Infusing Information Technology into the Core Business Curriculum: A Change Management Project

Donald A. Carpenter and ****Vijay K. Agrawal
Mesa State College and University of Nebraska at Kearney

Many modern businesses have implemented information technology in a seamless inter-functional manner based on integrated databases. However, few business schools have followed suit by integrating information technology seamlessly into core curricula. Proprietary enterprise resource planning software packages show promise but have not been adopted in a widespread manner by academic departments for various reasons. Consequently, large numbers of business students are not as prepared for the work environment as they could be. This case study describes the initial processes to integrate information technology intensively into a university's core business curriculum. It illustrates the application of change management and the use of Product Model to develop web-based applications for classes and database applications for end-users. Benefits for students and other stakeholders explained.

Key Words: Business Curriculum, IT, Product Model, Change Management, Project Sponsorship

Introduction

In modern business, information technology (IT) is an integral part of the products and services delivered to customers (Henderson & Lenz, 1995-96). Businesses can satisfy customer requirements and queries without delay by accessing information from *integrated corporate databases* (Ives, 1984), which allow for seamlessness among all business functions. However, by that standard, many business college graduates are not properly prepared to be immediately productive in today's technology-rich business environment.

The Association for Advancement of Collegiate Schools of Business (AACSB) has adopted standards for business schools' accreditation, calling for the "use of information technology as they influence the structure and processes of organizations and economies, and as they influence the roles and techniques of management" (AACSB, 2005). Yet, many business colleges teach information technology concepts and practices in a non-integrated manner (Carpenter & Agrawal, 2004; Carpenter, 2002). Anecdotal evidence indicates that this situation persists broadly in business schools worldwide (Shaw, 1994).

A typical approach in colleges and schools of business is to teach *about technology* (e.g., computer skills courses and information systems curriculum) and to teach *with technology* (e.g., the use of distance education and computer presentation systems). There are some efforts to *integrate technology into specific courses* (e.g., case studies on compact disks, web sites packaged with textbooks, and proprietary general accounting packages).

There is little evidence of efforts to *integrate technology throughout the core business curriculum* in a seamless manner that allows students to gain the impression that such integration is the norm for real businesses operations (Thong, 1999). Therefore, students easily can gain an impression that technology is an add-on, rather than integral part of business functions.

At the time this project began, attempts to use enterprise information management solutions, such as the SAP University Alliances program (SAP, 2003), had not accomplished that goal for smaller institutions due to a lack of faculty participation. Typical reasons given for non-usage of such proprietary enterprise resource planning software are

that (1) the software is too complex to easily incorporate into student class assignments, (2) required hardware platform and related ongoing management are too costly, and (3) faculties have no control over software revisions made to the proprietary commercial packages.

Faced with those challenges, the Management Information Systems (MIS) faculty in the College of Business at a small Midwestern U.S. university undertook a project to develop a software product to support IT integration in the core business curriculum. The product would be comprised of application modules to use in an interdisciplinary manner throughout the core business curriculum. The application modules would tie into a comprehensive database so that both database and modules would simulate a realistic modern business environment.

Stakeholders of the project included the project manager, customers (students and faculty), sponsors, and the performing organization (the MIS department) (Pearlson & Saunders, 2004, p. 265). The project manager was a senior MIS faculty member, relying on his advanced knowledge of and expertise as a consultant using proper project management techniques. The associate project manager was a junior MIS faculty member with many years of industry experience managing project development.

Customers included students who would use the application modules in their classes and faculty who would implement the application modules in their various classes. The modules were to be implemented gradually over a number of semesters, with the beginning accounting courses as a logical starting place, then expanding to marketing courses to demonstrate the flexibility of the product. Hence, accounting and marketing faculty and students were on the project team and actively participated in the design of modules.

Sponsorship is a critical element in the success of such a project (McNurlin & Sprague, 2006, p. 413) and was secured when a college alumnus made a substantial donation. A small percentage of that donation was used to sponsor the project through its projected five-year development process. Advocacy for the project existed at all levels of the college.

The performing organization, i.e., those most directly involved in the work of the project, was comprised of MIS students under close supervision of MIS faculty. In beginning MIS classes, the project was introduced on a small scale by students creating applications for live businesses. Students in the advanced MIS classes created the six accounting and marketing research modules that would be implemented in the core business classes.

Creating such project components in the beginning and capstone MIS courses required substantial changes to those courses. Therefore, the project provided an interesting opportunity to properly manage those changes and to study the impact of those changes. This article discusses the usage of an IT-enabled Product Model for transforming the core curriculum of business schools as well as change management issues resulting from the initial implementation efforts of IT-enabled transformation.

The next two sections discuss the theoretical background and research context for the project, followed by a discussion of the methodology and research models and measures. The article then discusses results obtained in the initial phases of the project to provide insight and extension to guide research and practice for future projects.

Background

Business Transformation in the Information Age

IT has become a major facilitator of business activities in the world today (Gill, 1996; Mandel, et. al., 1994; Tapscott & Carson, 1993), as well as a catalyst of fundamental changes in the structure, operations, and management of organizations (Dertouzos, 1997). IT's powerful effect on organizational design may be attributed to its ability to simultaneously influence strategy, production, coordination, and control (Applegate, 1994, p.36). Most businesses in the industrial world could not be truly competitive and many could not even survive without computers and software (Jones, 1994, p.17). IT plays an integral part in the delivery of products and services to customers (Henderson and Lentz, 1995/1996).

The Industrial Age model of business has been a mechanistic one (Gouillart and Kelly, 1995, p.3), meaning that corporations have been economic agents in an efficient market system and part of an ever-expanding complex machine. In the Information Age, this model of business has been stretched to its limits. Grover and Kettinger (1998) stated the characteristics of corporations in the Industrial Age versus the Information Age as given in Table 1. Information Age characteristics include the need for new processes that transform a business.

