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IS2010: Looking Through the Windshield or at the Rear-View Mirror?

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ABSTRACT

Curriculum committees provide a valuable service to the academic community. They analyze, evaluate, organize and summarize the best practices of institutions from all over the world. In the rapidly changing world of IS, model curriculums take so long to develop that by the time they are applied, they simply can’t keep pace with change.

In this paper we describe some of the insights yielded by a ground-up redesign of our existing, already successful undergraduate MIS program. The design team employed an “outward-in” approach, starting with key stakeholders, and then used this to re-imagine the curriculum. They also contrasted what they heard from stakeholders with the IS2010 model curriculum and found a contrast between the “low-value” skills emphasized in that document with the “high-value” skills that were being demanded. This paper introduces some of these ideas and challenges future curriculum committees to examine the merit and consider incorporating these ideas into future curriculum.

Keywords

IS2010, IS2009, IS curriculum, program redesign, assessment, pedagogical and curricular innovations.

INTRODUCTION

It is well-known that education in the field of Information Systems faces special challenges. From declining enrollment to rapid changes in technology and how it is used, this list of challenges continues to evolve. For an IS department to be successful, their curriculum must focus on both innovation and quality. It is one of the few disciplines that face rapid and continuous change. This requires ongoing scanning of the environment and periodic tuning of curriculum content in order to be well-aligned with industry. Often, incremental change is not enough – shifts like the rise of social media, data analytics, and cloud computing have forced many of us to rethink what it means to train an Information Systems professional.

Towards the end of 2009 our department started an initiative to redesign our undergraduate curriculum from the ground-up. Our program was well-ranked by several reputable organizations in both teaching and research; also, unlike many other MIS programs, enrollment was growing. However, it had been over five years since the last redesign of the program. The field had fundamentally changed and we felt it was time to re-evaluate our suite of courses to maintain our competitive advantage in the market and continue to create value for our students.

A key part of the process was comparing our proposed curriculum with AIS’ model curriculum for Information Systems (IS2010), the existing standard for designing an undergraduate Information Systems academic program. While we were in agreement with some of the guiding principles of IS2010 (Topi et al., 2010), we found the core curriculum was not well-aligned with the needs of our undergraduates. In fact, the model curriculum looked much like our existing program as it had originally been envisioned five years earlier. However, the role of the information systems professional was changing.

Instead of a focus on implementing systems that support business initiatives, information systems had become a driver of new business models and an agent of enterprise transformation. IS professionals must possess the skills to acquire and synthesize new information. Technical literacy, systems analysis, and database design, while important skills are now by-
products of a larger set of problem-solving skills. If current frameworks, such as IS2010, were insufficient to train today’s students, what is the alternative? How could we create technology-savvy professionals that could adapt to the changing landscape of the field?

The goal of this paper is to challenge future curriculum committees to consider periodic radical, not incremental, redesign of the Information Systems curriculum. We want to challenge these committees to create innovative courses that change at pace with our discipline.

THE RE-EVALUATION PROCESS: AN OUTWARD-IN APPROACH

To re-evaluate our current suite of courses, we engaged a wide variety of stakeholders including alumni, regional executives, faculty, and current students. Instead of starting with what we thought should be taught, we started with our external constituent groups. This “outward-in” approach ensured that we would not be constrained by the existing set of courses and learning goals. We held a series of meetings with each group; some of these conversations were face-to-face, while others were facilitated using a blog-based discussion forum. We did this to get maximum participation and involvement.

This process and these discussions were iterative in nature (see Figure 1). A discussion with one group would challenge our current thinking and force us to reevaluate. With each discussion and each cycle through our group of stakeholders, we moved forward. We moved slowly at first, with a tendency toward incremental changes to the program. For example, some faculty members who taught systems analysis and design continued to make the case for the need to include UML diagrams, despite knowing it was a skill few of our graduates used. Faculty members who had taught the database management course continued to argue that you can’t understand data analytics without a comprehensive understanding of SQL. Despite this, we were hearing from our constituents and stakeholders that these skills have limited value for today’s IT professionals.

