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Enterprise Resource Planning in Higher Education: A Comparative Case Study

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ENTERPRISE RESOURCE PLANNING IN HIGHER EDUCATION:
A COMPARATIVE CASE STUDY

by

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DEDICATION

I would like to dedicate this dissertation to a number of individuals who have supported me in my pursuit of a doctorate of education in educational leadership at the University of North Florida. This dissertation is dedicated to my family. I would like to thank my wife, Angela Marterer; children, Lenora and Genevieve Marterer; parents, Gerald and Suzanne Marterer; and parents-in-law, Willis and Linda Blume. I humbly express my gratitude to these individuals for their loving support and encouragement over the past few years. This dissertation is dedicated to my dissertation chair, Dr. Kathe Kasten; my dissertation committee members; and the faculty of the UNF educational leadership doctoral program. I thank these individuals for providing me a truly meaningful, life-changing educational experience. Finally, this dissertation is dedicated to the administrative leaders both at the University of South Carolina Beaufort and in Division of Student Affairs and Academic Support at the University of South Carolina. I am deeply appreciative of these individuals for encouraging me to pursue this professional growth opportunity.
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ABSTRACT

Case study research on enterprise systems in higher education organizations has shown that the challenges associated with implementing enterprise systems in higher education occur when unique organizational characteristics found in universities do not align with the standard characteristics built into the software programs. Based on such findings, the purpose of this study was to further explore the interaction between higher education organizations and enterprise systems during Enterprise Resource Planning (ERP) implementations in order to gain insight into the effects of ERP implementations in higher education. Through the theoretical lens of actor-network theory, the purposes of this comparative case study at three universities were to identify (a) how higher education organizations re-structured to the standards of the enterprise software, (b) how ERP software was customized in order to adapt to the characteristics of higher education organizations, and (c) how the enterprise software and higher education organizations interacted and translated into a unique identity as a result of ERP implementation. The data for the study were collected through semi-structured interviews and institutional artifacts at three universities which were commonly bound by similar institutional characteristics and the same enterprise software. Further, the study was limited to the examination of the interaction between individuals associated with the registrars’ offices at the three institutions and the student module found in each instance of the software.

The data revealed that, while the institutions did not organizationally restructure or make policy changes in order to adapt their institutions with the infrastructure of the software, the registrars’ offices made many reactionary changes in their business
processes, procedures, and nature of work as a result of the enterprise system implementation. The data also revealed that the software customizations, developed to account for unique statutory requirements, caused overwhelming implementation challenges during the enterprise software implementation and post-implementation phases.
Enterprise resource planning, or ERP, is an information technology strategy to merge all information within an organization to create a comprehensive information infrastructure encompassing all organizational units and functions. The strategy requires a central database which places all organizational information into a unified format so that it may serve as a resource in meeting the data needs of managers, stakeholders, customers, employees, and suppliers from a local to a global context (Davenport, 1998).

The power of enterprise systems found in the business sector was discussed in Thomas Friedman’s best-selling book *The World Is Flat: A Brief History of the Twenty-first Century* (2005). In his examination of economic globalization, Friedman explained how the global information infrastructures, including ERP, have “flattened” or standardized organizational data so that organizations world-wide can link into complex global supply chains from factories in China, to call centers in Bangladesh, to consumers in Jacksonville, Florida. The size and scope of such globally linked infrastructures has brought about a global “democratization” (Friedman, 2008). As Friedman noted, “more people grew out of poverty faster” as a result of the global integration of markets (2008, p. WK10). Though enterprise systems can be described as a panacea for improving market standardization and globalization, such global economic infrastructure also has the ability to facilitate world-wide financial crises.
In the higher education sector, colleges and universities across the country began to replace home-grown information management systems with enterprise systems created by such companies as Peoplesoft, SunGard SCT, Datatel, Oracle, Jenzabar, and SAP, as early as the late 1980s. Though such technology advancements have been presented to higher education institutions as remedies for problems in managing college enrollment and controlling fiscal accountability, ERP implementations in higher education have often included implementation set-backs, escalated costs, and unpredicted, undesirable effects. As I will discuss in Chapter Two, such challenges found in ERP implementations at higher education institutions have revolved around the lack of alignment between the unique organizational characteristics of colleges and universities and the standard characteristics of the enterprise software.

Statement of Purpose and Research Questions

The technology consulting firm the Gartner Group is generally believed to have coined the term Enterprise Resource Planning (ERP) in 1990 to identify a stage in the development of a type of information infrastructure which complemented a 30-year history of information management system technology (Harwood, 2003). Though the Gartner Group has updated both the term and the definition of ERP (to include ERP II), a common assumption runs through the definition of both terms, namely, that the success of enterprise system implementation is dependent upon an organizational strategy to restructure itself in order to integrate business process. As Gartner, Inc. (2004) defined on its Web site, ERP and ERP II ideally start with an “institutional vision” to integrate technical, financial, and human resources functions to “dynamically balance and optimize
enterprise resources.” With a vision of integration and the appropriate enterprise software, an organization should ideally be “enabled to optimize its business processes and analysis capabilities for improved speed and efficiency” (Gartner Inc.).

Case study research on enterprise systems in higher education organizations has shown that the challenges associated with implementing enterprise systems in higher education occur when the pre-implementation organizational characteristics found in universities do not align with the standard characteristics built into the software programs (Pollock, 2003; Pollock & Corinford, 2004; Pollock, Williams, & Proctor, 2003; Wagner & Newell, 2004). Based on such findings, the purpose of this study was to further explore the interaction between higher education organizations and enterprise systems during the implementation process to better understand (a) how higher education organizations restructure to the standards of the software, (b) how ERP software is customized in order to adapt to the unique characteristics of higher education organizations, and (c) finally, how ERP software and organizations translate into a new identity during ERP implementation. The study utilized the theoretical framework called actor-network theory (ANT) and adopted a qualitative methodology with an interpretivist approach to investigate the following research question: What are the effects of ERP implementation in higher education organizations?

From the ANT perspective, I viewed technology, people, and their interactions within organizations as determiners of the effects of ERP system implementation. As a result, I subdivided the research question into three components which correspond to the actor-network theoretical framework. The questions are as follows:
1. How are higher education organizations re-structured to the standards of the software?

2. How is ERP software customized in order to adapt to the characteristics of higher education organizations?

3. How does the interaction between ERP software and higher education organizations translate into a unique identity as a result of ERP implementation?

Significance of Research

This study contributes in several ways to the knowledge base in the field of educational leadership to benefit both the researcher of and practitioner in higher education. From a researcher’s perspective, this study is significant because only a small number of scholarly studies have been conducted on ERP implementations in higher education organizations. As new generations of ERP systems emerge, it is important to supplement the research in this field to document the changes that occur to both ERP systems and organizations in order to build a more comprehensive theory of the phenomenon. From the educational leader’s perspective, a study in this field is crucial to understand both the short-term effects of ERP implementations in higher education organizations and, more broadly, the way in which the traditions of higher education are changing as a result of their many complex interactions with technology.

Conclusion

In Chapter Two of this dissertation, I review the literature which has examined the interaction between organizations and information system. In the literature review I
provide multiple theoretical perspectives on the interaction between technology and organizations and then tie those theoretical perspectives to research on the interaction between enterprise systems and organizations. Finally, I review the literature which specifically addresses the interaction between enterprise systems and higher education institutions. The literature review provides the basis for the choice of both the theoretical lens and the sampling for my qualitative study which is found in my methodology chapter, Chapter Three. In Chapter Four, I describe my experiences in conducting the studying in the context of my proposed methodology and provide an analysis of my findings. Finally in Chapter Five, I conclude the study by reflecting on both the wider implications of the findings and possible avenues for further research on the effects of enterprise system implementations in higher education.
Chapter Two: Literature Review

In this review of the literature, I establish a connection between philosophical perspectives on technology and computer information systems in organizations. While tying common philosophical perspectives on technology to current literature on information systems in organizations, I provide a broad backdrop of the "systems of values and beliefs concerning [the] research in general" including, "ideological stance[s] and theoretical positions regarding the particular phenomena or issues under investigation" (Baptiste, 2001, p. 2). Secondly, I provide a review of the literature on information systems which specifically addresses enterprise systems in higher education. Within that section I (a) show the relationship between the philosophical perspectives on technology, the literature on information systems, and the literature on enterprise systems in higher education; (b) describe the organizational characteristics of higher education organizations using Bolman and Deal’s four organizational frameworks (structural, political, cultural, human resources); and (c) explain how the organizational characteristics of universities generally interact with the characteristics found in enterprise systems during an enterprise system implementation.
Theoretical Perspectives on Technology,

Computer Information Systems, and Enterprise Systems

The first intent of this chapter is to introduce the various philosophical perspectives on technology which researchers have used as theoretical lenses. Coming from disciplines including information technology, sociology, anthropology, and business, researchers of information systems have used these theoretical lenses to provide a basis on which to examine the development of information systems, the implementation of information systems by organizations, and the use of information systems by organizational groups and individuals.

In the broadest sense, Don Ihde (1993) pointed out that, in 20th-century literature, technology across these disciplines has been examined through one of two opposing theoretical lenses: technological determinism and social determinism. As Ihde explained, technological determinism assumes that “once invented, technologies carry with their use a different kind of determinism which reflexively forms society itself,” whereas “the social deterministic view is one which sees the development of technology arising largely out of power relations and the decisions of elites, or groups of people in power” (p. 100).

More specific to information technology, Paul Ceruzzi, author of History of Modern Computing (2003), identified those same opposing lenses through which information technology scholars have viewed the relationship of modern computing and organizations. The first lens serves as a means of viewing information systems as a determiner of organizational structure and outcomes. In Ceruzzi’s words, computing, if viewed from the technological determinist perspective, can be seen as the arrangement of “engineer-designed hardware and software established in hierarchical layers” which
determines the way in which users interact with the system and each other (p. 5). On the other hand, the socially deterministic lens views computing in organizations as a “social construct,” which is defined not just by system engineers, but by the “social and political negotiation among a variety of groups” whose individual interests determine the use of computing hardware and software for their respective uses (Ceruzzi, p. 5).

In addition to these dichotomous theoretical lenses, a third theoretical lens emerged in the late 20th and early 21st centuries called “technoscience studies,” which has been described as a “hybrid” of the sociological and technological viewpoints (Law & Singleton, 2000). From this perspective humans and non-humans are viewed equally as actors or influential forces in the development of technology. In the following subsections, I will explain how researchers of information systems, and more specifically enterprise systems, have utilized all three theoretical lenses in their studies (Figure 1).
Figure 1. Theoretical lenses onto enterprise resource planning.
Technological Determinism

Technological determinism, as explained by Heilbroner (2003), can historically be identified in the “hierarchical organization of work” (p. 401). In his research on information systems, Ceruzzi (2003) concurred that the hierarchy found in the information systems can determine a hierarchical structure of an organization. In the literature on enterprise systems, Jacobs and Bendoly (2003) have noted the power of the technological deterministic forces of enterprise systems on the infrastructure of an organization. However, in their recommendations for further research, Jacobs and Bendoly argued that it is difficult to understand how the deterministic forces of ERP systems affect organizations without thoroughly identifying and understanding such forces which are imbedded in the ERP software. They wrote:

Ultimately researchers should keep in mind that ERP systems and these new extensions do not simply represent add-on tools that assist business with fleeting tasks. On the contrary, ERP systems represent corporate infrastructures, much in the same way that physical highway systems do. As corporations and academics gain increased experience with how this infrastructure impacts business decisions in their disciplines, research into the idiosyncrasies of ERP system design and use should emerge as a recognizable forum for knowledge exchange and research. (p. 234)

By describing enterprise systems as an “infrastructure” and not an “add-on tool,” Jacobs and Bendoly implied that the enterprise systems not only affect the way in which organizations operate but become internal workings of an organization.

The technologically deterministic viewpoint in the literature can be divided into two types: (a) “positivist” technological determinism and (b) “skeptical” technological determinism.

*Positivist technological determinism.* The literature on computing from the discipline of information technology has historically been written from a positivist
technological determinist viewpoint. That is, IT researchers and scholars do not typically research the technology in diversity of use or in social settings which may have their own unanticipated deterministic qualities. Instead, information technology literature, from a positivist standpoint, assumes that engineers or computer experts solve problems through innovation in a pre-user environment. These innovations, in turn, determine the success of the user environment. This viewpoint is commonly used in historical accounts of hardware and software development and innovation. As Ceruzzi (2003) noted, “A few historians of computing have adopted [the sociological deterministic] approach, but most have not, preferring to describe computing history as a series of technical problems met by engineering solutions that in hindsight seem natural and obvious” (p. 5).

The “natural and obvious” development of computers which historians describe connects with a larger positivist paradigm which is embedded in historical views of computing and, more broadly, technology. Apart from Ceruzzi (2003), historians of technology have echoed Enlightenment views of science which tie back to philosophers such as Kant. As Kant argued in *Idea for a Universal History from Cosmopolitan Viewpoint*, human history is a story of human intellectual progress (2003). For Kant, humankind, through the power of reason, is naturally moving toward an advanced intellectual state which he terms a “universal civic society” (p. 40). Technology, then, serves as a reflection of the progress of reason. To reiterate, Ferguson (1974) drew the connection between such Kantian beliefs and technology history by stating that embedded in 20th-century historical literature on technology is the assumption that technology “follow[s] an orderly or rational path, as though today’s world was the precise
goal toward which all decisions, made since the beginning of history, were consciously directed” (Ferguson, p. 19).

ERP researcher Davenport (1998) argued that it is easy for organizations to buy into the positivist notion of technological determinism when deciding to purchase an ERP system. Davenport wrote:

In order to understand the attraction of enterprise systems, … you first need to understand the problem they’re designed to solve: the fragmentation of information in a large organization. Every big company collects, generates, and stores vast quantities of data. In most companies, though, the data are not kept in a single repository. Rather, the information is spread across dozens or even hundreds of separate computer systems, each housed in an individual function, business unit, region, factory, or office. Each of these so-called legacy systems may provide invaluable support for a particular business activity. But in combination, they represent one of the heaviest drags on business productivity and performance now in existence. (p. 123)

As stated before, positivist-oriented literature on the historical development of ERP is found almost exclusively in the discipline of information technology. To further explain the positivist-orientation of ERP literature found in the discipline of information technology, I will provide a brief historical description of the development of enterprise systems in accordance with Gartner’s (2004) definition of ERP to include the development of computer hardware, ERP software, business function integration, business processes alignment, and data analysis capabilities.

Shields (2001, pp. 1-10) in his text on software development in e-commerce, divided the development of enterprise systems into four basic historical time periods. Though simplified, the division of time periods denotes developmental milestones of computing technology development as it relates to information management systems which led to the creation of ERP systems. The periods are as follows:

- Custom development period (1960s – 1970s)
• Standard software period (1970s – 1980s)
• Application suites (1980s – 1990s)
• ERP and E-business (1990s – 2000s).

During the custom development period in the 1960s and 1970s, the computer hardware became popularized in the business sector with IBM’s launch of the System/360 (Campbell-Kelly, 2003). The System/360 was a mainframe-based computer system designed to meet the needs of businesses across the sector at an affordable price. As these first business-oriented computers were being purchased by companies, the function-based application programs that ran on the computers were not automatically furnished by IBM, which only provided the programs that operated the system itself. Instead, application software was (a) written by employees within the organizational units of each company (Shields, 2001); (b) provided by IBM from a systems engineer in order to close a sale of a computer system (Campbell-Kelly); or (c) supplied “as is” by IBM, which collected and archived software programs written by their customers (Campbell-Kelly).

In the manufacturing sector, businesses were individually developing what became known as Material Requirements Planning (MRP) systems which allowed manufacturing businesses to automate production and inventory management systems in order to create automated production schedules (Harwood, 2003). During this time computers were not using any type of software architecture. Instead, customized programs were written for specific site-based computers for isolated business functions (Shields, 2001).
The standard software period in the 1970s and 1980s brought about both standard software packages that could be sold off-the-shelf from programmers to organizations and small-scale interfacing software to link modules, or function-based application programs. During the 1970s, standardized industry specific software was being created in the form of modules for the banking, construction, engineering, insurance, manufacturing, and pharmaceutical industries. Module vendors specialized in general business functions by creating software programs to handle ledger, payroll, or inventory functions specific to each industry (Campbell-Kelly, 2003). One such software vendor, SAP, was founded in 1972 by five IBM programmers who developed a finance module (Shields, 2001). By the 1980s, cross-industry standard software was being created in the areas of “accounting, finance, human resources, planning and analysis, … and office automation” (Campbell-Kelly, p. 139).

During the 1970s and 1980s, MRP had also entered a new stage of development, MRP II. MRP II systems integrated the finance module with the production schedule modules to transform MRP from an inventory tracking program to a system that could run cost-benefit analysis on a manufacturing operation (Harwood, 2003). Further, module programs in the manufacturing sector began to integrate between product design programs and manufacturing equipment.

In the 1980s the mainframe-based computers, such as IBM System/360, were being rapidly replaced with microcomputers that ran off integrated circuits or micro-chips (Ceruzzi, 2003). These computers were not only smaller and less expensive but were more powerful than their predecessors. The memory capacity of the microcomputer brought about more complex software programs. Microcomputers could store a suite of
enterprise software applications, and users could navigate software in a more user-friendly format called Graphical User Interface, or windows (Shields, 2001).

The 1990s and 2000s brought ERP systems as well as e-business capabilities. ERP systems are seen as the culmination of the efforts in developing and standardizing various commonly-used functional modules and integrating them into an application suite (Shields, 2001). Shields noted that the 1990s innovation of “common databases” and “shared drives,” which could facilitate real-time transactions, made ERP systems a popular trend. Firms such as “Oracle, SAP, JD Edwards, Peoplesoft, Baan, Lawson, and QAD” all experienced “tremendous growth” in regard to ERP package sales (Shields, p. 7). Finally, the development of e-business allowed for organizations to run ERP systems with no location or time dependency. The system was able to be accessed anywhere at anytime via the World Wide Web (Shields, p. 7).

Along with the positivist historical account of ERP development, positivist technological determinist literature on ERP systems assumes that the closer an organization corresponds with the pre-implementation or off-the-shelf structure of the ERP system, the more the ERP system can empower the data-related capabilities of the organization. For example, IT researcher Karl Kapp (2001) developed a hierarchy of levels at which organizations can effectively utilize an ERP system. In his attempt to explain the potential capabilities of ERP systems on organizational structure, Kapp described five interaction levels on which businesses can utilize ERP systems ordered from the lowest to highest levels of sophistication—from a warehouse for information storage to the key contributor in long-range strategic development. Kapp’s assumption was that the more an organization adopts the software engineer-designed assumptions
about business, specifically from the manufacturing sector, the more that the organization can maximize the potential of the system.

As Kapp (2001) described, an ERP system, at the lowest level, can be viewed simply as a “data management system” that captures, stores, and retrieves any and all organizational data. Second, an ERP system can be viewed both as a system to house shared databases and to integrate independent or “bolt-on” software modules. Third, ERP systems can be viewed as comprehensive software systems, which embody a type of “manufacturing philosophy.” For example, Kapp argued that ERP software developed historically out of an ERP forerunner, Material Requirements Planning (MRP), which imposes a type of logic on how a supply chain is to operate. Fourth, ERP can also embody a “business philosophy” of which the central focus is seamless communication between units and functions. The ability to retrieve data from any part of an organization on demand can allow a company to create a closed communication loop between the executives who develop organizational strategy, the managers who implement tactical plans, and the employees who conduct the day-to-day operational activities. Finally, ERP systems can be viewed as “knowledge management systems” which can lead the way in the fundamental change of organizational strategy, tactics, functions, and units. At this highest level, members from all parts of the organization can run an infinite number of analyses with any organizational data to develop the most innovative and efficient strategies (Kapp, 2001).

Research on ERP systems in the discipline of business generally followed the assumption that businesses which used enterprise systems at the highest level of utilization brought about the most economic benefit for an organization. Like the
information technologists, many researchers in the field of business have concluded through case studies and managerial surveys that ERP systems embody a determinism that must be adopted in order to bring about the most economic benefit for an organization.

According to several researchers, primarily in the discipline of business, utilizing an enterprise system at the highest level requires that businesses adopt the standard or default version of the software with no customizations to the baseline product. A customization is defined as “a modification of baseline software (code) to meet a functional need that the baseline product cannot” (Babey, 2006, p. 22). As discussed in the IT historical approach, ERP systems are developed as standardized software programs which contain modules which can be found across business sectors. The research in the business sector has recognized that organizations have unique practices that do not necessarily correspond to the modules found in the off-the-shelf ERP systems. For this reason, off-the-shelf ERP systems do not always correspond with existing business practices.

In their investigation of ERP implementations, researchers found that allowing the architecture of the software to determine organizational processes was beneficial to organizations. In the business sector, Al-Mashari (2003) found that organizations reduced the amount of enterprise implementation time and effort by adapting to the “vanilla version” of an ERP system. Nah, Zuckweiler, and Lau (2003), in their meta-analysis of journal articles on ERP, found that businesses who changed their business practices to conform to the best practices embedded in the ERP system required minimum customization and the costs associated with customization. Business process re-
engineering, according to Bingi, Sharma, and Godla (1999), “is not a matter of changing software systems, rather it is matter of repositioning the company and transforming the business practices” (p. 9). In addition to the cost of customization during ERP implementation, Bingi et al. also indicated that customization continually generates a cost with future maintenance and upgrade expenses. In sum, these researchers found that customization, which can bring historical continuity and individuality to organizations, can be costly and counterproductive during an ERP implementation.

Skeptical technological determinism. The skeptical technological determinism also views technology as embodying a type of logic that determines organizational structure and outcomes. However, unlike the positivist, who views technology as following a “natural and obvious” Kantian path toward an advanced intellectual state, the skeptical determinist views the logic of technology as a non-linear, man-made construct. As Ellul argued (2003), technology does not “progress in terms of a moral ideal” or “endure any moral judgment,” because the way in which technology is developed follows a non-rational path from theory to praxis (p. 392). That is, unlike the information technology historian, who views technological innovation as solutions to pre-user environments, Ellul argued that the theoretical problems, which computer engineers solve, are not at all the same problems which users encounter. Ellul stated:

It seems obvious that the [technology] researcher must absolutely not pose the problem of good and bad for himself, of what is permitted or prohibited in his research. His research, quite simply, is. And the same is true for its application. Whatever has been found is applied, quite simply. The technician applies his technology with the same independence as the researcher. (p. 392)

That said, Ellul felt that humans have been blind to the gap between the technology developer or “researcher” and the end-user because they assume that technology, like
science, is related to a positivist legitimacy which has a deterministic influence over humans. As Ellul concluded, “The instant that something is technological, it is legitimate, and any challenge is suspect” (p. 395).

