Developing the Enterprise Architect Perspective

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INTRODUCTION

Enterprise systems design, implementation, and integration are focal points for business and information technology. Businesses must change processes, environments, and technologies as organizations strive to become more integrated and break down traditional silos of information systems and responsibility. These challenges require a new type of technical professional: one with the training and perspective of an enterprise architect with general technical expertise as well as business strategy and planning skills. Some college and university programs have risen to this challenge in recent years, and the joint ACM/Association for Information Systems Task Force developed the MSIS curriculum model to establish the fundamentals of enterprise information systems in response to the increasing demand for university-trained graduates in an information economy (Gorgone, Gray, & Feinstein, 2000). Recently, the Association for Open Group Enterprise Architects called for industry and academia to work together to craft new enterprise systems curricula that are relevant to today's global business environment and developed from the perspective of an enterprise architect.

Today's globally competitive environment requires technical professionals to move beyond technical expertise and contribute to the strategy and development of dynamic IT systems that are able to support changing business objectives. To be prepared to meet such expectations, IT students must have broad experience in the design, implementation, and integration of such systems. This education is typically offered in a layered fashion, teaching students about databases, networks, and applications in different courses devoted to single topics (Nickerson, 2006). While this method allows universities to assign faculty with specific expertise to particular courses, it does not adequately prepare students for the work environment of the enterprise architect, where all of these different layers must be combined to support and align with business strategy. Students trained in a specific, narrow layer may fail to anticipate certain trends or requirements, such as a database designer overlooking the need for remote replication (Nickerson).

To meet this need, many information technology programs are incorporating enterprise systems curricula for senior students. These courses are often referred to as "capstones" in the curriculum, and must focus on a wide variety of educational goals including understanding the enterprise as a whole, understanding how technology can provide a competitive advantage, learning to design complex integrated systems, learning concepts underlying technical systems integration, learning how to assess the requirements of an integrated system, and learning how enterprise architecture design is practiced as a profession.

BACKGROUND

Enterprise architecture education is particularly important when trying to meet current business objectives. Several prestigious consulting groups, including IBM and Forrester, have noted a major shift in most technology-centric businesses since 2005 toward service-oriented architectures (SOAs; Boyle & Strong, 2006; Seethamraju, 2007). An SOA is the practice of sequestering the core business functions into independent services that typically do not change frequently. These services can then be combined to create composite applications that can be easily reconfigured to meet the changing needs of the organization. This new paradigm in enterprise systems development and integration highlights the demand for enterprise architects who can understand and align business goals with a technical strategy and architecture capable of supporting current and future needs. SOA does not represent the entire scope of responsibilities of the enterprise architect—it is simply one method of the overall goal of aligning the strategic vision of the business with its information technology infrastructure (Cannon, Klein, Koste, & Magal, 2004; Davis, 2004; Mulder, Lidtke, & Stokes, 1997).

In spring 2007, the Information Technology Association of America (ITAA) identified the need to double the number of graduates in science, technology, engineering, and math over the next 10 years to maintain U.S. information technology competitiveness. Specifically, ITAA (2007) identified "a commitment to the use of information technology to solve real customer problems now and in the future" as a primary goal of the U.S. education system—higher education in

particular. The organization is committed to enhancing IT education through better understanding of the IT workforce, and frequent assessment of the IT needs of industry.

The lack of well-educated IT workers is further emphasized when considering recent surveys predicting significant shortages in IT workers on the horizon. Despite the off-shoring of certain technology jobs, a large number of organizations in the United States are currently deficient in properly trained IT workers. A survey of Washington Trade Group members (over 14,000 companies) indicated that 36% of member companies had open technology jobs: *open* meaning the position has been posted and unfilled for more than 3 months (Barrett, 2007). The most common explanation for the open positions among executives interviewed is a lack of business literacy. In other words, applicants for the position are not sufficiently well rounded in business and technology. Most of these unfilled positions are for an employee who can interact with various groups within the organization, manage technology projects, analyze business needs and translate those needs into a technical solution, and become an effective bridge between functional business units and the technologists. In short, thousands of U.S. companies are in need of employees with the background, skills, and perspective attributed to the enterprise architect.

To meet the needs established by industry, information technology curricula must produce well-rounded students who have a broad enterprise-wide understanding of a variety of IT concepts from databases to networks, to data storage and management. IT firms are looking for employees who can engage the organization at a high level, define comprehensive requirements for large projects, design solutions, and be able to easily develop expertise in multiple areas of the company (Marshall & Roadknight, 2001; Sanders, 2004). This is no small task, and it necessitates a significant restructuring of many of the IT curricula in place today.

CHALLENGES TO ENTERPRISE SYSTEMS CURRICULA

Meeting the educational needs of enterprise-systems-related courses is difficult enough, but faculty and administrators in higher education are also plagued with paperwork and committees when attempting to implement new courses, content tracks, and areas of study. More significantly, university faculty are faced with a variety of concerns when attempting to produce and promote new curricular changes. On top of the challenge of mastering new content, many universities have an arduous approval process in place for any new class, making the task of linking a new course to an existing curriculum even more difficult (Helps, 2006). Most significant of all, the delivery of pedagogically sound content specific to information technology is problematic. Students must be prepared to engage rapidly developing equipment and practices by the completion of a degree, but ready access to equipment and content to meet these needs is extremely difficult. Universities cannot afford to adopt equipment at the same rate large companies are able to, making it difficult to offer a course on a topic like enterprise systems integration that will remain relevant and up to date (Davis, 2004; Prigge, 2005; Tompsett, 2005).

Beyond the challenge of specific courses, the landscape of enterprise information systems instruction in higher education covers a wide variety of interpretations. With no parent organization to make decisions about what is appropriate content for an information technology curriculum, individual colleges and universities are freely creating very disparate curricula. A 2005 survey of IT programs in colleges and universities around the United States showed that while many institutions placed unique emphasis on different aspects of information technology, all offered courses on networking, database construction and management, and software applications (including operating systems; Helps, 2006). Each of these parent topics in IT could easily be a curriculum of its own.

With such wide ground to cover with respect to content areas in information technology, capstone courses within the discipline are extremely challenging. Student preparation entering into these courses is often widely varied. These courses often take the form of an enterprise systems integration topic, or some other closely related topic (Suchan, Blair, Fairfax, Goda, Huggins, & Lemanski, 2006; Tetard & Patokorpi, 2005). It is at this point in an educational program that students have developed a broad-enough skill set to begin understanding the relationships between different areas of IT to one another and to the enterprise as a whole.

These capstone classes are often an ideal situation for academic-industry partnerships (Courte & Bishop-Clark, 2005; Turk-Bicakci & Brint, 2005). A few universities attempt to begin industry partnerships early in the academic program, but according to Courte and Bishop-Clark, partnerships involving more senior students tend to have higher rates of return (industry partners are interested in repeating the experience the following year) and more often lead to internships and job placements. Pedagogically, this industry interest in advanced students offers an opportunity to put students in situations that expose them to current technologies and problems within an industry setting.

The traditional method of teaching enterprise-systems-related topics at the college level would almost certainly involve the use of case studies to articulate relationships between technologies and practices. These case studies are beneficial to a student because they offer significant context to a real-life problem and afford the student an insider perspective on the subject. While this seems ideal, case studies cannot be written at the rate at which industry moves forward, rendering a specific case study more meaningless and outdated each semester. Industry engagement allows students