It became clear to all involved that incremental change would never get us to where we needed to be and that only by embracing a true “outward-in” approach and accepting the challenge of a complete redesign would we be successful. Faculty can be reluctant to truly embrace change. The recognition that a change was needed and the willingness to undertake a radical transformation were crucial to the success of this initiative. Another important success factor was that the entire faculty listened to our constituents and to each other, and no single faculty dominated the conversation regarding their personal vision for the new curriculum. Once the team accepted this reality, we moved forward at an accelerated pace in a brainstorming-like atmosphere where ideas could be generated without judgment and, based on their merit, be considered for inclusion as part of the new program.
The first conversations we had were with alumni. We focused them on discussing the skill sets they developed while in the program and how those skills were serving them on the job. The consistent theme that we heard was that dramatic changes were taking place regarding how people did their jobs. They reported that while they were working in what we consider “traditional” IT jobs such as business analysis, a new set of skills was required. For example, they were required to understand how to leverage data for analysis, not simply provide a mechanism for its storage and retrieval. They were also required to evaluate new technologies and abstract their key attributes and apply them in new areas. Our current curriculum at that time was teaching a solid set of skills, but ones which put our students in more of an operational role than in a position to be leaders in organizational innovation and value creation.

We spoke with CIOs and other senior IT leadership from the major corporations in our area. We found that the makeup of our advisory board was essential to successfully driving this degree of change. The diversity of our advisory board was one of the keys to our success. In addition to CIOs from large, “conservative” firms, we included technology entrepreneurs, change agents, and IT leaders from startups. We also included observers of change including technology journalists. We asked them what they saw as the key set of skills our graduates would need in order to make them competitive in the workforce and attractive to industry. We also wanted to know what skills would serve them as they proceeded through their careers. Their answers were very similar to the alumni. The low-value skills have become a commodity. This group challenged us to go back to the drawing board, multiple times, and demanded that we reject the idea that incremental change would get us to where we needed to be.

Between the meetings and discussions with alumni and CIOs, the faculty worked as a group and then in small teams. As a group we brainstormed options for defining the vision and the mission of the program. We developed a high-level, straw man curriculum that was discussed, debated, and refined. We proposed a list of learning outcomes and used them as the cornerstone of this process. The list of learning outcomes was iteratively refined and reworked. As proposed learning outcomes began to emerge, they were organized into proposed courses. Smaller groups of faculty members, usually two to three per team, worked through the details of creating courses, including the development of draft syllabi that detailed class materials and week-by-week learning objectives. As the new curriculum started to take shape, it was vetted by our alumni and CIO advisory boards. After a few iterations, we arrived at our final set of new courses.

While each iterative step through this process created value, there were two key lessons that academic institutions and curricular bodies should consider adopting. First, the “outward-in” approach is essential to ensuring academic departments are not constrained by the existing set of courses and learning goals, which naturally tends to reinforce the current mindset. Second, organizations must be willing to start from scratch and redesign from the ground up. Change is difficult for people, even people who work in a field where change is constant. However, if faculty do not truly embrace both of these concepts, they will not achieve the level of change necessary to keep pace.

**VALUE PROPOSITION – SKILL SET BY COURSE**

One consistent practice used while working on the new curriculum was to not only ask if students still needed a particular skill, but whether that skill warranted a place in a curriculum with limited space. Many specific learning objectives may at first appear critical because there is a long tradition of teaching them. However, technology skills frequently move over time from “high-value” capabilities that only a relatively few possess, to “low-value” capabilities that many possess and therefore become easily outsourced beyond the core IT function. For example, Roberts and Mok (2011) claim that “new and emerging technologies will enable new business models.” They conclude that organizations must rethink their core skills sets; otherwise they risk “becoming a mere commodity service provider.” (Roberts and Mok, 2011) Some examples of the difference between low-value and high-value skills are provided in Table 1.
Subdomain | Low-value Skills | High-value Skills
---|---|---
Understanding of Technologies | How operating systems manage memory, PC architecture | The ability to research, analyze, and understand new and emerging technologies
Data | Database administration, infrastructure design, and advanced SQL | Data analytics and the creation of insight using data
Analysis and Design | Creating UML-based use case scenarios which are rarely used in practice by application developers | Creating solutions to problems that employ a combination of off-the-shelf solutions with custom solutions to fill gaps
Project Management | Creating Gantt and PERT charts | Leading and managing change within an organization

