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Post-implementation Success Factors For Enterprise Resource Planning (erp) Student Administration Systems In Higher Education In

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POST-IMPLEMENTATION SUCCESS FACTORS FOR ENTERPRISE RESOURCE PLANNING (ERP) STUDENT ADMINISTRATION SYSTEMS IN HIGHER EDUCATION INSTITUTIONS

by

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ABSTRACT

This research study investigated the post-implementation experiences of 6 higher education institutions following the initial implementation of a Student Administration ERP system and explored how these institutions used the post-implementation phase to maximize the benefits from the ERP system. A mixed-method approach consisting of an online survey and qualitative case study was utilized for data collection; within-case and cross-case analyses were performed to generate the research results and findings. The overall post-implementation experiences of the case study institutions were found to be similar in nature, regardless of institution size. Several post-implementation characteristics were also found to be shared in varying degree among all case studies. Customizations and third-party software were used by all case studies in post-implementation to meet operational needs not provided by the Student ERP system. The number of customizations and enhancements completed or under consideration by the case study institutions indicate that there are many areas in which current Student ERP systems do not fit the needs of higher education institutions. The results of this research can inform and guide higher education administrators on the institutional impacts and changes that will occur in the ERP post-implementation environment. Administrators will be enabled to better evaluate the overall success of their project based upon post-implementation characteristics and experiences of the institutions in this study and apply the outcomes to improve planning for future ERP system projects.

This is dedicated with love and gratitude to my beloved husband, John,
our cherished children, John and Jessica, and our precious grandchildren.
And to my Mother, who continues to live, laugh and love.

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CHAPTER I
INTRODUCTION

During the last decade, higher education institutions have been faced with the need to upgrade or replace aging computer software systems, often referred to as legacy systems, which no longer meet or support current technology needs. As demands for more complex federal and state data reporting increased and new multi-campus and virtual campus environments required more robust systems, the majority of legacy systems were no longer able to perform to the level required. Other major catalysts for change included the year 2000 (Y2K) software limitations and student expectations for Web technology, an area most aging legacy system platforms were unable to support (Nah, 2002; Oliver, 2005). The solution for a number of institutions has been the selection and implementation of an Enterprise Resource Planning (ERP) system.

An ERP system "refers to large commercial software packages that promise a seamless integration of information flow through an organization by combining various sources of information into a single software application and a single database" (Nah, 2002, p. i). These sources of information may include all of the financial, administrative and operational data generated by a business. Prior to the ERP phenomenon, information from each business function was retained in its own individual software application, and companies were challenged to combine these data sources to extract the information necessary for business management and decision-making (Davenport, 2000).

ERP systems had their genesis in the manufacturing industry and were known as MRP (manufacturing resource planning) solutions (Davenport, 2000). Continuing

evolution and designs for industry-specific needs resulted in the development of ERP systems applicable to major operational areas such as human resources, finance and administration, and functions specific to specialized industries, including higher education (Davenport, 1998; Siau & Messersmith, 2003).

Current ERP versions used by higher education are those that have been designed by the vendors based on their expertise to provide best practice processes tailored to specific industry operations (Fowler & Gilfillan, 2003; Siau & Messersmith, 2003; Soh, Sia, Boh, & Tang, 2003). The integrated, off-the-shelf software promises "streamlined processes, better customer service, and, in turn, added value to the company" (Siau & Messersmith, p. 57).

The initial surge of ERP implementations in higher education was marked by a wide range of results. Many institutions struggled with highly-publicized implementation project difficulties that were evidenced by cost overruns, missed deadlines, and operational disruptions (Fowler & Gilfillan, 2003). Even with the tenuous start between higher education and ERPs, their popularity has continued to grow with more institutions undertaking implementations each year. In the EDUCAUSE Core Data Service survey for fiscal year 2005, 73% of the more than 800 responding institutions reported "having implemented or being in the process or RFP stage of implementing an ERP, with only about 18% reporting no plans to do so" (Hawkins & Rudy, 2006, p. 49). The same survey also reported a significant increase to 48.8% for completed implementations from the previous year's completion rate of 43.9%.

ERP systems are expensive and can represent one of the largest investments of human and financial resources by an institution (Dewey & DeBlois, 2006a, 2006b). They also bring a significant business process reengineering aspect to the institution and the implementation project by the integration of compiled industry best practices into the software. These embedded best practices often require the institution to alter its operations to match those delivered in the system. (Markus & Tanis, 2000; Pollock, Williams, & Procter, 2003; Wagner, Scott, & Galliers, 2006).

According to Dewey and DeBlois (2006b), "Projects of this scope might last three years or more and demand large and sustainable investment and commitment by institutional and IT leadership, both throughout and after implementation" (p. 66). Realizing the benefits from an ERP system and the ability to quantify these benefits are becoming more critical to those administrators and chief information officers who must continue to justify the significant on-going expense and operational impacts on the institution (Hawkins & Barone, 2003). The benefits are not usually realized at go-live, which is the point of the project where the ERP system becomes the production database for the operation of the organization and users enter live data in the system for normal operations. It may often take months or years for an organization to fully assimilate all of the process changes enabled by the new system (Hawking, Stein, & Foster, 2004; Markus & Tanis, 2000).

Purpose of the Study

The purpose of this research study was to explore the ERP Student Administration post-implementation experiences of selected institutions, and to present their successes and challenges so that higher education administrators and leaders can use the case study institution experiences to determine what actions they may need to take at their institutions for a successful post-implementation experience. This study will add to the small body of research focused on the higher education post-implementation ERP experience, as well as contributing to the growing area of ERP post-implementation research in general. Additionally, the research offers useful insights into the continuing impact of an ERP implementation project on the higher education institutional environment following go-live.

Statement of the Problem

Realizing the benefits from an ERP system and the ability to quantify these benefits are becoming more critical to those administrators and chief information officers who must continue to justify the significant on-going expense and operational impacts on the institution (Hawkins & Barone, 2003). Because the effects and benefits of an ERP implementation are not widely recognized until the post-implementation phase, this study explored answers to the question: "How have higher education institutions used the post-implementation phase to maximize the benefits from their ERP Student Administration system?"

Research Questions

Qualitative case study research is often characterized by emergent design, where the questions and design structure unfold as the research evolves (Lincoln & Guba, 1985; Miles & Huberman, 1984). However, the research literature also provides for more structured case study designs in which substantive research questions are predetermined (Yin, 1994, p. 69). The following overarching research questions were identified by the researcher to bound the study's focus:

1. What are the ERP Student Administration module post-implementation experiences among higher education institutions?
2. How have post-implementation activities supplemented, improved, or addressed issues created by or not resolved by the initial implementation?

General questions, as outlined in Chapter III of this dissertation, were utilized in interviews and further supplemented by additional probes from which was collected rich information necessary to conduct analyses and theory development relevant to the primary research topic.

Definition of Terms

The following terminology definitions are provided to clarify their use in the study:

Backfill – Temporary staff hired or reassigned to fill operational positions of functional staff who are assigned to work on an ERP implementation project (Babey, 2006).

Best-of-breed – Selection from among multiple applications of a function-specific software system or module designed to fit a specific operational need of the institution (Davenport, 2000).

Customization or Configuration – The addition of institution-specific field values and definitions into tables designed for this purpose without requiring modification of the program coding. This is often done by power users as no programming is required (Brehm, Heinzl, & Markus, 2001).

End-User – Although an end-user can be defined as "anyone who is reliant on the ERP software in some operational sense" (Dery, Grant, Harley, & Wright, 2006, p. 200), for the purposes of this study, an end-user is the administrative staff and faculty of an institution who may input operational data in the ERP system or rely on information retrieved from the system for decision-making.

Enterprise Resource Planning Systems (ERP) - Large commercial software packages promising seamless information flow through an organization by combining various sources of information into a single database (Nah, 2002, p. i).

Go-Live – The point of the project where the ERP system becomes the production database for the operation of the organization, and users enter live data in the system for normal operations.

Implementation Approaches – One or more methods used by the institution to develop and establish the ERP system as the production software for the organization. Different approaches are defined:

> Big-bang implementation – A rapid implementation process in which everything in the ERP system (or all chosen modules) is implemented simultaneously (Davenport, 2000).
>
> Phased implementation – A staggered approach by which the ERP system is implemented on an individual module, business unit, or functional basis (Davenport, 2000).
>
> Vanilla implementation – Implementing the ERP system as delivered from the vendor with no modifications or changes to the product to make it fit existing institutional processes and procedures. This implementation approach usually relies completely on business process reengineering (BPR) by the institution to fit the delivered ERP set-up structure and processes (Bancroft, Seip & Sprengel, 1998).

Initial Implementation – As used as a selection criteria for this study, initial implementation indicates the first implementation of an ERP system at an institution.

Legacy Computer Systems – Institutional computer systems, often developed in-house, which have been in place for many years and do not normally meet present day technology needs. These are usually the systems which are being phased out and replaced by ERP systems.

Modification – Changing the program code in the base structure of the ERP system. This is usually strongly discouraged by the system vendor and institution technical staff as it can make patch updates and version upgrades more difficult, as well as increasing resource costs related to maintaining the system (Brehm, et al., 2001).

Post-implementation – For the purposes of this study, post-implementation is the phase immediately following go-live when the ERP system (individual component or complete module) becomes the functioning system for live, day-to-day operations.

Third-party Bolt-Ons or Add-Ons – "Bolt-ons are extensive modifications of a basic ERP package developed by a third-party independent software vendor (under license agreements with the original vendor) to meet the needs of a particular customer segment" (Brehm, et al., 2001, p. 2).

Y2K – The change of century to year 2000 which was the impetus for much of the demand for ERP systems; these systems offered software solutions to century date change limitations in legacy systems (Davenport, 2000).

Design of the Study

This research study was conducted using a mixed-method approach. An initial online survey was conducted to assess the current status of ERP implementations in public and private U. S. institutions, and to provide the initial data from which to conduct purposive sampling for selection of the case study institutions. Case study methodology was employed to collect enriched and robust data on post-implementation experiences of

higher education institutions selected from among the survey respondents. Answers to the research questions and additional conclusions for the study were drawn from within-case and cross-case analyses of the data collected in the case studies, the quantitative online survey data, and review of supplemental sources.

Online Survey

An initial online survey was designed to collect the current status of ERP implementations at public and private higher education institutions nationwide. The survey was also used to identify from among the responding institutions those that met the case study selection criteria as defined in the section, "Case Study Design."

Population

The population for the online survey was defined as the over 600 public and private U.S. institutions of higher education with a Fall 2007 Integrated Postsecondary Education Data System (IPEDS) unduplicated student headcount of greater than 1,999 and which participated in the 2006 EDUCAUSE Core Data Service survey (Hawkins & Rudy, 2007). EDUCAUSE is a "nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology" (Hawkins & Rudy, 2006, inside cover page). The EDUCAUSE respondent population was selected because the voluntary participation in the Core Data Service survey indicated to the researcher an administrative interest in assessing technology usage on campus.

Instrumentation

The survey was pilot tested by 15 higher education technology administrators and leaders from a large university who were invited to participate in the pilot. The pilot survey included six additional questions for the respondents to provide feedback on their survey experience. Three administrators from the university's Operational Excellence and Assessment Support office also reviewed the survey and provided their recommendations on the survey design. Following successful validation of the survey and after obtaining Institutional Review Board (IRB) approval, the online survey was conducted in January and February 2008. The chief information officer (CIO) or primary technology administrator of each U.S. institution as defined in the preceding survey population section was contacted by email and invited to participate in the short online survey. Contact email addresses were obtained through institutional websites, online staff directories, or phone inquiries to appropriate offices.

Data Collection and Analysis

The quantitative survey data were summarized to define the institutional ERP status and characteristics of the population. Individual responses were used to identify those institutions meeting the selection criteria for the qualitative research activities of this study. The institutions meeting the selection criteria were then included in the purposive sampling evaluation for the case study institutions as described in the next section.

Case Study Design

Six institutions were selected for in-depth exploratory case study analysis in a multiple case design. The multiple case design was chosen for the richness and variety in data it can provide and for the compelling weight of evidence that it can add to a study (Miles & Huberman, 1984; Yin, 1994). The institutions were chosen from among the online survey respondents whose institutional ERP characteristics met the following selection criteria: (a) completion of an initial ERP Student Administration module implementation, and (b) completion of the implementation within the last 4 years.

Selection Criteria

The primary selection criterion was the completion of an initial implementation of an ERP system Student Administration module. Student Administration represents one of the three ERP system modules most often used in higher education to improve business processes; Finance and Human Resources being the other two modules (Kvavik, Goldstein, & Voloudakis, 2005). The Student Administration module was chosen as the primary institutional selection criterion because it is unique to higher education and limited research exists specific to Student Administration ERPs. Therefore, the case study research focused specifically on the post-implementation experiences of the Student Administration ERP module at the six selected institutions.