Herbert Marcuse took his skeptical notion of technology a step further by arguing that not only do humans find the deterministic logic of technology as positivistically legitimate, but that humans view the dominating determinism of technology in industrial societies as achievements in “affluence and liberty,” while it actually places constraints on human thought and action (2003, p. 411).

No camp of ERP researchers has adopted the skeptical technological deterministic viewpoint, but researchers such as Davenport (2000) have written about the paradox of enterprise system standardization reminiscent of the previous sentiments of Marcuse. Davenport explained this paradox in the following manner:

In addition to having important strategic implications, enterprise systems also have a direct, and often, paradoxical effect on a company’s organization and culture. On one hand, by providing universal, real-time access to operating and finance data, the systems allow companies to streamline their management structures, creating flatter, more flexible and more democratic organizations. On the other hand, the options also involve the centralization of control over information and the standardization of processes, which are qualities which are more consistent with hierarchical command-and-control organizations with uniform cultures. (p. 127)

As Davenport showed, standardization can bring about freedoms while paradoxically placing constraints on an organization.

Other scholars have examined this paradox from different perspectives within business. For example, Akkermans, Bogerd, Yucasen, and van Wassenhove (2002) conducted a Delphi study with business managers who served as leaders of ERP implementations. In one particular aspect of their research, they explained that managers
felt that ERP brought advantages in supply chains because it introduced standardization within companies and across the supply chain. On the other hand, business managers indicated that standardized supply chains become inflexible and difficult to manipulate as a result of standardization. In other words, technology enabled the supply chain to become an uncontrollable determiner of business practice (Akkermans, Bogerd, Yucasen, & van Wassenhove).

In sum, the philosophical foundation of technology as a determinant of human action and organizational structure falls into two general categories, positivist and skeptical. Further, these two categories can be found in literature on computer information systems, and more specifically in literature on ERP. Turning to the opposing lens, I will now discuss social determinism as it pertains to 20\textsuperscript{th}-century philosophy concerning technology, information systems literature, and literature on enterprise systems.

\textit{Social Determinism}

Research through the social determinist lens views technology as a social construct which organizations and individuals shape and control. In relation to enterprise systems, sociologists Hanseth, Aanestad, and Berg (2004) defined information technology from this approach by stating that information technology “only exists through our descriptions and practices, and hence it is never available in a raw, untainted state” (p. 2). Research from this perspective can be found in three main schools of thought: socio-technical studies, computer-supported cooperative work, and recent North American research (Lamb & Kling, 2003).
Socio-technical studies (STS) reflect a sociological perspective established in the 1970s by a group of Scandinavian scholars who were attempting to see how social settings were being established through information technology (Lamb & Kling, 2003). As Lamb and Kling summarized, STS was founded on the human resource discipline, which assumes that employees will perform more efficiently if they work in better living conditions, which can be enhanced through appropriate technological innovation. However, unlike the technological determinist, who credits pure technological advancement as the provider of innovation, STS researchers believe that end-users provide the best insight into what innovations need to occur. As Lamb and Kling explained, “[STS] researchers purport that when the workers who are expected to use the [IT] under development also take part in its design and implementation, the use context will be more fully reflected in the final system, and workers’ tacit knowledge about the task can be brought to bear” (p. 200).

Following the assumptions of STS researchers, researchers who have identified themselves as part of the computer-supported cooperative work (CSCW) approach agree that end-users impact the way in which computer software is developed, but they view users as individuals who do not typically view themselves as “users” but as workers in occupations. That is, users are less aware of the day-to-day negotiation of information technology and more in tune to their occupational-specific goals and functions (Lamb & Kling, 2003). From the CSCW approach, the way in which technology is used is defined by the interaction between organizational members and not necessarily between individuals and technology.
Finally, as Lamb and Kling (2003) noted, recent sociological views of technology from North America have also sprung from the assumptions of both STS and CSCW; however, both Marxist and open-systems perspectives have been added to account for power relationships within and outside of an organization. As they explained, “Several organizational [information systems] studies have stressed the need for a larger environmental scope when dealing with [IT] use, … influenced not only by organizational contexts, but also by interorganizational, cultural, and global contexts” (p. 200).

In addition to the sociological viewpoints already discussed, a few anthropological approaches have also contributed viewpoints which are based on determinism of humans or end-users, more specifically end-users’ patterns of behavior. For example, Abdinnour-Helm, M. Lengnick-Hall, and C. Lengnick-Hall (2003) argued that the normative culture in an organization can be more powerful in determining the way in which technology is used than the individuals or groups who are responsible for developing or implementing the system. Abdinnour-Helm et al. concluded that pre-implementation efforts to prepare employees for change made by ERP project leadership do not seem to affect individual attitudes towards an ERP project. Instead, job tenure is most positively related to resistance to ERP, while newer employees are more accepting of the cultural changes that ERP systems bring about in an organization.

Karahanna and Straub (1999) studied ERP systems from the innovation diffusion perspective. They found that an individual’s adoption of a new enterprise system did not occur until after an individual used the system. That is, end-user interaction with the enterprise system changed beliefs and attitudes about the technology. Again, as in the
case of Abdinnour-Helm et al. (2003), pre-implementation efforts were not determiners of adoption.

In addition to usage affecting adoption, Karahanna and Straub (1999) also argued that individual usage, which is often self-directed, brings about individualized ways in which users interact with the system, causing a multiplicity of user behaviors within an organization. As Karahanna and Straub stated,

... there is an interplay between technology and the social process of technology use resulting in the same technology being used in multiple ways. ... different users of technology, be it Windows or spreadsheets or workstations, will each “appropriate” and “reinvent” the technology in the process of using it. ... it is impossible to determine whether Windows adoption and use had the same meaning for all respondents in the organization or whether Windows as a technology had relatively stable perceived characteristics across adoption and continued usage. (p. 11)

By describing technology adoption as a subjective experience, Karahanna and Straub concluded that technology adoption should not only be measured by the rate of acceptance but by the way in which technology is adopted on an individual basis.

Finally, Greener (2002) viewed an organization’s interaction with technology from the path-dependency perspective, which assumes that organizations naturally become “locked into behavior patterns” which are mediated through technology. Path dependency, as Greener argued, is how organizational history and culture form in organizations. In regard to ERP implementation, the author stated that ERP systems will inevitably be shaped by the type of trial-and-error formed paths upon which users grow dependent.

Up to this point, I have reviewed the literature on technological and social determinism. My discussion of these two viewpoints brings me to the next theoretical
framework called technoscience studies, which has gained popularity in 21st-century research.

Technoscience Studies

Technoscience studies, as described by Latour (1999), assume that there is no distinction to be drawn between the deterministic forces of both humans and technology. In chapter six of his book entitled *Pandora’s Hope*, Latour laid out the theoretical foundation within technoscience studies, which he referred to as actor-network theory, or ANT. To explain the theory he juxtaposed two gun-control arguments from both the materialist (or technological determinist) and sociological determinist perspective. As Latour explained:

“Guns kill people” is a slogan of those who try to control the unrestricted sale of guns. To which the National Rifle Association replies with another slogan, “Guns don’t kill people; people kill people.” The first slogan is materialist: the gun acts by virtue of material components irreducible to the social qualities of the gunman. On account of the gun the law-abiding citizen, a good guy, becomes dangerous. The NRA, meanwhile, offers … a sociological version more often associated with the Left: that the gun does nothing in itself or by virtue of its material components. The gun is a tool, a medium, a neutral carrier of human will. If the gunman is a good guy, the gun will be used wisely and will kill only when appropriate. If the gunman is a crook or a lunatic, then, with no change in the gun itself, a killing that would in any case occur, will be simply carried out more efficiently. (pp. 176-177)

The analogy of the gunman and the gun explains, in very simple terms, how the interaction between any individual and a piece of technology will be a highly unique experience based on the qualities of the two agents.

As an alternative to the technologically and socially deterministic perspectives, Latour (1999) suggested that both the gunman and the gun, both of which he called agents or actors, have certain goals, intentions, capabilities, and “scripts.” When the two
agents cross paths, it is not the goals or intents of one agent which determine the goals or intents of another. Instead the goals are translated into “a new vocabulary” to create a goal or intention “which did not exist before.”

In the case of the gun control arguments, Latour (1999) explained the technoscientific view of the relationship between gun and gunman by stating,

You are different with a gun in your hand; the gun is different with you holding it. You are another subject because you hold the gun; the gun is another object because it has entered into a relationship with you. The gun is no longer the gun-in-the-armory or the gun-in-the-drawer or the gun-in-the-pocket, but the gun-in-your-hand, aimed at someone who is screaming. What is true of the subject, of the gunman, is true of the object, of the gun that is held. A good citizen becomes a criminal, a bad guy becomes a worse guy; a silent gun becomes a fired gun, a new gun becomes a used gun, a sporting gun becomes a weapon. ... If we study the gun and the citizen as propositions ... we realize that neither subject nor object (nor their goal) is fixed. When the propositions are articulated, they join into a new proposition. They become “someone, something else.” (pp. 177-178)

Latour termed this “becoming” as an invention of a new agent (pp. 179-180).

This concept has been applied to research on information technology and organizations, as seen in a compilation of seven case studies edited by Ciborra (2000b) in From Control to Drift: The Dynamics of Corporate Information Infrastructures. In these instances, researchers applying Latour’s theoretical approach tried to identify how organizations “drift” as a result of the interaction between the human and non-human actors when new information infrastructures are implemented. From the technoscience perspective, Ciborra refuted the assumption that a researcher should choose one of the two deterministic lenses. Instead, the author argued that the researcher of technology implementation needs to start in the “messy reality” of the field where the assumption is that “plans ... keep being diverted, surprises ... arise constantly, [and] opportunistic adjustments ... must be carried out on the spur of the moment” (p. 29), thus
understanding how the organization and information system create a new, unique, and unforeseen identity based on the context.

*Enterprise Resource Planning in Higher Education*

Though most higher education articles on ERP can be found frequently in weekly periodicals such as *Educause* and *The Chronicle of Higher Education*, scholarly research on enterprise resource planning in higher education is scarce and critically needed. According to Pollock (2003), the non-empirical literature on ERP and higher education typically follows the assumptions of positivistic technological determinism, which holds the view that innovations in technology will determine the improvement of educational organizations. Pollock prefaced in his own study,

> Much of the writing on universities tends to be future oriented, structured around questions about what the implications of the technology will be rather than on empirical studies. Much of this work overlaps with the more general debate on the future of the university, both of which generally give a large degree of influence to the capacities of new technologies. As a result one seldom gets a sense of where these artifacts come from, how they are shaped, the process by which they are built into institutions, or the variety of outcomes that might arise as they are deployed within the … institution of the university. (p. 103)

Perhaps one exception to Pollack’s (2003) statement is a 2006 volume of New Directions in Higher Education entitled *Building a Student Information System: Strategies for Success and Implications for Campus Policy Makers* edited by Don Hossler (2006), higher education researcher and enrollment management professional. In this volume, Hossler pulled together university enrollment management professionals to contribute articles on ERP implementations in higher education. The volume, as Hossler and Pape (2006) stated in the volume’s first article, was
written to provide faculty members, middle managers, and senior-level college administrators involved in implementing enterprise resource planning systems (ERPs) with a perspective on the history and purposes of ERPs, the costs and processes associated with implementing these systems, and the issues associated with the ongoing care and maintenance of those systems once they are installed (pp. 1-2).

Though the volume does not offer empirical studies on ERP implementations in higher education, it offers a historical account of the development of enterprise systems, a description of events in a standard implementation, and a glossary of ERP-related terms. More importantly, the chapters provide realistic, professional advice for leaders who are planning to implement a new enterprise system. For this reason, I will utilize the information found in the volume to assist me in defining ERP terminology.

This review of the literature on the effects of ERP systems in higher education will only include a small collection of empirical studies which arose out of a group of studies involving two post-secondary institutions. The first qualitative field study conducted at an American university, called both “Big Ivy” and “University ABC,” produced a dissertation from Wagner (2002), a working paper from Scott and Wagner (2002), an article from Wagner and Newell (2004), and a second article from Wagner and Newell (2007). The second qualitative field study at British university, called both “Big Civic” and “Red Brick,” brought forth articles by Pollock (2003), Pollock, Williams, and Proctor (2003) and Pollock and Cornford (2004).

In the final section of this chapter, I will discuss the studies on the research conducted on these two post-secondary institutions (Big Ivy/University ABC and Big Civic/Red Brick) by these two author groups (Wagner, Scott, and Newell; Pollock, Williams, Proctor, and Cornford) in four ways. First, I will briefly summarize research questions of these researchers and demonstrate how their theoretical lenses on technology
and information systems tie back to the common philosophical perspectives on technology and information systems. Second, I will discuss the methodologies and findings of the studies. Third, I will summarize how this group of researchers described the characteristics of higher education organizations. Finally, I will synthesize the findings of the authors’ research according to the four-part organizational framework developed by Bolman and Deal (1997) in order to discuss the current understanding on the effects of enterprise systems in higher education.

Research Questions

The research questions related to the ERP implementation at universities in the studies reviewed revolved around the lack of alignment between the unique organizational characteristics of universities and the standardized characteristics of enterprise systems. Wagner’s dissertation (2002) and her work with Scott examined ERP implementation from a sociologically deterministic perspective, by asking how negotiations between “disparate” groups and individuals at a university “manage, despite conflict to achieve a working system – one that binds disparate individuals and groups together for better or worse” (Scott & Wagner, 2002, p. 1). Wagner and Newell (2004) defined the term disparate more specifically in a cultural framework by examining the way in which the various epistemic cultures of a university interact with the standard configurations of the enterprise software, developed out of “best practices” by asking, “Is it possible to identify a standard ‘best practice’ in a context characterized by users from diverse epistemic cultures?” (p. 306).
Pollock and Cornford (2004) and Pollock, Williams, and Proctor (2003) addressed the tension between the current identity of a university in relation to the market-oriented identity embedded in the ERP system. From the viewpoint of technoscience studies, these studies inquired into the manner by which an institution and ERP system “translated” the identity of a university. To describe this translation, they looked at organizational decisions on whether to choose software default features or to customize software.

Pollock (2004) was also concerned with how a university constructed a new identity in relation to ERP. Pollock addressed the self-service module of ERP and investigated how the self-service module, which was developed in the e-commerce sector, translated in the higher education sector.

Theoretical Lenses

Within the scholarly works concerning ERP implementation in higher education, Wagner (2002), Scott and Wagner (2002), and Wagner and Newell (2004) utilized the socio-techno studies lens to examine their case. In relation to technoscience studies on Red Brick/Big Civic, researchers honed in on one concept introduced by Bruno Latour called “black boxing.” Black boxing, as defined by Latour (1999), is an expression from the sociology of science that refers to the way scientific and technical work is made invisible by its own success. Explaining the phenomenon of black boxing, Latour provided the following example.

When a machine runs efficiently, when a matter of fact is settled, one need focus only on its inputs and outputs and not its internal complexity. Thus paradoxically, the more science and technology succeed, the more opaque and obscure they become. (p. 304)
The authors looked for places of conflict to capture the details of the tension between ERP and the university before the conflict became “black boxed.” Pollock (2003), Pollock, Williams, and Proctor (2003) and Pollock and Cornford (2004) used the technoscience studies lens to examine an ERP implementation case.

Methodologies

All methodologies in these studies were qualitative in nature and all involved the study of a single institution. Research from Pollock (2003), Pollock and Cornford (2004) and Pollock et al. (2003) emerged from a 3-year ethnographic study during an ERP implementation at an institution known as both Red Brick (Pollock, 2004) and Big Civic, a British University in the North of England (Pollock et al., 2003). The method of transcribing the history of the implementation was conducted in “biography” format as established by Appaduria (1992) and Kopytoff (1992). From the anthropological perspective, the biography format allowed the researchers to examine more easily how technologies were “culturally redefined” by users rather than the theoretical application of technologies in a passive state (Pollock & Cornford). Various methods were used to collect data “which included direct and participative observation of ‘strategy’ and technical meetings and user testing sessions” (Pollock & Cornford, p. 39); meetings with programmers from the software vendor; individual and group semi-structured interviews with employees of the university; focus groups with end-users; and supporting documents including notes, e-mail correspondence, and reports (Pollock & Cornford).

The work of Wagner (2002), Scott and Wagner (2002), and Wagner and Newell (2004, 2007) was based on a year-long field study at “Big Ivy” or “University ABC” at which researchers conducted approximately 5 site visits, each visit lasting around 8
weeks (Wagner, 2002; Wagner & Newell, 2007). The site visits included sessions totaling at least 120 narrative interviews with representatives from central administration, departmental administration, and faculty researchers (ERP end-users). The lead researcher deduced what issues and events were important to all end-users in order to direct subsequent interviews toward such issues and events. This interview strategy was an adaptation of Adam’s “social times” apparatus, which tracks temporal shift in “working rhythm, pace, and order” (Wagner, 2002, p. 7). The assumption is that important issues and events tend to point to changes in administrative practices behind this strategy.

**Findings**

The findings from this group of studies all addressed two topics. First, the studies indicated that the pre-implementation strategies for establishing an ERP system did not encompass all organizational units and functions of the organizations. At Big Ivy, for example, the enterprise software met the business needs of the administration. Wagner and Newell (2004) described how Big Ivy administration hoped that their new ERP application suite would bring business-model fiscal stability through standardization of practices. However, as shown by Wagner and Newell (2004) and Scott and Wagner (2002), the ERP standard configuration, based on “best practices,” forced standardization of functions across units and did not complement the “diverse epistemic cultures” of Big Ivy. The fiscal needs of the central administration were different from those of the research faculty, but the ERP system forced users from both groups to work with the program that benefited only central administration. After the institution went live with the
enterprise software, faculty refused to work with the system unless it was modified to meet their needs. In reaction to the faculty’s actions, the university established an ERP support center for faculty along with a middleware system which met their needs and interfaced with the ERP system. As Wagner and Newell wrote:

> We conclude that, in a context where you have diverse user groups, with different work practices and epistemic cultures, and with different levels of background experience, a single industry solution is not going to be the “best” from all perspectives. (p. 325)

In the study of the ERP implementation, particularly a self-service module, at Big Civic, Pollock (2003), Pollock and Cornford (2004), and Pollock et al. (2003) described how the university hoped to (a) gain the market benefits of a self-service e-commerce system and increase efficiency in processing student registration; (b) exemplify the global technology characteristics of a contemporary business organization; and (c) achieve a cutting-edge higher education sector. First, the researchers concluded that it was difficult for the university, with its loosely coupled structure and distributed leadership, to adapt to the type of uniform “radical change” that the ERP systems demanded. The university did not have a mechanism in place to address the many organizational changes which the institution faced during implementation. Large numbers of implementation decisions were not addressed by the functional users and were instead “deferred” to the default settings in the software. The lack of shared goals and campus-wide communication led to the halt of the implementation of the self-service module. Late in the enterprise implementation, faculty voiced their disapproval about the new self-service business process found in the student module. Faculty felt that the concept of self-service did not correspond to their values related to the traditional face-to-face advisement and
registration process. As a result the implementation of the self-service component of the software was halted.

Second, the studies showed how conflict arose among units and functions during the ERP implementation process, as the unique needs of the organization, which were not articulated prior to the implementation, did not align with the standard defaults found within the enterprise software. The poor fit between the enterprise system and the organization resulted in unplanned reactions to solve challenges that were not foreseen in the implementation strategy. Such actions included post-implementation “work-arounds” by individual users and post-implementation software customizations to solve problems not addressed by the enterprise software.

Finally, Wager and Newell (2007) showed how the effects of ERP implementations in one university did not end with the implementation of the software. On the contrary, the interaction between the higher education organizations and enterprise software continued “iteratively” past the implementation phase and into the post-implementation phase as “phases of configuration/customization and implementation/use … alternate[d] cyclically [and] gradually,” (p. 520) so that the effects of ERP implementations remained ongoing even after the implementation. The reason for the university’s continued customization and configuration of the software was due to the fact that “best practices” imbedded in the software were not easy to “implement and use” (p. 520). In their concluding comments on their study of the post-implementation, Wagner and Newell established a significant connection between their findings on implementations and post-post-implementations; namely, that software vendors may actually sell software based on best practices already knowing that the unique needs of
higher education organizations will require implementation and post-implementation vendor-provided consultancy services for customization needs. Wagner and Newell, in explaining this supposition, offered the following analogy: "In some ways this is like selling a ready-made meal that still requires a professional cook to assemble the dish" (p. 520).

**Characteristics of Universities**

The previously mentioned findings on ERP implementations in higher education institutions suggest that the organizational characteristics of universities do not align with the characteristics of ERP software. Before I further discuss this lack of alignment, I will provide a summary of the unique organizational characteristics found in higher education organizations. In the literature on ERP implementations in higher education, I have identified four organizational characteristics (structural, political, cultural, and human resources) by which these authors define the characteristics of higher education organizations. These organizational characteristics fit into a four-part framework developed by Bolman and Deal to examine organizations and organizational change (1997).

In describing structural characteristics at Big Civic, both Pollock (2003) and Wagner and Newell (2004) referenced Karl Weick (1976) in defining the organizational structure of the university. Weick described the educational institutions as “loosely coupled” organizations. That is, “events” and “mechanisms” within the same educational organization tend to preserve their “own identity” and some evidence of “physical or logical separateness” (Weick, p. 2). In his original journal article on loosely coupled organizations, Weick provided an example of a secondary educational organization
which embodied a loose coupling between the “technical core of the organization” and the “authority of office” (Weick, p. 4), writing:

   In the case of an educational organization, it may be the case that the counselor’s office is loosely coupled with the principal’s office. The image is that the principal and the counselor are somehow attached, but that each retains some identity and separateness and that their attachment may be circumscribed, infrequent, weak in mutual effects, unimportant, and/or slow to respond. (p. 3)

In the world of higher education we can easily see the organizational relationship between the counselor and the principal as similar to the relationship between a university president and an administrator of a research grant, a department chair, or an adjunct instructor.