While businesses continuously use IT to transform their processes and in order to cater to the requirements of the Information Age, the core curriculum of (arguably) the majority of business schools still addresses the requirements of the Industrial Age. To accomplish the transition to Information Age requirements at the subject university, the project followed a transforming *Product Model* process to mimic the new transforming processes of businesses.

Table 1: Characteristics of Corporations by Category

	Industrial Age	**Information Age**
Focus	• Cost driven • Cost reduction • Efficiency	• Vision driven • Alignment (strategy, people, processes, technology) • Opportunity exploitation • Effectiveness
Process Architecture	• Rework existing processes • Total quality management • Incremental improvement	• New clean state processes • Transforming
Information Architecture	• New technology for cost reduction and control • Workflow computing • Cooperative processing • Intra-organizational networks • Cooperative database	• New infrastructure and architecture to exploit new processes • Client/server • Inter-organizational networks • Human-centered information

(modified from Grover & Kettinger, 1998)

A Product Model for IT-enabled Business Transformation

E-commerce value chain activities have been widely accepted (Palvia & Palvia, 1992). The electronic economy brings with it new forms of IT-enabled intermediation, virtual supply chains, rapidly changing electronic commerce technologies, increasing knowledge intensity, and unprecedented sensitivity for time-to-market by consumers (El Sawy & Bowles, 1997; Mougayar, 1998; Tapscott, 1996). This demanding environment presents new challenges and opportunities for enterprises. Survivors need to innovate and invent new ways to create value (Kim & Mauborgne, 1997).

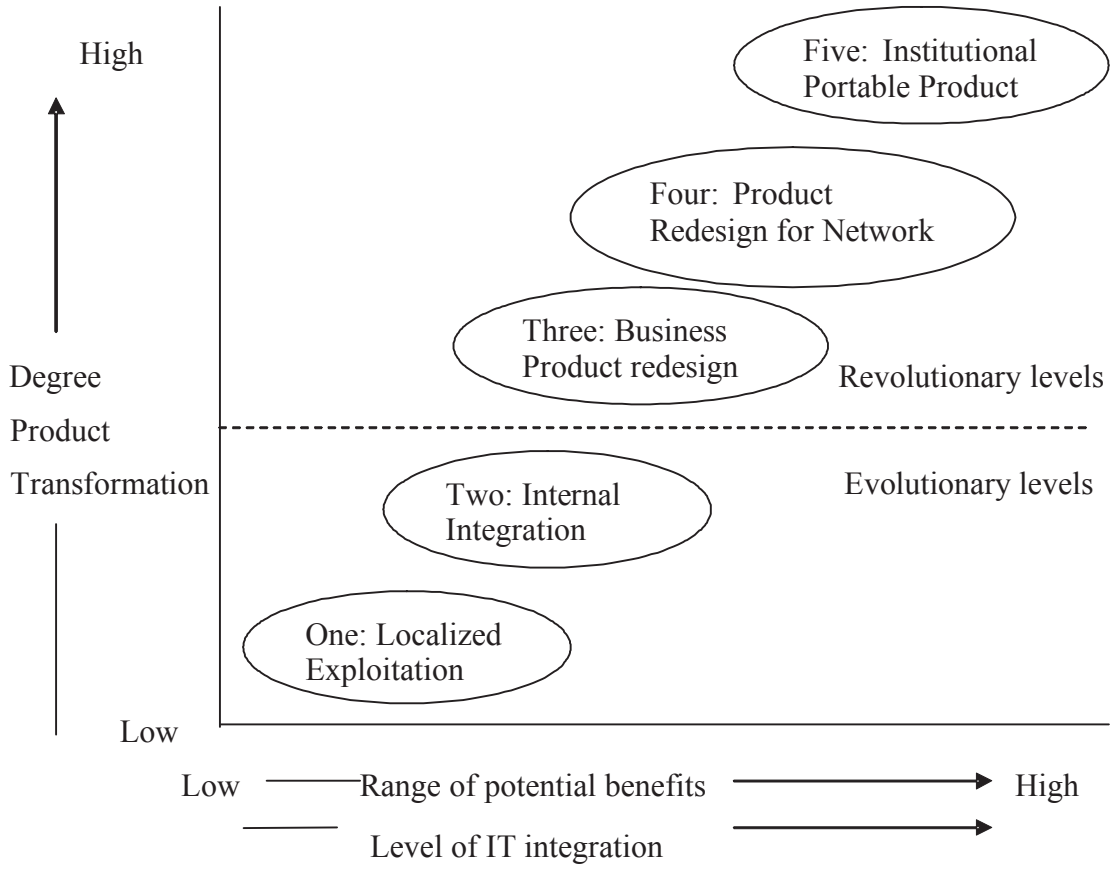
Enterprises pass through levels of IT-enabled transformation (Venkatraman, 1994), ranging from localized automation, internal integration, business process redesign, and business network redesign, to business scope redefinition. Organizations then proceed to a higher level of transformation as the demands of competition and value creation increase.

This study considers the IT-integration into the core curriculum of business schools *as its product.* The

rationale behind considering the curriculum to be *the product* is that the business processes are being taught to their student customers in a business school as curriculum. Agrawal and Carpenter (2004) expanded on that model suggested by Venkatraman (1994), developing the business school's Product Model. In this case research, the developed model is used as a roadmap for IT-enabled transformation in the core business curriculum.

Figure 1 is a schematic representation of the modified model (Agrawal & Carpenter, 2004) developed by mapping the business school's product (curriculum) on business processes. The model consists of five levels along two basic dimensions--the degree of product transformation and the range of potential benefits from IT/level of IT integration. The description of the first two levels is evolutionary, requiring relatively incremental changes in the existing business product (i.e., the core business curriculum). In contrast, the other three levels are revolutionary, requiring fundamental changes in the nature of business product, as discussed below.