A second criterion was that the initial implementation of the Student Administration module was to have been completed within the last 4 years. This time

period was selected based upon the researcher's personal experience with higher education ERP implementations and from consultation with three additional higher education professionals. All three individuals have experience in higher education administration and ERP implementations: two are currently working as university administrators, each having gone through two ERP conversions, and the third has worked several years in higher education as an ERP Student Administration consultant for implementation projects. Specifying an optimal time frame was important to this study for identifying institutions that had sufficient time in the post-implementation environment to develop relevant experiences and responses to the initial implementation before transitioning focus and efforts to major enhancements and upgrades.

The design was further enhanced by incorporating institutional size as an additional selection determinant. ERP literature reflects a recurring theme that organizational size is a determining factor in the implementation experience and that further research based on organization size is needed (Esteves & Pastor, 2001; Hawking, et al., 2004). Three size levels based upon the Fall 2007 IPEDS unduplicated student headcount were used, representing small (2,000-7,999), medium (8,000-14,999) and large (15,000+) institutions.

Purposive Sampling

Final selection of the six case study institutions was accomplished through purposive sampling. Purposive sampling is designed to allow the researcher to select

cases that will provide the widest range of post-implementation experiences (Erlandson, Harris, Skipper & Allen, 1993; Lincoln & Guba, 1985; Miles & Huberman, 1984; Patton, 1990). After receiving IRB approval for the qualitative phase of this study, the purposive sampling process began by contacting via email the survey respondent of each institution which met the case study selection criteria. The email requested the opportunity for the researcher to contact the respondent by phone for further discussion on their ERP implementation and post-implementation experiences as a follow-up to the original ERP characteristics survey.

The phone discussions provided the researcher with an opportunity to verify the online survey responses, obtain additional information about the institution's post-implementation experience and also to determine the respondent's interest in supporting participation as a case study institution for this study. The researcher used the discussion responses to select the six institutions which would provide the richest range of experiences for study and optimize "the researcher's ability to identify emerging themes that take adequate account of contextual conditions and cultural norms" (Erlandson, et al., 1993, p. 82).

Case Study Protocol

On-site Visits

The institutional representatives for the six selected case study institutions were contacted by email to inform them that their institution had been selected to be one of the

case study institutions for this project and to request consent for an on-site visit by the researcher. Interviews were requested with administrators, staff and faculty directly and indirectly involved in the ERP system project at each institution "on the basis of what they can contribute to the understanding of the phenomenon under study" (Erlandson, et al., 1993, p. 91). The individuals were identified as including the Registrar, Director of Admissions (Undergraduate and Graduate), Director of Student Financial Aid, Information Technology (IT) developers, functional end-users of the Student Administration module, academic advisors and faculty members. All six institutions originally selected for the case study research agreed to participate. Each school identified a contact person who set up the interview and activity schedule and served as host for the researcher during the on-site campus visits.

The on-site visits were conducted in June and July, 2008, and spanned 1, 2 or 3 days, depending upon the interview schedules arranged by the institution. A site visit database was created to record general data about the overall site visit and to maintain an audit trail of interviews, activities, and other information relevant to the visit. A reflexive journal was maintained by the researcher in which to record her personal daily observations, thoughts, and impressions of the research process.

Interviews

As outlined in the on-site interview protocol developed by the researcher, signed authorization of informed consent was obtained from each individual at the beginning of

the interview session prior to any data collection. The interviews were conducted individually or in small groups to accommodate participant schedules, and utilized a focused approach (Yin, 1994). Although Barrow (1994) recommends the CIO, or primary institutional representative be the first person interviewed at each institution to provide "a historical perspective on the university computing organization and structure…. and basic information on the information technology environment on campus" (p. 58), this was not practical for most of the institutions visited due to individual scheduling availability. However, the phone discussions with the CIO or chief technology administrator that occurred during the purposive sampling process served the same purpose, and provided the researcher with the historical context of the ERP project and supplied a frame of reference for the interviews.

Digital voice recordings were the primary means of interview data collection; the technology was unobtrusive and did not appear to affect the respondents' interactions with the researcher (Erlandson, et al., 1993; Yin, 1994). Additionally, written field notes were taken by the researcher to capture main discussion points and observations about participants. All audio recordings were transcribed verbatim into hard copy. A copy of the transcript was emailed to each participant for validation and feedback. An interview database was prepared by the researcher and completed as soon as possible after the interviews to provide an audit trial of general logistical information about the interview, a short summary of the interview results, and to indicate whether any follow-up was needed.

Interview Questions

The on-site interview participants were asked to respond to the following overarching, guiding questions that correlate to the two research questions previously identified in the Research Questions section of this dissertation:

1. Describe the institution's ERP Student Administration implementation experience from your perspective.
2. Describe your experience with the ERP Student Administration implementation.
3. Describe the ERP Student Administration go-live experience from your perspective.
4. What has been the institution's post-implementation experience from go-live to present from your perspective?
5. What has been your post-implementation experience from go-live to present?
6. How would you describe the current status of the ERP Student Administration module?

Based upon the respondent's answers, the researcher supplemented the general inquiries with additional probes to draw out the details necessary to identify emerging themes and provide rich data for analysis from which the answers to the research questions of this study were developed.

Follow-up discussions with the interviewees were conducted telephonically and via e-mail for the purposes of clarification and review of personal interview transcriptions

as needed. All feedback was recorded and retained in logs which correspond with initial interview records.

Documentation

Multiple sources of data were collected during the on-site visits. In addition to interviews, access to relevant documentation and archive records was requested during the on-site visit. Examples of these documents and records included the ERP project plan, project meeting minutes, project team organizational charts, and current ERP project information. Supplemental sources, including institutional websites and existing literature, were also researched for information to support and enrich the case study analysis.

Data Collection and Analysis

A case study database was created for the retention of the data and documentation collected so that the evidence could be made available for independent review by other researchers. According to Yin (1994), "a case study database markedly increases the *reliability* of the entire case study" (p. 95). The items in the database included the researcher's written field notes, verbatim and summarized transcripts of the digital voice recordings, reflexive journal, site visit and interview databases, documentation, archive records, and all other additional data or evidence collected.

All data and documentation were coded based upon conceptual categories that were continually evaluated and refined throughout the case study process (Lincoln & Guba, 1985; Miles & Huberman, 1984). The coding and categorization allowed for the utilization of table matrixes for within-case and cross-case analyses as suggested by Miles and Huberman.

Data Validation

Traditional research has established validity tests for determining data quality and trustworthiness: (a) construct validity, (b) internal validity, (c) external validity, and (d) reliability (Yin, 1994). These tests have been redefined to be more applicable to qualitative research using the following terms which correspond respectively to the conventional validity tests: (a) confirmability, (b) credibility, (c) transferability, and (d) dependability (Erlandson, et al., 1993; Lincoln & Guba, 1985). Trustworthiness and data quality was established for this study utilizing these techniques.

Confirmability was addressed by creating an audit trail of the research, collecting multiples sources of evidence, maintaining an awareness of researcher bias, and by having institutional case study informants validate their interview transcripts (Erlandson, et al., 1993; Lincoln & Guba, 1985; Yin, 1994). Credibility was established by triangulation of data (multiple sources of evidence from different data sources and methods), utilizing peer debriefing with a second reader of the draft research study, review of the draft case study report by the institutional informants, and the use of a

reflexive journal (Erlandson, et al.; Lincoln & Guba; Miles & Huberman, 1984; Yin). Transferability was addressed with purposive sampling, by providing thick descriptions in the research chapter of this dissertation, and by the use of replication logic in this multiple-case design (Erlandson, et al.; Lincoln & Guba; Yin). Dependability was established by the creation of the case study database, maintenance of the research audit trail, and use of the reflexive journal (Erlandson, et al.; Lincoln & Guba; Yin).

Analysis

The use of multiple case study design for this research provided for compelling and robust analysis. Each individual case study was first analyzed as a single case design. Upon completion of the single case analyses, cross-case or multiple-case analysis was also conducted. Table matrices for within-case and cross-case analyses were utilized as outlined by Miles and Huberman (1984). Replication logic was also applied to the analysis and aided in theory development and analytical generalization (Yin, 1994). Literal replication, or similar results, was anticipated among the institutions of similar sizes, whereas theoretical replication, or contrasting results, was expected to occur across the size ranges (Yin). From this analytical review, a theoretical framework was developed which, according to Yin, "later becomes the vehicle for generalizing to new cases, again similar to the role played in cross-experiment designs" (p.46).

Delimitations and Limitations

Population selection for the initial online survey was limited based upon the institution's participation in the EDUCAUSE 2006 Core Data Service survey. Delimiters were applied that required the institution to be located in the United States and have a Fall 2007 IPEDS unduplicated student headcount greater than 1,999.

Selection of case study institutions was delimited by the requirement to have completed the implementation of an ERP Student Administration module. The institution selection was further delimited by requiring the implementation to have been completed within the last 4 years. A response of "Not Interested" to follow-up discussions on the institution's ERP experience (see survey question 8 in Appendix A) was a limitation which excluded institutions from consideration for case study participation.

Significance of the Study

The future research recommendations in recent literature indicate a need for information that can be used by higher education administrators and leaders to aid them in understanding the continuing impact of the ERP implementation on the institution environment following go-live. This study adds to that growing body of knowledge by identifying post-implementation characteristics that can be used to gauge levels of success, with emphasis on those that may be unique to higher education. The results of this research can inform and guide higher education administrators on the institutional impacts and changes that will occur in the ERP post-implementation environment.

Administrators will be enabled to better evaluate the overall success of their project based upon post-implementation characteristics and experiences of the institutions in this study and apply the outcomes to improve planning for future ERP system projects.

CHAPTER II
REVIEW OF LITERATURE

According to Markus and Tanis (2000), research on enterprise systems can add considerably to the overall body of information systems (IS) literature in the following areas: (a) financial costs and risks, (b) technical issues, (c) managerial issues, (d) information technology (IT) adoption, use, and impacts; and (e) integration. "Enterprise systems affect nearly all aspects of organizational life, not only at the point of startup but also throughout their operational lives" (p. 205).

This chapter provides an in-depth review of existing research on ERP systems. Initially, the evolution of ERP research is presented, followed by a discussion of the major theoretical research approaches found in the literature. Specific research on ERP systems as applied to organizational fit and higher education is then considered, with a summary of current literature on ERP post-implementation concluding the chapter.

Evolution of ERP Research

The history of ERP system evolution is well documented in much of the literature. ERP systems had their genesis in software developed for the manufacturing industry in the 1970's. These solutions were known as MRP (materials requirement planning) systems and evolved during the next decade to MRPII (manufacturing resource planning) systems. The design of the MRP and MRPII software was focused on inventory management, production scheduling, and later incorporated financial management

(Nah, 2002; Okunoye, Frolick & Crable, 2006; Pairat & Jungthirapanich, 2005; Umble, Haft & Umble, 2003; von Hellens, Nielsen, & Beekhuyzen, 2005).

Continuing evolution and designs for industry-specific needs resulted in the development of ERP systems applicable to major operational areas such as human resources, finance and administration, and functions specific to specialized industries, including higher education (Davenport, 1998; Siau & Messersmith, 2003). Much of the early literature focused on this application and growth of ERP systems within business and commercial enterprises, with the majority of the research examining implementation methodologies

The early ERP literature was surveyed by Esteves and Pastor (2001) with a focus on IS studies conducted during 1997-2000. Their search encompassed IS journals and academic conference proceedings, using keywords containing various combinations, all of which included "enterprise," for example, enterprise wide systems. Esteves and Pastor also searched on the main ERP vendors at the time which included SAP, BAAN, Oracle, PeopleSoft and J. D. Edwards. Additionally, relevant articles from other publications were selected, resulting in a collection of 189 documents for the bibliography review.

Esteves and Pastor (2001) used a six-phase ERP life cycle classification system to categorize the articles. The life cycle phases included (a) acquisition, (b) adoption, (c) implementation, (d) usage, (e) evolution, and (f) retirement. Of the life cycle phase literature, 62% (78 articles) addressed some aspect of the implementation phase. Esteves and Pastor defined success as making it through the implementation. This notation is

indicative of the attitude prevalent in the early literature which defined success on a project basis and did not address the organizational impacts or the realization of benefits in the post-implementation environment. The remaining 47 documents, classified as life cycle research, were distributed among the acquisition, adoption, usage, and evolution phases. The additional literature which fell outside of the ERP life cycle categories were classified as either general or education. The general category included recent studies in research issues, organizational knowledge, business modeling, and ERP product development issues. Research focused on education revealed a developing interest in ERP academics with 16 studies addressing the incorporation of ERP into the curricula. The early adoption of ERP usage by higher education institutions was evidenced by only 10 articles found on this subject (Esteves & Pastor).