   This description of a loosely coupled organization complements Mintzberg’s illustration of the university as a professional bureaucracy. According to Mintzberg, a professional bureaucracy has a large operating core (faculty) “relative to its other structural parts,” a small technostructure (staff), and few levels between the strategic apex (administration) and the operating core (faculty). This structure forms a “flat and decentralized profile,” wherein “professionals are insulated from formal interference, freeing them to use their expertise” (Bolman & Deal, 1997, p. 66-67).

   In the context of the universities, Wagner (2002) and Wagner and Newell (2003) described the loose coupling between faculty researchers, central administrators, and departmental administrators. Pollock (2003) indicated loose coupling between the students and the university and between faculty and administrators. Pollock and Cornford (2004) discussed loose coupling between the software vendor and senior management; between students and the university; and between ERP end-users and the ERP software system.
The political characteristics of a university are described as a shared or diffused governance. Such governance is distributed across the organization in the form of departments, divisions, faculty and student organizations, and committees, within all of which decisions are made and negotiated among campus and community stakeholders, as described by Cohen, March, and Olsen (1972).

In similar terms, Pollock (2003) defined the formal political structure within a university in the following manner:

[The university] is a band of scholars coming together in pursuit and dissemination of knowledge, governed by a more or less collegiate model of organization, based around a complex structure of committees and with a high degree of individual and departmental autonomy. In this sense, the university as an organization tends to lack a clear identity, primarily existing in the heads of people who constitute it and a myriad of locally negotiated practices and interactions. (p. 103)

As Pollock stated, the political structure of a university, by design, is not organized to force a unified top-down direction of the organization in a controlled manner, as many businesses are designed. Though informal power relationships may exist throughout organizations, the formal political power structure does not follow clear chain of command.

Cited by Wagner and Newell (2004), Cohen et al. (1972) argued that essentially no individual, or select group of individuals, is ever in charge of the decision-making in the organization. Instead they explained that universities tend to operate on the basis of (a) “a variety of inconsistent and ill-defined preferences”; (b) simple trial and error procedures; and (c) “fluid participation” of members or decision makers (p. 1). The result of these characteristics is that universities make decisions without “consistent, shared goals” (p. 2). Universities, according to both Weick (1976) and Cohen et al. (1972), hold
a number of unique goals from autonomous loosely coupled interests groups. In fact, unlike most organizations in the business sector, universities tend to promote differences among groups and individuals, through a loosely coupled structure and a shared form of governance. The control of the allocation of resources also becomes difficult to maneuver within a university because the decision-making process, according to Cohen et al. (1972), tends to uncouple problems from the decisions. As Cohen et al. stated,

Although decision making is thought of as a process for solving problems, that is not often what happens. Problems are worked upon in the context of some choice, but choices are made only when the shifting combinations of problems, solutions, and decision makers happen to make action possible. (p. 16)

When conflicts arise, they are often reinterpreted during the decisions process, so that original problems are not resolved and final decisions are made by “flight or oversight” (p. 16).

According to Bolman and Deal (1997), the cultural perspective on organizations embodies the assumptions that “what is most important about any event is not what happened but what it means (p. 216). In the literature on ERP in higher education, the cultural characteristics of universities are specifically addressed by Wagner and Newell (2004), who argued that universities, as a result of loose coupling between functions, grow “diverse epistemic cultures” (p. 306). That is to say that, if the meaning of events and actions within in an organization are derived from the way in which we view the world, a university would hold within it many meanings for one action. Wagner and Newell argued that enterprise software did not align with this organizational characteristic because it embodied the assumptions of only one epistemic culture, which the software vendor called “best practices.” Wagner and Newell defined a diverse epistemic culture as a community which embodies “different sets of social, material and
discursive practices that make up how we know what we know” (2004, p. 308) This diversity, in turn, brings about the “heterogeneity of knowledge-creating activity across contexts” (p. 308). In their study, Wagner and Newell found that the enterprise systems meant something different within each culture at the university according to each group’s “way of knowing.” For example Wagner and Newell described how the faculty research culture viewed funding differently from central administration. Faculty researchers were described as a community which thrived in ambiguity. In the research culture, their financial processes tend to be messy and unpredictable because the outcomes of research were reached in a nonstandard pattern. Further, as mentioned in the political framework, participation within the research community was “fluid.” On the other hand, the central administration embodied a rational linear understanding of budgets and finance. In working with faculty researchers, the central administration was not able to discern budget patterns in the research processes in order to create linear processes and improve fiscal responsibility and accountability (Wagner & Newell).

As in the other frameworks, the human resources characteristics of a university found in the literature on ERP and higher education show a diversity in the ways in which people fit into university. According to Bolman and Deal (1997), the following assumptions provide the foundation of the human resources frame: (a) organizations exist to serve human needs rather than the reverse; (b) organizations need ideas, energy and talent; people need careers, salaries and opportunities; (c) when the fit between individual and system is poor, one or both suffer; and (d) a good fit benefits both. The needs of people in a higher education organization differ widely from function to function and unit to unit. What may meet the needs of one department may serve as a poor fit for another.
Employee needs, as shown in the case studies on ERP implementations in higher education, included concerns of job stability, job efficiency, and job competence. Structurally, the loose coupling of the university organization allows for these unique fits to co-exist within the same organization.

Researchers studying ERP implementations in higher education discussed how the fit between the person and the job in all facets of the university is loosely defined as a result of the loosely coupled structure. For example, in Wagner and Newell’s study (2004), the departmental administrators were described as faculty members who served as the organizational link between central administration and faculty. Though they were responsible for administrative tasks including departmental budgeting, they were also seen as leaders in their disciplines and perceived themselves more as scholars than administrators. As administrators, the departmental administrators were defined as generalist in terms of carrying out organizational bureaucracy. They were able to receive basic and easy to understand financial reports from the finance division and employed assistants to carry out many of the administrative functions related to such reports (Wagner & Newell).

*Characteristics of Universities in Relation to Characteristics of Enterprise Software*

In this review of the literature on ERP systems in higher education, all authors argued that ERP systems are built on organizational assumptions which do not correspond with the characteristics of higher education organizations. This lack of correspondence caused both the software and the university to merge and translate into a new unforeseen identity.
Structurally, universities have been described as being “decentralized” (Bolman & Deal, 1997), and “loosely coupled” (Weick, 1976). These labels stand in contrast to the ERP systems in the business sector. Kapp (2001) described these systems as embodying both the linear logic of MRP systems, which are designed to align units and functions in a supply chain, and a “business philosophy” to standardize all data across an organization in order to provide seamless communication between all units and functions with the goal of improving organizational efficiency.

The organizational assumptions on which ERP systems were founded contrast to the assumptions on which higher education organizations have evolved. That is to say, ERP systems are designed to align and standardize data system across functional units, while higher education organizations condone a diversity of data systems within different functional units. Even within the sector of higher education, this diversity exists across institutions. Wagner and Newell (2004) pointed to the best-practices design of ERP systems as a problem for higher education organizations when implementing ERP systems. The best practices of an industry may be determined by leadership in the field, consultants, and software vendors, with the assumption that all organizations can run on standardized practices. Wagner and Newell found that a gap exists between the higher education best practices embodied in the software and the unique context of each university.

Politically, the loosely structured decision-making process of the university brought tension to the overwhelming number of policy and procedure decisions that had to be made during implementation, as seen in the case study by Pollock and Cornford (2004). Both a “senior management committee” and a “project committee,” which met
once per week, were assigned to the task of making these decisions. Because members of
the committee did not have the knowledge base to make decisions, these committees
failed to resolve many of the policy and procedure issues. This meant that the vendor-
created or default policy imbedded in the software was utilized in lieu of a more context-
driven policy. As Pollock and Cornford (2004) described,

Here, then, is a first example of how the status of a university is distributed: because the committee cannot decide on the details of the system, responsibility for resolving the decision is deferred and then pushed down to the project team who, in turn, are unable to do anything other than shift the decision onto the system itself. What implication does this distribution have for the university? (p. 42)

Here, Cornford provides a clear example of how the shared governance of a college or university does not align with centralized and fully dedicated decision-making group required for enterprise implementations.

From a cultural perspective, the ERP system came into conflict with the diverse epistemic cultures as described in Wagner and Newell (2004). As Wagner and Newell explained, diversity in a university can co-exist within a loosely coupled organization because groups with disparate points of view were not tightly bound by uniform patterns of behavior. ERP, on the other hand, forces these groups to operate under a homogenous culture which was driven by the best practices of a business logic embedded in the ERP software. While university administration viewed the ERP business model as a favorable solution for the economic goals of the institution, the new system brought difficulties to the existing cultural behavior of faculty researchers and departmental administrators. As Wagner and Newell concluded, “Unless one believes that power indicates superiority, the notion of ‘best practice’ can only ever mean the dominant perspective” (p. 326).
From the human resources perspective, Wagner and Newell (2004) showed that the central administrators of Big Ivy felt that ERP would bring improved stability, efficiency, and competency to a financial process that was previously perceived as lacking “institutional order and accountability” (p. 321). At the same time, departmental administrators (faculty chairs) felt that ERP threatened employees’ stability, efficiency, and competency in that ERP “assumed a level of sophistication and a knowledge base fundamentally at odds with the current arrangement of university work” (p. 322). Departmental administrators, described as generalists in their administrative duties, were unqualified to manipulate complicated accounting functions imposed by the system. This made them unable to do their jobs. In turn, when faculty researchers were not getting their traditional budget report from departmental administrators, as they had in the past, they came into direct contact with the ERP system and quickly they grew distrustful of central administration and the way research monies were monitored by ERP. Their distrust eventually led to the halting of the ERP system implementation.

Table 1. Characteristics of Universities in Relation to Characteristics of Enterprise Systems (Frameworks Adapted from Bolman and Deal, 1997).

<table>
<thead>
<tr>
<th>Frameworks</th>
<th>Universities</th>
<th>Enterprise Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural</td>
<td>Loosely coupled units</td>
<td>Integrated system</td>
</tr>
<tr>
<td>Political</td>
<td>Distributed governance</td>
<td>Centralized controls</td>
</tr>
<tr>
<td>Cultural</td>
<td>Diverse epistemic cultures</td>
<td>Best practices</td>
</tr>
<tr>
<td>Human resources</td>
<td>Loosely defined roles</td>
<td>Specialized roles</td>
</tr>
</tbody>
</table>
In sum, these problems found in the literature reflect a broader issue in higher education which Barnett, in his work *Realizing the University in an Age of Supercomplexity* (2000), described as an identity crisis in the university. Barnett argued that the traditional identity of the university as an Ivory Tower must now include the current market demands of the outside worlds in order to survive. These demands require an accountability that enterprise systems were designed to handle. Barnett wrote,

Deep down, the university still holds to a belief in its role as a site of reason in society. And not just any old reason: reason for a better world is still embedded deeply in the university’s self-understanding. But that story has taken a new twist. Markets, information technology, the lure of patents and technology transfer, and the multiplication of society’s economic capital: all these – and many other features – signal the insertion of the university into the values and activities of a wider world. ... Somewhat uneasily, it also acknowledges that it has to be a part of the audit society, the enterprise society, and even the modern society. (pp. 23-24)

In conclusion, Barnett questioned how the two worlds are to merge in a meaningful manner. He continued:

Purity and enlightened reason on the one hand; performativity and economic reason on the other: the university sees itself in both camps at once. It embraces the new stance of performativity while refusing to disinvest itself of the older stance of disinterestedness. Does this self-identity hang together? Can the university be a site of disinterested reason while also giving society the new forms of knowing that society calls for? (p. 24)

This organizational identity conflict, which Barnett identified, between the “disinterested interest” and “performativity” within universities corresponds with the type of tension found between higher education organization and enterprise systems. First, the external performativity demands on higher education correspond closely with the “best practices” assumptions found within ERP systems which, from a technologically positivist approach, serve to maximize the value of organizational data in order to increase performance and accountability. That said, higher education organizations’ structural,
political, cultural, and human resources components are clearly founded on organizational characteristics which run counter to such ideologies. In the next section I will discuss how the research questions found in the literature on ERP addressed the effects ERP implementations when the best practices found in the enterprise systems interact with the unique characteristics of higher education organizations.

Second, as Wagner and Newell (2007) pointed out, the best practices or performativity promises associated with the software may only be serving as a vendor sales pitch to attract higher education organizations into purchasing an enterprise system which claims to improve accountability. After the implementation begins and the tensions between the capability of the software and the needs of the organization arise, the notion of performativity is often sidelined, while the short-term challenges of implementation crises take precedence over strategic goals developed during pre-implementation planning.

Conclusion

As I have illustrated in Chapter Two, the implementation of information infrastructures into organizations is a complex phenomenon. In the previously mentioned cases, researchers described how the initial strategic assumptions for implementing ERP steered off the course when disparate groups within a higher education organization continually brought new issues and problems to the implementation process. In each context, many decisions involving university restructuring and ERP customization were not predicted during the pre-implementation planning stages. The findings in all studies
described institutions that drifted in unique ways from their pre-ERP state into a form which was not predicted.

In this chapter I have discussed the philosophical and contextual considerations of ERP systems in higher education. Such considerations will play a role in the shaping of my proposed study. In the next chapter I will discuss the methodology of my study, which is grounded both in the philosophical assumptions of technoscience studies and the findings of the previously discussed scholarly studies found in the context of ERP implementation in higher education.
Chapter Three: Methodology

The purpose of this study was to examine retrospectively ERP implementations in the context of higher education. From my literature review I have developed a general research question: What are the effects of ERP implementation in higher education organizations?

To answer this research question I built an hourglass-shaped framework through which to conduct my study at three universities (see Figure 2). This framework is loosely based on Bruce’s (2007) discussion of qualitative methodological strategies and Salganik and Heckathorn’s (2004) discussion of “snowballing,” or respondent-driven sampling.

The top half of the hourglass, which is funnel-shaped, represents both the narrowing of my conceptual framework and topic of study. That is, I (a) placed parameters on the concepts shaping the study (theoretical lens, approach to data), (b) reduced the population of ERP implementations to three commonly-bound cases, and (c) limited my inquiry to a target population within the ERP implementation related to both the student module found within the enterprise software and the university registrar’s office found within the university.

In the bottom half of the hourglass I designed a snowball framework (Salganik & Heckathorn, 2004) through which I explored the network of interaction between the student module and agents within the university. Here, I sought data through three stages of respondent-driven information gathered from interviews and collection of artifacts. I
incorporated the snowball framework for this portion of the study because it corresponded with the theoretical lens, actor-network theory, through which I chose to view the interaction between the higher education institutions and enterprise systems. Respectively, the snowball framework, or respondent-driven sampling, is a means of discovering information about a hidden population. As Salgenik and Heckathorn wrote, respondent-driven sampling provides a “network perspective” which views a hidden population as actual individuals “connected in a network of relationships” and not as “discrete, atomized units” (p. 196).

While developing the methodology for this study, I conducted a pilot study at a university which had implemented an enterprise system. I chose the university for my pilot study for the reasons of both convenience and relevance. Geographically, the university was nearby and accessible. Additionally, the pilot study university (a) had similar organizational characteristics to the institutions I visited for my formal study, and (b) had recently implemented the same enterprise software as the three institutions I visited for my formal study. The pilot study provided me the opportunity to assess the content validity of my pre-interview survey (Appendix A) and interview questions (Appendix B). In the cases of both pilot study and formal study, all interviewees were present in their positions at least one year prior to going live with the ERP student module.
Theoretical Lens
*How do I understand technology and human interaction?*

Techno-science Studies Lens

Approach to the Data
*How do I view the quality of the data?*

Interpretivist Approach

Population
*What is the population of the study?*

Universities which have implemented ERP systems

Target Population
*Where can the effects of ERP implementation be sought specific to higher education?*

ERP Function  University Function
Student Module  Registrar’s office

First Stage of Data Collection and Analysis.
*What were the effects of ERP implementation in Registrar’s functions which had the greatest amount of customization or default decisions?*

Collect and analyze pre-interview surveys and conduct initial interviews with registrars.

Second Stage of Data Collection and Analysis
*What agents or actors influenced the interaction between the student module and the registrar’s function?*

Conduct interviews with participants, whom the registrars identified.

Possible Third Stage of Data Collection and Analysis
*What were the effects of the ERP implementation?*

Interview individuals in the registrars’ offices one year after go live.

*Figure 2. Methodological framework.*
Theoretical Lens

I implemented the theoretical lens of actor-network theory as described by Bruno Latour (1999) in order to examine the enterprise implementations at each institution. Determined by the lens, I divided the general research question into three questions: (a) how do higher education organizations re-structure to work within the standards of the software, (b) how is ERP software customized to in order to adapt to the characteristics of organizations, and (c) finally, how does the ERP software and organization interaction translate into a new organizational identity as a result of ERP implementation.

As the previous ERP studies in higher education have shown, actor network theory, a theory described by Latour (1999) within the area of technoscience studies, sheds light on the change or drift which occurs within colleges and universities. By opening the black boxes in which customization and default decisions were made, the researchers of the previous studies noted how enterprise systems and organizations merged and translated into something new and different.

\[\text{Figure 3. Visual representation of research questions adapted from Latour (1999).}\]
While addressing implementation black boxes, I confronted a limitation in the study. By studying organizations after implementation had occurred, or retroactively, it was impossible to go back in time and reconstruct, in their entireties, the key moments or “black boxes,” as the passage of time often hides the “drift” or “translation” of the previous intentions of the agents (Latour, 1999). As a result, this study recognized the context of the data, which were gathered after the software implementation. I addressed this contextuality by utilizing an interpretive approach, as defined by Lacity and Jansen (1994) and Ciborra (2000a).

The “interpretive approach” in case study research is not uncommon in the field of information technology. The interpretivist approach as illustrated by Lacity and Jansen (1994) does not seek to find an objective reality within the data but views the data as a reflection of the context of the data at the time it was retrieved. Ciborra (2000a) emphasized the importance of interpretive perspective when examining implementations of new information infrastructures in organizations. In describing the function of the interpretivist approach, Ciborra contrasted two research approaches of information infrastructure: a positivistic technological deterministic approach and a technoscientific studies approach. From a positivistic technological deterministic perspective, a researcher can view technology as “possessing its own tendency towards perfection and systemization” (standardization, seamless task execution, “embedded set of conventions of practice”; Ciborra, p. 32). From the technoscience studies viewpoint, the interpretivist approach addresses the context recognizing that any number of influences can shape an information infrastructure in use and that the infrastructure cannot be viewed as a constant environment but an ever-changing context:
• including actors who are “involved in its establishment or development, so that it cannot be controlled by only one actor.”

• recognizing the “battles of standards” involving the “setting up and management of complex coalitions of actors and technologies.”

• addressing “history,” “path dependency,” and “unique events” that punctuate the development of infrastructure and have an irreversible influence on its configuration at any given moment. (Ciborra, p. 32)

Because, as Ciborra argued, there is no way to achieve a bird’s-eye perspective on an enterprise system implementation, I limited the study to only one functional module in an ERP system and relied on the perspectives of a limited number of actors to inform me of the complex coalitions in their histories of their ERP implementations.

Population

Unlike the previous studies which have qualitatively examined single cases or sites over a period of time during the implementation process, this study examined the implementation process across three sites retroactively or at one point in time after the ERP systems had gone live. I based the design of my comparative case method on Robert Stake’s methodology proposed in Multiple Case Study Analysis (2006). In the words of Stake, I studied the “quintain” or “collective target” across cases which are bound together by “common characteristics or conditions” (pp. 4-6). By doing so I sought to understand the cases individually, in addition to gaining a broader perspective on the quintain discerned through a collective examination of the cases. Indeed the schools had many common characteristics. First, they were all public 4-year universities located
within the same state. Second, they all fell under the same state governing board. Third, they shared the same regional accrediting body. Fourth, they were all implementing the same instance of enterprise software from a common vendor. Finally, they all shared a similar ERP implementation timeframe. In addition to their common university characteristics, I studied both the same module within the software—the student module—and the same university office at each institution—the registrar’s office.

Though the previous case studies on ERP implementations in higher education have been single-case studies, the deliberate selection of multiple institutions with such common characteristics may add to the theory building on the change or drift that occurs to universities and ERP systems as a result of ERP implementation. By utilizing these criteria, I was, according to Eisenhardt’s (1999) description of qualitative case selection, controlling “extraneous variation,” which “helps to define the limits for generalizing” the findings (p. 537) or lessons learned. At the same time, the analysis of similar institutions with similar implementation periods and with the same vendor allowed me to (a) “clarify a domain of the findings” (Eisenhardt, p. 537) as universities using ERP system implemented between 2003 and 2006, and (b) discern similarities and differences across similarly selected cases to build theory within the domain (Yin, 1984).

Target Population

In regard to the specific context within each case, I examined the implementations from one vantage point within the university—the registrar’s office—as well as from one vantage point in the ERP system—the student module. The student module was chosen because it is the module within enterprise systems that is unique to the higher education
sector. The registrar’s office was chosen for its close association with university enrollment planning and management.

The registrar’s office was also chosen for its close association with the student module. Almost all registrar’s office functions can be found within an ERP student module. According to Stewart and Wright’s (2005) study of the job duties of registrars’ offices at 80 universities in 26 states from 1995 to 2005, functions in the registrar’s office may include:

- Budgetary management
- NCAA athletic eligibility certification
- Classroom scheduling
- Commencement/graduation planning
- Enrollment reports/projections
- Coordination of registrar policies and procedures among academic units
- Enrollment verification
- Ensuring integrity of data issued from the registrar’s office
- Initiating coordinating changes to the student information system
- Issuance of transcripts
- Maintenance of student academic records
- Monitoring satisfactory student progress
- Performance of degree audits
- Performance of final degree certifications and diplomas
- Processing grades
- Professional organization affiliations
• Proposal/development of academic calendar
• Publication of catalog/bulletin
• Registration
• Scheduling classes and publication of class schedule
• Supervising academic advising
• Transfer credit evaluation
• Veterans affairs (pp. 24-25)

In addition to these commonly identified functions, the registrar’s role in the university setting has also grown more central to the development and maintenance of information management systems, such as ERP. In their study of the registrar’s changing job duties from 1995 to 2005, Stewart and Wright (2005) noted the increased job competencies for data management systems:

Today, higher education institutions are also seeking registrars who can demonstrate successful experience with the management of large and complex computerized databases for storing and maintaining student academic records; experience with classroom scheduling software; leadership experience in planning, implementing, and augmenting technology-based solutions; and experience implementing or maintaining online applications. The registrar’s office has become the institutional leader in implementing institution-wide technology applications such as online registration, grading, and degree audit, which are used by students, faculty, and staff. (p. 26)

I used this list of commonly identified registrar’s functions as the basis for my pre-interview survey (see Appendix A).