Figure 1: Five Level IT-integrated Product Model (Modified from Scott Morton, 1991, p.127)



Level 1: Localized Exploitation (Automation) is the integration of IT within business functional courses. In many instances, CDs are packaged with textbooks to accommodate this requirement. Thus, IT integration achieves function-specific goals (i.e., localized without necessarily influencing related areas of operations).

Level 2: Internal Integration is a logical extension of the first in the sense that integration of IT in functional business courses is accomplished through the use of a Model Universal Enterprise Information Structure (MUEIS) database (Carpenter, 1992) and web-based user interfaces. Two types of integration are critical here. The first is technical integration, namely the integration of the different systems and applications using a common IT platform (web-based interface and the MUEIS database). The second is the integration of each course within the function to allow students to address the business problems/issues by holding different roles and responsibilities that exploit the technical integration capabilities. Deployment of a common IT platform (i.e., the Internet) along with the MUEIS database serves to integrate the product (i.e., the core business curriculum) potentially enhancing efficiency and effectiveness.

Level 3: Business Product Redesign involves the complete integration of IT based on process flow into all business courses using the MUEIS database and web-based interface. Instead of treating the existing functional courses in isolation, the business course itself is redesigned to maximally exploit available IT capabilities. That provides an integrated perspective in solving business problems. This reflects conscious efforts to create integration between the IT infrastructure and the business process, rather than simply superimposing the technology platform onto the existing business functional course.

Level 4: Product Redesign for Network is the reconfiguration of the scope and tasks of the business network involved in the creation and delivery of the products and services. This includes the business tasks both within and outside the formal boundaries of a focal organization and the consequent redesign of this "virtual business network" through IT capabilities, i.e., distance learning, web-based tutoring, and IT-based classroom teaching.

Level 5: Institutional Portable Product is the raison d'etre of a corporation, pertaining to the possibilities of increasing profit by enlarging the business mission and scope through standardization of its products and services. Examples include electronic collaboration with other business schools and joint projects for standardization of products.

As a firm moves through the steps of an IT-integrated Product Model, it must manage change properly. Hence, some background on change management as applied in this project is explained below.

Change Management and Implementation

Characteristics of innovation are differentiated along four dimensions (Poutsma, et. al., 1987). Two of the four dimensions (Thong, 1999) characterize the business school's core curriculum. One is the dimension of product innovation, which is driven by technology-push as well as market-pull. The other is the aspect of new activities being undertaken in a planned manner to incorporate incremental and radical change to meet the changing needs of the market. In this study, an attempt is made to implement changes in four stages: (1) change MIS course curriculum (both incremental and radical change), (2) develop a technology-centered functional business course curriculum (incremental change), (3) implement technology-centered functional business courses (incremental change), and (4) create technology-centered functional business courses (radical change). The rationale behind categorization of the four stages as incremental and/or radical change is discussed below.

Whether an IT application succeeds or fails depends entirely on the decisions that are made regarding how it shall be used (Bostrom & Heines, 1977). Kalkota and Robinson (1999) note that IT solutions are in a matured stage and customers are faced with similar products, too many options, and lack of time to make thorough decisions. Customers look for the cheapest, most familiar, and best perceived quality products. Thus, the major problem with IT applications is in implementation, not in the technology.

To best manage IT implementation, one must understand the organizational impact of IT by viewing organizations as socio-technical systems. This would include people, tasks, technology, culture, and structure as the basic components of the organization (O'Brien; 1999, p. 570). Lucas (1975, p. 6) contends that the major reason most information systems fail is that businesses have ignored organizational behavior problems in the design and operation of computer-based information systems (CBIS). Change strategies are important as people respond to how changes are determined and implemented as much as they do to the actual change (Bell & French, 1973; Davis, et. al., 1975; Mumford, et. al., 1972; Schultz & Slevin, 1975).

Organizational change deals with how for-profit and nonprofit organizations plan for, implement, and handle change, which can be caused by internal or external factors. Overcoming resistance to change can be the hardest part of bringing IT into a business. The dynamics of change can be viewed in terms of a change model, as Schein (1969) proposed a three-stage approach for change: *unfreezing, moving, and refreezing*.

Unfreezing is the process of ceasing old habits and creating a climate receptive to change. *Moving* is the process of learning new work methods, behaviors, and systems. *Refreezing* involves reinforcing changes to make new process second nature, accepted, and part of the job. Jeong (1995) concludes that the most important factors for successful implementation of a business process reengineering (BPR) project are related to resistance to change and managerial problems. The most important factors for successful IT implementation relate to overcoming managerial problems, project related problems, and resistance to change (Agrawal, et. al., 2003).

Given the above, this study used a three-stage approach for change: unfreezing, moving, and refreezing. It also relied on top-level leadership support and project management skills to manage change.

The Project

Inclusion of Small, Realistic Projects in Introduction to MIS Courses (Incremental Change)

These applications are smaller in size and implemented in the curriculum of the Introduction to MIS skills course. Students were expected to develop realistic applications for departments of the university and non-profit organizations in the community by working in live environments, maintaining continuous interactions with users, and using Microsoft PowerPoint, Excel and Access. Previously, students developed fictitious applications using PowerPoint to meet course requirements, but the development of real-life applications in introductory classes helped to change the mindset of students and facilitate the adoption of changes in advanced courses. The project in the course constitutes only 15-20% of the grade. For the success of such projects only change management (motivational tools) and project management skills were evaluated. In this article, the integrated projects introduced in the introductory MIS classes pertain to Level 1 and Level 2 of the Product Model (Figure 1). Therefore, the nature of the change in this introductory MIS course is incremental.