In their review, Esteves and Pastor (2001) noted a lack of in-depth studies on user satisfaction and user involvement with the ERP system. They additionally highlighted the interdisciplinary nature of ERP systems and strongly suggested that future ERP research should be approached from this perspective.

Botta-Genoulaz, Millet and Grabot (2005) conducted a survey of recent literature to identify new trends in ERP research. A review of major publishers selected from science, management and applied sociology disciplines for the period 1996 through 2003 revealed an increase in ERP-focused research articles from 18 in 1996 to 461 in 2003. This increase mirrors the growth in ERP adoption during the same time period. To specifically consider the most recent trends in ERP research, Botta-Genoulaz, et al.

(2005) conducted online searches in multiple disciplines for articles and conference communications, published in 2003 and 2004, which contained "ERP" in the title, keyword, or summary information. This search process resulted in obtaining 250 relevant documents which were reviewed and narrowed to the 80 articles analyzed in the literature survey.

A synthesis of the selected literature by Botta-Genoulaz, et al. (2005) identified six major areas of recent significant research: (a) ERP implementation, (b) ERP optimization (post-implementation), (c) management by ERP, (d) ERP software applications, (e) ERP and supply chain management (SCM), and (f) ERP case studies. They found that ERP implementation, although one of the first focuses of ERP research, continued to receive significant attention in current studies. The recent areas of implementation research have expanded to include studies on socio-cultural factors, business process alignment, and various aspects of organizational and human factors that influenced the success or failure of an implementation.

Their second classification of recent significant research, optimization of ERP, highlighted the small, but growing interest in the post-implementation phase of an ERP project and the corresponding shift of focus to investigate returns on investment and benefits received by an organization from the adoption of an ERP system. From this viewpoint, Botta-Genoulaz, et al. (2005) proffered their own definition of ERP success, "In reality, success is achieved when the organization is able to better perform all its business processes and when the integrated information system can support the

performance development of the company" (p. 514). The research on optimizing the ERP system is divided into three distinct areas: (a) post-implementation, (b) user satisfaction, and (c) gaining competitive advantage. Botta-Genoulaz, et al., posited that the maintenance and upgrade of the ERP system was a distinct aspect of the post-implementation environment and highlighted the dearth of research on ERP maintenance. Their survey found growth in studies on user satisfaction and the correlation of user satisfaction to the successful incorporation of an ERP system into an organization. From these studies, Botta-Genoulaz, et al. reflected that the use of the technology by employees had a greater impact on the company than the technology alone. In reviewing the third post-implementation research area, Botta-Genoulaz, et al. found that realization of competitive advantage through the adoption of an ERP system was not validated by the literature.

Consideration of the impact of ERP systems on organizational management and its requirement for cross-functional interaction was highlighted in the third area of significant research by Botta-Genoulaz, et al. (2005) with studies that looked at management issues, impacts on the organization, fitting the ERP to best business practices, and cultural issues. The two areas of research in ERP software and supply chain management documented the further growth of ERP studies into specific aspects of the system software itself and into the changing dynamics of ERP systems, including interactions with complementary applications. The significance of emerging studies and potential growth for research in these areas was indicated by Botta-Genoulaz, et al. in

which they observed, “It is interesting to notice that most of the research is done on the periphery of the ERP, and not on the systems themselves” (p. 512). Because of the continuing and rapid evolution of ERP system application and usage as highlighted in their literature survey, Botta-Genoulaz, et al. stressed the importance for ERP researchers to be knowledgeable of current research not only in their own fields of study, but also in related disciplines. They supported the utilization of the case study approach as a relevant part of ERP research. By noting the exceptions found in the reviewed literature, Botta-Genoulaz, et al. highlighted the prevalent practice of concealing the identities of the organizations participating in case studies, although the majority of the studies indicated the type of business of the participating institutions.

Botta-Genoulaz, et al. (2005) concluded from their literature survey that future ERP research must consider the expanding and changing dynamics of ERP systems. They also acknowledged that the present definition of an ERP system is changing. Additionally, they stressed that researchers should be aware of the impact an ERP system has on a company, its far-reaching effects into all aspects of the organization, and account for this in future studies. Finally, Botta-Genoulaz, et al. emphasized the multi-disciplinary nature of ERP research and noted the lack of studies that fully incorporate this aspect.

Dery, et al. (2006) built on the Esteves and Pastor (2001) literature review by examining ERP studies from 2000-2005 and applying the Esteves and Pastor classification framework to these articles. Dery, et al. reviewed 238 papers to assess the

on-going development of ERP literature and found that emphasis on the implementation life cycle phase continued to predominate the research. Their examination also revealed an increase in studies on usage and maintenance (post-implementation). Dery, et al. separated the post-implementation studies into two distinct emphases: (a) user satisfaction and managerial use, and (b) ERP return on investment. These results indicated that researchers were addressing the lack of in-depth depth studies on ERP user satisfaction and user involvement identified by Esteves and Pastor and corresponded to the findings of Botta-Genoulaz, et al. (2005).

The review by Dery, et al. (2006) also included an analysis of the literature by journal category. In addition to IS publications, the studies came from journals in business, accounting, logistics and human relations disciplines, with business being "the fastest growing publication category for ERP papers, currently comprising approximately 30 per cent of total publications" (p. 202). This finding evidences the expansion of ERP research into disciplines other than IS, indicating the evolution to interdisciplinary approaches in the study of the ERP phenomenon. The need for this development was indicated in the findings by both Esteves and Pastor (2001) and Botta-Genoulaz, et al. (2005).

The Esteves and Pastor (2001) review was updated in 2007 by Esteves and Bohorquez. Using the same search methodology as in the earlier study, Esteves and Bohorquez surveyed ERP research for the period 2001-2005, and added an additional 260 documents to the bibliography. Their analysis supported the development trends in recent

ERP research as summarized by Botta-Genoulaz, et al. (2005) and Dery, et al. (2006). Further, Esteves and Bohorquez found that as the research progressed to follow the dynamic evolution of ERP systems within organizations, new avenues for study had emerged. A shift in focus by ERP vendors from large companies to small and medium size businesses provided opportunities for research into different markets and company types. The recent spate of acquisitions and mergers among ERP vendors provided great opportunity for research and analysis on the impact of this activity on the ERP industry. Esteves and Bohorquez also argued in their conclusion that there was a lack of "systematic comparative research among organizations, industrial sectors, and geographic regions" (p. 240) and they continued to promote an interdisciplinary approach in the study of ERP systems.

This overview of the evolution of ERP research provided a foundation for understanding the ERP system phenomena and illustrated the dynamic nature of ERP system development and utilization. Gaining knowledge on the early and current areas of ERP research as well as becoming aware of identified gaps has aided this researcher in defining the subject for this dissertation study and in the selection of the methodology by which the research was accomplished.

Research Approaches

This section presents a discussion of the major theoretical approaches used in ERP research. The approaches are separated into five areas of focus: (a) defining success,

(b) ERP life cycle models, (c) critical success factors, (d) alternative process-oriented approaches, and (e) work and organizational theory.

Defining Success

One of the early challenges to ERP research reflected in the literature was how to define success in evaluating outcomes of an ERP project. No single definition has been settled on. The definitions for a successful ERP experience have evolved in correlation to the development and expansion of ERP research, beyond a technical systems orientation to include socio-technical theory, process models, factor research and organizational impacts following implementation (Calisir & Calisir, 2004; Nah, Zuckweiler & Lau, 2003; Parr & Shanks, 2000; Peslak, Subramanian, & Clayton, 2007; Umble, et al., 2003). However, the varied approaches to defining success for an ERP adoption can be grouped into two general categories based upon the focus of the research. The first category is project success, defined by Parr and Shanks as "bringing the project in on time and on budget" (p. 291). A broader outlook focused on the organization is the second category which emphasizes business process analysis and improvement (Barrett, Gallagher, Worrell, & Gallagher, 2007). Parr and Shanks, however, additionally noted that the definition of success may change over the life cycle of the ERP project.

The idea of success being an evolving and dynamic concept as opposed to a static measure was further developed by Markus, Axline, Petrie and Tanis (2000) who posited that the definition of success can vary depending upon the point of view from which it is

evaluated. In their study on the experiences of 16 manufacturing organizations that adopted ERP systems, Markus, et al. differentiated five viewpoints to consider in measuring success: (a) technical aspects, (b) economic, financial, or strategic business terms; (c) the extent to which business operations run smoothly, (d) the perceptions of an organization's managers and employees, and (e) the perceptions of the organizations' customers and other external stakeholders. They additionally argued that success may also be defined by the point of time in which it is measured. Markus, et al. selected three distinct phases in the ERP life cycle, as defined by Markus & Tanis (2000), to which they attributed distinct success measures. (These phases are described in greater detail in the ERP Life Cycle Process Models section of this chapter). In the project phase, success related to completing the project on time, within budget, and implementing operational functionality as defined by the scope of the project. The second phase, referred to as the shakedown phase, considered short-term changes to operations and impacts on performance in determining success. Achieving expected results, improving business processes, and routine maintenance and upgrades of the ERP system are success indicators associated by Markus, et al. with the third, onward and upward, phase.

Markus, et al. (2000) evaluated the 16 manufacturing organizations through a combination of qualitative in-depth case study methodology and interviews. Applying the differing dimensions of success metrics to the companies' ERP experiences, Markus, et al. validated that predefined factors do not determine success nor remain constant throughout the course of a project. They further found that "in order to understand the

success of an ERP experience, one needs to look at what goes on (e.g. problems experienced and attempts at problem resolution) at each phase of the experience cycle" (p. 259).

The evolving concept of success was further expanded by Markus and Tanis (2000) with their proffered definition of *optimal success* as "the best outcomes the organization *could* achieve with enterprise systems, given its business situation, measured against a portfolio of project, early operational, and longer term business results metrics" (p. 186). Markus and Tanis argued that the concept of optimal success has theoretical application in that it incorporates the unexpected events and impacts on an organization resulting from an ERP implementation that are not part of the projects's planned measures and outcomes. They aligned this concept with emergent process theories, which integrate organizational objectives with external influences, and submitted it to practical application in their Enterprise System Experience Cycle discussed in the following section.

Understanding the varying approaches to evaluating the success of an organization's ERP experience as presented in the literature provides multiple frames for application to future research. This researcher applied the success metrics as described by Markus, et al. (2000) to the analysis and interpretation of the experiences of the six case study institutions that participated in this study. The concept of optimal success (Markus & Tanis, 2000) was also considered in developing the conclusions for this research project.

ERP Life Cycle Models

Efforts to better understand and manage ERP adoption processes has led to the development of conceptual ERP life cycle frameworks or process models by a number of researchers.

Early ERP Life Cycle Development

The traditional information systems life cycle model, Systems Development Life Cycle (SDLC), was presented by Greci and Hull (2004) as a framework by which to understand the differences between new ERP applications and existing technology within the context of incorporating instruction on ERP systems into current information systems curriculum. However, Greci and Hull suggested that it could also be applied to empirical research. In their review of literature, they correlated the stages of the SDLC life cycle (planning, analysis, design, implementation, support) with ERP life cycles phases identified by ERP vendor, SAP (planning, analysis, configuration, installation, support). However, Peslak, et al. (2007) argued that SDLC was originally conceived as a model for companies to manage in-house development of new software and that "the actual implementation of commercial off the shelf software ERP systems is an area that is suggested to have a life cycle of its own" (p. 25). This argument limiting the application of SDLC to ERP research appears to have some validity as this researcher found no other major study in the literature which used the SDLC as the basis for ERP systems research.

An early ERP life cycle structure was presented by Bancroft, et al. (1998) in their text on implementing the ERP system R/3 by vendor, SAP. Their five-phase cycle focused on the acquisition and activities commencing at the start of the project through the implementation of the system. By ending with the implementation phase, this model represents a limited view of the ERP life cycle and does not provide for the on-going maintenance, support, and continuing organizational change that are characteristic of ERP projects (Fowler & Gilfillan, 2003; McCredie & Updegrove, 1999).

In a study that evaluated whether 15 manufacturing companies realized business value benefits from their investments in ERP systems, Ross and Vitale (2000) applied a five stage life cycle model to their analysis. To bound the study, the firms were selected based upon completion of an ERP system implementation from one of the major ERP vendors. These vendors included SAP, Baan, Oracle and PeopleSoft. The researchers intentionally sought representation by each of the vendors among the firms chosen. The data for the study were collected through phone interviews from three different levels of user perspectives: (a) executive project sponsors, (b) implementation project managers, and (c) business unit department heads.