Data Collection and Analysis Procedures

The design of my data collection and analysis was based on the concept of snowballing or respondent-driven sampling. Respondent-driven sampling is a popular
method of data collection in study of “hidden populations” such as homeless populations or undocumented workers (Salganik & Heckathorn, 2004). Respondent-driven sampling allows a researcher to study a population through the social networks of certain individuals within that population as opposed to a random sampling or a predetermined sampling of a known group of individuals within the population. With respondent-driven sampling, a researcher identifies one individual within a population as a “seed,” collects data from the seed about the population, and obtains additional participants in the study based on the social network of the seed. After these additional participants are identified and agree to participate in the study, they in turn can serve as seeds for identifying yet more participants. Thus, this snowballing of participants establishes a social network within a population.

In my study I used this method of collecting information on the network of interaction that occurred between actors or agents during the implementation of ERP software. Though homeless populations and populations of undocumented workers may be less accessible to a researcher than employees in a university, the notion of accessing hidden populations corresponded closely with the theoretical lens that I chose for my study.

The network that I sought to understand was in fact hidden—or as Latour termed it, “black boxed” (1999). That is, when the two agents (either human on non-human) cross paths, it is not the goals or intents of one agent which determine the goals or intents of another. Instead the goals are translated into “a new vocabulary” to create a goal or intention “which did not exist before.” This alters the goals and intents of each agent. However, once the new goals or intentions are created, the translation of two goals into
one goal becomes "black boxed" or hidden. As a result it becomes difficult to understand the change or drift that occurred during the translation.

I identified the registrars as the seeds at institutions which I chose to examine for my study. Based in data I collected from the registrars through both a survey and an interview, I planned to determine both future participants in the study and directions for artifact collection.

Stage One of Data Collection and Analysis

In my first stage of data collection I intended to both provide a pre-interview survey to registrars at each site concerning student module customization and default choices within registrar’s office functions (Stewart & Wright, 2005) and conducted interviews with registrars at each institution. The pre-interview survey (see Appendix A) was distributed to the registrars at the 2 of the 3 institutions 1 month prior to the interviews. In the survey, I asked registrars to identify and list all registrar functions in their respective offices, as well as identify their perceptions of effects that ERP had on each of those office functions. The survey was to assist me in (a) determining the commonalities and differences of functional responsibilities across campuses and (b) identifying both the degree of software customization in the student module and the amount of department restructuring which occurred within the registrar’s office at each campus site. This pre-interview survey was also designed to assist me, from an interpretivist approach, in identifying software and organizational changes which “punctuate[d] the development of infrastructure and have an irreversible influence on its configuration” (Ciborra, 2000a, p. 32). As I discuss in chapter 4, the pre-interview survey was not an effective means of
identifying institutional restructuring and software customization at the first 2 universities I contacted. For this reason, I did not distribute the survey to the third institution.

To conduct the interviews, I spent at least one day at two of the three institutions and conducted interviews at the third institution by telephone. During the interviews, I used a set of common questions (see Appendix B) which related to the ERP implementation in order to determine the effects of ERP implementation based on the four organizational frameworks defined by Bolman and Deal (1997). I also asked the registrars to identify individuals both within and outside of the registrar’s office, who might provide additional insight about the ERP issues discussed in the interview.

Stage Two of Data Collection and Analysis

During stage two of the data collection and analysis process, I contacted those individuals whom the registrars had identified as potential interviewees for the study. In this stage, I planned to interview three to five individuals at each institution. All interviewees were to have been present in their positions at least 1 year prior to going live with the ERP student module.

Possible Third Stage of Data Collection and Analysis

In the third stage of data collection and analysis I followed-up with individuals at the institutions via telephone conversation and e-mail correspondence. The goal of my follow-up interviews was to evaluate the effects of the ERP implementations at the institutions 1 year after their first go-live semester.
Ongoing Data Collection and Analysis

Throughout these stages, I collected documents from the members of the registrars’ offices and other related offices, which assisted me in both building a historical timeline to identify the span of ERP phases as defined by Harwood (2003) and placing key historical events within those phases from each institution.

Data Analysis

Data collected in the form of interviews and documents were organized by (a) institution; (b) registrar’s function (Stewart & Wright, 2005); (c) the ERP implementation time frame (Harwood, 2003) to which the data referred; and (d) the type of work (strategy and planning, workflow and processing, and customer service). I analyzed the data to identify patterns and discontinuities both within each case study and across all case studies.

In my analysis of data collected on ERP implementation in higher education, I considered the following for analysis considerations as put forth by Baptiste (2001): (a) defining the analysis, (b) classifying data, and (c) making connections between and among categories of data. The definition of the analysis concerns how ontology, epistemology, and causality structure the design of the analysis (Baptiste). Ontologically, the philosophical lens that I chose determined the structure of the study. I chose a philosophical stance of technoscience studies (within which actor-network theory resides), which views both technology and technology users as determiners of the outcomes or effects within an organization. From an epistemological standpoint, I adopted an interpretivist approach addressing my data as a few perceptions of a complex
phenomenon and not an objective or bird's-eye reality of a phenomenon. I sought to contrast and compare perceptions using my knowledge of the topic at hand and with parameters which reduce the data sought within predetermined categories. As stated before, many perceptions or stories can be gathered from an ERP implementation; I intended to tell a story about the association between one university department (the registrar’s office) and one particular aspect of an ERP system (the student module). Causality is implied in my study, as my research question focused on the “effects” of ERP implementation. Based on the literature, it is a common assumption that ERP implementations cause change within organizations. That said, the causal inferences which I describe are perceived causes which both participants in the study and I, as the researcher, defined in order to make sense of the phenomenon.

In terms of classifying data, I tagged or labeled data according to the type of work within the registrar’s office and phase of implementation (see Figure 2). Within these categories I sought to determine events when (a) an organization re-structured to work within the standards of the software; (b) ERP software was customized in order to adapt to the unique characteristics of organizations; and (c) finally, the ERP software and organizations established a new unique organizational characteristic. Finally my task as a researcher was to use my own knowledge of ERP implementations when making the connections between and among the categories of data.

The study examined the ERP implementations as they related to both the traditional functions and emerging ERP functions found in the registrar’s office retrospectively in three general time periods of the ERP cycle: pre-implementation, implementation, and post-implementation. Harwood (2003) provided an explanation of
smaller phases which happen within these periods. During the pre-implementation phase organizations (a) recognize the need for a new information infrastructure and (b) select a software vendor to meet the pre-implementation needs of the organization. In the implementation phase the organization prepares and executes the project. According to Harwood:

The preparation involves the creation and maintenance of the conditions for the successful execution for the project. The execution itself involves a series of activities focused upon business processes ... to include ... process design, development and testing, training of users, and the production of support materials. (p. 5)

During the post-implementation phase organizations a) go live with the software and b) attempt to improve the system after the system is up and running (Harwood). The implementation cycle, as Harwood explained, does not follow a simple linear path and the struggle to seek organizational alignment is always an issue. For example, organizational needs may change due to market changes after a vendor has been selected, additional ERP costs and business process problems may only emerge after software goes live, or post-implementation improvements may be “more of a hindrance than an enabler” after the system has been established and business processes have become concretized (Harwood, pp. 5-6).

To achieve a wide perspective on the effects of ERP implementation on the registrar’s functions, the study included interviews with staff members at all organizational levels, including interviews with individuals involved with (a) planning and leadership, (b) workflow and processing, and (c) customer service. Outside staff and administrators who worked closely with the registrar’s office during ERP implementation were also interviewed as implementation issues arose that require additional perspectives.
Such individuals included staff from the admissions office, computing services, members of key steering committees, and administrative leadership.

In addition to interviews, data were gathered from other sources such as institutional documents, vendor documents, and follow-up questions to address issues that emerged during data collection. Though I sought to study institutions with similar characteristics and vendor selection, I understood that functions and organizational structures differed slightly from one site to the next.

In sum, I pursued answers to my research question through one university department—the registrar’s office—which corresponds to one module found on higher education ERP systems—the student module. When examining specific functions I attempted to gain perspectives on the effects of ERP implementation from organizational members and affiliates that interacted with those functions before, during, and after ERP implementation. To better make sense of my findings, I classified the work of such individuals in three categories: strategy and planning, workflow and processing, and customer service (see Table 1). After classifying the data into categories, I summarized the effects of the enterprise system implementation within the four-part theoretical framework developed by Bolman and Deal (1979), which provides a means by which to examine organizations. As discussed in the literature review, Bolman and Deal’s framework provided the researcher with four overlapping lenses—structural, political, human resources, and cultural—through which to examine organizations and organizational change.
Table 2: Example of Inquiry on the Effects of ERP Implementation in Higher Education.

<table>
<thead>
<tr>
<th>Type of work</th>
<th>Registrar’s function</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Example: Classroom scheduling</td>
<td></td>
</tr>
<tr>
<td><strong>Strategy and planning</strong></td>
<td>Pre-implementation</td>
<td>Implementation</td>
<td>Post-implementation</td>
</tr>
<tr>
<td>perspective</td>
<td>perspective</td>
<td>Perspective</td>
<td>Perspective</td>
</tr>
<tr>
<td><strong>Workflow and processing</strong></td>
<td>Pre-implementation</td>
<td>Implementation</td>
<td>Post-implementation</td>
</tr>
<tr>
<td>perspective</td>
<td>perspective</td>
<td>Perspective</td>
<td>Perspective</td>
</tr>
<tr>
<td><strong>Customer service</strong></td>
<td>Pre-implementation</td>
<td>Implementation</td>
<td>Post-implementation</td>
</tr>
<tr>
<td>perspective</td>
<td>perspective</td>
<td>Perspective</td>
<td>Perspective</td>
</tr>
</tbody>
</table>

**Interviews**

I received approval from the University of North Florida Institutional Review Board to conduct the study prior to making contact with the university registrars at the three institutions (see Appendix E). In order to uphold confidentiality guidelines and human subject policies developed by the Institutional Review Board at the University of North Florida, I created fictitious job titles for the individuals I interviewed and fictitious names for the institutions at the individuals worked, the enterprise system which they implemented, and relevant committees and organizations with which they associated.

I created two informed consent forms, which were approved by the Institutional Review Board. One form was designed for university registrars (see Appendix C), while the other was created for individuals whom the registrar referred to me for an interview (see Appendix D). I obtained informed consent from all individuals interviewed.

Interviews were semi-structured, in that I had a pre-determined set of questions to ask interviewees (see Appendix B), but I noted any context-specific events or general themes across interviews which led me to findings in preceding interviews. Interviews were
recorded and transcribed for analysis. The tapes were only accessed by myself, as principle investigator, and my dissertation chair. Tapes will be securely stored in my home for 3 years after completion of my dissertation. Data analysis occurred concurrently during the interview process across the sites.

**Delimitations and Limitations of the Study**

A number of delimitations and limitations of this study may warrant subsequent study after completion of my dissertation. With respect to the delimitations, my study of three public institutions of the same size within the same state, limits my ability to generalize beyond those cases. I did not capture information on other public US institutions from other states, private institutions, for-profit institutions, or newly established universities, whose organizational characteristics may have interacted differently with ERP software.

In terms of the limitations, the nature of this retrospective study limited data retrieval on the enterprise system implementation experiences which occurred prior to my interviews. Many important events of the enterprise system implementations may have been forgotten or black boxed as events occurring during the interviews become the more important events in the process. Further, I only spent a limited amount time at each institution at one particular point. Participants’ perspectives about the enterprise system implementations may have been limited to only certain issues on those particular days. Finally, I relied on the honesty and candor of participants and their abilities to recall what was important. Interviewing only those individuals related to the registrar’s office, I may have obtained too narrow a view on the interaction between the higher education
organizations and the enterprise system software. A more fully ethnographic study conducted across all three implementation phases would have provided greater insight into the “internal complexity” of ERP implementations (Latour, 1999, p. 304).

**Conclusion**

In spite of such limitations, studies of this nature are in critical need. As stated before, the body of scholarly research conducted on the effects of ERP implementation in higher education is small. As the rate of ERP adoption increases in higher education, it will be more important for educational leaders to reflect on the effects of enterprise systems across colleges and universities.

In the following chapter, I will both describe my experiences in conducting the study and provide the findings of my study. In doing so I will explain (a) how enterprise software implementations affected three universities, (b) how the enterprise software implemented at those three universities was affected by the implementation, and (c) how the enterprise software and universities interacted, thereby forming new institutional identities.
Chapter Four: Findings

The three schools in this study, Large Public Urban (LPU), Large Public Suburban (LPS), and Mid-sized Public Urban (MPU) fell into a “quintain” or “collective target” in that the three cases were bound together by “common characteristics or conditions” (Stake, 2006, pp. 4-6). The three public universities were bound, not only by the same state location, but by the same governing board, a state governing body which managed and controlled a state university and community college system. Primary board purposes included the centralization and standardization of many resources, policies, and procedures across multiple universities and community colleges. A manifestation of this purpose was the oversight of the student information systems at each campus, as well as the decision to replace the legacy student information systems at each campus with new enterprise systems. The legacy systems and the new enterprise systems encompassed the areas of human resources, finance, and student modules. In the early 1990s the board had purchased standard student information systems from a software vendor and implemented them at all system institutions. Ten years later the board decided that the systems implemented in the 1990s needed to be replaced and signed a purchasing contract for new enterprise systems in the early 2000s. There was a clear need to replace the legacy systems. From a technical perspective, the software vendor of the legacy systems planned to discontinue technical support and upgrades to the legacy software. From an organizational perspective, the governing board desired to provide better Web-based self-
service to students, staff, and faculty through an improved self-service component found in the new baseline software, as well as through a third-party portal software product, as detailed in the governing board's guiding enterprise implementation principles.

To implement the new enterprise systems across multiple institutions, the board divided the schools into multiple implementation groups. Each group of institutions would undergo a 2-year implementation process to include implementations of three ERP modules: finance, human resources, and student, along with third-party portal software. The implementation start dates of the three modules were staggered to create three occasionally overlapping implementation schedules. The student module implementation was to last approximately 18 months. All three of the universities I studied were in the first group of institutions to implement the software.

Though all three schools fell within a clearly defined quintain, the schools had unique characteristics that defined them individually. Comparing each school's Carnegie Classifications (www.carnegiefoundation.org/classifications/), I found that all three schools (a) had balanced arts and sciences/professions instructional programs, (b) were primarily non-residential, (c) and offered both baccalaureate and master's degrees.

LPS and LPU were more similar to each other in classification because of their size; they were both classified as "large" in size, serving between 20,000 and 30,000 students, and both offered doctoral degrees. However, while LPU had only a slightly smaller student population than LPS, LPU had a larger total revenue (governing board Web site, February 19, 2008), a much larger graduate population, a stronger research focus, and a law school. On the other hand, LPS had a smaller total revenue (governing board Web site, February 19, 2008), a larger full-time undergraduate population, fewer
doctoral programs, and a stronger undergraduate teaching focus (www.carnegiefoundation.org/classifications/). Classified as “medium” in size, MPU served approximately 7,500 students and offered no doctoral degrees. MPU and LPS had similar characteristics in that they both had served a very large undergraduate population.

Each institution’s setting within the state also characterized the institutions uniquely. While all three settings could be classified as “urban,” their urban characteristics varied. LPU was located in the downtown of a city with over 500,000 residents, while both LPS and MPU were located in smaller but fast-growing cities of approximately 100,000 residents (http://factfinder.census.gov). The city in which LPS was located bordered a much larger city, which is why I classified it as suburban, while MPU was located in a city which can be identified as the largest city in a multi-county rural region.

**Modifications to the Planned Methodology**

When I visited LPS and LPU in 2007, they were in their 13th month of the 18-month implementation phase of the student module and were in their first “golive” semester, which meant that functions within the registrars’ offices were running for the first time on the new enterprise software. When I interviewed the registrar at MPU, one year after I visited LPU and LPS, she was in the sixth month of the post-implementation phase.

After completing data collection from two of the institutions and while I was conducting my initial analysis of the data from the first two institutions, I contacted the third institution to conduct my final data collection. For the third institution, my
questions about the effects of enterprise implementations became narrower as they were then based on the data analysis of the first two institutions. I adopted a data collection method called “elite interviewing” in order to inquire into whether the enterprise implementation experiences of the registrar at the third institution were similar to or different than those of the first and second institution (Marshall & Rossman, 1999). In a sense, my first two case studies were exploratory in nature, while my third case was confirmatory. While I explored the effects of ERP implementations in the first two cases, I used the third case as a means of confirming whether the implementation experiences at the first two universities were similar to that of the third university. In the third case, the parameters of my inquiry were narrowed by the findings of the first two case studies. Due to time constraints, I was not able to analyze the data from all institutions concurrently and used the findings from the first two cases as a basis for inquiry into the third case.

Finally, I contacted participants at the institutions in the three cases 1 year after the enterprise system implementation just prior to completing my analysis in order to determine how the interaction between the enterprise software and the institutions forged a new institutional identity during post-implementation. At LPU and LPS, a year had passed between the time of my first interviews and the follow up interviews. In the case of the third institution my questions about both the implementation and pre-implementation occurred simultaneously, 1 year after the institution’s first go-live semester. When I developed the methodology, I did not intend to conduct follow up interviews during the post-implementation with the institutions 1 year after my visit. I decided to conduct these interviews as a result of reading an article written by Wagner.
and Newell (2007), which argued that the interaction between organizations and software continues to occur at a significant level during the post-implementation phase.

At LPS and LPU, institutional representatives had agreed to participate in my study of enterprise systems in higher education. I was able to visit LPU for 2 days and LPS for 1 day to conduct interviews. Additionally, I attended a state governing board-sponsored conference on the new enterprise system, at which the LPU, LPS, and MPU registrars attended. All governing board schools were present at the conference to hear presentations and conduct discussions about the new enterprise system.

While visiting LPS and LPU, I conducted interviews with individuals whom the registrar at LPU and the vice president of enrollment management at LPS had identified as key individuals in the implementation of the student module. At MPU and at the governing board, I only interviewed one individual. At LPU I interviewed the registrar, the assistant registrar, the scheduling coordinator, the client services coordinator, the records coordinator, an admissions representative, and an IT representative. At LPS I interviewed the vice president for enrollment management, the registrar, a financial aid representative, and an admissions representative. At MPU I interviewed the registrar, and at the governing board I interviewed an IT manager.

After returning from my fieldwork at LPU and LPR, I transcribed the interviews, organized my data, began extensive data analysis on the two cases, and began to establish findings about the effects of ERP implementations at both institutions. Once I developed some preliminary findings about the implementations at LPS and LPU, I conducted my interviewing with the MPU registrar to confirm my findings established from the first two institutions, as well as to gain post-implementation perspectives. Finally, I contacted
representatives from LPU and LPS 1 year after my visit to both inquire into their perceptions of the implementation 1 year after their go-live semester and hear about their post-implementation experiences.

Before visiting LPS and LPU, I attempted to contact the registrars at LPS and LPU as my initial points of contact. While the registrar at LPU became my initial point of contact, the vice president for enrollment management became my initial point of contact at LPS. Slightly different from LPU, LPS had a more tightly grouped enrollment management division to include the registrar, admissions coordinator, and a financial aid coordinator. At LPU those functions operated, on a day-to-day basis, more independently, and I spent most of my interview time with individuals in the registrar’s office. After establishing the points of contact, I sent each point of contact my pre-interview survey. The surveys were designed to receive information about the types of functions for which each office was responsible, the degree of change which had occurred in the registrar’s office functions as a result of ERP implementation, and whether the type of change was perceived as a software customization or a departmental re-structuring.

I sent the pre-interview surveys to the Registrar at LPU and the vice president for enrollment management at LPS via e-mail and postal carrier 3 weeks prior to visiting the institutions. I did not receive the completed surveys prior to my visit at the institutions via e-mail or postal carrier. During our first interview, the registrar at LPU provided me with the survey on which she indicated a few functions her office handled but did not indicate the areas which experienced change during the implementation. I did not receive the document from the vice provost for enrollment management at LPS.
Shortly after introducing myself to individuals at both institutions, both individuals stated that it was difficult to complete the pre-interview survey, as it was difficult to think about the changes that occurred in their departments categorically in the manner which the pre-interview survey required. This was also the case in my pilot study. In the words of Ciborra (2000b) and Latour (1999), I believe that the history of the implementation or the “black box” (Latour) could not be unpacked by these individuals categorically by function and degree of change. Instead the changes that occurred within the registrars’ offices during ERP implementation, as related to both the software and the departmental structure, were easier to discuss in the interviews within the context of the “unique events’ that punctuate[d] the development of [the enterprise system] and ha[d] an irreversible influence on its configuration” (Ciborra, p. 32). I was able to extract much of the pre-interview survey data from the interviews with the LPU and LPS registrars. Due to the lack of success with the pre-interview survey at LPS and LPU, I did not provide the survey to the registrar at MPU.

Though I did not receive completed pre-interview surveys from representatives at the three universities, I obtained data (interviews and documents) which indicated how the registrar’s office had to restructure in order to adapt to the parameters of the enterprise software and how the enterprise software was tailored to meet the requirements of the governing board and individual institutions. Such data included past and present organizational charts of the registrars’ offices, indicating the degree of organizational change which occurred; a list of the governing board’s system-wide software customizations, which had a tremendous impact on the implementation process; and
interview data which highlighted many of the system-wide and institutional implementation decisions that affected the registrar’s office functions at each institution.

Based on my theoretical framework, I assumed going into this project that the implementation of an enterprise system would cause changes, both to the enterprise software and to the organization. So what I sought to learn was how the software and organizations were affected by the implementations and how the characteristics of software and organizations merged to form new organizational identities at each institution.

In the next three sections of this chapter, I discuss the effects of ERP implementation at LPS, LPU, and MPU. First, I discuss my findings on how the registrars had to re-structure their offices to adapt to characteristics of the enterprise software. Second, I discuss how the ERP software was customized to fit with the characteristics of the universities. Finally, I discuss how the interaction between the enterprise software and the universities resulted in new institutional identities at each university as a result of the interaction between the software and the institutions.

