Cutting to the Core: Curriculum Strategies to Address Outsourcing

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Abstract

Outsourcing is a threat to many jobs in the IT sector, and puts pressure on IT curricula to adjust. The threat of outsourcing should not be underestimated. What are the characteristics of jobs that are easily outsourced? And what can be done to produce well rounded IT professionals insulated from outsourcing? Where outsourcing is not the answer, IT curricula should take advantage. Teaching students to be innovative, creative, culturally aware, work in teams, and communicate well can prepare them to compete in the global economy. This can be accomplished by reinforcing general education skills within the IT curriculum.

Keywords: Outsourcing, IS2002, general education, curriculum

1. INTRODUCTION

Outsourcing. The very word can strike terror into the hearts of IT professionals. And why not? Even though reports state that more IT jobs are available in the US than at the height of the dot.com boom, other reports suggest that 12 to 14 million jobs are vulnerable to outsourcing over the next 15 years, (Aspray et al, 2006; Yourdon, 2005). Information technology executives and business managers have ranked outsourcing as the second highest area of expected spending in the next year (Spangler, 2006). There is no need to debate the threat of outsourcing; it is a fact of life in the current IT world. Outsourcing is single handedly redefining the types of IT jobs in our economy. 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 US Department of Labor's list of industries with the fastest wage and salary employment growth, in 2000, computer and data processing services were listed as number one. In 2004, though employment was noted 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).

What is a subject for discussion is the threat to IT academic programs and how education of IT professionals can adapt to meet the challenges in an outsourcing environment. While degree programs appear under many names, five majors cover most of the programs: computer science, computer engineering, software engineering, information systems, and

information technology (Aspray et al, 2006). This paper will include all these programs under the term IT education.

There are two serious facts facing IT academic programs in the U.S.:
1. There has been a 60% decline in the number of US college freshmen considering CS as a major during the period 2000 to 2004.
2. The number of professional software developers in such Asian countries as China and India is increasing rapidly (Glass, 2006).

If the goal of educational institutions (US or otherwise) is to produce students capable of competing for IT jobs in the world economy, are we laying the groundwork and preparing them accordingly? Or are we preparing them for yesterday's jobs? Education can be the means to combat the offshoring of IT jobs; however, the academic system that underpins the IT profession will need to change (Aspray et al, 2006). In deference to the IS2002 guidelines, the model curriculum should be designed to produce competent and confident graduates well suited to workplace responsibilities.

Fortunately, the IS2002 model curriculum allows for flexibility and adaptability (IS2002). However, to improve long-term employment opportunities in the IT industry, students should not only have a strong foundational education in IT (and keep up to date with developing technologies) but also develop teamwork skills, familiarity with other cultures, and good communications skills (Patterson, 2006). Rather than focus strictly on the most up-to-date technologies, education must also focus on those intangible skills that IT professionals will need to retain their jobs in the US. This proposal is not protectionist but rather one that will work within the framework of the IS2002 curriculum and with the reality of outsourcing to ensure that the IS2002 curriculum is "preparing students for the global economy and adapting to the changing nature of IT" (Aspray et al, 2006).

IT professionals will need to have well-developed skills which are peripheral to IT core knowledge – skills such as creativity and an ability to communicate (Yourdon, 2005). Studies of job advertisements from Fortune 500 companies and discovered that not only do employers expect their IT employees have the technical skills needed to perform on the job, but also to have certain business skills, such as management ability, interpersonal skills, and communications skills, and system skills, including problem solving ability (Lee & Lee, 2006). "Students fear if they become programmers they'll lose their jobs to counterparts in India and China…however, analysts believe programmers with leadership and business skills will do just fine" (Hamm, 2006). "Solid communications skills, analytical thinking, and being a quick study are the new keys to success. Ironically, these are staples of the classic liberal arts education" (Overholt, 2006). "Thinking like a computer scientist means more than being able to program a computer. It requires thinking at multiple levels of abstraction" (Wing, 2006). These staples are apparently the general education skills required in a college curriculum.

When the US has been threatened in past by losing competitiveness in the global market, the traditional response has been to focus on mathematics and science as the cure-all. IT programs typically add more IT-specific courses. IT departments have the means to keep up with current technology; but to restate—more technological focus alone will not address the issue.