To analyze how the companies, most of which had been live with their ERP systems for less than a year, had progressed through the ERP experience to their current level of operation, Ross and Vitale (2000) used a five stage life cycle model. They defined the five stages as (a) ERP design, (b) implementation, (c) stabilization, (d) continuous improvement, and (e) transformation. By applying the framework of the

ERP life cycle to their study, Ross and Vitale identified and analyzed the issues, obstacles and outcomes at each stage of the ERP experience. They found little differentiation among the experiences of the companies; they appeared to all be generally following the path of technology adoption. The outcomes for these organizations would be dependent their abilities to successfully overcome any hurdles along the way. One drawback to this study, as determined by this researcher, was that the authors did not provide a theoretical foundation or reference to support their research approach, especially in the design and application of the ERP life cycle presented.

Enterprise System Experience Cycle

Markus and Tanis (2000) identified a four-phase Enterprise System Experience Cycle by which an ERP implementation project can be initiated, goals and objectives defined, performance measures established, and outcomes assessed from conception until the system is upgraded or replaced. In contrast to Ross and Vitale (2000), and as previously discussed in this chapter in the section on defining success, the Markus and Tanis framework is modeled on emergent process theory, which "emphasizes the often unpredictable interactions between people in organizations and the environment" (p. 187). In selecting this theoretical foundation, Markus and Tanis contrast it to rational actor and external control theories, both often applied in IT-related research.

Rational actor theory, grounded in social psychology, attempts to interpret the interactions of individuals with the technology and to explain the adaptation of users to a

reasonable acceptance of the technology (Agarwal, 2000; Bendoly & Cotteleer, 2008; Fichman, 2000). An example of this theory is the Technology Acceptance Model (TAM) by Davis, Bagozzi, and Warshaw (1989) (as cited in Bendoly & Cotteleer, 2008; Fichman, 2000; Markus & Tanis, 2000) which focused on "how work behavior may be contingent on both the perceptions of ease of use and usefulness of an IT" (Bendoly & Cotteleer, 2008, p. 25). Markus and Tanis (2000), however, noted that the rational actor theory does not account for the influences of external factors on the outcomes of technology acceptance.

The influence of external factors was addressed in the second theoretical perspective summarized by Markus and Tanis (2000), external control theory. Under this theory, external influences can be considered as the effect of the technology on the organization or the individuals in the organization (Markus & Tanis). Other factors within this theoretical orientation can be described as the external institutional pressures affecting an organization's assimilation of ERP technology through influence on top management, as presented in an empirical study by Liang, Saraf, Hu and Xue (2007). In their research, which was framed by institutional theory, Liang, et al. tested six hypotheses related to top management, external institutional forces, and IT assimilation through survey methodology of 77 Chinese companies that had implemented ERP systems. Their findings, that top management had a mediating effect on how successful an organization adjusted to the adoption of an ERP system, presented an argument which supported the summary statement by Markus and Tanis that "a strength of external

control theories is their explicit acknowledgement that organizations and people have less than perfect ability to make their goals a reality" (p. 187).

The emergent process theory upon which Markus and Tanis (2000) elected to ground their Enterprise System Experience Cycle, considers the internal and external influences between the organization and its environment. This theoretical choice was called into question by Gattiker and Goodhue (2005) whose research on ERP alignment with subunits in 111 manufacturing plants following the shakedown phase suggested a rational actor theory is appropriate for ERP system study. This appeared to conflict with Markus and Tanis' emergent process theory assertions in that Gattiker and Goodhue did not find significant unpredictable variance in factors affecting ERP outcomes. However, following further analysis, Gattiker and Goodhue identified differences in research focus in which they determined Markus and Tanis' emphasis was on implementation while their research evaluated the organization following successful completion of an ERP implementation. Gattiker and Goodhue then acknowledged that when studying the implementation phase emergent process theory is relevant, because of the difficulty in attempting to predict implementation results. They further concluded that using a predictive model for the study of post-implementation impacts is appropriate.

Markus and Tanis' (2000) four phase Enterprise System Experience Cycle consisted of (a) the chartering phase, (b) the project phase, (c) the shakedown phase, and (d) the onward and upward phase. The chartering phase focuses on the initial decision-making processes which lead up to the purchase and funding of an ERP system; the

project phase consists of all the activities required to develop the system and release it as the production environment; the shakedown phase represents the period between go-live and when normal operations become stable and routine on the new ERP system; and the onward and upward phase covers the remaining operational life of the ERP system until it is upgraded or replaced.

This dissertation research study was conducted within the shakedown and onward and upward phases in the conceptual framework of the Markus and Tanis (2000) model. In addition to the theoretical grounding of this model, the benefits of using the framework are identified by Markus and Tanis as (a) the use of meaningful terminology in the naming and descriptions of each phase, (b) specific consideration of external factors and their impact on planning and problem resolution, and (c) a focus on goals appropriate to organizational strategy.

Critical Success Factors

A second approach to ERP research has been the incorporation of factor research which analyzes the factors deemed pivotal to ERP implementation success (Aladwani, 2001). Critical success factor (CSF) theory was originally applied in other industries and areas, including general project management, manufacturing systems, and reengineering (Holland & Light, 2003). Several ERP researchers have taken previously identified CSFs and adapted them to determine the levels of success or failure for ERP implementations. One of the early examples of this is found in the text on ERP implementation by

Bancroft, et al. (1998), in which they described nine factors from general project methodology which they posited as being critical for any major implementation to succeed. These factors included corporate culture for change management, business process change, communication, top management support, project management, team makeup, project methodology, training, and commitment to change. According to Bancroft, et al., there is a changing business culture being ushered in by enterprise systems. In this new environment, they argued, all of the nine factors must be more closely adhered to now than in the past due to the high cost, high complexity stakes of adopting an ERP system.

CSF Applied Management Perspective

In an oft-cited study, Holland and Light (2003) utilized case study methodology to develop a CSF framework and to assess its practical application for ERP projects from an applied management perspective. The first phase of the project, development of a CSF framework, was accomplished through case studies of business organizations that had implemented ERP systems. Seven organizations representing different industries were selected through purposive sampling to provide a variety of implementation experiences and from which the theoretical framework would be developed. Interviews with key functional and technical personnel were conducted over a two year period and secondary data sources were also examined. Single case and cross-case analyses were performed from which Holland and Light developed their CSF framework for ERP implementations.

The critical success factors framework was separated into two conceptual areas, strategic and tactical. According to Holland and Light (2003) strategic factors focus primarily on the planning aspects of a project which have the most importance in the beginning phases of a project. Tactical factors focus on the activities necessary to carry out the project and grow as the project progresses. The strategic factors in Holland and Light's CSF framework included legacy information systems, business vision, strategy, top management support, project schedule and planning. Client consultation and acceptance, personnel, business process change and software configuration, monitoring and feedback, communication, and troubleshooting were the framework's tactical factors.

Holland and Light (2003) evaluated the practical application of the framework by applying it to two case studies from the first phase of the study. In their results, two strategic factors were highlighted as particularly significant and provided contrast between the two organizations, legacy information systems and ERP implementation strategies. The impact of moving from a legacy information system affected the two companies differently and this influenced the strategy each chose for implementing their ERP system. One company selected a very basic minimalist implementation strategy, attempting to minimize the impact on moving from their legacy system. The other company chose to do a full implementation, implementing all modules across all business units. The choice of implementation strategy significantly affected the tactical factors, particularly business process change and software configuration within each organization. Using these examples, Holland and Light discussed in their analysis how the strategic and

tactical factors interacted within the critical success framework during the course of an ERP implementation project. Their research conclusions highlighted how the pervasive nature of ERP systems interweaves all aspects of a business organization and results in the ERP platform redefining the IT infrastructure of the company. Holland and Light recommended further research which continues to explore the complex, multi-faceted nature of ERP systems from different perspectives, one of which is post-implementation issues.

ERP Project Best Practice CSFs

In a variation on success factor research, Ferratt, Ahire and De (2006) conducted a study on large ERP projects, investigating the extent to which the adoption of best practices for ERP implementations resulted in positive outcomes for the project. They observed that early ERP adopters did not have ERP-specific best practices to draw on and most often had to rely on general project management methods. Following the growth in ERP adoption, researchers have since accumulated a large base of ERP best practices, or CSFs, as evidenced in the literature. As the first step in the study, Ferratt, et al. (2006) reviewed the literature to identify the guiding managerial themes based upon ERP project research. They classified the project success factors found in the literature into three overarching categories: (a) on-time performance, (b) on-cost performance, and (c) project success. From this synthesis of the literature, Ferratt, et al. constructed a listing of nine best practice factors previously identified in ERP research and their corresponding

outcomes. Over 4,500 chief technology administrators were then asked to participate in a survey to determine the extent to which these factors were incorporated into their ERP projects. Analysis of the 120 survey responses received indicated that the best practices were mostly followed and there were positive outcomes in the implementation projects.

Ferratt, et al. (2006) identified four best practices that emerged from the survey data: (a) top management support and participation, (b) software selection and acquisition, (c) participation by the IT systems area, and (d) consulting participation. They additionally considered contextual factors as determinants which affect the ability of organizations to realize benefits in an ERP project. One of these factors was the size of an organization. Following their analysis, Ferratt, et al. concluded that organization size did not make a difference. However, they did note that larger or random samples may reveal different outcomes. Ferratt's conclusion on organizational size was supported by Cramer (2005); however, this finding contrasts with other research in the literature which suggests organizational size may affect ERP project outcomes and benefits (Hawking, et al., 2004; Mabert, Soni & Venkataramanan, 2003; Markus, et al., 2000).

ERP Implementation CSFs

Conducting a synthesis of existing literature, Nah, et al. (2003) identified 11 CSFs determined to be critical to the success of ERP implementation projects. The CIOs of Fortune 1000 companies were then surveyed by the researchers to measure their perceptions of the criticality of the 11 CSFs to an ERP project. The CIO responses ranked

the top five factors most critical to a successful implementation as being (a) top management support, (b) having a project champion, (c) teamwork and team composition, (d) project management, and (e) a change management culture. The high level of importance placed by the CIOs on these factors is consistent with CSFs identified by other ERP researchers (Bancroft, et al, 1998; Ferratt, et al., 2006; Holland & Light, 2003).

Building on the study of Nah, et al. (2003), Ngai, Law, and Wat (2008) conducted a literature review in 2006-2007 for CSFs, using the 11 factors identified by Nah, et al. to group the research outcomes. Forty-eight articles on ERP implementation were included in the study and from these, Ngai, et al. identified seven additional CSFs for a total of 18 critical success factors which were analyzed for applicability not only to ERP implementations in general, but also across 10 countries and regions. In their findings, Ngai, et al. validated the CSFs identified by Nah, et al., but argued that the CSFs were not necessarily transferable to ERP projects in other countries or regions due to differences in culture, IT knowledge and infrastructure, and economic challenges. Further research into the successes and challenges of ERP implementations in different countries and cultures was recommended.

Higher Education ERP Implementation CSFs

Noting the lack of research on CSFs specific to higher education, Nielsen (2005) reviewed current ERP research literature and created a listing of 29 success factors

through this synthesis. Nielson applied these factors to a university ERP implementation study to determine their criticality in the post-secondary academic environment. The study was bounded by a framework developed from the literature on information system project success as well as previous studies on ERP implementations and CSFs. The framework consisted of six elements: (a) strategic factors, (b) organizational context, (c) ERP system quality, (d) ERP implementation quality, (e) ERP project scope, and (f) user satisfaction and use. Citing Yin (1994), Nielsen selected case study research methodology for the university study and utilized pre- and post-implementation interviews of administrators, staff and students as the primary means of data collection. Additional information from secondary sources and observations was also gathered. The use of multiple data sources allowed triangulation of the data which increased the credibility of the study.

The key findings of the study revealed that 22 of the 29 CSFs established by Nielsen (2005) during the literature review were also identified by the case study participants as being important to their ERP experience. Furthermore, the study also identified four additional CSFs not previously mentioned in the literature: (a) competitive edge, (b) service for students, (c) knowledge management, and (d) system ownership. The results of this research study indicated that while there is much commonality in ERP system experiences across industry sectors, particularly in the implementation phase, there are also unique differences in the higher education environment as evidenced by the

four additional CSFs identified in the university experience which had not previously been addressed in the literature.

This researcher's review of the literature on CSFs found the research most heavily oriented toward ERP implementations. Few empirical studies were found with a specific application of CSFs to the post-implementation environment. This was supported by the research of Ngai, et al. (2008) which found that the majority of ERP CSF research remained focused on implementation, echoing the findings of earlier ERP researchers. In their discussion on implications for future research, Ngai, et al. argued that although the preponderance of ERP CSF studies investigated implementation phenomena, the post-implementation phase of the ERP was just as critical to the organization, so all aspects of the ERP life-cycle warrant conclusive study.