The Effects of ERP Implementations on the Registrars’ Offices

From an organization-wide perspective, the registrars indicated that none of the institutions restructured their organizational chart at the divisional level in the hope of optimizing the potential of the enterprise software. The schools did, however, all create cross-functional student implementation teams. The registrars at all three institutions were on cross-functional teams that included representatives from financial aid, admissions, student financial services, and information technology. The implementation
teams dealt with the implementation of all functions related to the student module. All of the registrars’ offices in the study had a direct reporting line to a division head of enrollment management, so they were familiar with the role of such cross-functional teamwork on their campuses. At all three institutions, the office of financial aid, the admissions office, and the registrar’s office were all housed in the enrollment management division. The LPS and MPU registrars both indicated that the enrollment management teams on their campuses worked together closely and effectively prior to the establishment of the student implementation teams on their campus. For this reason, they felt that the positive working relationship in their enrollment management teams spilled over into the student implementation team. Additionally, both the LPS and MPU registrars attributed many of the successes of the implementation on the effectiveness of their student implementation teams.

In the domain of the registrar’s office, only one institution, MPU, reported changes in its academic policies due to the inability of the enterprise software to accommodate existing policies. During the implementation, MPU identified two policies, the academic standing policy and semester honors policy, which could not be accommodated in the baseline software. To implement the software, new policies needed to be developed and approved by a number of units across campus. One such governing unit was the faculty organization, which voiced reluctance in making policy changes based on the limitations of the software. That said, a number of individuals on campus felt that the changes in the academic standing policy brought about a positive institutional change, which was not necessarily related to the enterprise system.
The registrars at all three universities described how the implementation of the new enterprise system demanded both changes to job descriptions and the need to develop new positions. None of the registrars was involved in any pre-implementation activities such as vendor demonstrations, vendor selection, or vendor-facilitated analyses of business processes, so they were not able to anticipate effects of the software implementation in advance. Though the registrars viewed the enterprise implementation as ultimately beneficial to their respective institutions, they did not feel as if their institutions were tied into a vision or strategy for institutional business process reengineering or organizational integration. Instead, the registrars felt that the overall goal of the project was both to improve the way in which the board managed the system of institutions and to replace a legacy system with a new system. The few pre-implementation activities conducted on the institutional level by implementation teams were initiated outside of the scope of the project. For example, the MPU registrar indicated that the cross-functional student team at her institution developed some valuable conversion assessment activities on its own, such as reviewing and clarifying the purposes of old programs which were run on the legacy system.

In terms of staffing during the pre-implementation, no positions in the three registrars’ offices were added or reclassified to work exclusively on enterprise system pre-implementation activities. Adding such positions, described as “backfill,” is a common implementation strategy in which supplemental staffing is “hired or reassigned from other departments to replace key functional and technical staff assigned to the project because of their knowledge, skills, and abilities” (Babey, 2006, p. 22). The LPU registrar stated that she regretted that the governing board and her institution had no
backfill strategy, nor had they involved the registrars' offices from the various institutions sufficiently in the pre-implementation phase. She recalled that the governing board and the board institutions were much more strategically involved with the pre-implementation staffing decisions that the institutions had made during previous legacy system implementation in the early 1990s. According to the LPU registrar, the university added a project manager, three project positions, and two full-time consultants to assist with the implementation of the student module during the early 1990s pre-implementation phase. The LPU assistant registrar stated that the additional project staffing during that implementation allowed the office to conduct the proper strategic planning and "put the [implementation] fires out" while the rest of the office could continued daily functions.

The lack of dedicated staffing to the enterprise system implementation created negative effect in the LPU registrar's office when the enterprise system entered the implementation phase. With no dedicated implementation staff or backfill, the staff in the registrar's office felt that they were not effective troubleshooters of the new system while dealing with day-to-day registrar's office activities. Commenting on the implementation phase, the LPU registrar stated:

"With the new system, if a fire breaks up in our face, we say, "I wonder where we want to start putting this thing out." We have no idea. We just don't know [the enterprise system] well enough yet."

It is important to note that all three registrars described with much gratitude how their staff performed during the implementation with no backfill positions. They all described how their staffs' sense of loyalty to their institutions and of duty to serve the students, faculty, and staff kept them coming back to work every day. For example, the MPU
registrar described how her staff agreed to work extra hours during the weeks and came in on the weekends to work on implementation activities. Though all registrars noted that tears were shed in their offices during the implementations, in general none of the offices experienced an unusual number of retirements, terminations, or resignations during this period.

During the implementation phase, the registrar at LPU began to evaluate job descriptions and job classifications as the new enterprise system quickly brought about demands for higher-level job skills. She provided me with an organizational chart from 2 years prior to the start of the implementation and an organizational chart which projected office staffing in the office’s near future. Discussing the charts, she stated that she has re-defined almost all positions which were classified as “entry-level data entry” positions to positions which required a strong technical background, as well as skills to analyze data and make data-related decision. She felt that these skills were most often acquired through a post-secondary degree. She stated:

As each position has come open in the past two years, I’ve grabbed the open position, I’ve re-classified it, and upgraded it either to an hourly paid data management specialist or I’ve taken hourly pay and moved it to a professional position and hired an MIS [management information systems] graduate. I have four new MIS staff that are new to the office, that are bright, trained... They knew nothing about the registrar’s office before coming in, but they know how to write reports, they know how to query data, they know how to analyze problems, and we can teach them how to do testing.

During the implementation phase, LPS had neither increased staffing nor changed jobs descriptions. The LPS registrar stated that she would like to re-write job descriptions and reclassify jobs as vacancies come open but did not expect any turnover or additional funding for new positions in the near future. Just as the LPU registrar iterated the need
for more advanced job skills in her staff, the LPS vice president for enrollment management explained:

We can no longer function at the same level that we have. At one time, you could hire someone with a high school diploma who could do data entry. Now you have to have someone who is more intuitive. You almost have to have someone who has some college work.

Despite the stated lack of funding, the LPS registrar and the vice president for enrollment management clearly understood the need for staff to have higher-level education level and skills.

Additionally, the vice president for enrollment management stated that staffers also needed analytical skills to conduct more sophisticated customer service for the students, faculty, and parents, as the new system had brought about more complex questions and problems from self-service users.

You can no longer just have someone answering the phone or going to a form or a screen – ask a direct question get a direct answer. There is so much [in the new enterprise system] that is intertwined that you need someone who has the ability to think and go further and dig deeper. We’ve found this to be a big problem. … So we have got to start updating or having higher level job function questionnaires to get people with higher level abilities … of, course you’ve got to pay more too.

Unlike LPU, the LPS registrar’s office was concerned that their lack of funding to hire additional staffing would bring about continued workforce challenges. As the LPS registrar emphasized, “[Y]ou’ve got to keep in mind that we’re not funded very well, so you only have the opportunity to do it with turnover.”

The MPU registrar noted very similar effects of the enterprise system on job duties. In terms of the minimum requirements for processing and customer services positions, the MPU registrar stated that she traditionally “looked for individuals with data entry experience, some experience working in a college or a university, and a high school
diploma.” With the new enterprise system, staffers were required “to not only enter data, but interpret data and know what to do with the data.” In sum, she stated that the hiring challenge bought to her office by the new enterprise system was that her office could not afford to hire individuals for future openings who have the needed “data analysis skills which are typically acquired through the completion of a bachelor’s degree.” During the implementation, as staffing challenges emerged at MPU, the registrar immediately identified two new positions which had to be created when two functions, which were previously not demanding a great deal of effort from staff, became complex and time-consuming functions.

In sum, the registrars discussed the organizational changes brought about by the effects of the implementation as reactionary and not strategic. The registrars stated that they were not involved in any formal pre-implementation activities and received no funding for backfill positions during the pre-implementation and implementation. Further, the registrars’ offices at all three schools cited that the implementation most strongly affected the type of the work which registrar’s office staff conducted on a day-to-day basis. Organizational characteristics which were not noticeably or significantly affected at the institutional level included the divisional and departmental structures at the institutions, as well as the institutional policies.

Effects of ERP Implementations on the Software

During the interviews with staff at all three institutions, discussion about customization of the baseline software dealt exclusively with the system-wide baseline customizations which were developed and delivered by the governing board. One month
before signing the software vendor contract, the governing board adopted implementation principles which underscored the need to minimize software customizations in order to (a) eliminate potential escalating cost, (b) reduce delays in the implementation timeframe, and (c) ensure that necessary governing board data remain standard across the systems (Vendor Document, March 2006). Institution-specific baseline customizations were not permitted. Nevertheless, during the pre-implementation process, the governing board made several decisions to customize the enterprise software because of “statutory requirements” or “business cases.” Board customizations became a central topic of conversation during my interviews with the LPS, LPU and MPU registrars; the number and complexity of customizations caused both an escalation in the time and effort which institutions spent on customization tasks and a rift in the logical sequence of the implementation.

Not only did the customizations require a great deal of time and effort from each institution, but also at the board which managed the project. Minutes from the governing board’s enterprise system committee, just 8 months after Group One went live, indicated that customizations were becoming costly and consuming most of the time and effort of the governing board’s IT support staff, so much that the IT staff were unable to advance on planned post-implementation projects. Reflecting on the implementation, a board IT manager noted that more time should have been spent on exploring alternatives to customization. With the legacy system, each board institution had been accustomed to making its own baseline customization decisions, but as a board IT manager stated, the ERP database, unlike the legacy database, was comprised of “highly normalized data that goes deep and touches many things.” The board IT manager explained that data in the
legacy system were stored in “data silos” which did not touch each other, so when a customization occurred, the process of creating and implementing the customization was much less complex than implementing a customization in the new ERP system.

The registrar and an admissions coordinator at LPS explained that when the legacy system was in place the governing board was primarily concerned with receiving standard data from all board institutions, and was not as concerned with how the legacy system was managed locally. In fact, data analysts at the governing board office often assisted individual schools with customizations. As an LPS admissions coordinator explained:

Before [with the legacy system] we had [board] IT support for things we wanted to change. With [the new enterprise system] we lost a lot of programming from the old system and so a lot of it is falling back on us [functional users] to figure it out.

The LPS registrar continued:

Meaning more processes in [the new enterprise system] are functional user processes, where the [processes in the legacy system] were technical processes. So a lot more things come down to the functional office. [The board is] not involved near as much in a lot of the changes.

The MPU registrar also noted the shift in programming functions related to the reporting from the technical side to the functional side under the new system, as well as the shift from local IT- and board-supported customizations to local-function user programming. Though the new programming functions used by the registrars could not affect the baseline enterprise software, writing programs to retrieve and report on data in the legacy system was typically supported by the IT staff at the each institution, with whom all three registrars worked closely under the legacy system.
During the enterprise implementation, once it was determined that a customization needed to be incorporated into the baseline system across all board institutions, it was turned over to a specific community college or university to develop globally for all schools under the governing board. The owners hosted a team of individuals to work on the customization, including one or two representatives from other institutions as well as software consultants both from the board and the ERP vendor.

At the time of my initial interviews, the board had identified and initiated approximately 20 customizations that were related to the student module of the enterprise software. Customizations were based on system-wide statutes and business cases on such issues as developmental course credit, state lottery-funded scholarship eligibility, student immunization requirements, and course repeats. While LPU and LPU owned multiple student module customizations, MPU only owned one. In addition to owning and developing system-wide or “global” customizations, the three registrars also met the challenges of receiving and integrating customizations which were owned and developed by other schools. Based on the interviews with individuals at the three institutions, I will first discuss the challenges of owning and developing customizations and then describe the challenges of receiving and integrating customizations from other institutions.

**Baseline Software Customizations**

When discussing the experience of owning and developing customizations, 2 of the 3 registrars interviewed identified two challenges which affected the implementation: the customization ownership teams and the testing of global customizations with local data. The LPS and LPU registrars, who owned highly complex customizations, noted that
the customization teams were not effectively structured to develop the customizations in a thoughtful and timely manner. First, no team members on the ownership teams were fully dedicated to the development of the customizations. Customization teams were comprised of student implementation team representatives from the ownership institution, two or three student implementation representatives from other institutions, a vendor consultant, and an IT support person from the board; all of these individuals were working on other various implementation projects in addition to the customizations. For example, the two registrars, while serving on customization teams, were also dealing with initial unforeseen problems which were emerging during implementation, as well as managing essential day-to-day business activities. Respectively, the board and vendor consultants, who were customization team members, were also dedicated to other system-wide efforts across implementation groups and modules. The LPS registrar explained that when the board and vendor consultants were working on the customizations with the LPS and LPU customization ownership teams, they were also in the midst of starting up implementation activities with implementation Group Two, which was comprised of multiple institutions. As she described:

And so we’re one small component in the big picture – [Group] 2 is coming along - and they’re trying to get things installed there - and that’s just [the] student [module] – there also HR and finance. So the [technical consultant] support from [the vendor] is lacking to be able to handle that – and of course we’re to the part of the project now where all of the support is rolling off – there are two [vendor technical consultants] who have rolled off now. And resources are dwindling but the work is not.

The LPS and LPU registrars pointed to the board’s group-based implementation schedule as another reason for the ineffectiveness of the customization ownership teams. When customizations were being developed, only Group One schools had begun working
with the ERP system, while Group Two schools had not yet begun implementing. That said, 3 of the Group Two schools each owned a customization. This became a problem because the Group Two schools had not yet not received baseline training, did not have a data set to conduct customization testing, and did not have experiential pre-implementation knowledge, which Cohort One had recently acquired. The LPU registrar and assistant registrar pointed out the contrast in work between Group One and Group Two on the customizations. The LPU registrar iterated:

The owners of [the developmental courses customizations] were not Group One schools. So they didn’t have the hands-on knowledge and didn’t have training - yet they were designing a mod.

The LPU assistant registrar added:

Meanwhile, you had Group One people trying to design [customizations]; they were also having to go to training, they were also having to do conversion, they were also having to set the system up. That isn’t a good scenario. Not in this timeframe.

Another way in which the customization teams were not effective concerned the physical proximity of the team’s members. Team members were not all physically in the same location, and so they worked on the creation of the customizations by communicating via e-mail, telephone, and Web conferencing. The LPU registrar described the challenge in the following manner:

The structure of the modification teams was that a school had to be the owner. [For example, LPU] owned the modifications that had to do with the state scholarship. So we were the team leads, along with the [board] consultant, and later the [vendor] programmers who were not physically on site. … It just doesn’t work as well as when they came physically on site so we could show them what was wrong and why it wasn’t working and what to do with it – but the [vendor programmers] were all over the state.

When the board and vendor consultants made occasional visits to the institutions to work on the customizations, the LPU registrar felt that no progress could be made
during the face-to-face meetings because so little progress had been made on the
customizations through remote communication means (telephone, e-mail, Web
conferencing). Instead, the LPU registrar felt that close physical proximity among team
members for longer periods of time would have been more effective. As she stated:

They would come in to test the [customization] – once - and then it would have so
much stuff wrong with it, they’d have to go home, do their thing, and send it back.
The only other way to do it is to have people physically together for a period of
time and just get it done.

Reminiscing on the implementation of the legacy system in the early 1990s, the LPU
registrar recalled how the close proximity of team members was a key part of getting
tasks done during the implementation. She recounted:

We had three positions, and a project manager [in the registrar’s office] ... and
two onsite consultants – and this is what I think made it very helpful – they were
all physically located on the [same] floor of the [building] where we are now.
They renovated that floor and the IT people and the bursar folks were there too.

Finally the teams were ineffective in creating the customizations because of the
lack of knowledge that team members had about the enterprise system as they began their
work. The team members coming from the board institutions had not yet worked with the
new ERP system. They had been trained on the baseline version of the enterprise
software, but the training was not comprehensive enough for the team members from the
board institutions to know how the customizations were to be written. Meanwhile the
enterprise system consultants did not have enough insight into the board policies to
recommend non-customization solutions. This gap in team knowledge would later cause
more work in patching or fixing the customizations after they were integrated into the
system. The LPS registrar and an LPS financial aid coordinator explained the knowledge
gap in the following manner. The LPS registrar stated:
You really have to have the [customizations] worked out ahead of time so that you can train on them – but the trainers don’t know the [customization] so there is no training with the [customizations]. … so having someone who has a thorough knowledge of the area that’s to be modified and all of the areas that it touches, was lacking. And it snowballed from there.

An LPS financial aid coordinator added:

And a lot of this was that when we were writing [the customizations in the ownership teams] we didn’t know the system. Then, we had to write a lottery customization, so we were saying, “Let’s just put it down’ [in writing].” But we didn’t know how it would work. It would have been good if we knew all of the [screens] [in the new system] but we didn’t know all of the [screens].

The MPU registrar had a different experience in owning and assisting with customizations. In her case, she owned only one customization which was less complex than the customizations owned by LPS and LPU. Because of the simplicity of the customization, she was not as dependent on participation and contributions from the entire team. Instead, she was able to do most of the work, such as the testing of the customization, on her own without assistance from her customization team members.

Another baseline customization issue which affected the registrars’ offices was the way in which the customizations and customization fixes were tested prior to being sent to all governing board schools. After the customizations were developed, team members developed the specifications and coded the data. Then the customization underwent a testing phase mainly with sample data or with data from the institution which owned the customization. Though all institutions were working within the same instance of the enterprise software and institutions were not permitted to customize baseline software, the system-wide customizations still affected each institution differently. As the LPU registrar explained:
The team that owned the [customization] created the test cases and communicated it, and that limited their scope because now they only knew what they did at their institution.

The variation in effect was related to the fact that each institution used its data differently. This was especially apparent between the community colleges and the 4-year institutions.

The LPS registrar also noted the difference between the test data used for customization testing and each institution’s real data that was affected by the customization, stating:

You might have [sample data] scenarios [in the testing phase] that other people would never have - so the first [customization] we got was the [remedial courses customization]. Well, we were the first to convert data into that [customization]. Well you can test all day with made-up data but the conversion data is a whole new scheme. There were a lot of things that didn’t work [in the testing phase] because we were the first to convert data into it. … you can’t just build every scenario.

Another problem with customization testing for some institutions related to the lack of the customization teams’ access to institutional test data. The university test data were stored in large data instances which reflected the size of all university data. Because of their size, instances took up large amounts of space on university servers, and often multiple customization ownership teams from other areas of the university (human resources, finance) were either testing customizations in a shared instance or were erasing instances used by one area to create more space on the server. This caused problems during the testing phase. As the owners of the lottery customization which identified students who were eligible for the lottery scholarship, the LPU registrar and assistant registrar emphasized how it was difficult to maintain “clean” or untested data with limited instances of locally generated data on the server. As the LPU assistant registrar stated, "[I]t took hundreds of records repeatedly to test that [lottery customization]."
The LPU registrar added:

[The test data] had to be built new each time because once you’ve touched them they can no longer be the scenario that they are coming in.

The LPU assistant registrar elaborated:

[For example] once you have an [admissions] applicant and you register that applicant, you can’t make them go back to being an applicant anymore. You’ve got to come up with a new applicant.

The LPU registrar concluded, "So all the time you’re building test cases."

In addition to the challenge of maintaining new instances of data for testing the lottery customization, the LPU team could not always rely on the presence of new or partially used instances of data on the server to conduct testing. Because of the limited space on the server, only a few data instances could be held on the server, and the instances had to be shared among implementation teams on campus. The implementation teams, however, did not coordinate the use of the instances and occasionally a team would call for new data instances without notifying the other teams. As the LPU assistant registrar explained:

If you do have some [data in an instance] that can still be used [other functional areas may] copy down a new instance and [yours is] all gone anyway.

The LPU registrar continued:

Because you’re sharing your instance with everybody – HR, finance, whatever.

The LPU assistant registrar added:

So [for example] something is coming up big in human resources – and they’ve got to have a clean instance to start off with that matches their production. But I am not done. I’ve just created 200 records to test lottery, and I am not done testing lottery. “Well we’re so sorry.”
The LPU registrar concluded:

Then, when they bring the production down on top of you, all of your test data goes away. Now, for a pretty long while we had a student instance that we could control and we could say when it could be cloned and who could get into it and what would happen with it. But we had to give that up.

In sum, with a lack of a dedicated instance, the LPU registrar’s office found it difficult to make meaningful progress on the development and testing of the modification.

In addition to the problems with the customization ownership teams and the testing, the development of the customizations, as noted by a board IT manager, simply demanded time and effort, as there were so many touch points between the data and structures within the ERP system. These complications eventually brought about a delay in the completion and delivery of the customizations. Group One schools, including LPS, LPU and MPU, were deeply affected by the delay because they received the customizations from the other teams after they went live with the new system. The adding of customizations to the baseline software during the first golive semester made it harder for the three institutions’ functional and technical staff to determine whether unforeseen glitches in the new system were originating from the baseline system or the newly installed customizations. When I asked an LPU records coordinator about the effects of receiving customizations after golive, she responded:

You have to be very flexible because what worked yesterday may not work today or even next week. And you’re not quite certain what changed. Or why it changed or what the source of it is. That you’re not getting the same results today that you got yesterday.

An LPU client services coordinator explained that student attendance customization, which was designed to capture attendance information for financial aid, was impacting the information that was being reported to an enrollment verification
service, though it was not intended to do so. In the school’s legacy system, the information for financial aid and enrollment verification were captured independently. Financial aid attendance was captured from voluntary faculty input while enrollment verification was captured from registration data. In the new system, the data for both financial aid and enrollment verification reporting were being pulled from faculty input captured in the enterprise system. Describing the problems with this new data relationship, the LPU client services coordinator stated:

We have a lot of faculty that sometimes click on the wrong [attendance] button and report a student as “never attended” and it was the wrong student. That automatically impacts that student’s enrollment status.

The LPU registrar and the LPU IT representative tied the problems with the attendance customization to the owner of the customization, a community college. In their discussion of the attendance customization, the LPU registrar and LPU IT representative stated that they believed that the community college, which developed the customization, had either a different interpretation of how attendance data were to be captured in the system or did not accurately test the customization prior to releasing it.

The LPU registrar also expressed a concern for many of the institutions which were not picking up on such data discrepancies after the customizations were installed. She stated:

We were saying [to other board institutions] the [attendance customization] is not working right and the other schools are saying, “We sent our [enrollment verification] information and there wasn’t anything wrong with it,” but they didn’t look.