Inclusion of Complex, Integrated Projects in Advanced MIS Courses (Radical Change)

In the Systems Analysis and Design I (SAAD-I) and Systems Analysis and Design II (SAAD-II) sequence, the projects were large, complex, and fall into the category of radical change. Students were expected to design and develop the integrated web-based interface modules of business applications using the MUEIS database by working in live environments and maintaining continuous interactions with users. Before Fall 2001, students were expected to undertake only small systems design projects. Thus, by assigning large projects that require them to develop and demonstrate working software, there was a radical change in the MIS curriculum. To introduce the radical change, a systematic and tri-partite focus on change management, project management, and support from top leadership were used.

Inclusion of Technology-Centered Functions in Core Curriculum (Incremental Change) and Creation of Technology-Centered Functional Business Courses (Radical Change)

The portion of the project to include IT-based functions in the core business curriculum and to create of IT-based functional business courses began in fall 2006. In each functional course, technology was used to a certain extent, using software and exercises available on CDs packaged with the course textbook. Students and faculties were required to focus their teaching/learning from an integrated perspective. It is, therefore, considered an incremental change. However, converting the entire core curriculum to be IT-centered is a radical change.

The Importance of Project Results for All Business Faculty and Students

This project demonstrated a new means to teach the core business curriculum. It encouraged faculty to teach their respective disciplines in a manner that integrates all disciplines through the application of computer information technology. It caused students to think in terms that all business functions are integrated, which is made possible through the use of computer information technology. It opened more job opportunities for graduates to work in modern businesses that presently have to retrain employees because of the way they are now being taught in business schools. Further, the efforts of the students were utilized productively by developing real-life applications for the community, business houses, and the university.

In addition to the invaluable new learning experiences gained by all business students who participated in the project, future students will benefit tremendously from the project. MIS students will create both client-side applications and server-side support modules in capstone courses under the direction and supervision of the principal investigators. The knowledge gained by those students will increase their employability as well.

Through the project, business faculty should also gain an appreciation of how a truly integrated business computer technology platform operates and can pass that knowledge on to students. They also should be motivated to create interdisciplinary case studies for class use, document improvements in teaching/learning, and disseminate their findings.

Portability of the Application Modules Created by the Project

At the end of the project, the initial outcomes will be ready for use in business schools and colleges. Ultimately, the product will be portable to other institutions of higher education. Activities will initially increase the vitality of the participating colleges in terms of their ability to recruit and retain top-quality business students. Eventually, the potential will exist for the vitality of any participating business program to similarly improve.

The core business curriculum is fairly consistent among American universities, making the project easily portable to any business college that desires to implement it. High school and community college students could also benefit from the use of the applications created by this project. Faculty from those settings will be invited to join the training sessions funded by this project. Similarly, faculty from non-business disciplines will see the applicability of the concept in their respective fields and might join the efforts. Existing ties with foreign universities also could lead to international use of the applications.

Methods

Technology-Related Research Model

This case study research uses multiple research methods. The authors conducted in-depth interviews with academic faculty at the university where the project was undertaken. They discussed three aspects of the project at several professional meetings: (1) the requirements of such projects, (2) limitations in implementing academic service learning into classroom, and (3) enterprise resource planning solutions in course curriculums at business schools. The literature search and opinions of faculty from several disciplines helped to identify the suitability of the MUEIS database for development and implementation. For change management during implementation, the Agrawal, et. al., (2003a) model was used, showing an exponential relationship between the degree of transformation and the IT-induced configurations.

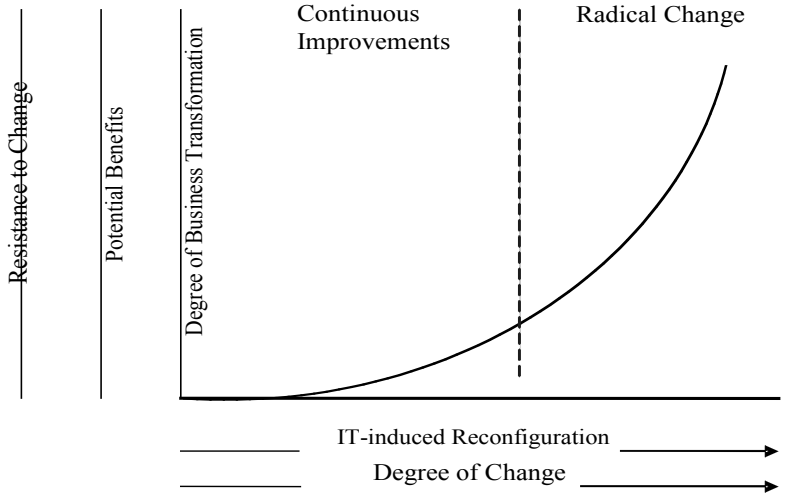
In this study, the model is modified by including the degree of change and resistance to change. Further, for the road map to indicate the future direction, the Product Model developed by Agrawal and Carpenter (2004) is used, which is modified from a model by Venkatraman (1994). The development of application software used phases of system analysis and design (Whitten, et. al., 2004) and the three stages of change management approach (Schein, 1969). The authors collected the review data of examiners and student feedback to evaluate the project.

The model (Figure 2) showing relationship among variables has been prepared using the findings of Agrawal, et. al. (2003). The proposed model depicts the exponential relationships between the degree of change and amount of resistance to change. The lower degree of change corresponds to continuous improvements (incremental change), while the higher degree of change corresponds to radical improvements (radical change). In this study, the projects undertaken in the Intro to MIS classes fall into the category of continuous improvement. The projects in Systems Analysis and Design classes fall into the category of a radical change.