Alternative Process-Oriented Approaches

Project Phase Model

Parr and Shanks (2000) argued that neither life cycle phases nor CSF theory were singularly sufficient to adequately address the complex issues in analyzing ERP system effects. Their study promoted an extension of the previous research by combining life cycle phases with CSFs into a single project phase model (PPM). This model presents the ERP life cycle in three phases, (a) planning, (b) project, (c) enhancement, and relates individual CSFs to specific project phases. The researchers described the model as being "centered on the individual, discrete phases of the implementation project itself rather

than one which treats the project as just another phase in the whole implementation enterprise" (pp. 289-290).

Two case studies were used by Parr and Shanks (2000) for empirical testing of the PPM model. The two companies were separate business units affiliated with the same parent corporation and were selected to offer a cross-case comparison between what were considered successful and unsuccessful ERP implementations. Data were collected using semi-structured interviews guided by an interview protocol developed from the PPM model. Additional information was collected through review of company and project related documentation for data triangulation to increase the validity of the study. A minimum of five stakeholders were interviewed at each company to obtain a variety of viewpoints and included representation from administrators, technical and operational managers, end users, consultants, and project team members.

The case study approach allowed Parr and Shanks (2000) to identify the CSFs that were perceived by the companies as important for each phase of the PPM model. They noted in their findings that the company with the successful ERP implementation project considered seven CSFs - management support, project champion, change culture, vanilla ERP, empowered decision makers, full-time personnel support, deliverable dates, and defined project scope and goals - as important across all phases of the PPM model. Whereas the company with the unsuccessful ERP implementation identified only one CSF, management support, as important.

The limitations of the PPM model for applicability to this study are that it used the more narrow definition of project success, on time and on budget, and it focused on the implementation phase of the project. Implications for this dissertation study from the Parr and Shanks (2000) research is that neither of the case studies in their research found the enhancement phase following go-live to be consequential. This differentiates from the life cycle process model studies which identified the post-implementation phases to be significant.

Aladwani (2001) and Yu (2005) offered two variations on process research which highlighted the dynamic nature and multi-faceted elements of an ERP system. They contrasted the process-oriented approach with factor research, which, according to both Aladwani and Yu, is valuable for interpreting certain aspects of ERP implementation, but has limited effectiveness in evaluating dynamic processes due to its static nature. Yu argued that "since the installed ERP system is not an ending but instead is continuously working and improving over time and across the organization in a complex exercise, the measurement effectiveness cannot be simplified and understood from a single aspect only" (p. 119).

Integrated Process-Oriented Model

Aladwani (2001) presented an integrated process-oriented model to address the challenge of worker resistance to the adoption of an ERP system. Aladwani's model was based on the application of two marketing concepts, strategic marketing and consumer

behavior, to an ERP framework. He equated the marketing elements of buyers, sellers and products to the users, implementers and systems of an ERP project. A theoretical framework that identified user resistance to technical innovation was also incorporated into the model. Aladwani cited the research by Sheth (1981) which proffered two sources of resistance: perceived risk and habit. According to this framework, perceived risk is the uncertainty of outcome, or risk, associated with the adoption of the new technology as perceived by the user; habit is the user's comfort level in knowing and completing processes on a routine basis. The purpose of Aladwani's model is to offer a framework by which top level management can address and overcome user resistance to the ERP system.

Aladwani's (2001) change management model utilized a three-phase process approach. Phase one was knowledge formulation, in which the attitudes and beliefs of individual users and various stakeholder groups were identified and evaluated to determine the source(s) of resistance. The information collected during phase one was used to develop change management strategies for application within the second phase.

Strategy implementation, the second phase, was the application of strategic activities by organization and project managers to positively influence or change user attitudes toward the ERP adoption. These strategies were approached from three levels: awareness, feelings, and adoption. Based upon the analysis of outcomes from previous ERP research, Aladwani (2001) offered suggested change management strategies to positively influence users at one or more of the following levels: (a) communication, with

primary emphasis on communicating to users and groups the benefits of adopting the ERP system and how the system will work after it is implemented; (b) cost minimization, not just in an overall fiscal sense, but to individuals and groups in individual effort, job security and success, power balances, and positive net outcome; (c) hands-on training to change users' perception of risk associated with adoption of the new system, (d) project support and active involvement in the project by leaders of formal and informal organizational groups, (e) carefully planned timing for actual project work, beginning after activities to positively influence user attitudes have occurred, and (f) clear commitment and support of the ERP project by top management.

The third phase of the change management process model was the status evaluation phase which provided the feedback mechanism by which managers measure and determine the effectiveness of their change strategies. Aladwani (2001) argued that having a performance measurement system for change management activities is just as important as having a performance measurement system for business objective outcomes. In this model, the systematic, dynamic feedback allows managers to make the needed corrections to strategic activities to offset negative attitude indicators that may arise during the adoption of the ERP system. Aladwani concluded his proposal with recommendations for testing the practical application of this model. Although empirical research of the proffered model was not included in this paper, it did provide theoretically grounded concepts which added to this researcher's understanding of user resistance,

which contributed to a richer analysis of user resistance as experienced by the case study institutions in this dissertation.

Operational Effectiveness Casual Chains

In one of the few studies specifically focused on post-implementation, Yu (2005) investigated potential causal chains affecting ERP operational effectiveness in the post-implementation environment. He supported the need for the focus of this study with the observation that, although a large number of companies have implemented ERP systems, few are using these systems effectively. The research methodology used in this study was grounded in social and cognitive psychology theory and investigated attitudinal influences on post-implementation effectiveness. A review of the literature and interviews conducted at Taiwanese companies that had adopted ERP systems comprised the first phase of this study.

From the literature review a series of measurement variables were identified; they included five belief variables, seven attitude variables, 12 behavior variables and five effective variables (Yu, 2005). These variables were incorporated into a questionnaire that was used to guide interviews at 14 businesses from manufacturing and service industries in Taiwan. Selection of the companies was based upon the completion of a fully implemented ERP system. The data were collected through a series of three interview sessions at each organization. Interview participants were representative of differing personnel levels, management and project involvement, including the project

governing board, major end users, ERP vendors and consultants, technology directors and top-level organization administrators. The questionnaire was administered to all interview participants and 127 valid responses were collected from 140 questionnaires.

Following completion of the literature review and data collection from the corporate interviews, Yu (2005) proposed four hypotheses by which to evaluate the interaction of varying combinations of effectiveness variables, behavior factors and attitude factors. Additionally, several stepwise multiple-regression analyses were performed and summarized. The overarching end-to-end causal chain indentified from this analysis led Yu to proffer that the post-implementation experience is decided even before the system is implemented. According to Yu, the commitment and involvement of top-level administrators and middle-management, and the professional knowledge and experience of the project management team are critical to the initiation and continuation of project implementation activities. This led to his conclusion that "the greatest complexity and difficulty in ERP implementation lies in dealing with human beings including all levels of management and end-users throughout the organization" (p. 128). Yu contrasted the predominant literature, which identified the first considerations in ERP project planning to be implementation strategies or business process reengineering, with his conclusion that finding the right individuals for project leadership roles should be the first concern at the genesis of a project.

Based upon the growth in ERP post-implementation issues, the limited amount of research specific to this environment, and the findings from his study, Yu (2005) offered

several recommendations for future ERP post-implementation research: development of a metric for clear-cut measurement of post-implementation effectiveness, expanding the application of the research framework to western cultures, effective ERP user education program development and measurement, and the expansion of ERP systems to interface with burgeoning third-party applications designed to enhance functionality of the base ERP platform.

Work and Organizational Theory Applications

The changing perceptions of what the adoption of an ERP system actually means to an organization are reflected in the refinement of the definition of ERP by Jacobs and Bendoly (2003). They differentiated between ERP *concept* and ERP *system*: the ERP *concept* is the overarching infrastructure in which all business operations are integrated for effective and efficient results; the ERP *system* is the means by which this integration is accomplished. This expanded definition is seen in the work and organization theoretical orientations being utilized in recent studies (Dery, et al., 2006).

Socio-Technical Theory

Socio-technical theory which attempts to explain the relationship between technological design and organizational work life has been used extensively in recent ERP literature, especially as applied to user-centric models (Calisir & Calisir, 2004; Worley, Chatha, Weston, Aguirre & Grabot, 2005; Yang, Ting & Wei, 2006; Zviran,

Pliskin & Levin, 2005). In an example of this theoretical research, a study on end-user satisfaction with ERP systems by Calisir and Calisir (2004), highlighted the application of socio-technical theory to an ERP organization. Data on factors that influence end-user satisfaction with ERP systems were collected using surveys. A questionnaire, developed from previous IT research found in the literature, was distributed to 24 companies. The organizations, which were identified to the researchers by ERP vendors, represented a variety of business industries. Three surveys were distributed to randomly chosen end users in each company. The results, compiled from 51 survey responses, identified ease of learning and perceived usefulness of the system as high-level determinants in how satisfied the users were with their systems. Calisir and Calisir found that perceived usefulness of the system resulted in the highest level of user satisfaction. However, when the system was felt to be difficult to use, this had an indirect effect on satisfaction with the system.

Because the survey participants came from many industries (education not among them) the authors indicated this as a research limitation in that the relationships found in the study may not be evidenced within specific industries. Based on this, one recommendation for future research from the authors was the evaluation of user-satisfaction with ERP systems within a specific industry. A second area of recommended research was to identify unmeasured variables not explained by the study's conceptual model. Calisir and Calisir (2004) found 48% of the variance in ERP satisfaction was

explained by the variables in the model, leaving a large percentage of satisfaction factors unexplained.

ERP and Organizational Fit

The choices made by an organization during implementation can have far-reaching effects into the post-implementation environment. While ERP solutions are promoted as off-the-shelf solutions that incorporate compiled industry best practices, each organization has its own unique business needs that may require a combination of system modifications, customizations, and institutional business process reengineering (BPR) to achieve satisfactory results. (Brehm, et al. 2001; Markus & Tanis, 2000; Pollock et al., 2003; Wagner et al., 2006).

In a study on tailoring ERP systems, Brehm et al. (2001) identified how organizations may respond to lack of fit between the delivered system and existing business processes. The company may choose to use the business practices built into the ERP software, making the necessary changes to internal processes and unit structures as required. Alternatively, the organization may use the system as delivered without adapting existing business processes, accepting gaps in solution functionality and relying on workarounds or shadow systems to accomplish needed tasks. A third response, and one that the literature indicates is most widely incorporated, is that of tailoring the ERP system to meet specific business process needs in combination with operational business process changes.

Brehm et al. (2001) discussed the risks and inherent costs in maintaining a system that has been modified to meet institutional needs. They have identified nine different types of ERP system tailoring and developed a typology framework for use by other researchers to determine the impact of system modifications and customizations on an organization. The nine tailoring types upon which the typology is based are (a) configuration, (b) bolt-ons, (c) screen masks, (d) extended reporting, (e) workflow programming, (f) user exits, (g) ERP programming, (h) interface development, and (i) package code modification. The researchers also provided insight into additional factors that contribute to the impact of on-going system support, maintenance, and expense to the organization. These additional factors included (a) the extent to which the tailoring type is applied, (b) the number of tailoring types used, (c) how well the programming changes are made, (d) changes to the data and data structure, (e) interdependence among tailoring types, (f) ease of retaining tailored programming for upgrades, and (g) organizational complexity and geographic dispersion. A recommendation for future research from this study is an answer to the question, "Does extensive tailoring really promote user acceptance and business success?" (p. 8).

ERPs and Higher Education

The adoption of ERP systems by higher education in the last decade has generally paralleled the experiences of business corporations. As stated by Okunoye, et al. (2007), "At the turn of the century, higher education was being redefined through advances in

information technology" (p. 113). Colleges and universities were implementing ERP systems to replace aging legacy computer software systems that were not in compliance with Y2K requirements and which could not meet advancing technology demands (Kvavik & Katz, 2002; Okunoye, et al., 2007). The efforts to implement ERP systems in higher education institutions were marked by a wide range of results, as many institutions struggled with highly-publicized implementation project difficulties that were evidenced by cost overruns, missed deadlines, and operational disruptions (Fowler & Gilfillan, 2003; Kvavik & Katz, 2002). Even with this tenuous start, the popularity of ERP systems has continued to grow as more institutions undertake implementations each year. In the EDUCAUSE Core Data Service survey for fiscal year 2005, 73% of the more than 800 responding institutions reported "having implemented or being in the process or RFP stage of implementing an ERP, with only about 18% reporting no plans to do so" (Hawkins & Rudy, 2006, p. 49). The same survey also reported a substantive increase to 48.8% for completed implementations from the previous year's completion rate of 43.9%.

