahan, 2007). Jobs that are routine and use standard software applications are the most likely to be outsourced. Application development and programming are being added to the list of U.S. jobs being sent offshore to reduce IT costs. Programming skill is becoming a commodity that is available worldwide, often at significantly reduced cost (VanLengen, 2007). It's not just IS jobs being outsourced; entry-level jobs in many career fields have also seen dramatic drops in U.S. employment, to include loan processors, X-ray technicians, customer service representatives, architects, and even engineers (Yourdan, 2005; Aspray et al, 2006, Engardio, 2007).

Digitization is one of the forces driving the outsourcing trend in the architecture field. Many architecture firms are adopting sophisticated computer tools to design buildings; these tools require technical skills that can be hard to find in the U.S. (Engardio, 2007). The outsourcing of legal and architecture back-office work is said to be in its infancy and will continue to increase dramatically (Kripalani, 2007). Even small and medium sized businesses that can't afford to hire numbers of IS workers but must deal with office technology that's becoming more complex have turned to outsourcing. Outsourcing reduces the ordeal of having to manage complex technology and can reduce employee costs (Tam, 2007). Thus, there is a line being drawn between the IS jobs that can easily be transferred out of an organization and those that stay, and the line divides the creative and innovative from the routine.

That line has moved above call center jobs, has crossed into the programming field, and threatens system analysis jobs (McAleer and Szakas, 2006). If the threat of outsourcing should not be underestimated then IS professionals need to "find their value where outsourcing lacks" (Yourdon, 2005). Where outsourcing is not the answer is where IS departments need to take advantage. Displaced U.S. IS workers can gain some advantage by becoming managers of the outsourced projects. For the outsourced projects to be successful, they need managerial review and continuous project management (VanLengen, 2007). Though some managers believe large scale IT outsourcing including the management of the entire IS application infrastructure, on average, firms already spend about 8% of contract amounts to manage and monitor vendors offshore. Under Sarbanes-Oxley, those costs will continue to grow due to management's requirement to certify annual reports (Hall & Liedtka, 2007).

7. LEGISLATIVE DIRECTIVES

The Sarbanes-Oxley Act was enacted in 2002 to address serious business fraud and to increase accountability of senior management for accurate financial information. Increasing pressure has been put on IT managers by the reporting disclosures required of public companies and those who do business with public companies by the Sarbanes-Oxley Act (techrepublic.com, 2007). As a result, organizations have tried to hire employees with a combination of computer skills and business understanding so that they understand internal controls over financial reporting systems and appropriate management of internal communications (Hall & Liedtka, 2007). Corporate documents, along with emails, must be preserved as business records. Understanding proper data management is critical for IS professionals as the CIO could be judged to be as accountable as the CEO and CFO under the law. Compliance with current legislation such as the FOIA demands understanding of the law and the requirements it places on organizational data storage and availability. The chance of future additional legislative initiatives concerning data and its use is not only possible but likely. IT managers will need to know how to implement systems to ensure that

the organization's managers are in full compliance with the laws and regulations.

8. THE SWOT

In the business field, managers periodically take stock of current conditions and plan for future strategies by conducting an audit of internal factors within an organization and an external audit of the opportunities and threats outside the purview of the organization (David, 2007). This audit combines an awareness of what is happening within the organization, within the industry, and in the external environment (Andriole, 2007). The process is called a SWOT, meaning an assessment of the internal strengths (S) and weaknesses (W) and the external opportunities (O) and threats (T). Then, using a SWOT matrix format, managers can plan feasible strategies by matching internal factors with external factors There are four types of strategies that can generate alternatives for action planning (David, 2007). The first set of strategies is developed by using a firm's internal strengths to take advantage of external opportunities (expand the product line, enter a new geographic area, developing methods for use in bioinformatics). The second set is improving internal weaknesses by taking advantage of external opportunities (acquire a competitor or critical parts supplier, expand areas of cooperation with complementary programs). The third set is using a firm's strengths to overcome external threats (use the legal department to sue a rival who has copied patented processes, use cutting edge technology for solving business problems). The fourth set of strategies develops from matching internal weaknesses with external threats, which can mean drastic actions such as liquidation or bankruptcy. An example would be discontinuing a degree program or merging with a complementary program.

	Opportunities	Threats
Strengths	SO Strategies	ST Strategies
Weaknesses	WO Strategies	WT Strategies

Figure 1: SWOT Matrix

The State of the IS Curriculum, using a SWOT:

Upon review of the IS 2002 curriculum, there are still some enduring qualities which should be continued. These strengths are that the IS 2002 curriculum:

- Is flexible and adaptable (objectives can be moved from one course to another)
- Recognizes rapid technological changes
- Is designed for entry level with basis for career growth (Gorgone et al, 2002)
- Has core courses grounded in the fundamental body of computer and IS knowledge

However, there are some areas that could be addressed in a curriculum revision. These weaknesses are that the curriculum:

- Has no business course required in the core
- Is designed for entry level jobs
- Has not changed since 2002
- Has core courses grounded in the fundamental body of computer and IS knowledge.