Some steps that IT programs can take to improve graduates' chances of long-term IT employment are to provide a strong foundation in discipline topics alongside those which also enhance general education (GenEd) core skills. What is needed is a stronger focus on reinforcing within the IT department the traditional liberal arts skills which are emphasized in the GenEd component of every degree program in a university curriculum.

Industry professionals and educators define general education in different terms. Accrediting bodies such as the New England Association of Schools and

Colleges (NEASC) define GenEd core skill areas as written communication, oral communication, quantitative skills, scientific inquiry, social science, the humanities, and fine arts. These skills have already been introduced to students early in their academic programs; it is the reinforcement of these skills that now becomes more important within the IT curricula. For clarity, this paper will focus on those GenEd skills defined as desirable by employers: innovation, creativity, communications, teamwork, and cultural awareness (Aspray et al, 2006) and not the GenEd quantitative, technical, or critical thinking skills which are already sufficiently reinforced from within the IT curricula.

2. CHARACTERISTICS OF OUTSOURCED JOBS

What are the factors that contribute to the determination that a job is outsourceable compared to one that is not? Predictions are that globalization and offshoring within the IT world will continue to grow (Spangler, 2006). Outsourcing solves management's desire to focus resources on organizational core competencies and "hire" other resources to do the tasks superfluous to the mission of the company. Many executives believe that outsourcing allows them to lower costs by lowering salaries. (Burrows, 2005). Jobs that are routine and use standard software applications are the most likely to be outsourced. Said another way, standardized jobs are more easily moved offshore that those that require higher-level skills. And it's not just IT jobs being outsourced; entry-level jobs in many career fields have also seen dramatic drops in U S employment, to include loan application processors, X-ray technicians, customer service representatives, and even engineers (Yourdon, 2005; Aspray et al, 2006).

However, reports point out that the types of jobs that will not be likely to be outsourced are those that are not routine, are critical from a data security standpoint, and are in a business which depends on proprietary information. Said another way, those jobs that are not likely to be outsourced are those which have a heavy emphasis on GedEd skills. This paper's focus is on those jobs that are not routine. Some argue that "left-brain" intellectual tasks that are routine and computer-like are migrating to where it is cheaper; the US will retain jobs that are strong in "right-brain" work that entails creativity, artistry, and empathy with the customer (Engardio & Einhorn, 2005). Steve Jobs of Apple argues that cost savings are not worth giving up the teamwork, communication, and ability to get groups of people working together to create new ideas (Burrows, 2005).

Thus, there is a line being drawn between the IT jobs that easily can be transferred out of an organization and those that stay, and the line divides the creative and innovative from the routine. In IT terms, IT call centers are below the line; programming jobs are near the line and are vulnerable to outsourcing; systems analyst jobs are above the line – and appear to be safe, for now.

It is nearly impossible to radically change the IS2002 curriculum to add more courses dealing with the interdisciplinary skills of teamwork, creativity, and artistry; *nor is it necessary*. What is needed is a new teaching philosophy built around what the National Resource Council recommends, that is, more reinforcement within the curriculum of those intangible skills that sustain and build on the foundations of the IT core. As the NRC has found, one of those skills, spatial thinking, is a way of thinking that permeates across disciplines, and therefore should be infused across the curriculum in as many disciplines as possible to enable students to achieve a deeper understanding of subjects across the curriculum.

> "However spatial thinking itself is not a content-based discipline in the way the physics, biology, and economics are disciplines; it is not a standalone subject in its own right. Spatial thinking is a way of thinking that permeates those disciplines and the committee would argue…instruction in spatial thinking should play an equivalent role to that of the "writing across the curriculum approach….The guidelines should, therefore, be infused across the curriculum in as

> many disciplines as possible. Spatial thinking is the lever to enable students to achieve a deeper and more insightful understanding of subjects across the curriculum." (NRC, 2006)

IT curricula find themselves in a similar situation – how to infuse GenEd skills that are needed in today's job market and can no longer be ignored nor entrusted to other departments within the institution. This must be addressed across the curriculum without adding a course. It will be difficult to craft an educational response into a practical curriculum; but, it is possible to follow the example of the NRC in reinforcing those GenEd/core competencies from a liberal arts perspective within IT program specific courses. If one looks at the IS2002 curriculum, it is readily apparent that the learning objectives for technology mastery are formidable. Students graduate from an IS2002 program with a solid foundation in current, cutting-edge theory and technology. But, what about those intangible skills that students will also need to be successful in the long-term, perhaps needing those intangible skills more than "current" technology.