Research specific to the higher education experience, however, has not followed at the same rate. It is only in the past 10 years that ERP higher education research has begun to appear in the IS literature. In a survey of 238 ERP research papers published from 2000 to 2005, less than 10 were focused on academic ERP systems (Dery et al., 2006). This reflects the fairly recent (mid to late 1990s) entrance of ERP systems into the infrastructure of higher education. Corresponding to the significant number of higher

education institutions adopting ERP systems, a comprehensive review of the literature by this researcher found continuing growth in the last few years (2006-2008) of research specific to higher education ERP implementation and post-implementation experiences.

The requirement for ERP research specific to higher education is highlighted by the identification of characteristics that potentially differentiate the college and university setting from the commercial business environment. While there is no consensus in the literature that higher education institutions have sufficient significant characteristics to warrant them being considered unique when compared to business organizations, some researchers have identified certain areas of differentiation where "the information systems developed for business may not be directly appropriate in universities" (Okunoye, et al., 2006, p. 112). Pollock, et al. (2003) identified significant operational issues that arose when the vendor tried to force-fit the student role into the general ERP human resource design that was structured for an employee or customer. The traditional committee decision-making culture of large universities was presented by Fowler and Gilfillan (2003) as another characteristic unique to academia that brings its own set of challenges to the ERP project process.

Post-Implementation

Second Wave Research

Recent research reflected the continuing expansion and evolution of ERP systems and technology. As companies who were on the leading edge of ERP technology are now

on their second (or more) subsequent system upgrade or replacement projects, the literature also reflected a corresponding shift in research into areas beyond initial product selection and implementation issues. This was often referred to in the literature as the Second Wave, which focused on "maximizing benefits, making continuous improvements, and taking advantage of new, including web-based, technologies and new ways of configuring systems" (Shanks, Seddon, & Willcocks, 2003, p. 5).

Recent ERP research also included the analysis of post-implementation effects and benefits, including the impact of ERP systems on work, end-users, and the organization as discussed previously in this chapter (Botta-Genoulaz et al., 2005; Brehm et al., 2001; Dery et al., 2006; Jacobs & Bendoly, 2003). According to Yu (2005), "system assessment after ERP implementation is not an end but rather [one that] needs continuous execution" (p. 117).

As the purpose of this study was not to examine the experiences of higher education institutions that had expanded into subsequent ERP system implementations or major upgrades, the literature related to the second wave was not reviewed for inclusion in this chapter. Information on second wave research is provided to give the reader an understanding of the continuing evolution of ERP post-implementation research.

Directions for Future Research

Recommendations for future research have shifted from initial implementation or go-live successes to determining project success based on post-implementation factors

and the organizational impact of the ERP systems on users, business processes, and institutional culture (Boudreau, 2005; Dery et al., 2006; Harrison, 2004; Holland & Light, 2003; Nielsen, 2005). The literature indicated that there remain significant areas of knowledge needed by administrators and project managers to achieve success and gain full benefit from their ERP systems.

CHAPTER III
METHODOLOGY

This chapter presents the methodology by which this research study was conducted. The reasons for the chosen methodology are explained first, followed by a description of the quantitative phase of the study which includes the design and administration of the online survey. The second phase of the study, which utilized qualitative methodology, is described in detail. This portion of the chapter encompasses the purposive sampling process by which the case study institutions were selected and the protocols for the case studies. Discussion of the procedural approach to data collection, validation and analysis, with delimitation and limitations defined, complete the chapter.

Design of the Study

This research study was conducted using a mixed-method approach to answer the following overarching research questions:

1. What are the ERP Student Administration module post-implementation experiences among higher education institutions?
2. How have post-implementation activities supplemented, improved, or addressed issues created by or not resolved by the initial implementation?

According to Patton (1990), the use of multiple methods in a qualitative study increases the methodological rigor of that study. An initial online survey was conducted to assess the current status of ERP implementations in public and private U. S. institutions, and to

provide the initial data from which to conduct purposive sampling for selection of the case study institutions. Case study methodology was employed to collect enriched and robust data on post-implementation experiences of higher education institutions selected from among the survey respondents. This methodology was selected for the qualitative portion of the study because case studies enable the researcher to investigate "a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 1994, p. 13). Answers to the research questions and additional conclusions for the study were drawn from within-case and cross-case analyses of the data collected in the case studies, the quantitative online survey data, and review of supplemental sources.

Online Survey

An initial online survey was designed using www.surveymonkey.com to collect the current status of ERP implementations at public and private higher education institutions nationwide (see Appendix A). The four primary questions which focused on the institution's ERP system characteristics were adapted with permission from the 2006 EDUCAUSE Core Data Service survey (see Appendix B). EDUCAUSE, which has administered the Core Data Service survey to higher education institutions annually since 2002, is a "nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology" (Hawkins & Rudy, 2006, inside cover page). Additional information requested included the institution name and

unduplicated student headcount for Fall 2007. The survey also asked the respondent to indicate his or her interest in participating in a follow-up discussion on their institution's post-implementation experience and gave the opportunity to provide contact information.

Population

The population for the online survey was defined as the over 600 public and private U.S. institutions of higher education with a Fall 2007 IPEDS unduplicated student headcount of greater than 1,999 and which participated in the 2006 EDUCAUSE Core Data Service survey (Hawkins & Rudy, 2007). The EDUCAUSE respondent population was selected because the voluntary participation in the Core Data Service survey indicated to the researcher an administrative interest in assessing technology usage on campus.

Instrumentation

Initial approval was obtained from the Institutional Review Board (IRB) for the survey phase of the study (see Appendix C). The survey was pilot tested by 15 higher education technology administrators and leaders from a large university who were invited to participate in the pilot (see Appendix D). The pilot survey included six additional questions for the respondents to provide feedback on their survey experience (see Appendix D). Three administrators from the university's Operational Excellence and Assessment Support office also reviewed the survey and provided their recommendations

on the survey design. The initial survey was modified based upon the feedback and suggestions received, and reviewed a second time by selected individuals who participated in the first pilot.

Following successful validation of the survey, the online survey was conducted in January and February 2008. Contact email addresses for the chief information officer (CIO) or primary technology administrator for 596 of the 667 institutions identified in the preceding section were obtained through institutional websites, online staff directories, or phone inquiries to appropriate offices. Contact information for 71 schools was not obtainable due to institution policy or non-response to inquiries. The 596 CIOs or leading technology administrators were sent an email with an invitation to participate in the short online survey (see Appendix E). To avoid bias, the researcher's university was excluded from this study due to her involvement in the Student Administration ERP implementation project and active role in post-implementation issues resolution. A master institutional listing containing the CIO contact information and initial email date was maintained in a password protected spreadsheet. During the survey period, the researcher routinely updated the spreadsheet with the survey response ID and color coding for those institutions that had responded to the survey. This data tracking method allowed the researcher to easily identify those institutions which had completed the survey so that a reminder email could be sent only to the schools that had not responded. The researcher felt this detail was an important courtesy to those who had already taken the time to complete the survey. A week prior to the survey closing date, the reminder

email was sent to 463 institutions to encourage their participation in the survey (see Appendix E). The survey was closed on February 8, 2008 with a 29% response rate (174 responses received).

Data Collection and Analysis

The final survey results were downloaded from Survey Monkey in both summarized and detailed spreadsheet formats. The survey results included a unique 9-digit respondent ID number assigned by Survey Monkey to each response received and the date of the response. The researcher used the 9-digit number throughout the course of the study as the institutional identifier for the case study institutions and all related documentation. This was done to provide an audit trail for the span of the study as well as to use an identifier that would not be easily associated with the participating institutions by a casual reader or observer.

Initial validation of the data found that 23 respondents had accessed the survey, which generated a respondent ID, but did not answer any questions. These 23 were eliminated from further analysis. Two additional institutions had two respondent IDs each, one with response data and one without. The extra respondent IDs with no data were also eliminated from the response totals. Following this validation, the total number of survey responses used for summary statistics and follow-on analysis was 149 (25%).

The quantitative survey data were summarized to define the institutional ERP status and characteristics of the respondent population. Pivot tables were used to generate

the summary characteristics tables and to aid in analysis. The results are provided in Chapter IV and Appendices F and G of this study. The survey response data was then used to identify those institutions meeting the selection criteria as described in the following section for the qualitative research activities of this study.

Case Study Design

Six institutions were selected for in-depth explanatory case study analysis in a multiple case design. The multiple case design was chosen for the richness and variety in data it can provide and for the compelling weight of evidence that it can add to a study (Miles & Huberman, 1984; Yin, 1994). The institutions were chosen from among the 149 online survey respondents whose institutional ERP characteristics met the following selection criteria: (a) completion of an initial ERP Student Administration module implementation, and (b) completion of the implementation within the last 4 years.

Selection Criteria

The primary selection criterion was the completion of an initial implementation of an ERP system Student Administration module. Student Administration represents one of the three ERP system modules most often used in higher education to improve business processes; Finance and Human Resources being the other two modules (Kvavik, et al., 2005). The Student Administration module was chosen as the primary institutional

selection criterion because it is unique to higher education and limited research exists specific to Student Administration ERPs.

A second criterion was that the initial implementation of the Student Administration module was to have been completed within the last 4 years. This time period was selected based upon the researcher's personal experience with higher education ERP implementations and from consultation with three additional higher education professionals. All three individuals have experience in higher education administration and ERP implementations: two are currently working as university administrators, each having gone through two ERP conversions, and the third has worked several years in higher education as an ERP Student Administration consultant for implementation projects. Specifying an optimal time frame was important to this study for identifying institutions that had sufficient time in the post-implementation environment to develop relevant experiences and responses to the initial implementation before transitioning focus and efforts to major enhancements and upgrades. The initial timeframe selected was 3 years. However, following analysis of the survey results, it was expanded to 4 years to increase the number institutions to be included in the purposive sampling process. The three individuals consulted initially on the time period selection concurred with this change.

The design was further enhanced by incorporating institutional size as an additional selection determinant. ERP literature reflects a recurring theme that organizational size is a determining factor in the implementation experience and that

further research based on organization size is needed (Esteves & Pastor, 2001; Hawking, et al., 2004). Three size levels based upon unduplicated student headcount were used, representing small (2,000-7,999), medium (8,000-14,999) and large (15,000+) institutions.

The institutional size categories were derived by the researcher following a review of existing sources containing postsecondary institutional classifications. The primary institution classification source used in higher education is the Carnegie Classifications by the Carnegie Foundation for the Advancement of Teaching. There are five general size categories, very small (VS), small (S), medium (M), large (L), and very large (VL), each with a specified range of full-time equivalent (FTE) student enrollment. These categories however are limited in that they are based on undergraduate student FTE only (Carnegie Foundation, 2007). EDUCAUSE has established a small college constituent group for institutions with less than 5,000 FTE (EDUCAUSE, n.d.). In a product solutions brochure, Oracle (2008) highlights its software solutions for small and medium-size institutions, defining them as organizations with less than 10,000 FTE.

Due to the lack of pre-established institutional size classifications that met the requirement for this study, the researcher used the existing Carnegie Foundation and EDUCAUSE categories for general guidance in establishing the three size groupings by which the case study institutions would be selected. Unduplicated headcount was selected in lieu of FTE because it more closely reflects the actual number of students at an institution which directly impacts the technology demands on an institution. FTE is a

calculated single value representing the equivalent of full-time student enrollment which is derived by combining full-time and part-time student enrollment using headcount or instructional activity (National Center for Education Statistics). Unduplicated headcount is the sum of students enrolled for a given period where each student is counted only once regardless of when the student enrolled or the number of credits taken (National Center for Education Statistics). The difference that can occur between FTE and unduplicated headcount is illustrated by the Fall 2008 enrollment at the University of Central Florida where the FTE was 38,042.5 and the unduplicated headcount was 50,254 (University of Central Florida, 2008).

To identify the institutions meeting the selection criteria, the survey response data were loaded into Microsoft Excel and pivot tables were used to filter and define subsets of data based upon specified criteria. Recoding of selected input data was utilized for ease of calculating and interpreting the results. For example, numeric responses in a range, such as 1 to 4, were recoded to display the corresponding text value associated with each number. Blanks or null response fields were recoded to display "No Response."

In the pivot table design, the responses to survey question 5, "Please indicate the implementation status for the major ERP information systems on your campus," were used to select those institutions that had indicated that they were (a) planning an initial implementation, (b) had completed an initial implementation, or (c) planning to upgrade for Student Administration. The selection was further defined by survey question 6,

"Please indicate implementation and/or upgrade years for each module" where only those institutions that had indicated initial implementation was completed in years of 2004, 2005, 2006, or 2007 for Student Administration were included. A final filter was used to eliminate any institution that had indicated "Not Interested" in response to question 8, "Please indicate if you would be willing to participate in a follow-up discussion of your institution's post-implementation experience."