Success of the project within MIS courses is measured by feedback and survey results, i.e.:

- Inclusion of smaller, real-life applications in introduction to MIS courses (incremental change)
    - Evaluation of real-life applications by MIS faculty
    - Feedback from students during the development of real-life applications
    - Feedback from external users while using the real-life applications
- Inclusion of complex, integrated applications in advanced MIS courses (radical change)
    - Evaluation of the integrated applications by MIS and functional faculty
    - Feedback by students during the development of the integrated applications
    - Feedback by faculty and student users of the integrated applications

Figure 2: Conceptual model of relationships between IT-induced reconfiguration and degree of change versus degree of business transformation, potential benefits, and resistance to change



The ultimate evaluation of the project will be in terms of the effectiveness of the use of the applications created. First, the applications will be used by students within accounting and marketing classes in the original college. Then they will be used at another institution.

In the long run, the project is intended to have an impact upon the employability of graduates. This college annually surveys its graduating seniors and alumni. Thus that survey will be expanded to measure enhanced employability.

The Quality of the Project's Design

The Model Universal Enterprise Information Structure (MUEIS) that is at the heart of this project was based upon two decades of data collection and has been properly validated (Carpenter, 1992). The MUEIS database is a superset of the databases needed for most general business applications. From the MUEIS database, all of the entities and attributes needed for the modules in this project can be drawn. This allows for the project to proceed without the concern of whether future application modules can be integrated. Eventually, a sufficient number of modules can be created based on the MUEIS database so that a teaching platform can exist that emulates an enterprise-wide information system with one united database.

The fact that the project can be accomplished has been proven through prior and ongoing projects and has been presented in stages at academic conferences where it received favorable response from business faculty (Carpenter, 2001; Carpenter 2002; Agrawal & Carpenter, 2004; Agrawal & Carpenter, 2005; Carpenter & Agrawal, 2004; Carpenter & Agrawal, 2005). One such report was recognized by an innovative education award (Carpenter & Agrawal, 2005).

The modules were designed in cooperation with faculty from other disciplines who will use the modules in their classes. Accounting and marketing professors have provided invaluable advice on the proper design needed for use by future students in their classes. The quality of what has been accomplished is furthered by demonstration of the products created by students, which is tied into the formal assessment process for the management information system program. The design and construction of the modules follows the best practices of the MIS field.

Results and Analysis

Inclusion of Smaller, Realistic Projects in Introduction to MIS Courses (Incremental Change)

In the Introduction to MIS courses, students are expected to complete a project using Microsoft Excel, PowerPoint and Access applications that generally weigh 15-20% of the total grade for the course. Prior to Fall 2001, students developed fictitious applications using only Power Point. In Spring 2002, it was decided to incorporate service learning into the classroom by undertaking pilot projects based on real-life applications. Based on the success of pilot projects, additional real-life applications were undertaken in subsequent years.

A large percentage of the students in the Introduction to MIS class were from non-business areas. However, they were able to fulfill the course requirements. For successful interactions with the students, user groups attended the classes of the respective applications along with the students. During the development process, user groups came to every class and were available to the students after class time. Group members also visited user sites, where users helped them establish useful suggestions on the projects and on user acceptance. Suggestions were then incorporated into the applications. As motivation to find their own real-life projects, extra credit points were awarded.

In Spring 2002, two projects were undertaken as the pilot study: one at a non-profit enterprise, the other at a university administrative office. In the former, two groups were assigned a real life application to develop a PowerPoint presentation. The project was successful and the presentation is being used in the enterprise for training programs. In the other project, one group was assigned a real-life application from the university office to develop a database with user

interface. The application keeps the information about the spouses of the employees, which is used to arrange employment for them. This project was also successful.

Based on the success of pilot projects, many Access, Excel, and PowerPoint application projects were assigned from Fall 2002 through Spring 2006. These developed applications met user expectations and are being used by four non-profit agencies and three university offices. In each instance, the users were extremely pleased with the outcomes of the student projects. One of the user organizations actually received the state's First Lady's Community Service Award for what they accomplished by using the application produced by students.

There were 318 students who participated in this part of the study. Data was gathered and analyzed using regression analysis in SPSS 12.0. Feedback from students indicated the following:

- For approximately 80% of the students, the reason for taking the course was that it was required in their major area of study. Motivating students to perform well on such projects in a mandated course is a challenge and the students rose to the challenge.

- Students reported that part of their motivation came from the extra credit that was given for completion of live projects versus case study projects.

- Students reported that their actual learning in the class exceeded their anticipated learning and they credited the projects with that difference.

- Students reported that a significant amount of the additional learning from the project was due to their experience with the dynamics of team work.

These results indicate that proper project management and motivational tools can effectively handle any moderate change.

Inclusion of Complex, Integrated Projects in Advanced MIS Courses (Radical Change)

From 1992 to 2000, a few selected students in the database management class created a number of small, free-standing applications utilizing the MUIES database. The advent of mature web-based technologies allowed a more seamless integrated approach. Hence, in the Fall 2001 semester, a group of students from the database management class engaged in a project that proved the workability of the concepts. Upon that success, it was decided to assign the task of developing a web-based interface of modules in the two-semester sequence of Systems Analysis and Design (SAAD-I and SAAD-II). Prior to Fall 2001, Systems Analysis and Design students were required to develop systems documentation of free-standing applications. The decision to change the course so that it stresses development of realistic integrated modules consisting of analysis, design and programming is, therefore, considered a radical change in MIS curriculum.

In Spring 2002, a group of students from the systems analysis and design class engaged in a project to design and build a prototype of user interfaces for applications that eventually will be used in beginning accounting classes. From Spring 2003 through Spring 2006, additional groups of students refined the basic accounting prototype and added a marketing research application that can be used in introductory marketing classes. In all instances, the students were supervised by MIS faculty and were advised by a systems administrator and accounting and marketing faculty.

Consequently, at the end of the Spring 2006 semester, five embellished and alpha-tested user modules for accounting and a sixth less fully featured user module for marketing existed. These modules are relatively simplistic in nature, but demonstrate that the concepts at the core are achievable.