Table 1. Low and high-value skills in critical IS subdomains

In order to facilitate a move from low-value to high-value skills, we focused on three key principles:

1. Focus on new, extensible capabilities
2. Teaching the synthesis of new ideas versus covering technology content
3. Design from a designer’s perspective

FOCUS ON NEW, EXTENSIBLE CAPABILITIES

A forward-looking information systems program needs to focus on developing capabilities aligned with emerging trends. This requires a topic-level rethinking of what is truly essential to our core and what no longer needs to be taught. For example, if you look at IS 2010.2 (Topi et al., 2010), the core course in Data and Information Management, you will find a traditional course in database management and administration. We believe many of these skills can be categorized as “low-value,” and can easily be outsourced to a low-cost provider. That is not to say these skills are not important, core technology skills, but they are no longer core for a business-oriented IT professional. This is also consistent with what we are seeing from prospective employers – traditional database topics do not adequately prepare students with the “high-value” skills needed to create competitive members of the workforce.

The high-value skill involving data no longer involves its capture and storage. Instead, it is the application of data analytics techniques to that captured data. In a recent survey of CIOs by Gartner (Mok and Berry, 2011), 66% of CIOs strongly agreed that the growth of this captured data is creating demand for “a new class of IT experts.” These experts must combine business skills with analytics and visualization skills. The effective use of data analytics is not only one of the skills seen as most valuable by prospective employers of our IS graduates, but we have found it is of significant value to students across the entire school of business. Organizations are less interested in IT professionals who can design a relational database in third normal form; this skill has been commoditized to the point that it is no longer a source of competitive advantage. Instead, they seek IT professionals who understand the role of data and can use data to create strategic insight.

As we redesigned our program, we transformed our traditional database administration course into a modern data analytics course. One challenge we faced was how to maintain a baseline level of literacy of traditional database management topics, while providing sufficient time to cover the higher-value data analytics topics. We did this by splitting the course into three sections. The first third of the course develops a basic level of literacy around ER modeling and SQL queries. However, we deliberately scoped the goal of this part of the course to simple scenarios that taught the role of ER modeling and SQL instead of developing advanced proficiency. For example, cardinality was emphasized over distinctions between normal forms, and retrieval of data (the SQL SELECT statement and joins) was emphasized over the modification (the SQL INSERT statement and referential integrity).

The second section of the course describes how data moves from an operational data store to an analytical data store. The differences between relational and dimensional data are covered, along with the ETL (extract, transform, load) process. We emphasize the identification and extraction of information critical to analysis, and the underlying rationale for the
organization of data into an analysis-ready format. Students navigate data cubes using pivot tables in Microsoft Excel, which has the advantage of being both a commonly-accessible tool and one that emphasizes the business-focus of the course.

In the final section of the course, students focus on modern data analytics techniques. As with the other topics in this course, the emphasis is on the cases where the techniques can be applied and an understanding of the data needed to perform the analysis. We highlight three topics – decision trees, clustering, and affinity analysis – and the students perform a series of hands-on exercises using SAS Enterprise Miner.