The results of an external review uncovered the following opportunities for revision to the IS curriculum:

- The increase of non-traditional students
- IS career ladder leads to managerial positions
- The use of data mining to assist management with decisions/strategies/VIRT
- Data stewardship issues in the protection of key business assets

Likewise, the external review identified threats to the current IS curriculum:

- The continued outsourcing of entry-level and programming jobs
- Requirements to comply with Sarbanes-Oxley and other legislative regulations
- The Increase in amounts of data to be managed
- Fewer students choosing IS degree programs

By performing the matching of strengths with opportunities and threats, and weaknesses with opportunities and threats, the

following strategies for the curriculum are suggested by the matching:

Strength/Opportunity (SO) strategies:

- Add objectives for management/business knowledge outcomes (S1, S3, O1, O2, O3)

- Include course/objectives for data mining (S2, S4, O3)

- Include course objectives for data stewardship (S1, S4, O2, O4)

Strength/Threat (ST) Strategies:

- Add objectives for management/business outcomes (S1, T1, T2, T3)

- Replace programming courses with data mining and security issues (S1, S2, T1, T2, T3)

- Recognize career ladder includes management (S3, T1)

- Delete introductory course; incoming students have computer experience (S1, S2, S4, T1, T4)

Weakness/Opportunity (WO) strategies:

- Recognize career ladder to management (W1, W2, O1, O2)

- Include course/objectives for data mining and security (W3, W4, O3, O4)

Weakness/Threat (WT) strategies:

- Recognize career ladder to management (W1, W2, T1)

- Include issues of data stewardship (W3, T2, T3)

- Delete introductory course and add data mining and stewardship (W3, W4, T1, T3, T4)

Using a SWOT matrix as a tool to match internal strengths and weaknesses with external opportunities and threats suggests areas for change in the CIS curricula in the future, including:

1. Should the curriculum reflect the changing nature of the student body from traditional students to non-traditional students with previous work experience? The SWOT has identified that the introductory level course for IS programs could be deleted as students coming into the degree programs now have computer experience. Removing the entry level course will allow a new course that could cover applied management principles for data utilization, data mining, and data security.

2. Are graduates prepared to enter/return to the workforce with a BS or must they continue their education at the Master's or doctoral level? If curriculum designers recognize that the career ladder for IS professionals will eventually lead to managerial positions, the inclusion of a course dealing with applied management principles will allow graduates to reenter the workforce ready to assume management responsibilities.

3. Are graduates being prepared to manage, store, analyze, and mine databases to suggest new uses of the information? The SWOT identifies that the need for data mining and data security has become a key business asset and the ability to manage and utilize data is critical to the success of the organization. IS professionals must understand the importance of the data that is needed, and the appropriate use of the data.

4. How does outsourcing affect curriculum planning? Outsourcing is a threat to Is professionals; recognizing the types of jobs that are easily outsourced and those that managers want to control indicates that the handling, managing, and protection of data is critical to an organization. Those who are able to keep information secure and keep information required to be in compliance with legislative initiatives will be in demand.

5. Are graduates knowledgeable in accountability issues under current business regulations such as Sarbanes-Oxley? A weakness in the current curriculum is the lack of emphasis of data security and storage; future legislative initiatives are probable; understanding the implications of laws and regulations becomes the responsibility of the data handlers and the data professionals.

9. CONCLUSION

With the ongoing maturing of the Information Systems (IS) profession and incoming students being more IS savvy, it is time to rethink the discipline as it relates to the professional work environment. Finding the direction for the new IS model curriculum requires an understanding of the external forces affecting the very core of IS educa-

tion. By using the business strategy tool called a SWOT, curriculum designers are able to identify the strengths and weaknesses in the current IS 2002 curriculum and plan revisions based on the external forces so as to take advantage of opportunities and reduce the effects of the threats. This tool can also be used to evaluate future curricula by revisiting the strengths and weaknesses of the curriculum and revising the opportunities and threats in that future time.

Understanding the impact of the increasing number of nontraditional students coming into IS programs, knowing that these non-traditional students are intending to enter/return to the work environment with their education and work experience preparing them for higher than entry level positions, knowing that the amount of data is increasing dramatically, that outsourcing can be both an opportunity and a threat, and that legislation demands tighter controls and more secure storage of data, leads to the conclusion that the need to inject management training into the curriculum to prepare graduates to position themselves on a career ladder that includes management positions becomes critical.   To be able to take advantage of the opportunities presented to the IS field in the context of a business organization, and to prepare to meet current and future threats to the field, will require a solid understanding of how IS can give an organization a competitive edge in this environment. The skills needed to properly prepare the next generation of IS professionals are primarily the soft skills of IT management (White & Tastle, 2006).   IS 20xx should require a management course that can facilitate data stewardship and a strong understanding of how IS can be part of management's efforts at meeting future challenges.

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