A systematic and tri-partite focus on change management, project management, and support from top leadership was used to introduce the radical change. The experience of the project is divided into five sub-parts: (1) unfreezing, (2) moving, (3) refreezing, (4) student feedback during the

development of application package, and (5) the evaluation of the project by MIS faculty.

Unfreezing: Unfreezing is the first-stage of the three-stage approach of change. This is the process of ceasing old habits and creating a climate receptive to change. The project consisting of the five modules of accounting was assigned to students in Systems Analysis and Design in Fall 2001 and Spring 2002. Students had diverse backgrounds, either majoring in MIS (41%) with extensive business course background or in other than MIS (59%) with little or no business background, even though the course was required by their program of study.

Students were expected to work in a simulated professional IT environment with the user groups during the development process. The user groups came to a number of classes and were available after class time to the students. Working in this live environment, students were expected to modify the existing modules by interacting with accounting faculty, graduate students, IT Services staff, and an undergraduate student who had been involved in the earlier design aspects of the project. The details of the group activities are as given below:

Fall 2001**:** In the class of SAAD-I the students were exposed to systems analysis and design methodology and CASE tools (Visible Analyst). The project was discussed in the class with project work to begin the next semester.

Spring 2002**:** In the SAAD-II course, to overcome deficiencies of non-MIS students, a number of steps were taken, including extensive discussions of required concepts of MIS and DBMS principles, plus offering extra credit on assignments, tests, group projects, and presentations. Additional help was also provided: (1) a complete write-up on the existing project, (2) a detailed discussion on the project, (3) additional meetings between the students and accounting faculty and graduate assistants, (4) a detailed write-up containing revised database and processes for the modified project, (5) help in forming the groups in such a manner that each group had members consisting of business and technical skills with weaker students being grouped with excellent students for a better learning environment, (6) one of the business students was made an inter-group coordinator and he performed well in solving the inter-group problems to facilitate integration of modules, (7) an arranged number of guest lectures by IT Services staff in the class on Dreamweaver and ASP, (8) IT Services staff, graduate students, and former students were available to all students for solving specific difficulties on programming, (9) no class lectures in the last month as class time was given to complete the project, (10) the project was explained from accounting and technical perspectives, and (11) the extra credit (30% of the project) option was given for completing the programming part of the project.

The large number of students who resisted the group project quite extensively was of the opinion that this course had little value for them. Therefore, they were not willing to participate in the development of application package, as they wanted to limit the scope to only system design. Considering their concerns, students were given to opt for any of the three options: (1) on completion of programming and user manual they could receive extra credit of 30%, (2) complete the systems design documentations and appear for the final examination as per syllabus, or (3) take a comprehensive examination.

The results on the project were as anticipated in the unfreezing stage. Though all students opted to complete the programming and user manual, a large number of students refused to cooperate. Several students did not visit the accounting users to get systems specifications. This non-cooperation resulted in frustrations among motivated students. Despite these difficulties, students completed one module (payroll) while four other modules were completed partially.

Student feedback revealed their adverse feelings in Fall 2001 and Spring 2002. It is worthwhile to mention that a larger number of students attempted to put a pressure on the college dean to discontinue the project and to discontinue changes to the MIS curriculum. College leadership was firm in the decision for radical change in the curriculum to provide quality education to the students. That support helped to create a climate receptive to change in subsequent semesters.

Moving: Moving is the second stage of the three-stage approach for change. Moving is the process of learning new work methods, behaviors, and systems. The activities and results are discussed below for fall 2002 and spring 2003.

Fall 2002: The students again had diverse backgrounds. There were fifteen students from MIS area with business backgrounds and two students from non-MIS area with little or no business background. Further, most of them did not have adequate knowledge of the principles of MIS or database management systems. This course was not viewed as adversely by the students. In this class, students were again assigned the project for development to begin in Spring 2003. However, remedial instruction was started in late Fall 2002.

Spring 2003: Students were involved fully in the development efforts. They partially completed the six modules by working in a live environment and interacting with user groups of accounting faculty and graduate assistants. During the development process, user groups came to a number of classes and were available to students after class time. Campus IT Services staff members and graduate assistants were available to advise and help them. The results on the project were more than satisfactory. There were complaints about the ASP programming language used in the project. To address the students' concerns, the programming language was introduced in the MIS curriculum in Fall 2003. Further, project planning problems caused some stress.

Students were now receptive to change. The project management problems were treated as a learning experience and were resolved. The firm action taken by the college dean in response to the Spring 2002 student objections helped create a climate receptive to change. Student feedback in Fall 2002 and Spring 2003 supports the argument of a change in students' mindset.

Refreezing: Refreezing is the third-stage in three-stage approach of change. Refreezing involves reinforcing changes to make the new process second nature, accepted, and part of the job. The activities and results are discussed below for Fall 2003 through Spring 2006.

Fall 2003 through Spring 2006: The students again had diverse backgrounds, with the majority from MIS with a business background and the minority from non-MIS areas with little or no business background. Most of them did not have adequate exposure to principles of MIS and database management systems. This course was not viewed adversely by the students. In these classes, students were again assigned to continue working on partially completed modules of the project. Students were involved fully in the development efforts. The ASP programming was introduced in this course (SAAD-II) for 2004 and 2005, and was placed in a prerequisite course beginning in Spring 2005. The groups of students in these semesters extended the work on the partially completed six modules by working in a live environment and interacting with user groups of accounting faculty and graduate assistants. Again, campus IT Services staff members and graduate assistants were available to advise and help them. The results on the project were more than satisfactory. The students removed the bugs from some of the programs pertaining to the six modules and had added features to the modules.

It was noticed that the students had accepted the radical curriculum change. Student feedback in Fall 2003 and Spring 2004 supports the notion of a change in the students' mindset about the importance of the project.