This revised design is a radical rethinking of what data-related skills are needed by undergraduate Information Systems majors. We shifted to a format where two-thirds of the course is the interpretation and analysis of data to aid strategic decision-making, with relatively little time spent on the storage of that data. We believe this has several benefits. First, the interpretation of data is a widely applicable, extensible skill. As new data analytics techniques emerge, our students should be able to adopt them as they’ve been taught to use an “analytics mindset” to approach problems. Second, these skills position our students as agents of organizational change and value creation. Those are the types of skills that will persist over time. Third, the course has real applicability for non-IS majors, breaking down the perceived boundaries between business disciplines and information systems.

TEACHING THE SYNTHESYS OF NEW IDEAS VERSUS COVERING TECHNOLOGY CONTENT

Information Systems programs typically have one or more courses which expose them to technology. From servers and storage technologies to networking technologies, our graduates are expected to be tech-savvy. However, we have found that when we used traditional lectures and a traditional textbook, we achieve poor results. By the time students complete their final exam, they forget half of the content covered in the course. By the time students finish the program, much of the content students did retain is out of date. By using traditional “survey” approaches to teach students about technology we fail to prepare them for a career in the IS field where rapid change is the norm. When faced with learning about a new or changing technology, would an IS professional ever use a textbook?

Because of these rapid shifts, we are developing new ways to approach teaching new technologies to our undergraduates. A new “delivery system” was needed to create students who could adapt to these shifts, and to enable greater flexibility in the course. We shifted the focus from the technology itself to the skills necessary to gather and synthesize new information. One example is our Enterprise IT Architecture course. In this course, students learn about infrastructure technologies including networking, storage, and servers. They examine knowledge and content management platforms like SharePoint and WordPress, and explore digital ecosystems like iTunes and Xbox Live.

At the start of each course topic, the instructor introduces the technology and the underlying rationale for its importance. From there, the instructor focuses on teaching students to research the class of technology and to construct a business cases for a strategic investment. Each student has in-class access to a netbook with connectivity to the Internet. Students are frequently accessing information from Gartner Research, vendor white papers, and even using resources like Wikipedia during class to research technologies. Students are expected to incorporate the methods used by IS professionals, where using the web to research technology is the standard practice. The course also incorporates guest speakers who are industry experts on each technology, allowing students to gain the skills of integrating insight from external consultants.

There is also an experiential component, where students try out the technologies – for example, playing the Xbox 360 as part of learning about the Xbox Live digital ecosystem. The traditional learning outcomes of technological literacy become a fortunate byproduct of this process, but the importance of any single piece of technical knowledge becomes less important. There are several deliverables to assess student learning. The first is the “Flash Research Paper.” This is a one-page executive summary which highlights the key capabilities of a technology and the business case, positioned for a managerial audience. Exams model real-world work scenarios, not their ability to memorize facts about technologies. Students show up for class and are asked to research and write a new Flash Research paper for a technology that has not been covered in class. This allows students to demonstrate the research and analytical skills they have developed.

We challenge curriculum committees to examine this delivery technique as an alternative to the traditional lecture/survey model for courses that teach technology literacy. The key is that students learn tools and techniques that enable them to locate and incorporate new information as new technologies are introduced and as existing technologies evolve. This gives students the tools to maintain an “evergreen” set of knowledge and skills, and creates a course that remains relevant over time.
DESIGN FROM A DESIGNER’S PERSPECTIVE

A course in Systems Analysis and Design is a standard part of an Information Systems curriculum. With the rise in popularity of design thinking, there is a new focus on creating solutions for open-ended, loosely-defined problems. In these environments, innovation and creativity are key. Roberts and Mok (2011) propose the emergence of a new type of IT organization that de-emphasizes service delivery in favor of skills that support the design and creation of “innovative and technology-enabled business solutions.” However, the traditional approaches to process-based systems analysis and design prepare students to solve structured problems (a.k.a. “design-by-numbers”). This has the two shortcomings of the “low-value” skills we have discussed previously. First, those proficiencies are easily replicable, and therefore easily outsourced. Second, it risks generating people who solve technology problems instead of solving business problems, a more fundamental and value-creating skill.