Looking back on the recent customization problems LPU, LPS, and MPU representatives stated that they would have preferred a slower implementation schedule so that they could have done more collaborative research and development of the
customizations and assisted Group Two schools in the customization process. However, the rapid implementation, customization tasks, and maintenance of day-to-day functional activities prevented them from such collaborative work. As the LPU registrar commented,

"[The ERP implementation] went up so fast with so many problems. You spend the whole day putting out fires on your own campus. You can’t help [the other schools]. As much as you want to help them, you can’t. There’s just not enough time in the day to do it. … [A Group Two school] called us and wanted us to do a presentation on the [scholarship customization] but we were in the middle of our first grading. We can’t teach them what we know about lottery even for an hour presentation because we can’t leave campus.

In summary, the LPU registrar had hoped for an implementation schedule in which the enterprise implementations from one cohort to the next could have evolved into a gradually smoother and logical process as one cohort learned from the latter cohort’s experience.

In addition to receiving customizations after go-live, the three institutions also received many patches or fixes to the customizations. Just as the customizations affected institutions uniquely and in unforeseen ways, each patch that was delivered could have the same kind of unforeseen effect. Elaborating on the remedial studies customization, the LPU registrar and IT representative recounted the following events. The LPU registrar stated:

"The [remedial studies customization] has had 18 change requests to it, which means after it was originally written, they added 18 different changes to the original specifications [of the customization]. So each time you have to go back and test the whole thing because, while this change request could have fixed what you said was broken, it could also break something that was fixed. We finally lost track of that one. We just prayed that they were right, because we didn’t have time to deal with the testing.

The IT representative continued:
That was part of the whole [customization] thing: the [customization] owners couldn’t go back and test – they would just test whatever, fix what was outstanding, do a patch. They wouldn’t go back and test the whole thing [how a customization affected all data].

Though all board schools received the same customizations and respective patches, each school could determine a unique strategy for integrating the customization or patch into the ERP system. While LPU dedicated a large amount of resources to hiring three IT systems administrators who were dedicated to checking and testing all incoming customizations and patches, LPS and MPU did not have the resources to hire individuals solely for such ERP implementation tasks. By dedicating IT staff to checking and testing customizations and patches, LPU was able to cut down on the number of unforeseen glitches that occurred as a result of a customization or patch which could unintentionally affect the system. This served as a valuable support to the LPU registrar. In a conversation with the LPU registrar and an LPU IT representative, the LPU IT representative described the role of these technical support individuals in the following manner:

We have our own [systems administrators]; they install all of the software. All of the board institutions do not have their own [systems administrators] on site within IT. A lot of the community colleges, they get all of these [customizations] put in their system and they don’t even know they’ve got them. They don’t know to test so they are not finding anything.

The LPU registrar added:

They’re not finding their errors yet.

The LPU IT representative responded:

At least we have control. For a lot of the schools, their [customizations] will come from the [customization] center [located at the governing board] -the Board [systems administrators] will put them in the other schools’ test systems. And when some school [that has done testing] like LPS says it’s OK, they’ll just move those customizations into the other schools’ production systems. [At LPU] we get
a notification that those [customizations] are released; we control them, we communicate with the client [like the LPU registrar] and say “are you ready for this to go and test” because they might have the patch from the last [customization] that they’re not through testing and they want to know it worked before we go “Are you ready for this to go and test?” They test it they say, “This is right. Put this patch in prod[uction],” and we control all of that. And a lot of the schools don’t. It takes extra effort, but it lets us know what we’ve got where. And we had to have three high-paid people that we locally funded at [LPU] that do that for us instead of using the Board [systems administrators]. Other schools have system administrators, but they don’t work with the patches.

So, despite the fact that each institution had the same instance of enterprise software, the LPU IT representative provided an example of how the same patch could affect each institution differently, according to the level of technical expertise on each campus.

When discussing local control over moving customizations and patches into production, LPS responded that they did not have the resources at their institution to hire project staff to conduct such efforts. The database administrator hired to work on the system at LPS worked primarily on third-party or data feed projects that did not affect the baseline system. As the LPS registrar explained,

We had a person on the IT side that developed some programs that don’t directly use the system but need information from the system like the library. For [the library] system their computer system feeds off of our data from the main system: the ID system, the parking system, [student government association] elections. All of these things needed new interfaces build for the new system. So there was some supplementing there – but there was no supplementing in the [systems administrator] area ... as we lost people, [the ERP software vendor] provided some resources. Of course we paid for it but they provided the resources.

The LPS vice president for enrollment management added:

Everything that comes extra at all has a high price tag on it.

The LPS registrar continued:

We probably did minimal in comparison to other schools. Like one of the community college. They hired somebody to converted them. That’s how much assistance they had. We did a lot of extra remote [assistance] to try and save costs. We had extra technical sessions to help with conversion and just answer questions.
and things like that, and we did a couple of extra consulting sessions to say “Here’s what we’ve done. Here’s our procedures. This won’t work. That won’t work. How do we do this?”

In contrast to LPU, limited funding prevented the LPS from hiring local support to react to the unforeseen effects of the implementation. Instead they sought more cost-effective avenues of implementation consultation.

The MPU registrar also noted how her office had to react to the problems caused by the patches to the customization. For example, she recalled how a patch was sent from the board on a Friday prior to the beginning of a registration period, which was to start on the following Monday. When she arrived at work on Monday, she immediately discovered that students could not register. Staffers in both the MPU registrar’s office and IT department scrambled to contact the board and find a solution to the problem caused by the patch installed on that Friday.

**Software Configurations**

In addition to the software customizations, the three registrars also discussed the impact that enterprise software configurations had on their institutions. Unlike a software customization that requires the baseline enterprises software to be altered, a configuration allows the owner of the software to make certain decisions about how data structures are to set up within the system. The registrars discussed the effects of two configurations at length. The first configuration, which occurred at the board level, concerned the decisions about how to configure standard data values to be used across all institutions. The second configuration, which occurred at the institutional level, concerned the management of user access to institutional data.
During the implementation, the data values in the ERP system needed to be configured to match data values in the board’s legacy systems at the individual institutions in order to convert the legacy data into the new enterprise system. The board established a system-wide data standards committee to identify and match the values from the legacy system to the new system. The chair of the data standards committee, who was a member of the enrollment management staff at LPU, stated that the committee was comprised of over 30 individuals representing all board schools, the governing board, and the software vendor. The group met at the board office during the pre-implementation and implementation phases to establish common data values and terminology for the entire system.

The data values in the new system were divided into three levels. As the registrar from LPS summarized, the first level of data values were standardized across all campuses and used for system-wide tracking and reporting; level 1 data could not be altered and supplemental data values could not be added to the level one data values. Level 2 data fields included standard system-wide values that were developed by the data standards committee but supplemental fields could be added by individual institutions to the level 2 values. Level 3 fields were open values which could be configured by each institution. The standard level 1 and 2 values were established as unalterable to keep the data consistent across the system for board reporting purposes.

The challenge that the data standards committee faced was determining the standard data values in the first and second levels, as the configuration of the data fields in the legacy system did not align with the data fields in the new system. Though all board schools had only been using the same legacy system since the early 1990s, the data
values within those legacy systems had, over time, been configured uniquely at most institutions to meet each institution’s individual needs. In terms of matching the data values from the legacy system to the new system, the LPS registrar described the process in the following manner:

Level one [data] was hard when you had more data [from the legacy system] than values [in the enterprise system] and you couldn’t fit it. [For example,] we were probably the king of address types, so that affected us more than the other schools. The larger [the institution] you are, the more ingenious you have to be in some of your coding to try to break things down but yet still have it all together. So we lost some functionality in things like that.

Describing the data standards committee and the committee meetings, both the chair of the data standards committee and the LPS vice president for enrollment management (who was also a member of the committee) reiterated the ineffectiveness of the data standards committee in determining the standard data values accurately and decisively. Suggested reasons for the committee’s ineffectiveness included an unclear purpose for the committee, the size of the committee, and the limited knowledge of the members about the committee’s objectives.

The LPS vice president for enrollment management stated that when the committee met the first few times, the purpose of the committee remained unclear and there was no work for the committee to do, which caused a decrease in meeting attendance and a lack of accountability for individual team members.

The first time they called everybody in, it was about 30 of us. We all sort of looked at each other after the [board academic head] gave us the charge and said, "What is it we’re supposed to do?" And we came away thinking, “OK, I think we’re supposed to be cheerleaders to get this thing going and tell everybody, ‘Keep your chin up.’” But then as we began to meet there was only a core of 6, 8, or 10 at the most that were there consistently at the meetings.
The administrators I interviewed indicated that the committee members had several knowledge gaps that were barriers to completing the committee’s objectives. The data standards committee chair explained that, while there was active discussion about the common data values and terminology, there could have been more resolution on the commonalities if the committee members had greater working knowledge about data values. Those interviewed identified three reasons why the committee lacked the knowledge and ability to make sound decisions about data values.

First of all, the committee chair stated that representatives from Group One, who had already begun implementation before the start of the data standards committee meetings, were more active in the discussion of common data values than representatives from Group Two, who had not begun the enterprise system implementation and were unfamiliar with the new system. Second, the LPS vice president for enrollment management stated that a major challenge for the team had to do with the software consultant turnover and inconsistent consultant messages. While some consultants brought insight to the committee, other consultants simply encouraged the committee to move forward with the work without providing guidance.

The [ERP vendor] consultant came [to the meetings], but they had changes in consultants, and there were different levels of expertise with the consultants. When we were asked to decide on the values, we were not allowed to dwell on the functionality. We were asking [the consultant], “How does this work before we decide on the value?” And they said, ”Don’t worry about the functionality, you’ve just got to decide.” But you don’t even know what it does or how it relates. So it was very easy to not make a hard and fast decision at all because you didn’t know and didn’t want to make the wrong decision.

By describing the consulting abilities of multiple vendor consultants, the LPS vice president for enrollment management also highlighted how critical knowledge and abilities of a vendor consultant can be to an implementation committee.
Third, as the LPS vice president for enrollment management stated, multiple members of the committee representing other institutions were not actively engaged in the day-to-day management of university student data and had no knowledge or skills to bring to the committee. She stated:

Some of the committee members were from student development at other schools. They could care less [about data values]. They didn’t know what any of it meant. Those were the people that dropped out early. In fact, some of them came to the first meeting and that was it, because they didn’t see the need for it. It wasn’t relevant to them.

In looking back on the composition of the committee, the LPS vice president for enrollment management stated that she would have liked to have seen the expert functional users of the data, such as university registrars, represented on the committee to sort out the highly detailed work of determining data values.

So I reflect back on it and think, “That was probably a lot of time wasted, when it would have been better to have some of your functional people there deciding on those things.” Then if they were there to consider some of the functionality they would have made better decisions.

It was clear the LPU and LPS registrars would have liked to have been more involved in the decision-making process of the data standards committee. They felt that their functional expertise would have allowed the meetings to go to a lower level of discussion where the committee could make decisions about individual data values in a timely manner, been less dependent on the knowledge of consultants, and reached better compromises with the functional experts from the 2-year institutions.

The MPU registrar did not express the same frustrations with the data standards committee as the LPS and LPU registrars, though she indicated that the functional expertise of the representative from MPU was a key factor in the success of MPU’s interaction with the data standards committee. When the data standards committee was
first established, MPU appointed a representative from student affairs, who did not have expert knowledge in student data. Shortly after the data standards committee began to meet, the MPU registrar indicated that the individual from student affairs was replaced by the MPU admissions coordinator, who did have a good grasp of the functional details of the student module and communicated with the MPU registrar frequently about the committee’s work. In sum, the registrar indicated that the MPU representative’s knowledge about student data and her assertiveness enabled her to persuade the committee to include a very important and unique MPU data need.

As discussed in previous sections, the rapid implementation schedule required teams and committees, like the customization ownership teams and data standard committee, to work quickly on their projects. However, just as in the case of the customization teams not completing their work on the developing data standards before Group One’s first go-live semester, the data standards committees did not complete their work until after Group One began converting data. The LPU registrar explained that the rapid implementation schedule, as well as the slow pace of the work being completed by the data standards committee, caused common data values in each instance of the software to be changed even after Group One schools had converted data into the system. As the LPU registrar stated,

[The committee] was supposed to develop our prototype, give us the values that were required for different fields in the system, and they were months late, past when we needed to have implemented things and giving us the information we needed to develop our procedures. And that is where I got frustrated. The problem was that [the values] kept changing. We would get [one set of data standards] and it would be a level 2 table and we would create some of our own values in it, and they’d change it back to a level 1 and we had already converted data, and then values are not valid.
As the data values were changing in their instance of the enterprise system, it was difficult for the LPU staff to identify the source of problems with the system, as problems could be related to changing data values, customizations added after golive, new patches, or simply golive glitches which weren’t caught during system testing.

Another configuration choice, which was made uniquely at each institution, involved the management of institutional user access to data in the enterprise software. At the three institutions, registrars had control over the management of the user “query” or “update” access to data for student records and registration. The control and accountability of user access is related to both insuring the integrity of data issued from the registrar’s office and coordinating registrar procedures among academic units. Data values in the enterprise system were organized according to function on screens. In the baseline system, managing access to data could be granted at the screen level. This meant that a registrar could maintain control over access to individual registrar-related screens but could not grant user access to limited individual data values found on a screen. In order to grant user access to select data values on a screen, the institution needed to implement an added enterprise product to the baseline software called “fine-grain access” during post-implementation. During implementation, fine-grain access was not implemented at the institutions, though the LPS and LPU registrars mentioned that they hoped fine-grain access would be adopted in the future.

The concept of fine-grain access was familiar to the registrars because the legacy system allowed for fine-grain access, but of a different nature than the fine-grain access found in the enterprise system. Comparing the user access of the legacy system with the new system, the LPS registrar described the two systems in the following manner:
In our old system it was very nice – one size fits all – all department secretaries fit nicely into one bucket and there’s never a deviation. [With the new system] either you had to tell a whole lot of people “no” or let everybody have it. ... In [the legacy system] you had data element security, but in [the new system] it’s more the table – not individual elements so to speak. [In the legacy system] I think the concept of fine grain access, a lot of times, was more blocking parts of the fields, like date of birth or last four digits of the social [security number], so it was more manipulating a field. So you’re securing the fields not just the users. ... So in [the new system] it’s nice to be able to go to one [screen] and view four or five tabs but from a security standpoint it’s awful. If you allow someone access to that form, [she] has access to five or six [tabs within the form] when I only wanted to give her one tab.

The transition from a system which could accommodate fine-grain access to a system which did not provide fine-grain access during the early phase of golive required the registrars to react swiftly to find solutions for the all-or-nothing configuration of the enterprise system.

When configuring user access on their campuses, the registrars chose different solutions to address the new enterprise method of coordinating user access. The LPS registrar decided to grant user access to screens on an individual basis according to employees’ specific job functions and centralize functions which were formerly decentralized in the legacy system in order to maintain control over data values. Meanwhile, the LPU and MPU registrars choose to grant access according to the institutional groups including department or job role, such as departmental secretary or assistant dean, which multiple employees shared, and did not assess each individual user’s access needs. These decisions on user access affected the registrars’ offices in unique ways.

The decision to grant user access on an individual basis provided the LPS registrar with the data security control she desired; by granting user access on an individual basis, she stated that she felt that she had been able to maintain a desirable
level of data integrity and experience no memorable user abuses or errors concerning user access on campus. With admiration, the LPS vice president for enrollment management even referred to the LPS registrar as the “Queen of Security.” That said, she also stated that it created a lot of extra work to convert the access profile of each legacy user individually, as well as set up and configure new user accounts for every new employee needing access to student data. Reflecting on how she set up user access at LPS, in comparison to other board schools, the LPS registrar stated:

We took a different approach and gave access by function – not by job responsibility. So one person might get ten screens but the other one only nine; I didn’t have to give that person ten just because [both individuals] have the same job. So we don’t have to give everybody all of screens which has helped with functionality, but it has created a lengthy process of getting each individual a level of security when a new account comes.

When asked if she had ever needed to re-examine an individual’s user access once a user account had been created, she stated that her tight control of user access prevented potential user-related problems, so she had not needed to re-configure any individual’s user access.

We’re conservative so we did not have to go back – we started out on the lesser size – it’s better to give than taketh away – that’s our philosophy.

The decision of the LPS registrar to offer limited access on campus was part of her strategy to protect the integrity of the student data for which her office was responsible.

In addition to determining user access on an individual basis, the LPS registrar centralized certain processes in the registrar’s office in order to maintain control of important data fields for which she did not want individuals outside of her office to have update access. Again, because fine-grain access could not be achieved, the LPS registrar decided to shift this additional work into her office from other areas rather than avoid the
negative effects of users who were employed outside of the registrar’s office
manipulating student data in ways that the registrar felt would compromise data integrity
or institutional procedures. The LPS registrar provided two examples of functions which
were centralized for this reason. The first example involved change-of-major data:

We centralized a lot of processes like the change of major process. Before [under
the legacy system] every department did their own change of major [processing
for students]. Well in [the new system] the change of major is on the registration
[screen], and we were not willing to give everybody the ability to register a
student. So we had to recentralize that process.

The second example involved the maintenance of the course schedule in the enterprise
system:

[At LPS] – the departments all build their own schedule [in the enterprise system],
but we’ve re-centralized it and do the schedule for the entire campus because if
we give them this they could change the titles of the courses. If the data is on two
tabs [on the same screen] it shares the same table - and you can’t give them this
without giving them that – so I’m hoping in future versions that that might
improve.

In sum, the LPS registrar, in her efforts to ensure the integrity of the student system data,
limited user access across campus, as the new system did not include fine-grain access
during the early phase of golive. Though the decisions added additional work for her
office, she felt that her decision reduced the amount of work she would need to complete
later on.

In contrast to the LPS registrar, the LPU and MPU registrars granted user access
by standard groups such as department or job role. At LPU, the registrar explained that
the advantage to granting user access by department or job role was that the LPU
registrar’s office did not need to dedicate time and effort to grant user access
individually. Instead user access was automatically determined based on standard
employee characteristics. The disadvantage of their method of coordination was that it
limited the amount of control that the registrar’s office had over data values because a greater number of individuals had update access to a greater number of screens.

The LPU registrar’s office staff had a lively discussion about two such screens. The first screen allowed users to provide students with overrides to register for courses for which the students were not formally eligible. The second screen allowed users to place holds on students. A scheduling coordinator described the override screen in the following manner:

A perfect example was [overrides]. It’s a real big deal here. All of the departments are allowed to give [overrides] for pre-requisites, closed classes, and that kind of thing. In [the legacy system] that was real easy because if I was [an advisor] in English I could only give a permit for [a student in] the English department. ... If some student came in[to the English department] and said, “You know, I really need to get in this class - it’s a history class can you give me a permit?” Well, the way [the legacy system] was set up I physically could not do that. With [the new system] anyone who has access to that [override] screen can put a[n override] in for any course.

The increased user access to the override screen brought about an initial large number of incorrectly granted overrides.

To ensure that overrides were not being inappropriately granted by users, the LPU registrar’s office had to develop what they referred to as a “back-end solution,” which required them to conduct an ongoing compliance audit on recently completed override transactions. The LPU scheduling coordinator, records coordinator, and client services coordinator explained the time and effort dedicated to back-end compliance in the following manner. As the records coordinator stated:

I get a report that says who gave a[n override] and that is monitored every day - so if you’re on that report and you gave a[n override] for a math class and you’re over in philosophy, they’re going to come find you. Now we stressed – it was a joke at first – but we stressed, “This is an honor system. We cannot have people giving permits they have absolutely nothing to do with it because they happen to like the student.” So security is a real big deal.
The client services coordinator added:

   In most of the departments it’s the secretaries that do the permits; the chairs have access but they don’t do it.

Finally, the scheduling coordinator concluded:

   So we can’t limit the access to that screen by the departments. We said, “OK who do you want us to give access to, so you can restrict who can touch the screens?” We were able to limit it that way but the problem is, because you do have five people in each department that can do these permits … they can do whatever they want.

In sum, representatives in the LPU registrar’s office felt uncomfortable with the honor system approach to user access.

   With user access defined by group, the LPU registrar’s office often discovered the undesired scope of user access after they went live. After LPU went live, they continued to conduct data testing and employee training to monitor how data were being updated by users in the system and to receive feedback from users about the system. After discovering that certain users were provided with too much update access, the registrar’s office was, on occasion, able to work with the university IT representatives to come up with a programming solution to limit override access.

   When discussing the holds screen, on which registration holds, transcript holds, and admissions holds could be added and removed, the client services coordinator and the records coordinator at LPU explained that any user who had access to the holds screen could add or delete any registration, transcript, or admissions hold regardless of proper authorization. To address this problem, university IT representatives were able to complete a small non-baseline script customization to prevent the adding or deleting of holds from unauthorized offices. This user access problem was discovered during the
testing and training that the registrar’s office provided after the institution went live. As
the records coordinator stated:

A lot of these things we did catch through testing and training. With the holds, we
did a holds training session and we were given the opportunity to get into the test
system and play. And they [the trainees] would ask a lot of questions. “Can I do
this?” or “Can I do that?” and we would say “Well, we didn’t think we tested
that.” So, we would go back and test because now we realized this person would
be able to do this and this and we would have to find a way to restrict it. So
testing was imperative in training.

Just as in the case of the LPS registrar’s office, the LPU registrar’s office used the
strategy of centralizing certain student data-related functions in their office to maintain
control over data. Like LPS, LPU centralized the course-scheduling process so that
individual departments could not have update access to course-scheduling data found in
other departments.

Comparing the scheduling process in the legacy system and the new system, the
scheduling coordinator explained:

In [the legacy system] you could define the user role. Like English [departments]
could only touch English [course schedule] stuff. Well, in the new system, right
now, I do all of the scheduling. We have not given that back to the departments,
and if we get to that point, that is something we’re going to have to stress because
they will be able to touch other parts of the system....

The records coordinator added:

Because we don’t have fine grain access, any [screen] a user has access to, they
change anything on. They are not restricted to fields on that [screen], and they’re
not restricted to doing anything to just their students or things in their college. It’s
an open gate.

By centralizing the process of entering course schedules into the enterprise system, the
scheduling staff in the registrar’s office had to manually key 8,800 course sections into
the system for their first golive semester. The office felt confident that they would gain
improved functionality in course scheduling in the near future so that this process would
not remain centralized in the registrar’s office and departments could once again enter their own schedules.

Like the LPU registrar, the MPU registrar also chose to grant user access by job role. She did not note any negative consequences with this decision because she granted fewer individuals on campus access to the enterprise system than she allowed for the legacy system. Instead, she was able to maintain a centralized control over the system by only allowing most individuals access to enterprise data through the Web-based self-service module.