Feedback by students during the development of application package: There were 125 students who participated in this part of the study. Feedback was gathered from the students via a questionnaire and the data were analyzed using appropriate statistical techniques. There were several significant findings:

- Perhaps the least surprising finding is that students were not motivated to take the courses (SAAD-I and SAAD-II) or to engage in the radical change projects that are part of this study. All of the students took the courses as part of their major. In the first year, slightly more than half the students were MIS majors and these were MIS courses. However, the remaining students were non-MIS students who openly resented having to take these two MIS courses and openly attempted to have the project thrown out. In the second year, there were only a couple of non-

MIS students in the courses, so the overall motivation level increased. In the third year, with no non-MIS students enrolled, the motivation level increased again. Still, the motivational level in both years was significantly less than for other courses. That motivation increased as ASP programming was moved from the projects course to a prerequisite course.

- Students in all years reported that the grade they received was significantly higher than the grades they had initially anticipated. The same is true for the amount of learning.

- The perceived difficulty of and the average amount of time spent on the course by students in the second year was significantly higher than in the first year. Initially, that was thought to be a reflection of the rebellious attitude by nearly half the students in the first year. However, in the third year the perceived difficulty and the amount of time spent declined to the first-year level. In the fourth and fifth years, both perceived difficulty and amount of time spent had rebounded to the second-year level. That is thought to be due to the instructor's initiative to add more meat to the project in the refreezing stage, i.e., fourth and fifth years.

***Evaluation of project by MIS faculty*:** The MIS faculties evaluated the outcome from the project during the second and third years. All were more than satisfied with the progress and results. Data for the change between academic years 2002-03 (the formal start of the project) and 2004-05 (the most recent year for which data is available) is shown in Table 2.

In one of twenty-five categories there was a decline in the faculty's evaluation from the first year to the last. Namely, the quality of visual aids in the final team presentation declined. Corrective action was taken to improve upon that for the year 2005-06. In seven of the twenty-five categories, there was no change in the evaluation by faculty.

In all other categories, faculty judged student performance to have increased from 3.68% to 90.0%. Most importantly, all four major groupings showed increases. The quality of student projects had increased as had the quality of the product they produced. Their ability to present (both orally and in written form) the concepts behind their project increased. Perhaps most significant to the project discussed in this article is that there was a 26.67% increase in student demonstrated knowledge of MIS, showing the benefit of radical curriculum change.

Implications, Future Research, and Limitations

The project described in this study is complex and ambitious. The results show that it can indeed be accomplished for the benefit of business students in the Introduction to MIS classes and for MIS students in the Systems Analysis and Design I and II classes. If this project were to continue, several other initiatives could be measured, evaluated, and reported. Those include:

- The project can reform the core business curriculum and instruction by modernizing the manner whereby technology is integrated across interdisciplinary boundaries, thereby making those boundaries more transparent.

- The project can provide a cost-effective way to improve instruction and operations by providing inexpensive and easy to use open source modules that will be perceived as an integral part of each class, rather than add-ons.

- The project has the potential to improve access, retention, and completion as it will be usable from any system connected to the Internet and will cause students to perceive that their studies are preparing them for employment in a more meaningful manner.

- The project includes the possibility of improving community college and high school since courses such as ones this product supports are often taught in those environments.

Table 2: Assessment of Radical Change Projects

Item #	Items	Percent Increase or Decrease, 2002-03 to 2004-05
I. The Project		
1	Appropriate project management techniques applied	13.33%
2	Project activities properly documented	0.00%
3	Project activities appropriately subdivided	7.14%
4	Project activities appropriately delegated	0.00%
5	Project quality techniques applied	0.00%
6	Effective communication among project team members	29.41%
7	Appropriate software development tools utilized	5.56%
8	Continuous contact with user maintained	0.00%
	Average of Section I	**3.68%**
II. The Outcome of the Project		
9	User specifications satisfied	0.00%
10	System properly designed	12.50%
11	System functions as designed	6.67%
12	System documentation usable	6.67%
	Average of Section II	**4.43%**
III. The Written Presentation		
13	Appearance of report is professional	30.00%
14	All aspects of the project and product clearly covered	8.33%
15	Appropriate grammar, punctuation, word choice and paragraph/sentence structure	25.00%
16	Vocabulary appropriate to MIS	14.29%
17	Report demonstrates knowledge of MIS	26.67%
	Average of Section III	**11.11%**
IV. The Oral Presentation		
18	Presentation divided logically and equally among team members	0.00%
19	Visual aids are attractive and effective in conveying information	-17.65%
20	Vocabulary appropriate to MIS	0.00%
21	Speakers demonstrate knowledge of MIS	14.29%
22	Delivery is professional	25.00%
23	Presenters engage the audience	20.00%
24	Presenters respond to audience questions effectively	90.91%
25	Presenters make professional appearance	100.00%
	Average of Section IV	**10.37%**

Evaluation Key used for the base data:

3 Exemplary - a clear mastery of competency is demonstrated
2 Good - an above average level of competency is demonstrated
1 Satisfactory - a minimal level of competency is demonstrated
0 Needs improvement - an unacceptable level of competency is demonstrated

Perhaps the most significant limiting factor for future adopters of the product described in this study will be the magnitude of the commitment required. In order for the initiating college and other educational institutions to take advantage of the project's potential, the need to improve the core business curriculum must be perceived. A significant number of faculty who take ownership of the project are needed in order to proceed with work required to change their courses. Moreover, there must be commitment and support from administrators to ensure completion.

THE DEMISE OF THE PROJECT

Despite the great success of the project in improving the Introduction to MIS and Systems Analysis and Design I & II courses and the readiness of the modules to implement in accounting and marketing courses, the project died. While the lessons learned will continue to be used in MIS courses and will continue to benefit those future students, the larger intent to infuse technology into the core business curriculum has ended.