The initial results of the pivot table produced 23 (15%) schools which met all three selection category filters: (a) initial implementation, (b) initial implementation completed within the preceding 4 years, and (c) an interest in participating in the case study. Data validation of the pivot table results identified one selected institution which was only in the initial implementation planning stage with no additional response in the other two categories of Completed or Planning an Upgrade. That institution was eliminated and the pivot table selection was modified to remove planning an initial implementation from the selection categories. A second run of the pivot table produced 22 institutions which met the desired selection criteria and whose respondents indicated a positive or potential interest in a follow-up discussion of their ERP post-implementation experiences. These institutions were advanced to the purposive sampling evaluation for the case study institutions as described in the next section.

Purposive Sampling

Final selection of the six institutions for the case studies was accomplished through purposive sampling. Purposive sampling is designed to allow the researcher to select cases that are rich in information and represent a broad range of experiences so that differing patterns as well as commonalities can be identified and studied (Erlandson, et al., 1993; Lincoln & Guba, 1985; Miles & Huberman, 1984; Patton, 1990).

The purposive sampling process was accomplished by follow-up phone discussions with the institutional contact identified in the online survey responses. A protocol for the follow-up phone discussion was developed by the researcher to aid in maintaining credibility for the study, eliminating researcher bias, and to insure all participants had the opportunity to respond to the same questions (see Appendix H). As the phone discussions were a follow-up to the online survey in which the respondents had been informed of their rights and had consented to participate, no additional consent form was required of the participants by the IRB.

After receiving IRB approval for the qualitative phase of this study (see Appendix C), the purposive sampling procedure began by contacting, via email, the survey respondent of the 22 institutions which met the case study selection criteria. The email requested the opportunity for the researcher to contact the respondent by phone for further discussion on their ERP implementation and post-implementation experiences as a follow-up to the original ERP characteristics survey (see Appendix H for email text). A password protected spreadsheet with created that contained the institution ID code, email

date and contact information, institution size, and optional comments from the online survey. The comments were included to provide the researcher with convenient access to them for reference during the discussion. Responses were received from 14 (64%) of the 22 schools, and confirmed appointments were scheduled with 13 (93%) of the 14 responding institutions. The confirmed appointment schedules for the follow-up phone calls were recorded in the spreadsheet.

The phone discussions provided the researcher with an opportunity to verify the responses provided in the online survey, obtain additional information about the institution's post-implementation experience and also to determine the respondent's interest in supporting participation as a case study institution for this research project. During the phone discussions, the participant's responses were manually recorded by the researcher. Following completion of the phone screenings, the written notes were scanned, then transcribed into a database log for coding and analysis. The discussion responses were used by the researcher to select the six institutions which would provide the richest range of experiences to optimize "the researcher's ability to identify emerging themes that take adequate account of contextual conditions and cultural norms" (Erlandson, et al., 1993, p. 82). Six response categories were defined by the researcher to aid in selecting the institutions that would provide a broad range of experiences and contribute to a rich case study. These categories included (a) ERP project governance, (b) implementation approach, (c) project timeframe, (d) type of institution, (e) single or multiple module implementation, and (f) availability of project and other key

stakeholders for interviews. An additional aspect which the researcher took into consideration in making the selections was the expressed willingness and authority to commit resources to support an on-site visit by the researcher (Stake, 1995).

The six selected institutions were evenly distributed among the three organization size levels with two schools representing each level. They had implemented either the Oracle PeopleSoft or SCT Banner Student Administration system. The ERP software vendor is not specifically identified by institution in the research analysis or published findings as it was not the intent of this study to make express or implied judgments about the quality of specific products.

Case Study Protocol

On-site Visits

The institutional representatives for the six selected case study institutions were contacted by email to inform them that their institution had been selected to be one of the case study institutions for this project and to request consent for an on-site visit by the researcher (see Appendix I for email text). Interviews were requested with administrators, staff and faculty directly and indirectly involved in the ERP system project at each institution "on the basis of what they can contribute to the understanding of the phenomenon under study" (Erlandson, et al., 1993, p. 91). Specific positions were identified as including the Registrar, Director of Admissions (Undergraduate and Graduate), Director of Student Financial Aid, Information Technology (IT) developers,

functional end-users of the Student Administration module, academic advisors and faculty members. The scope of positions was determined based on expected expert knowledge of the ERP Student Administration system and the differing perspectives on the post-implementation experience by operational areas and between managers and administrators and end-users (Patton, 1990; Rubin & Rubin, 1995; Spradley, 1979). A one-page summary statement outlining the research project, the primary research question, and the questions bounding the study was also provided in the email to each of the institution representatives for distribution as appropriate (see Appendix I). All six institutions initially selected for the case study research agreed to participate. Each school identified a contact person who set up the interview and activity schedule and served as host for the researcher during the on-site campus visit.

The on-site visits were conducted in June and July 2008, and spanned 1, 2 or 3 days, depending upon the interview schedules arranged by the institution. A site visit database was created to record general data about the overall site visit and to maintain an audit trail of interviews, activities, and other information relevant to the visit (Miles & Huberman, 1984; Yin, 1994). A reflexive journal was maintained by the researcher in which she recorded her personal daily observations, thoughts, and impressions of the research process. The reflexive journal is a qualitative research tool designed to aid the researcher in identifying personal biases or other mental states which may influence data collection. Additionally, the reflexive journal contributes to the research audit trail, as well as to the credibility and validity of the study (Lincoln & Guba, 1985; Miles &

Huberman; Spradley, 1979). An interview database was prepared by the researcher, as shown in Figure 1, and completed as soon as possible after the interviews to provide an audit trial of general logistical information about the interview, a short summary of the interview results, and to indicate whether any follow-up was needed at that time (Miles & Huberman; Yin).

INTERVIEW SESSION SUMMARY

Institution Code: 561493616-1	Session: 5	Date: 6/12/08
Scheduled Time: 1500 – 1530PM	Recording Time: 00:34:31	Recording Message #: 08061203
# Participants: 9	Participant Area(s): Financial Aid, Registrar's Office, OIT, Student Accounts, UG Admissions	Participant Job Levels: Asst Registrar; Application Developer, Specialist, Analyst; Assoc Director
Location: Conf Room	Date Transcription Emailed: 11/11/2008	Feedback Received: N
Interview Overview: Student ERP Cross-functional team meeting Training Team lead staffing issues Implementation issues and impact on post-implementation experiences Relationship development among depts and with OIT		
Limitations Noted (if any): 30 min was probably too short of time for full data collection from 9 people.		
General Comments: Majority of team contributed to discussion Team readily agreed to let me sit in on remainder of meeting to observe.		
Transcription Review Feedback: None		

Figure 1. Interview database entry form

Interviews

An on-site interview protocol was developed and followed by the researcher for all interview sessions (see Appendix J). A signed authorization of informed consent was obtained from each individual at the beginning of the interview session prior to any data collection (see Appendix K for IRB-approved consent form). The interviews were conducted individually or in small groups to accommodate participant schedules, and

utilized a focused approach (Yin, 1994). Although Barrow (1994) recommends the CIO, or primary institutional representative be the first person interviewed at each institution to provide "a historical perspective on the university computing organization and structure … and basic information on the information technology environment on campus" (p. 58), this proved not to be practical for most of the institutions visited due to individual scheduling availability. However, the phone discussions with the CIO or chief technology administrator that occurred during the purposive sampling process accomplished the same purpose, providing the researcher with the historical context of the ERP project and supplied a frame of reference for the interviews.

Digital voice recordings were the primary means of interview data collection; the technology was unobtrusive and did not appear to affect the respondents' interactions with the researcher (Erlandson, et al., 1993; Yin, 1994). Additionally, written field notes were taken by the researcher to capture main discussion points and observations about participants.

Interview Questions

The on-site interview participants were asked to respond to the following overarching, guiding questions that correlate to the two primary research questions previously identified in the Research Questions section of this dissertation and at the beginning of this chapter:

1. Describe the institution's ERP Student Administration implementation experience from your perspective.
2. Describe your experience with the ERP Student Administration implementation.
3. Describe the ERP Student Administration go-live experience from your perspective.
4. What has been the institution's post-implementation experience from go-live to present from your perspective?
5. What has been your post-implementation experience from go-live to present?
6. How would you describe the current status of the ERP Student Administration module?

Based upon the respondents' answers, the researcher supplemented the general inquiries with additional probes to draw out the details necessary to identify emerging themes and provide rich data for analysis from which the answers to the research questions of this study were developed (see Appendix L for sample listing of probes used). The use of probes is an accepted interviewing technique which allows the researcher to encourage or elicit further information from the participant to expand upon initial answers to interview questions (Babbie, 1995; Patton, 1990). Summary data on the interview participants and sessions are provided in Table 1.

Table 1

Interview Participants, Sessions, and Time Summaries

Interview Sessions	Case Study Institutions					
	A	B	C	D	E	F
# of Participants	12	14	29	13	6	33
# of Interview Sessions	3	10	10	5	2	12
Interview Time - Total	2 hrs, 48 min	8 hrs, 28 min	9 hrs, 37 min	4 hrs, 30 min	1 hr, 55 min	9 hrs, 35 min
Interview Time – Average per Session	56 min	51 min	58 min	54 min	57 min	48 min

To increase credibility of the study, during each interview session, the researcher would note other individuals mentioned by the participants for potential interviews. This would allow for triangulation of data sources so that the information provided by the first participant could be validated by a subsequent participant. In the majority of cases at all six case study institutions, the individuals mentioned during interview sessions were already on the researcher's interview schedule. During interviews, the researcher also noted comments related by participants about important events or relevant facts which she then attempted to corroborate during follow-on sessions through the use of probes or direct questioning as appropriate. (Lincoln & Guba, 1985; Patton, 1990; Rubin & Rubin, 1995; Stake, 1995).

Following completion of the on-site visit each participant was sent a thank-you email with a reminder that they would be emailed a transcription of their interview session for review and feedback (see Appendix M for email text). Follow-up discussions with the participants were conducted telephonically and via e-mail for the purposes of clarification and review of personal interview transcriptions as needed. All feedback was recorded and retained in the interview database (Figure 1) to correspond with initial interview records and to maintain the research audit trail (Lincoln & Guba, 1985).

Documentation

Data were collected from multiple sources during the on-site visits. In addition to interviews, access to relevant documentation and archive records was requested during the visits. Hard copies of some documentation were obtained, but most institutions provided the project website address where all relevant information was accessible. Examples of these documents and records included the ERP project plan, project meeting minutes, team organizational charts, and current ERP project information. Supplemental sources, including additional web pages on the institution websites and existing literature, were also researched for information to support and enrich the case study analysis. Each document or supplemental information resource was annotated and coded in a documentation database for analysis and to provide easy retrieval of the documents based upon source, type, or relevance of each document (Miles & Huberman, 1984). Figure 2 provides an example of the documentation database form and coding used.

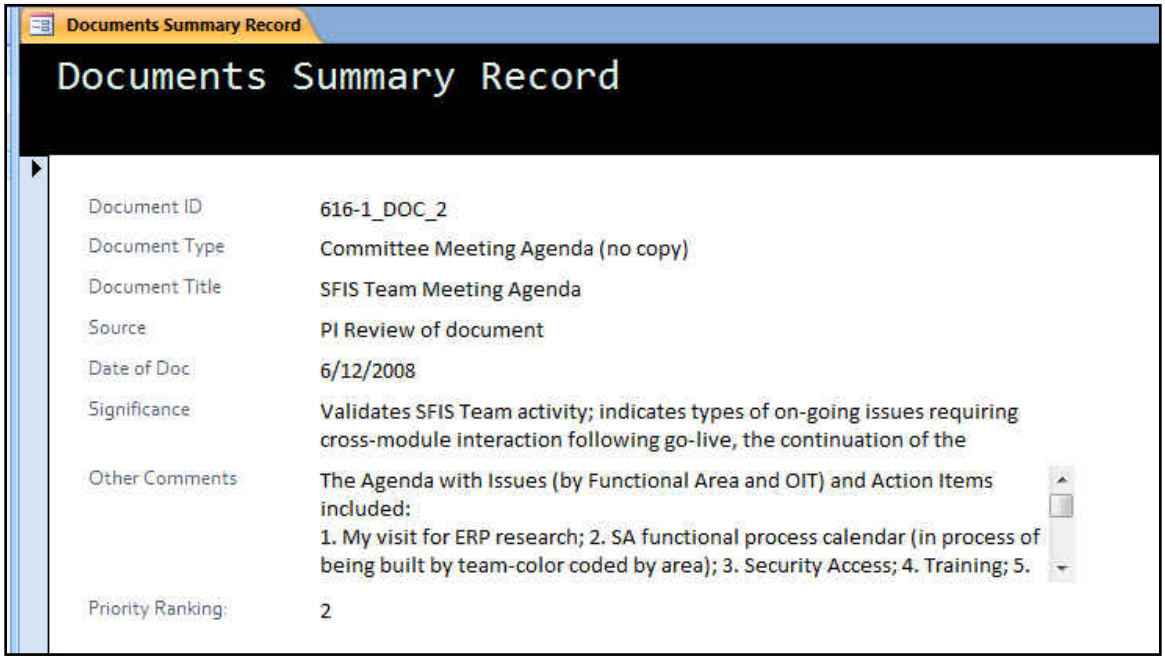

Figure 2. Documentation database entry form

Data Collection and Analysis

All of the files, documents, and other information related to the study were managed and retained in a case study database. According to Yin (1994), "a case study database markedly increases the *reliability* of the entire case study" (p. 95). The items in the database include the researcher's written field notes, verbatim transcriptions of the digital voice recordings, reflexive journal, individual databases for the follow-up phone calls, site visit, interview, and documentation data, hard copy documentation, archive records, and all other additional data or evidence collected. The case study database will

be retained by the researcher to provide an audit trail of the study and to allow for independent review by other researchers.