In order to be competitive in the future, traditional Systems Analysis and Design courses must evolve into Business Analysis courses where a mastery of technology is only one of the many tools the modern business analyst brings to the table and where a true understanding of design is essential. As IS2009 originally recognized (Topi et al., 2009) and IS2010 reinforced (Topi et al., 2010), there has been a significant shift away from the in-house development of applications to the assembly and leveraging of off the shelf solutions. The role of the Business Analyst must reflect this. While most traditional Systems Analysis and Design courses spend significant amounts of time developing skills to create low level UML models like interaction diagrams, most modern Business Analysts never use these skills. Many Systems Analysis and Design courses are not consistent with Roberts and Mok’s (2011) vision of the “new IT organization” and the changing role of the Business Analyst. Just as courses in project management take the lead from organizations like the Project Management Institute (PMI), courses in Systems Analysis and Design should be taking the lead from the International Institute of Business Analysis (IIBA) and leveraging tools like their Guide to the Business Analysis Body of Knowledge (BABOK) if they are going to prepare the next generation of analysts.

As part of the program redesign, we transformed our course from a traditional Systems Analysis and Design course to a modern Business Analysis course called Digital Design and Innovation. In addition to IT professionals, we added a professional architect (the kind that designs buildings) to our design team. The architect knew little about IS but was an expert in true design thinking and design processes. As part of leveraging the expertise of the architect we discarded the traditional “design-by-number” activities and infused the course with a variety of design activities that truly challenge students to think in new and innovative ways. Class activities are designed around an innovative “Design Inquiry” framework developed by Temple’s Center for Design and Innovation (cD+i) in the school with proficiency in this area. Each project was applied and experiential - there is always a real client with a real problem. Students use modern brainstorming and idea generation techniques in a series of hands-on, team-based activities. Much of the most important learning occurs when students learn from each other as part of doing this work. We deliberately wanted to break with traditional approaches where content can be abstract and the case studies are outdated and fictional. We have abandoned a traditional Systems Analysis and Design textbook and have adopted materials that focus on the best practices of the IIBA which truly prepare students to play the role of the modern Business Analyst.

As with the previous two examples, this course is has made the transition away from developing the traditional “low-value” skills like generating detailed UML models, to “high-value” skills that are used by the modern business analyst. By following the lead of organizations like IIBA, this course now focuses on what our students will be doing, not what we faculty members used to do.

CONCLUSION

The purpose of this paper was to provide a roadmap, along with several examples of outcomes, detailing how to challenge existing thinking regarding what constitutes the existing model IS curriculum. As the “high-value” skills of yesterday become the “low-value” skills of today, academics must be ever vigilant about where they are investing precious contact hours. For example, previously high-value skills like database administration have been commoditized while data analytics has become the skill that is in-demand.

Our students need to be competitive globally, and the best opportunity for that is to infuse them with analytical and design capabilities that turn them into agents of change within their organizations. Not only is what our students learn important, but also how they learn. We also propose that an experiential approach to information discovery is an important learning goal in itself. This is as important as their understanding any particular technology, as we want our graduates to have the skills
necessary to maintain currency. Even skills which some view as classic and never-changing, such as systems analysis and
design, have changed radically over the past decade and we must ensure that we are developing the skills students will need
going forward, not the skills which served us well in the past.

Curriculum committees provide a valuable service to the academic community. They analyze, evaluate, organize and
summarize the best practices of institutions from all over the world. The work they perform provides value to us all.
However, in a rapidly changing field such as Information Systems, periodically radical rethinking is needed. We propose this
involves “starting over“ and designing IS curriculum from the ground up. The challenge is significant: incremental change to
an existing, established curriculum is far easier than a complete redesign. However, the stakes of not keeping pace with
industry are high. We need to prepare students to be key contributors in organizations for the next 20 years, not the last 20
years. If not, Information Systems programs will not be able to successfully deal with the wide range of challenges,
including declining enrollment and the outsourcing of technical skills to low cost providers. We need to make sure that we
are all looking through the windshield, not through the rear-view mirror.

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