In retrospect, the project was very successful as far as it went. That was due largely to the cooperation and dedication of many participants, as well as to the care and skill applied in managing the project. The project managers paid close attention to proper project management techniques. The project was on schedule for its five year cycle. Change was managed effectively, using the Product Model described in this article.

Factors outside the project manager's control were sponsorship, change of job by the project manager, decline in enrollment of MIS students, and budget cuts due to a slack economy.

Sponsorship: The discussion on this part is divided in to three sub-parts: leadership, financial, and availability of graduate assistant.

Leadership: Since 2001, college leadership changed four times. In the beginning the project was well advocated and enjoyed the support of leadership. The first leader had envisioned the project as a key element in the college, especially in its progress toward achieving and maintaining AACSB accreditation and providing quality education the students. However, subsequent leadership decided the project was not important to earn AACSB accreditation, the college's primary goal. Thus, the MIS faculty did not ask for any additional support from the leadership. The college is now accredited by AACSB. However, due to the factors discussed below, it was not possible to request additional sponsorship.

Financial: After the second year of the project, the sponsoring alumnus, whose generous gift funded the project for its first two years, changed his mind as to how his gift should be used. Ultimately, that funding was lost. The servers and software needed for the project had already been purchased. Hence, the project could continue without a large infusion of capital. The project manager and the junior MIS faculty applied for a FIPSE grant for three years to support both the faculty during summer sessions so that they could do the development work on the project. The grant proposal was not successful. The lack of such support resulted into slowing down the progress of the project.

Availability of Graduate Assistant: Graduate assistant support was available for the first two years to provide technical support, especially managing the server and database. After the first two years of the project, the college did not receive qualified applicants for the graduate assistantship and the position remained vacant during last three years. The junior MIS faculty provided the technical support for the project during this period.

The project manager and associate project manager continued to advocate for the project, as they had seen the benefit to the students. They continued to use MIS students to develop modules. The MIS and non-MIS faculty who had been involved the project continued to believe in the benefits of the ultimate product of the project. Furthermore, the project was still seen by many faculty as an important component of the pursuit of AACSB accreditation.

Change of Job by Project Manager: After the third year, the project manager left the institution for employment at another college. Consequently, the

primary advocate for the project was gone. The associate project manager continued to use the concepts of the project in the Introduction to MIS and Systems Analysis and Design courses. The non-MIS team members continued to believe in the benefits of the project. The project continued, but more behind-the- scenes than in the limelight it had previously enjoyed.

Decline in Enrollment of MIS students: The decline in enrollment in MIS and computer science is a national problem. In the college, enrollments in the systems analysis course were thirty-one (2001-2002), seventeen (2002-2003), ten (2003-2004), five (2004-2005), nine (2005-2006), and three (2006-2007). The decline in number of developers slowed down the progress of the project significantly. The situation does not appear that it will improve in the near future. The slower development cycle will not meet the users' need for timely project completion. The users may be wise to opt for an already-mature proprietary enterprise resource planning solution.

Budget Cut: The adverse economic condition resulted in a significant budget cut by the state. Consequently, the junior MIS faculty could not request funding for this project.

Conclusion

Faced with many interrelated challenges, the MIS faculty at a Midwestern university undertook a project that resulted in development of a product (database and application modules) to support courses in the core business curriculum. The result was the completion of six modules to initiate the transformation of the business core curriculum. The project utilized a Product Model to develop web-interfaced software from the MUEIS database in order to redesign the core business curriculum to be centered on IT. A systematic and tri-partite focus on change management (three phases: unfreezing, moving, and refreezing), the effective use of project management, and support from leadership enabled the planning and development for radical change in the MIS curriculum and the completion of the initial phase of transformation of the core business curriculum.

In the case of live projects in the Introduction to MIS applications class, it was possible to incorporate a service learning component in the course curriculum using project management techniques (incremental change). Live user systems can be incorporated productively in the development of realistic applications. Students acquire realistic business experience when participating in the development of such applications. Further, organizations can continue to meet their applications software requirements at minimum cost by having applications developed and maintained in MIS courses.

Future phases of the project were intended to complete the infusion of technology into the core business curriculum. However, those efforts have been suspended, as the project has effectively died. Perhaps one of the greatest learning experiences from this project related to the importance of the sponsorship of a large, long-term project such as this. For various reasons (sponsorship, change of job by project manager, decline in enrollment of MIS students, and budget cuts due to slack economy), the project could not be continued and was destined to end.

The demise of this project corresponds with, but was not influenced by, improvements in the SAP University Alliances program. If the concept of infusing technology into the core business curriculum was to be resurrected at this college, the faculty would be wise to reconsider the SAP approach. Whereas there were too many cost and time limitations previously with that proprietary product, considerable advancement have been made, although it is beyond the scope of this article to describe those.

*Dr. Donald Carpenter is a Professor of Computer Information Systems in the Department of Business at Mesa State College. He received his Ph.D. from the University of Nebraska. He has published over eighty times in a variety of information systems topics and presently serves as President of the Mountain Plains Management Association.

**Dr. Vijay Agrawal is an Associate Professor of Management Information Systems in the College of Business and Technology at the University of Nebraska at Kearney. He received his B.S. in mechanical engineering from the University of Indore, MBA from the University of Toledo, and M.S. in computer science from Bowling Green State

University. He received his Ph.D. in management information systems from Jamia Millia Islamia (University of Millia Islamia), New Delhi, India. He has over eighteen years of business experience. He has worked as the heads of information systems for a number of companies and as an engineer at Hindustan Aeronautics. He has published in Production and Operations Management, National Social Science Journal, Global Journal of Flexible Systems Management, Encyclopedia of Operations Reserch and Management Science, and others.

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