The problem is that there are only so many courses/credit hours available in an undergraduate program for every skill set to have a separate course. It is known that universities are slow to make changes in their course offerings (Aspray et al, 2006). Therefore, to accommodate the learning objectives of the technology component and also be able to emphasize/reinforce those intangible skills, the method of presenting each IT course must implement the NRC teaching philosophy which would include creative problem solving and innovative thinking, communication, and cultural awareness across the curriculum.

3. REINFORCING THE GEN ED CURRICULUM FROM WITHIN THE IT CURRICULUM

Reinforcing those GenEd requirements across the curriculum is not as foreign to IT curricula as it may seem. Just as IT faculty have learned how to infuse technical advances such as XML into the curriculum without adding new courses, so can the GenEd skills be infused into existing courses.

There is no specific course in the IS2002 curriculum model that deals specifically with XML. In fact, XML isn't even part of any learning outcome of the model. But there is little doubt of XML's importance and potential/current impact on the IT profession (Ditch, 2003). How does an IT department handle such a task when confronted with impact of new technology? In some cases, old or dated material can be removed and substituted with the new "more relevant" material, just as departments begin to change in the past from COBOL to C++ and now from C++ to Java.

But when you do not have a set of courses that can be swapped, IT departments need to "infuse" the topic into their existing curriculum structure. In the case of XML, one might introduce/reinforce the topic of XML into the existing web based electives, right after cascading style sheets, and perhaps begin to restrict the discussion and/or emphasis on the JavaScript portion of the course (for example). In a programming course, i.e. Java, XML can be merged at both ends, with a study of Ant™ build files on a Linux platform, or during a discussion of java server pages(JSP), in which JSP's normally include XHTML or XML markups (Deitel, 2005). And even in database courses where discussions of Data exchange formats, web services, and storing data with complex structures, XML topics may be presented. (Silberschatz et al, 2006).

If the threat of outsourcing should not be underestimated then IT professionals need to "find their value where outsourcing lacks" (Yourdon, 2005). And, where outsourcing is not the answer is where IT departments need to take advantage. Outsourcing will probably not improve a department's creativity, nor make data more secure, nor protect intellectual property nor achieve the same cultural awareness and actually improve a department's customer interaction/satisfaction ratings. Intellectual property protection becomes

more difficult as IT expands on an international scale. Communication paths are longer and therefore more apt to suffer distortion and error from language and cultural differences (Aspray et al, 2006). These areas lead to the intangibles that must be developed by IT professionals to provide the best opportunity to save or keep an IT job in-house (or at least onshore).

It is through the GenEd core skills that an IT worker best chance for survival in this hostile environment rests. And just like the steps to "infuse" XML or any other state of the art technology, it is time to do the same in an IT discipline, and begin a serious well coordinated attempt to "infuse" more of the intangible GenEd requirements into every course an IT department teaches.

4. EXAMPLE OF REINFORCING THE CORE

Here are two examples to give an idea of where and how to infuse reinforcement of GenEd skills into an IS2002 core course (P4) and a programming course in Java. Note that the GenEd requirements of Quantitative/Technical/Critical thinking are already well instanched into the course, need no further reinforcement, and are not considered to be intangible.

Example 1: IS2002.P4 – Information Technology Hardware and System Software

- Communication skills
  - Written: term paper on a hardware topic,
  - Oral: required presentation of term paper findings and discussion of articles,
  - Obtaining/Reporting specifications to purchase machines in a manner that a non-technical person can understand.
- Cultural awareness:
  - Issues of UNICODE vs ASCII,
  - Obtaining/installing fonts for other languages,
  - Setting browser language plug-ins,
  - Power supply issues in varying countries,
  - Time/Day issues across different zones,
  - Ergonomic/Human issues,
  - Handicap accessible I/O.
- Creativity
  - Issue/Representation of Color,
  - HW Tools for artists:
    - Digitizing tables,
    - Color printer/Plotters,
    - 3D laser printers.