In sum, the software, which was implemented at multiple institutions, was affected both by customizations and configurations. The system-wide customizations to the student module, which were developed to align with unique governing board mandates and policies, were cited as the biggest source of implementation challenges and set-backs according to the representatives from LPU and LPS. At both a system-wide level and the institutional level, configurations also affected the software. System-wide configurations created by the data standards committee were developed to standardize certain data elements across all institutions. From the perspective of all three registrars, the data standards created to accommodate all institutions under the governing board did not account for the many unique institutional characteristics. The MPU registrar cited that the standardization of the software instances proved to cause the greatest number of challenges and setbacks at her institution.
Continued Post-implementation Interaction between Institutions and Software

One year after visiting LPS and LPU, and shortly after my initial interview with the MPU registrar, I conducted follow-up inquiries with representatives from the three institutions to capture perceptions about their enterprise system implementations from a post-implementation perspective and learn about the institutions' post-implementation activities. I was only able to make contact with representatives from two of three institutions. Though the MPU registrar admitted that she had a difficult time recalling some of the implementations details 1 year after go live, her perceptions, along with the perceptions of the other individuals I interviewed, provided me with valuable user perceptions, which Wagner and Newell (2007) argued offer data on more meaningful interaction between the functional users and the software as functional user interaction increased and users placed new demands on the software. Indeed, through my post-implementation interviews with representatives from the institutions, I discovered that, while the amount of implementation work had, in general, decreased, interaction between the software and the staff in the registrars' offices continued to occur during post-implementation, affecting both the software and the institutions.

One year after their first semester go live, a few aspects of the functional work had become more stable as implementation activities diminished and increased functional use provided staffers with a better command of the system. Registrar’s office representatives at LPU and MPU indicated that staff were working relatively normal office hours and that evening and weekend work was only being conducted during those times when traditional seasonal tasks required overtime commitment. For the LPU registrar’s office, which had a budget to upgrade positions, two more technical support positions were
added during post-implementation to strengthen the newly needed technical and analytical skills required for the new system. The MPU registrar was still relying on her institution’s high-performing cross-functional enrollment management to work with the system and address post-implementation challenges but was concerned about a possible re-organization of enrollment management offices as proposed by new administrative leadership.

LPU and MPU administrators clearly stated that the Web-based self-service module comprised of both an enterprise self-service module and a portal had brought added value for students and faculty. The new Web-based services facilitated students and faculty with greater data access and user-friendly data transaction capabilities. As an LPU office representative stated, “Faculty have gotten used to the new self-service and are finally coming around.” Both MPU and LPU representatives were also able to successfully add new institution-based services for faculty and students. The ability of both registrars’ offices to make local adjustments to the self-service module and the portal allowed the institutions to address their unique needs. For example, at LPU many paper-based transactions had become automated in the self-service module. Through the self-service module, students could apply for university admission, register for classes, request transcripts, and check their progress toward degree completion by performing a degree audit, while faculty could submit grades and student class attendance information. An LPU representative stated that the course registration features found in the self-service module had greatly improved the efficiency of the registration processes during new-student orientations. Additionally, communication with students has become both cost-effective and of a higher quality. As one LPU registrar’s office representative stated,
the thousands of records and registration-related mailers that the office had mailed prior to the new enterprise system were now simply e-mailed. In sum, the self-service module and portal had a positive effect on customer service capabilities.

Though LPU customer service functions had seen an improvement as the self-service module of the software enable better services for faculty and students, the efforts to maintain the system behind the scenes was simply described as “a nightmare”; a nightmare defined for the most part by steady influxes of both customization patches and upgrades.

Recently published governing board minutes stated that an estimated $1 million had been spent on customizations by the board since the beginning of the enterprise project. The same minutes noted that the cost was a concern, and that the customization work done by the board’s IT staff was taking the staff’s time away from other important post-implementation efforts. The effects of these customizations were not only affecting the board office, but the registrars’ offices across the system.

First, many of the customizations in the student module were not functioning properly one year after implementation, and the board IT office was continuing to deliver customization patches. The continued attempts to repair customizations prevented the LPU registrar’s office from making institutional post-implementation improvements to their processes. For example, one particular academic grading customization was continuing to generate errors in the calculation of grade point averages. As a result, processors in the registrar’s office were still manually auditing end-of-the-semester grade reports, outgoing transcripts, and academic probation and suspension lists to ensure that grade point averages calculated in the enterprise system were correct.
The second post-implementation problem concerning both customization patches and upgrades, as explained by an LPU registrar's office representative, was due to "the cascading effect" caused by a steady introduction of patches and upgrades. Software upgrades are "new releases of the enterprise software … containing new functionality or fixes to software bugs (problems)" (Hossler & Pape, 2006, p. 5). When patches and upgrades are implemented into an enterprise system, they had to "cascade" across all relevant relational data elements within the enterprise system. As in the case of customizations and patches, upgrades also had to be tested and configured by the institutions receiving them. The cascade effect occurred when unforeseen effects occur from the act of an implementation of a patch or an upgrade. During post-implementation the complexity of the cascade effect had increased as a larger number of patches and upgrades were added to the system. The high number of changes to the baseline product made it increasingly difficult to foresee how patches and upgrades would affect the system. Though upgrades, by definition, are viewed as improvements to a baseline enterprise system, they were inadvertently causing unforeseen changes in the baseline system, as well as in the customizations and customization patches. When I conducted my post-implementation interviews, the governing board had already sent the institutions two major upgrades to the software. In the LPU registrar’s office, each upgrade caused unforeseen changes to the configuration of the student module. She concluded that the cascade effects caused by patches and upgrades forced the office to remain in the process of operating by trial and error, similar to the way in which they operated during the implementation. Her sentiments reflect the findings of Wagner and Newell (2007), which point out how functional users continue to experience iterations of implementation
activities as both functional users learn more about “exploiting” the system and the software adapts more to institutional, or in the context of this study, governing board

needs.

The complexities within the baseline system caused by the customizations also generated potential problems with future upgrades. The software vendor had already developed around 10 versions beyond the governing board’s version, and some features within those new software versions were critically needed at the board institutions. For example, the board needed to catch up to the latest version of the software to remain in compliance with financial aid federal mandates accounted for in the most recent version. However, due to the customizations to the baseline system, the board could not rapidly implement multiple upgrades without generating an overwhelming number of unforeseen problems in the system. With each upgrade the board, along with the institutions, would need to perform extensive testing for each version. According to a representative from LPU, there had been a discussion about upgrading only that portion of the student module which was needed to remain in compliance. This would mean that each instance of the software at each institution would need to install internal bridges to link two different versions of the software within each instance. Given her past experience with upgrades, one representative from LPU expressed a great concern for how this strategy would unknowingly affect the student data maintained in the registrar’s office.

Though the time staff spent in the office had been reduced within relatively normal office hours, much processing-related work that the office staff generally conducted on a day-to-day basis remained manual or non-automated. Further, many of the post-implementation manual processes were processes that were actually automated
in the legacy system. The perceived reason for the continued manual processing during post-implementation was attributed once again to the customization patches being delivered from the board to the software instances. The changing nature of the software continued to cause changes to post-implementation processes and prevent office staff from enhancing their processes through automation. Also, software features which were designed to enhance automation, such as workflow and fine-grain access, had not been implemented.

The Effects of the Enterprise System Implementations and the Emergence of New Institutional Identities

In Chapter Two I discussed the findings of studies conducted on ERP implementations in higher education. The authors of those studies concluded that the unique characteristics of higher education organizations did not align with the business-model assumptions found in enterprise software, and that the lack of alignment between the two agents contributed to the effects of the implementation. While enterprise systems embodied the assumption that standardization across organizational units, processes, and data elements are desirable characteristics in an organization, the higher education organizations in those studies enabled uniqueness and autonomy among structural units, processes, and data elements. The poor fit between the enterprise system and the organization resulted in reactions to solve challenges which were not foreseen in the implementation strategy. At the end of that chapter, I used Bolman and Deal’s (1997) four organizational frameworks (structural, political, cultural, human resources) as a framework through which to better understand the effects of the interaction between the
university characteristics and enterprise system. In this section of Chapter Four, I will again use the four organizational frameworks described by Bolman and Deal to better understand the effects of the enterprise software implementation. While discussing the effects of the enterprise system implementation, I will also describe how the effects of the implementations brought about new organizational identities at the three institutions. Similar to the way in which I discussed the case studies in my literature review, I will offer some comparative analysis in my discussion of LPU, LPS and MPU in the context of all four of Bolman and Deal's organizational frameworks.

From the structural perspective, Pollock (2003) and Wagner and Newell (2004) cited Weick (1976) in describing the universities as “loosely coupled” in that “events” and “mechanisms” within the same educational organization tend to preserve their “own identity” and some evidence of “physical or logical separateness” (Weick, 1976, p. 2). From this perspective, Pollack, Pollack and Cornford (2004), and Wagner and Newell described how loosely coupled units within the university (found among faculty, administration, and students) each interacted with the enterprise system in different ways, which slowed down or even halted the momentum of the project.

When reading through the interviews in all three cases from the structural perspective, it was clear that that all registrars recognized that tighter coupling of units, as well as the centralization and standardization of functions and processes within the organization, made it easier to adapt the identity of the institutions to the characteristics of enterprise software. By the same token, they also noted difficult challenges when trying to align the standard configuration of the enterprise software with loosely coupled units and unique functions and processes found in the institutions.
For example, the LPU registrar noted the difficulties of implementing an enterprise system at a comprehensive institution which included a law school. The law school operated much more independently and uniquely from the other colleges and schools on campus. During the implementation, the law school could not be integrated into the enterprise strategy and maintained its existing stand-alone shadow system and respective business processes. On the other hand, LPS and MPU, which both had very large undergraduate populations and a strong focus on undergraduate teaching and learning, had units with common characteristics and goals. At these institutions the registrars did not discuss as many problems associated with widely varying processes among colleges and schools.

The three registrars also noted that adapting the organizational identities to the standards of the software—by centralizing business processes—positively affected their implementations while maintaining decentralized processes during the implementation negatively affected their implementations. The positive effect of organizational centralization could be seen in the way in which the registrars from the two large schools configured user access. The LPS registrar assigned each user's access individually, and the LPU registrar assigned user access by group. While LPS staff spent greater time and effort establishing individual user access centrally on the front end, they were able to maintain a higher level of control over user update access, which reduced the amount of update errors occurring in the system. On the other hand, the LPU registrar's office assigned user access by group, which required less work on the front end but caused a greater amount of time and effort enforcing university policies and end-user transactions.
Additionally, the findings showed that institutions which had high-performing cross-functional teams prior to the implementations were better able to adapt their organizations to the cross-functional design of the software. The positive effects of this type of organizational centralization could be perceived in the way that the LPS and MPU registrars discussed the effectiveness of their student implementation teams during both their implementations and post-implementations. Representatives from both institutions noted that the pre-implementation enrollment management divisions had already existed as tightly coupled units within a strong cross-functional team. This history of collaborative work in enrollment management positively contributed to the implementation efforts of their student implementation teams.

On the system-wide level, the findings suggested that there was a clear tension between the standard instances of software and the varied identities of the institutions. For example, the differences between the community colleges and the universities, as well as among the universities, became very evident during the implementation. As the MPU registrar, looking back on the implementation, stated:

I think our biggest challenge - that being, the short implementation calendar with all schools being viewed the same – overcast[ted] all other challenges we faced. Our [governing board] deemed that all schools would be set up alike, but because we all operate differently, including our infrastructures, this became increasingly challenging.

As a result, the governing board spent a great deal of time and effort reactively adapting the software to meet the needs of certain institutions, while the various institutions made great efforts adapting institutional practices to fit into the parameters of the software.

In terms of the software, which was adapted to meet the unique needs of the governing board’s “system identity” across all instances of the software, customizations
created tremendous implementation and post-implementation challenges and set-backs on the institutional level. Though the board was able to, in the words of Scott and Wagner (2002), fit the “disparate” universities and community colleges into standardized instances of software (p. 1), they were ironically unable to adapt the system’s unique characteristics into the baseline software. During my post-implementation interviews, representatives from both LPS and LPU spent the majority of their interview time discussing the continuing negative effects of customizations and customization patches. In sum, the decision to tailor the software to meet the needs of the governing board initiated an overwhelming number of customizations and patches, which in turn caused a number of setbacks to the implementation. Not only did the frequent customizations and patches cause the cascading effect of unforeseen changes to the system, but the customizations deterred the governing board from installing needed software upgrades.

From the political perspective, Wagner and Newell (2004) cited Cohen et al. (1972), who argued that no individual or select group of individuals is ever in charge of the decision-making in higher education organizations. According to Cohen et al., higher education institutions are structured in a way so that units within institutions can develop their own goals independent from other units. When decisions need to be made across units within an institution, shared-governance structures such as committees are often responsible. The committee structure, however, often operates without “consistent, shared [institutional] goals” (Cohen et al., p. 2) and member participation is often “fluid.” When conflicts arise within a committee, the conflicts are often reinterpreted during the decision-making process, so that original problems are not resolved and final decisions are made by “flight or oversight” (Cohen et al., p. 16). In their study, Pollack and
Cornford (2004) concluded that this method of decision-making affected the ERP implementation that they studied, in that a high number of important configuration decisions were “deferred and then pushed down” from higher level committees to project teams “who, in turn, are unable to do anything other than shift the decision onto the system itself” (p. 42).

During my interviews with individuals at both LPS and LPU, the failure of the committee structure during the implementation was most evident in the data standards committee (which dealt with configuration) and the customization teams. As discussed earlier, members of the data standards committee were unclear about the goals of the committee, participation of committee members was not consistent, and committee members struggled with decisions about developing data standards because many of these decisions required the functional expertise of individuals who were not members of the committee. After the data standards were established by the committee and configured in the system, the functional experts at each campus had to deal with the effects of the committee’s decisions. The effects of these decisions were primarily discussed in the context of the challenges the registrar’s faced when the newly configured data values were implemented after golive, and data fields that the individuals needed were not included in the initial configuration and had to be added or accounted for in the form of a workaround.

Also loosely structured, the software customization teams perhaps faced the biggest challenge during the implementation. The task of developing customizations was delegated by the governing board to ownership teams comprised of individuals from multiple institutions, as well as technical consultants from both the board and the
software vendor. As explained by representatives at LPS and LPU, the ownership teams experienced a number of problems in accomplishing their task as (a) member participation was fluid; (b) committee members were not in close proximity to one another, which made it difficult to complete tasks; (c) members were dedicated to other projects and committees and not solely dedicated to the customization task; (d) committee members lacked knowledge concerning both the governing board policies and the enterprise software configuration; and (e) team members from the 2-year community colleges and team members from the universities had conflicting agendas. It is difficult to determine to what extent the customization committees contributed to the effects of the customizations, but it is clear that the customizations played perhaps the largest role in shaping the identity of the post-implementation institutions.

From the cultural perspective, Wagner and Newell (2004) described the university as a community made up of “diverse epistemic cultures” which embodies “different sets of social, material and discursive practices that make up how we know what we know,” because a diversity of cultures brings about the “heterogeneity of knowledge-creating activity across contexts” (p. 308). Wagner and Newell found that a standard enterprise system founded on “best practices” did not take into account the practices of all unique epistemic cultures on campus, including those of faculty researchers, central administration, and departmental administration. Their conclusion suggested that certain organizational units such as an administrative unit responsible for university finance were culturally more aligned with the enterprise software than others and such alignment favored their practices.
During the interviews, members from all three institutions highlighted the uniqueness of 4-year universities when discussing the challenges of accommodating the cultures of both the 2-year community colleges and the universities within the same software parameters. Under the legacy system, technical support for the mainframe was not provided from the governing board; rather, it was handled locally at each institution. Unlike the 2-year community colleges, which relied on the board to maintain their mainframes, the universities configured and customized the legacy mainframe to meet the needs of the culturally diverse units within their institutions. Over time, the 4-year institutions drifted away from the vanilla version of the legacy system and developed unique components and processes. During the implementation of the enterprise system, and in particular during the data standards and customization committee meetings, the difference in practices between the 2-year community colleges and the universities became apparent. As the MPU registrar summarized, the biggest problem of the implementation was “trying to put all schools into one mold because we’re all unique.”

When comparing the cultures of LPS, LPU and MPU, it also became apparent that the three schools had unique organizational cultures. With a larger graduate population, a stronger emphasis on research, and a law school, LPU was described by the registrar as having very unique cultures across campus. The diverse cultures, especially the culture of the law school, caused challenges during the implementation. The registrar at LPS, on the other hand, described the culture of her institution as more homogeneous. She attributed the unified culture to the institution’s shared goals, including (a) a focus on undergraduate teaching and learning, (b) a focus on meeting regional educational needs, and (c) the need to collaborate across campus to make the best use of scarce resources.
She believed that these characteristics created a collaborative culture that positively affected the enterprise system implementation.

The MPU registrar also described the culture of her university more homogenously than the registrar at LPU and attributed shared cultures across campus as positively affecting the enterprise system implementation. She explained that a cultural commonality across the university related to both the large military installation in the city where MPU was located and the small size of their institution in relation to the other board universities. At MPU one-third of the student body was affiliated with the active military and around one-sixth were veterans. According to the MPU registrar, the military population had unique needs, and the campus community shared a common goal to make sure that the new system accommodated those needs. The small size of the school also created a shared need across campus to be heard during the system-wide implementation activities, such as the data standards committee meetings and the customization ownership team meetings.

Finally, from the human resources perspective, researchers studying ERP implementations in higher education discussed how the fit between the person and the job in all facets of the university was loosely defined as a result of the loosely coupled structure (Wagner & Newell, 2004). For example, faculty members who are promoted to administrative levels for their specialized research accomplishments may not embody the needed managerial or leadership skills, while administrative assistants with no formal accounting skills may be assigned to managing large departmental budgets. Wagner and Newell described that when transitioning from a legacy system to a new enterprise system, new and more specialized administrative skill sets were required of faculty and
staff who were considered generalists in administrative functions such as reporting, budgeting, and database management.

In their discussions about the changing jobs skills of their employees, all three registrars clearly emphasized that the enterprise system required more specialized and higher-level skills than those required for the legacy system. The traditional data entry and clerical skills were no longer adequate for the analytical decision-making skills required to troubleshoot the new enterprise system. At all three universities the registrar saw the need to focus on hiring college graduates with high-level analytical skills over the traditional job applicants with high school diplomas and generalist backgrounds. All three registrars noted that the hiring of such individuals came at a high price, which often was not affordable. During the post-implementation, the emergence of more robust Web-based client services bought about improvements in automated self-service for students, faculty, and staff. Ironically, the business processes associated with the new student module were, in some respects, less automated than the business processes associated with the legacy system. Commenting on the loss of processing functionality in the new enterprise system during post-implementation, the MPU registrar noted:

[The new enterprise system] is no longer the main focus on our campus, but getting it to the level of operation of our old system that the campus was used to, is still a priority and concern for all. Saying that though, many have come to accept that it took us 25 years to get the old system to where it was and it will take some time [with the new system] to get us back to where we were.

The MPU registrar’s words support the finding that implementation effects continued into the post-implementation phase, as the functional users, customization patches, and upgrades affected the enterprise system.
Conclusion

In this chapter I presented the findings of my study on the effects of ERP implementations in higher education. I introduced my findings by providing a description of the quintain of schools included in this study and the nature of my data collection. I organized my findings according to my three research questions. First, I discussed the effects of ERP implementations in the registrars’ offices. Second, I discussed the effects of ERP implementations on the enterprise software. Third, I provided a perspective on the continued post-implementation interaction between institutions and software. Finally, I discussed the effects of the enterprise system implementations and the emergence of new institutional identities. In my concluding chapter I will provide a brief summary of those findings, offer implications for future research and practice, and conclude with closing statements.
Chapter Five: Conclusion

In the previous chapter I discussed the findings of my comparative case study of three similar institutions which implemented the same enterprise software within the same time-frame. The goal of the comparative case study was to gain insight into the effects of ERP implementations in higher education organizations. Utilizing the theoretical lens of actor-network theory, I developed three questions to guide my methodology: How are higher education organizations re-structured to the standards of the software? How is ERP software customized in order to adapt to the characteristics of higher education organizations? How does the interaction of ERP software and higher education organizations translate into a unique identity before, during, and after ERP implementation?

To answer these questions, I primarily interviewed individuals at the three commonly bound institutions and collected institutional documents related to the enterprise system implementations. I narrowed the parameters of my fieldwork to the student module within the enterprise system module, which is unique to the education sector, and the organizational unit of the registrar's office, which interacted directly with the student module. Using respondent-driven sampling, as described by Salgenik and Heckathorn (2004), I asked individuals at the institutions to refer me to other individuals whom they felt were key participants in their enterprise system implementations.
After conducting interviews, collecting institutional documents related to the enterprise system implementations and analyzing the data, I organized my findings according to my three research questions. In examining how institutions were restructured to the standards of the enterprise software implementations, I determined that the three institutions, in general, maintained their unique organizational identities and did not organizationally restructure in order to align their institutions with the relational data infrastructure of the software. That is, organizational divisions and units did not shift substantively and institutional policies, generally, did not change to fit into the parameters of the software. The structures and policies of the individual institutions remained static, in part, because the institutions were overseen by a governing board which (a) controlled the strategy of the project, (b) conducted all of the pre-implementation preparations, and (c) managed the implementation processes. For this reason the strategic goals of the implementation focused more on the needs of the governing board than the individual institutions. As project manager of the multi-campus implementation, the governing board did not undergo substantive structural changes or revise any policies to adapt to the parameters of the software; this resulted in the development of several system-wide customizations.

Though institutional structures and policies did not change much at the three universities, business processes and procedural functions were strongly affected by the implementation. In general, I discovered that when registrars centralized and standardized business processes in reaction to the standards of the software, they were able to conduct day-to-day business more effectively during both the implementation and post-implementation phases. In instances where business processes were not centralized or
standardized, such processes were either executed manually or maintained outside of the enterprise system all together. Additionally, the type of work which registrars and their staff conducted on a day-to-day basis changed noticeably as job functions became less clerical and more analytical in nature. From the client services standpoint, the self-service component of the software, enhanced by a third-party portal, improved the Web-based user capabilities of the students and faculty. The registrars' offices were able to reduce the amount of paper communication, as more transactional features were available for users through the Web, and the offices were able to communicate more effectively with faculty and students through targeted messaging based on specific client attributes.

In examining how the software adapted to the needs of the institutions during the implementation, I determined that the customizations implemented by the governing board in each instance of the software caused overwhelming implementation challenges and severely limited the capabilities of the enterprise software during post-implementation. During the implementation and the post-implementation the software customizations, which were developed to maintain unique governing board mandates and business processes, pulled staff away from baseline implementation activities and caused many unforeseen glitches in the performance of the software. While the institutions were implementing the software, the delivery of customizations and customization patches during the three institutions' first golive semester significantly increased the number of unforeseen errors in the system, and reactionary efforts to troubleshoot customization problems overwhelmed institutional staff. During the post-implementation, the customizations continued to delay the conduct of post-implementation activities to improve business processes and procedures through automation. The customizations also
caused alterations in the baseline software which prevented the governing board from integrating vendor-created upgrades to the system.

Despite my fortunate opportunity of identifying and studying a quintain of commonly bound institutions implementing the same instance of software, my study had limitations which prevented me from gaining further understanding about the effects of ERP implementations in higher education organizations. First, the time I spent collecting data was limited. During the institutions’ implementation phases I spent 2 days interviewing on the campus of LPU, 1 day interviewing on the campus of LPS, and conducted only phone interviews with individuals at MPU. During the post-implementation phase I conducted short follow-up phone interviews with representatives at the institutions. More extensive fieldwork at all three institutions over all phases of the implementations could have introduced more details of the effects of the implementations. Second, the focus of my study was only limited to a small number of individuals related to the registrars’ offices at each institution. Further, those individuals only interacted with the student module within the enterprise system. In Chapter 3, I argued that it is impossible to understand the entirety of an ERP implementation objectively because there are so many individuals and units involved in the lengthy process, each potentially having a unique perspective on the implementation. That said, collecting data from such individuals and units may have provided alternative perspectives on the implementations I studied.
Lessons Learned About ERP Implementations in Higher Education

From my findings, I have identified some lessons learned about the effects of ERP implementations in higher education. Though my findings from this qualitative study cannot be generalized, I feel that these lessons learned on the effects of ERP implementations may inform future higher education research and the professional practice. My hope is that these lessons learned can serve as (a) an addition to the small body of research on enterprise system implementations in higher education, (b) a confirmation of findings in previous studies, (c) a voice for those higher education professionals who have experienced enterprise system implementations, and (d) a discussion springboard for higher education leaders who are looking to implement enterprise software.

First, enterprise systems require universities to establish and maintain high-performing cross-functional teams to operate within a relational database. As shown in the literature, the traditional loosely coupled structure of universities does not align to the relational structure of an enterprise system, and implementation at a traditional university can be costly if the institution does not structurally adapt to integrate with the software (Pollock, 2003; Pollock & Cornford, 2004; Pollock, Williams, & Proctor, 2003). My findings confirm this point indicating that high-performing cross-functional teams (such as the enrollment management teams at LPS and MPU), which are in place prior to enterprise system implementations, may provide an advantage to institutions when establishing cross-functional ERP implementation teams. Such high-performing cross-functional teams tighten loosely coupled organizational units so that unit staff can more
easily centralize and standardize business process and adapt to the infrastructure of a relational database during implementation and post-implementation phases.

Second, enterprise systems require employees who work within the enterprise system to have more specialized job skills. As shown in the literature, the nature of the work conducted by functional users of university information systems can change dramatically when a legacy system is replaced with an enterprise system. That is, work generally shifts from generalist-level tasks to tasks requiring specialized training, knowledge, and skills (Wagner & Newell, 2004). My findings confirmed this. Given the findings of my study, functional users’ work, as it related to processing and customer service, shifted dramatically, from traditional clerical duties and data entry to more specialized tasks, including enterprise system trouble shooting, data analysis, and data testing functions. This required registrars to create, upgrade, or reclassify jobs, calling for job applicants with higher levels of skills typically acquired through a post-secondary degree completion. This also required registrars to have a larger budget to hire more highly qualified functional users.

Third, enterprise systems require implementation committees to be fully educated about the functionality of the legacy system, strategy of the enterprise project, and the relational infrastructure of the enterprise system. As the literature identified, the traditional university governance structure filled with multiple loosely coupled committees is an unsound structure for completing the work required in an enterprise system implementation. In the literature, committees established to work on enterprise system implementations (a) were overwhelmed with the large number of decisions needed on matters such as university policy changes and system configuration, and (b)
must include an effective collaborative decision-making process among both institutional leaders and functional experts (Pollock & Cornford, 2004).

Finally, ERP implementation project managers at higher education institutions need to make great efforts to seek alternatives to software customizations. Though enterprise software is generally only customized for statutory regulations or justifiable business cases, a thorough review of those regulations and business processes must be conducted in order to find alternative solutions to customization. Each customization and customization patch will result in a cascading across the software and respective institutional functions, making it difficult to concretize and improve business processes through features such as workflow and fine-grain access. Excessive customizations also deter institutions from upgrading to current versions of enterprise software, which may include required industry solutions.

Recommendations for Future Research and Practice

From this study on the effects of enterprise system implementations in higher education organizations, I have formulated several recommendations for future research and practice. In terms of research, it is critical that more qualitative case studies be conducted at those institutions which have not yet, but plan to, implement enterprise systems in the future. As argued by Latour (1999), the complex details of enterprise system implementations can be black boxed and historically forgotten after the implementation has occurred and functional users become familiar with the new way of doing things. As my study and the studies in the literature show, it is important to observe and capture the many events, decisions, and adaptations which occur during an enterprise
implementation in order to gauge the effects of the implementation on an institution. Such studies will provide valuable insights for both the researcher and the practitioner.

Second, future research needs to be conducted on enterprise system implementations in order to understand how higher education organizations develop their visions and strategies for enterprise system implementations. More specifically, it would be of great benefit to identify how ERP visions in higher education organizations tie into the concept of organizational integration, which is the key premise of enterprise resource planning. According to the Gartner IT Glossary (2004), enterprise resource planning begins with an organizational vision to integrate functions (such as technical, financial, human resources, and student) to dynamically balance and optimize enterprise resources. When applying the concept of integration to the higher education sector, it would be valuable to understand how ERP visions in higher education reconcile the concepts of organizational integration with the traditional higher education organizational structure comprised of the loosely coupled units, diverse epistemic cultures, shared governance, and broadly defined job roles. Comparative case studies may provide insight into alternate visions of organizational integration in higher education. For example, it may be of value to look at ERP implementations at institutions in the for-profit sector in order to understand more about how business-sector organizational structure interacts with an enterprise system. Additionally, it may be fruitful to conduct studies at recently established higher education institutions built on enterprise systems and not on legacy systems.

Third, more specific aspects of changes in the enterprise software need to be examined. For example, I did not examine how institutions choose to adapt supplemental
data fields found in the baseline software to meet their needs, write programming scripts which can affect the way in which data is displayed and reported to a user, select and integrate third-party software applications, and develop procedures for possible data feeds into databases which are not connected to the enterprise system. An examination of these software changes would provide more in-depth findings on the effects of enterprise system implementations.

Fourth, beyond the institutional walls of university campuses, it may also be valuable to look at the effects that client-sponsored consortiums and associations as well as vendor-sponsored user conferences have had on enterprise software. As the number of institutions using enterprise software has grown and software vendors have expanded nationally, it would be of great interest to examine the way in which user groups have steered the direction of the software to meet user needs.

This study on the effects of ERP implementations in higher education also has implications for practice. First, from an educational leadership standpoint, higher education administrators need to reflect on whether the integrated solutions promised by enterprise systems provide the best information solution for their unique organizational needs. The two integration questions which university leaders must ask themselves are: (a) does our institution’s ERP vision truly embody a vision of integration (structural, political, human resources, and cultural)? and (b) will the enterprise software enable our institution to achieve our goals of organizational integration? Based on the literature and my study, I conclude that higher education organizations ultimately value their unique institutional identities over the prospect of a new integrated organizational identity, which would require radical changes to the traditional organizational structure and policy.
Second, I would suggest that educational leaders focus on a comprehensive implementation assessment to build a shared institutional need and an institution-wide knowledge base from which to pursue the ERP vision. Implementation committees and teams should undergo a comprehensive education to both fill in knowledge gaps and gain a shared perspective concerning the implementation prior to beginning their work. The education should include (a) a thorough review of the institutions vision of integration, (b) a historical understanding of the legacy system from the functional experts’ perspectives, and (c) baseline training on the new enterprise system. If members of implementation committees are not educated comprehensively, they may make decisions based solely on historical practices, base decisions on an unclear understanding of the functionality of the enterprise software, or may altogether avoid making decisions, allowing implementation problems to be solved in a reactionary manner during go-live.

Third, educational leaders need to understand that enterprise resource planning is not a one-time event which occurs at the margins of the organization. On the contrary, the challenges of enterprise implementations continue into post-implementation. Enterprise systems are continually affected by changes to the system related to software upgrades, customizations, and customization patches, which in turn affect the organizational use of the software. By the same token, institutions are continually affected by new institutional policies, accreditation rules, state mandates, and federal regulations, which in turn place new demands on the software system. With so many external influences on higher education organizations and their information systems, an education leader needs to assess (a) whether the adoption of a vanilla version enterprise
system is even feasible, and (b) if the cost of customizations and upgrades to the software is financially affordable for the long run.

Conclusion

As I began gathering and evaluating the literature for this dissertation in 2005, I quickly recognized a need for a study on the effects of enterprise system implementations in higher education. Very little research had been conducted in this research area. As shown in my literature review, only a handful of studies have examined the effects of ERP implementations in higher education. I recognized that vendor-based information systems and third-party software solutions had pervaded universities, as the need to capture, analyze, and report on student data has grown with an increased nationwide focus on enrollment management. I recognized that it was important to identify how the implementations of these new systems were transforming the landscape of higher education.

As a researcher, I feel that the study has contributed to the scholarship on ERP implementation in higher education in that it adds a new type of qualitative case study, the comparative case study, to the existing body of literature. As a practitioner in higher education, I hope that the findings of my study tell a story with which educational leaders can identify about the complex interactions among the network of functional experts, institutional leaders, governing authorities, vendor consultants, and software components that make up an enterprise system implementation. By providing this story to both higher education researchers and educational leaders, I hope to inspire more reflective analysis.
on how educational leaders think about their own institutional identity and future organizational strategies in the context of enterprise resource planning.
Thank you again for agreeing to participate in this study on ERP Implementations in Higher Education. Please complete the following survey and enclose in the self-addressed stamped envelope. Result from this survey will assist me in preparing for interviews at your campus.

<table>
<thead>
<tr>
<th>Departmental Function</th>
<th>Departmental Oversight</th>
<th>Software Customization</th>
<th>Departmental Restructuring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage departmental budget</td>
<td>Yes</td>
<td>No</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Conduct NCAA athletic eligibility certification</td>
<td>Yes</td>
<td>No</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Schedule classrooms</td>
<td>Yes</td>
<td>No</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Commencement and graduation planning</td>
<td>Yes</td>
<td>No</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Compose enrollment reports and projections</td>
<td>Yes</td>
<td>No</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Coordinate registrar policies and procedures among academic units</td>
<td>Yes</td>
<td>No</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Enrollment verification</td>
<td>Yes</td>
<td>No</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Ensuring integrity of data issued from registrar’s issues</td>
<td>Yes</td>
<td>No</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>Initiating and coordinating changes to the student information system (Web-based self-service student account)</td>
<td>Yes</td>
<td>No</td>
<td>0 1 2 3 4 5</td>
</tr>
</tbody>
</table>
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</thead>
<tbody>
<tr>
<td></td>
<td>Please indicate whether your office is responsible for this function by circling Yes or No</td>
<td>Please indicate on a scale from 1 to 5 how much software customization needed to occur for this departmental function by circling one of the following numbers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = Cannot be Determined 1 = None 2 = Very Little 3 = Some 4 = Very Much 5 = Required External Software Solution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issue transcripts</th>
<th>Yes</th>
<th>No</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance of student records (paper records)</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Monitoring satisfactory student progress</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Degree auditing</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>Final degree certifications and issue diplomas</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<td>Yes</td>
<td>No</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>Academic calendar</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>University catalog</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Student registration (online and face-to-face)</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tbody>
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<td>Please indicate whether your office is responsible for this function by circling Yes or No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Software Customization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please indicate on a scale from 1 to 5 how much software customization needed to occur for this departmental function by circling one of the following numbers.</td>
</tr>
<tr>
<td>0 = Cannot be Determined</td>
</tr>
<tr>
<td>1 = None</td>
</tr>
<tr>
<td>2 = Very Little</td>
</tr>
<tr>
<td>3 = Some</td>
</tr>
<tr>
<td>4 = Very Much</td>
</tr>
<tr>
<td>5 = Required External Software Solution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Departmental Restructuring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please indicate on a scale from 1 to 5 how much office restructuring needed to occur for this departmental function by circling one of the following numbers.</td>
</tr>
<tr>
<td>0 = Cannot be Determined</td>
</tr>
<tr>
<td>1 = None</td>
</tr>
<tr>
<td>2 = Very Little</td>
</tr>
<tr>
<td>3 = Some</td>
</tr>
<tr>
<td>4 = Very Much</td>
</tr>
<tr>
<td>5 = Required Addition or Deletion to departmental structure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coordinate publish course schedule</th>
<th>Yes</th>
<th>No</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervise academic advisement</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Transfer credit evaluation</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Veteran's affairs</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Student database management (electronic record)</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Managing record changes with paper and online forms</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td></td>
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<td>5</td>
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<td></td>
<td>Yes</td>
<td>No</td>
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<td>5</td>
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</table>
APPENDIX B

Interview Questions

Pre-implementation Perceptions on ERP and the Organization

1. What functions or processes did the University/Registrar’s office want to maintain throughout the new ERP system?

2. What functions or processes did the University/Registrar’s office perceive as needing to be remedied by ERP?

3. Describe the bidding software vendors presentations.
   a. Did they address the functions/processes you wished to maintain?
   b. Did they address the functions/process you wished to remedy?
   c. Did they describe functions/processes not used or addressed by the university?

Perceptions of ERP and Organizations during implementation

1. How involved were you involved with the design and testing of the student module?

2. Describe for me the training that you went through to use the student module in your job.

3. How did you contribute to the production of support materials for the job that you do in strategy/processing/customer service).

Post-implementation post-“going live” perceptions of ERP and organizations

1. How has your job’s reporting structure changed after ERP implementation? How is your job’s reporting structure the same?

2. How has your access and use of the mainframe changed? How is it the same?

(political)
3. How has your interaction with people in your department and people in other departments changed? How is it the same? (cultural)

4. Have you been required to learn and use new job skills as a result of ERP implementation? If so, what new job skills were easy to learn? Which ones were difficult to learn? Have certain components of your job remained the same? Have certain aspects vanished or become easier? (human resources)
APPENDIX C

Informed Consent Form for Registrars

University of North Florida
Division of Sponsored Research and Training

INFORMED CONSENT FORM FOR REGISTRARS

Enterprise Resource Planning in Higher Education: A Comparative Case Study

I would like to invite you to participate in a research study on the effects of ERP implementation in higher education. In particular, I will be examining the effects of ERP implementation on the student record. You have been chosen as a possible participant because of your important duties related to records maintenance and the registration process at your university, as well as your direct interaction with your university’s ERP system. Please read this Informed Consent Form and formulate any questions or concerns you might have before agreeing to serve as a participant in this research study.

This study is being conducted by:

Aaron Marterer, Doctoral Student
Department of Leadership, Counseling, and Instructional Technology
University of North Florida
Jacksonville, Florida

Dr. Kathe Kasten, Committee Chair
Department of Leadership, Counseling, and Instructional Technology
University of North Florida
Jacksonville, Florida

Background Information

The purpose of this study is to explore the ERP implementation process in higher education in order to better understand a) how higher education organizations re-structure to the standards of the software, b) how ERP software is customized in order to adapt to the characteristics of higher education organizations, and c) finally, how ERP software and organizations may translate into a new identity before, during, and after ERP implementation.

I will visit three similarly characterized universities which have adopted the same ERP software and interview employees in the records and registration offices and related offices to collect employees’ perceptions of the ERP implementation related to registrar’s office functions. I hope to interview participants who have worked with both the university’s legacy system as well as the new ERP system.
Procedures

If you choose to participate in the study, I request from you the following provisions:

1) Please plan to complete a pre-interview survey concerning ERP student module customization and default choices related to registrar’s office functions. The pre-interview survey is included in this packet for your review. The survey allows you to identify and list all registrar functions at your institution, as well as identify your perceptions of effect which ERP had on each of those office functions. The survey will assist me in preparing for the interview component of this study.

2) Please be prepared to participate in a ninety-minute interview in person on the campus of your institution. The interview will related to ERP implementation at your institution and will be recorded and transcribed for data analysis.

3) Please allow yourself to be available for interviews sometime between July 2007 and December 2007.

4) Please be prepared to identify three to five individuals both within and outside of the registrar’s office, who can provide additional insight about the ERP issues discussed in the interview.

Risks and Benefits of Being in the Study

No known risks are connected with this study. Information acquired during your interview will remain confidential, but a small risk for breach of confidentiality exists.

Benefits of being in the study include the availability of the findings of this research study which may assist you or your institution in future decision-making. As a participant you may request to receive the results of the study.

Compensation

You will not receive payment for participating in an interview, but will receive a humble word of thanks from the researcher and results of the study upon request.

Confidentiality

In order to uphold confidentiality guidelines and human subject policies at University of North Florida, I will remove all institutional and personal names in order to create confidentiality for both the institutions and the participants discussed in the study. Interviews will be recorded and transcribed for analysis. The recordings will be securely stored and will only be accessed by the researchers.
Voluntary Nature of the Study

Taking part in this study is your decision. You may decide to stop at any time. Simply tell the director of the study that you wish to stop.

Contacts and Questions

The researcher conducting this study is Aaron Marterer. You may ask any questions that you have now. If you think of any questions after the interview, I encourage you to contact the researcher through the University of North Florida or by phone at (843) 521-4194 or by e-mail at marterer@sc.edu.

To inquire into UNF policies, the conduct of this study, the rights of research subjects or what recourse you have should you indicate any risk or discomfort related to your participation in this study, please contact the Chair of the Institutional Review Board, Dr. Kathaleen Bloom at (904) 620-2684.

I will provide you with a signed copy of this form for your records.

Statement of Consent

After reading the Informed Consent Form, I hereby agree to participate in this study on the effects of ERP implementation in higher education. I have had an opportunity to have any questions or concerns addressed. I have been given a copy of this form.

Printed Name of Participant:

________________________________________
Participant’s Signature Date:

Printed Name of Individual Obtaining Consent

________________________________________
Individual’s Signature Date
Enterprise Resource Planning in Higher Education: A Comparative Case Study

You have been identified by your university’s registrar as an individual who may be suitable to participate in a research study on the effects of ERP implementation in higher education. As a result, I invite you to participate in this study which will be examining the effects of ERP implementation on the student record. You have been chosen as a possible participant either because of your job duties related to records maintenance and the registration process at your university or your direct interaction with the university’s student module during ERP implementation. Please read this Informed Consent Form and formulate any questions or concerns you might have before agreeing to serve as a participant in this research study.

This study is being conducted by:

Aaron Marterer, Doctoral Student  
Department of Leadership,  
Counseling, and Instructional Technology  
University of North Florida  
Jacksonville, Florida

Dr. Kathe Kasten, Committee Chair  
Department of Leadership,  
Counseling, and Instructional Technology  
University of North Florida  
Jacksonville, Florida

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Procedures

If you choose to participate in the study, I request from you the following provisions:

1) Please be prepared to participate in a ninety-minute interview in person on the campus of your institution. The interview will related to ERP implementation at your institution and will be recorded and transcribed for data analysis.

3) Please allow yourself to be available for interviews sometime between July 2007 and December 2007.

Risks and Benefits of Being in the Study

No known risks are connected with this study. Information acquired during your interview will remain confidential, but a small risk for breach of confidentiality exists.

Benefits of being in the study include the availability of the findings of this research study which may assist you or your institution in future decision-making. As a participant you may request to receive the results of the study.

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I will provide you with a signed copy of this form for your records.

Statement of Consent

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Printed Name of Participant:

Participant’s Signature Date:

Printed Name of Individual Obtaining Consent

Individual’s Signature Date
APPENDIX E

Institutional Review Board Approval Memo

MEMORANDUM

DATE:    July 6, 2007

TO:      Aaron Marterer

VIA:     Dr. Katherine Kasten,
          Educational Leadership

FROM:    Dr. Kathaleen Bloom, Chair,
          UNF Institutional Review Board

RE:      Review by the UNF Institutional Review Board IRB#07-087:
          "Enterprise Resource Planning in Higher Education: A Comparative Case
          Study"

This is to advise you that your project, "Enterprise Resource Planning in Higher
Education: A Comparative Case Study," has been reviewed on behalf of the UNF
Institutional Review Board and has been approved (Expedited/Category #9).

This approval applies to your project in the form and content as submitted to the IRB for
review. Any variations or modifications to the approved protocol and/or informed consent
forms as they relate to dealing with human subjects must be approved by the IRB prior
to implementing such changes. Any unanticipated problems involving risk and any
occurrence of serious harm to subjects and/or others shall be reported promptly to the
IRB.
Your study has been approved for a period of one year. If your project continues for more than one year, you are required to provide a Continuing Review Report to the UNF IRB prior to 7/6/08.

Should you have any questions regarding your approval or any other IRB issues, please contact Nicole Sayers, Assistant Director of Research Integrity, at 620-2498.

Thank you.

c: Dr. Joyce Jones, Educational Leadership Chair
REFERENCE LIST


VITA

Aaron Marterer attended the University of South Carolina (USC) in Columbia, South Carolina for both undergraduate and graduate studies. He graduated from the USC with a Bachelor of Arts in German and Art History in 1993 and a Master of Arts in German in 2000. Aaron has enjoyed a career in higher education administration since 1998, when he began working for a US Department of Education TRIO program housed at the University of South Carolina Beaufort (USCB) in Beaufort, South Carolina. After 6 years with the TRIO program, he transitioned to the position of Registrar at USCB. He served as Registrar at USCB for 2 years before taking the position of Associate Registrar for Academic Enforcement at USC in 2008. Aaron currently lives in Columbia, South Carolina, with his wife, Angela, and daughters, Lenora and Genevieve.