Here is another example: A Java programming course:

- Communication skills
  - User manual,
  - Testing strategies
- Cultural awareness:
  - Language issues/Font selection,
  - Date/time
  - GUI (is the Interface interacted with from left to right then top down or is it top down then left to right
  - Currency – and have conversion methods, but don't mention what the actual currency is actually being stored (data hiding)
  - Measurement (metric or English)
- Creativity
  - Problem Solving

While realizing the difficulties of measuring how effective the reinforcement of GenEd skills can be, and how hard it is to assess student success in what can be intangible skills, there are metrics available. An example of how to assess the depth of cultural awareness students have gained after having the social sciences and humanities reinforced in the IT curriculum could be by using Hanvey's four levels of cross-cultural awareness. In level I, students would recognize that cultures are different through awareness of superficial and visible cultural traits. In level II, students would be aware of significant yet subtle cultural traits that are different from their own, and may rate those cultural traits as irrational. Students on level III would be aware of those significant yet subtle differences and understand the differences. And, by level IV, students would have learned how another culture feels from the standpoint of a member of that culture, and can appreciate and value the differences within cultures. (Hanvey, 1979). Those who can appreciate and value differences between and among cultures develop lifelong skills of being able to work with, benefit from interaction with,

and harness those differences towards a more creative and innovative workplace better able to adapt to outsourcing.

One means to measure creativity is a self-assessment tool found on the CREAX web-site. (http://www.creax/com/csa). This "test" of creativity measures a person's abstraction, connection, perspective, curiosity, boldness, paradox, complexity, and persistence and compares the scores to the "typical" measurement.

This tool, and others like it, are by no means definitive, but they do show that is possible to measure intangibles, and that some forms of assessment do exist.
This infusion of GenEd skills into courses can also be strengthened by how faculty teach. To encourage creativity, does the teacher encourage diversity of opinions? Do students feel they are listened to? Are their talents fully utilized? Are they encouraged to take risks? Are mistakes seen as learning experiences (Rose, 2005)? Just the process of classroom learning can reinforce creativity and innovation.
Following is a table listing the ten IS2002 core courses. This table shows the authors' opinion on levels of potential for infusion of reinforcement of GenEd skills in the curriculum and hopefully begins the discussion of implementing GenEd learning outcomes into future IS curricula.

IS2002 CORE COURSES Titles (with levels of potential for core infusion)	Communication	Innovation	Creativity	Teamwork	Cultural Awareness
Personal Productivity with IS (P0)	I	M	M	M	M
Fund of IS (P1)	I	M	M	S	M
Elect Business Strategy(P2)	S	S	M	M	S
IS Theory and Practice(P3)	S	S	S	S	S
IT Hw and System Sw (P4)	M	M	S	S	M
Data, File and Obj Structs(P5)	M	M	S	S	M
Networks (P6)	M	M	S	S	M
Analysis and Log. Design(P7)	S	S	S	S	S
Dsgn DBMS(P8)	S	I	M	S	I
Design & Implement in new Emerging Env. (P9)	S	S	S	S	S
Project Mgmt (P10)	S	S	S	S	S
S = Strong I = Intermediate M = Minor					

Table 1. Potential for GenEd Core Infusion

5. CONCLUSION

How would the CIS department begin to implement such a strategy? How can intangibles be measured? Realizing that not every course can reinforce every GenEd competency or skill, courses already in the curriculum need to be reviewed to see where the potential for best results lies and infuse the reinforcement as appropriate. In general, CIS students take their GenEd courses primarily in the first and second year of the Bachelor program, so it is more likely that reinforcing those intangible skills would occur in the third and fourth year courses. The potential for reinforcement of GenEd core competencies in courses from the IS2002 curriculum may vary from strong to intermediate to minor, but all the competencies can be reinforced in at least one course if not more.

The point here is that there **is** room for bringing in reinforcement of GenEd skills into the entire IS Curriculum, and it is this consistent reinforcement of these skills that will produce truly well rounded IT professionals. This should be considered in future curriculum guidelines to build GenEd reinforcement into IS Core Courses and in the form of additional learning outcomes to require GenEd reinforcement in the IS curriculum.

Outsourcing is still more of an art than a science (Kripalani, 2006). While there is still time, teaching students to be innovative and creative can help prepare students for the global economy (Aspray et al, 2006). Now, when students ask, "Why

do I have to take a Fine Arts course (or Humanities, or Public Speaking, or a Social Science)?" educators can relate those GenEd skills to the IT profession and the skills required to succeed. Reinforce the core? It can and should be done.

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