The signed consent forms obtained from each participant were scanned, password protected and saved on the researcher's primary research pc. The hard copy forms were filed in a locked metal filing cabinet in the researcher's home.

Verbatim transcriptions of the audio recordings were completed in a two-step process using Microsoft Word software, with each transcribed file individually password protected. The first transcription was considered a raw data file and included all product, institution and personal names as stated by the participant. The second step in the transcription process created a sanitized version of each verbatim transcript in which all personal and institutional identifiers were coded to prevent identification by non-participants. The verbatim transcription was emailed to each participant for validation and feedback (see Appendix M for the email text and Appendix N for a sample verbatim transcript). Participant feedback that necessitated data correction to the transcription was noted in the interview database, and the correction was made to a third version of the transcription, created by the researcher for coding and analysis. The audio recordings were retained by the researcher until completion of this study and then they were destroyed.

Coding of the data was accomplished using Atlas.ti (version 5.5) software from the family of computer-assisted qualitative data analysis software (CAQDAS). No codes were pre-built by the researcher; the initial codes were created on the first review of the

data. The codes and corresponding data were then organized into like categories and sub-categories based on themes, patterns and hierarchies for analysis (Carspecken, 1996; Miles & Huberman, 1984; Patton, 1990; Stake, 1995). This approach to coding and categorization allowed for the utilization of table matrixes for within-case and cross-case analyses as described by Miles and Huberman. Appendix O contains the coding and classification schemes used to define the data for analysis.

Analysis

The use of multiple case study design for this research provided for compelling and robust analysis (Erlandson, et al., 1993; Miles & Huberman, 1984; Patton, 1990). Each individual case study was first analyzed as a single case design. Upon completion of the single case analyses, cross-case or multiple-case analysis was also conducted. Table matrices for within-case and cross-case analyses were utilized as outlined by Miles and Huberman. Replication logic was also applied to the analysis and aided in theory development and analytical generalization (Yin, 1994). Literal replication, or similar results, was anticipated among the institutions of similar sizes, whereas theoretical replication, or contrasting results, was expected to occur across the size ranges (Yin). From this analytical review, a theoretical framework was developed which, according to Yin, "later becomes the vehicle for generalizing to new cases, again similar to the role played in cross-experiment designs" (p.46).

Each institutional case study report was written using thick descriptions. Thick descriptions, as originally defined by Geertz (1973), provide the context in which the elements of the study occur. They enhance the case study with rich detail and depth of emotions, feelings, interpretations, and actions as relayed by the participants. Thick descriptions also include researcher observations that clarify and contextualize the interactions and comments of the participants (Carspecken, 1996; Denzin, 2001; Patton, 1990; Rubin & Rubin, 1995). A draft of the individual institutional case study report was provided to each participant at that institution for review and comment. Additionally, a peer debriefer was utilized to read through the draft study and provide feedback to the researcher.

Data Validation

Traditional research has established validity tests for determining data quality and trustworthiness: (a) construct validity, (b) internal validity, (c) external validity, and (d) reliability (Yin, 1994). These tests have been redefined to be more applicable to qualitative research using the following terms which correspond respectively to the conventional validity tests: (a) confirmability, (b) credibility, (c) transferability, and (d) dependability (Erlandson, et al., 1993; Lincoln & Guba, 1985). Trustworthiness and data quality is established for this study utilizing these techniques.

Confirmability was addressed by creating an audit trail of the research, collecting multiples sources of evidence, maintaining an awareness of researcher bias, and by

having institutional case study informants validate their interview transcripts (Erlandson, et al., 1993; Lincoln & Guba, 1985; Yin, 1994). Credibility was established by triangulation of data (multiple sources of evidence from different data sources and methods), utilizing peer debriefing with a second reader of the draft research study, review of the draft case study report by the institutional informants, and the use of a reflexive journal (Erlandson, et al.; Lincoln & Guba; Miles & Huberman, 1984; Yin). Transferability was addressed with purposive sampling, by using thick descriptions in the write-up of each case study, and by the application of replication logic to the multiple-case design (Erlandson, et al.; Lincoln & Guba; Yin). The fourth test of validity, dependability, was established by the creation of the case study database, maintenance of the research audit trail, and use of the reflexive journal (Erlandson, et al.; Lincoln & Guba; Yin).

Researcher as Instrument

It is important that the role of the researcher in this study be included in the discussion on methodology. In qualitative studies, the researcher becomes the key research instrument as he or she collects, synthesizes, evaluates, and interprets the data gathered. The researcher must be aware of his or her role in the research process and be alert to the factors that can weaken the integrity of the process (Lincoln & Guba, 1985; Spradley, 1979).

While preparing for the data collection process for this study, the researcher was aware that her previous experience in ERP implementations at a large university could potentially bias her interpretations and interactions with the case study participants. She made a specific effort not to mentally compare her experiences with those being related during each of the interview sessions so that her observations, interpretations and responses remained unbiased. Additionally, the researcher used the reflexive journal to record any impacts on the data collection process that may have been related to her tacit knowledge of ERP system experiences.

Flexibility, adaptability, and responsiveness are among the key characteristics that make the researcher the primary instrument for qualitative studies (Lincoln & Guba, 1985; Patton, 1990). This was evidenced during the case study interviews where the researcher found it was helpful to add four additional explanatory elements to the interview protocol based on questions asked by the participants during the initial interviews sessions. The elements added were (a) confidentiality of the institution name in the research report, (b) reiteration of the confidentiality of interview responses, (c) confidentiality of the specific ERP product used by each institution, and (d) that transcriptions of the interview sessions would be emailed to each participant for his or her review.

CHAPTER IV
RESEARCH

In this chapter, the results of the research are presented. The ERP characteristics of the institutions responding to the online survey are summarized, followed by a case study report on each of the six participating higher education institutions. The institutions are not identified by name, but are differentiated as Cases A, B, C, D, E, and F. The use of institutional anonymity by the researcher encouraged the participation and responsiveness of the case study schools, and is an accepted practice in case study research (Botta-Genoulaz, et al., 2005; Holland & Light, 2003; Markus, et al., 2000; Yu, 2005).

Online Survey Results

As described in Chapter III, the CIO or chief technology administrator of 596 higher education institutions in the United States was invited to participate in the online survey on institutional ERP characteristics. One hundred seventy-four unique responses were received, which provided an initial 29% response rate. Following validation of the survey data, the valid response rate was reduced to 25% (n=149) due to elimination of 25 response records which did not contain any data. The blank response records were created by the respondent accessing the survey, but opting to not answer any of the questions. This resulted in the summary statistics and follow-on analysis being based on 149 survey responses.

Table 2 provides a summary of the surveyed institutions by unduplicated student headcount for Fall 2007. Small institutions (less than 8,000 headcount) represented 49% (*n*=73) of the responses, while medium (8,000 – 14,999) and large institutions (15,000+) combined represented 51% (*n*=76). Considered separately, the medium sized institutions had a 24% (*n*=36) response rate and the large schools 27% (*n*=40). These response rates when compared to that of the small institutions, 49% (*n*=73), could be an indicator of greater interest in or activity with ERP systems by small institutions.

Table 2

Survey Institution Headcount Summary (Frequency & Percentage)

Fall 2007 Headcount	Frequency	Percent
< 2,000	4	3%
2,000 – 7,900	69	46%
8,000 – 14,999	36	24%
15,000+	40	27%
Total	149	100%

In responding to the survey question on current ERP status, over one-half (*n*=86; 58%) of the responding institutions indicated completion of an initial ERP implementation, while 33 (22%) currently have an implementation in progress, as shown in Table 3. Survey responses on ERP implementation status by system module indicate

that 58 initial implementations of Student, Finance, or Human Resource ERP modules are planned during the next 3 years, with the greatest number (n=23; 40%) planned for the Student module (see Table 4).

Table 3

ERP Status of Survey Institutions (Frequency & Percentage)

Institutional ERP Status	Frequency	Percent
Have completed implementation	86	58%
Have an implementation in process	33	22%
In Request For Proposal (RFP) stage of implementation	4	3%
Considering an implementation	10	7%
No plans for an implementation	13	9%
No response	3	2%

Table 4

ERP System Module Implementation Status (Frequency & Percentage)

ERP System Module	Plan initial implementation in the next 3 years	Have completed initial implementation	Plan to upgrade module in the next 3 years	No plans to implement this model	No response
Student	23 (40%)	69 (26%)	40 (28%)	0	29 (17%)
Financial	15 (26%)	83 (30%)	40 (28%)	0	26 (15%)
Human Resources	20 (34%)	75 (28%)	41 (29%)	0	27 (16%)
Other	0	43 (16%)	22 (15%)	4 (100%)	90 (52%)

Note. Respondents were permitted to select more than one implementation status per ERP system module.

Case Study Reports

Individual case study reports on each of the six case study institutions are provided in this section. The reports are a rich description of the experiences and events which occurred during the pre-implementation, go-live, and post-implementation phases of each institution's ERP project. This researcher discovered that in all cases the post-implementation experience could not be considered in a vacuum, separate from the project decisions and activities that occurred during pre-implementation and go-live. As stated by one of the functional administrators interviewed for this study, "The post-implementation experience relates directly, correlates directly to the pre-implementation experience."

To provide the reader with some context when reading the case studies, information on the case study institutions and the interview participants are provided in the following two tables. Table 5 provides a summary of the characteristics of each institution, including the size category, type and year in which the initial Student ERP implementation was completed. The number of interview participants by job area for each case study is displayed in Table 6.

Table 5

Case Study Institution Size, Type, & Year ERP Implementation Completed

Case Study Institution	Institution Size Category	Institution Type	Year Completed Initial Student ERP Implementation
A	Large	Public	2007
B	Medium	Private	2006
C	Medium	Private	2005
D	Small	Public	2006
E	Small	Private	2004
F	Large	Public	2007

Table 6

Number of Interview Participants by Institution & Job Area

Participant Job Areas	Case Study Institutions A	B	C	D	E	F
Project Management	1		1	1		2
Student Module (Functional)						
Registrar Admin	1	1	3	1	1	6
Admissions Admin		1	2	1		2
Financial Aid Admin	1		2	1	1	1
Student Accounts Admin		1	2	1		1
Department End-users		2	10			5
Academic Affairs/Faculty	1	1	2			8
Training				1		1
Security Administration						2
Student Module (Technical)						
CIO/CTO		1			1	
OIT* Project Management	1	2		1	1	1
OIT* Management	3		3	2		1
OIT* Technical	3	2	4	4	2	3
Ancillary Departments						
Finance & Accounting		1				
Human Resources		1				
Institutional Research	1	1				
Total Participants:	12	14	29	13	6	33
Institution Size	Large	Medium	Medium	Small	Small	Large

* Office of Information Technology

Case Study Report - Institution A

Case study A (CS-A) is a large, public flagship institution of a state university system. Described as a metropolitan research university, it offers degrees up through doctoral and professional levels. During her on-site visit to the main campus, the researcher observed a campus infrastructure that was working to combine the old with the new. Modern-style structures were interspersed among the original, well-maintained older buildings on the compact campus. A major new construction project was under way which would be incorporating the latest in technology to support student learning. This was an indicator that the recent implementation of the ERP Student Administration system was just one major component of an active information technology division.

Of the six case studies, CS-A is one of the two that most recently completed an ERP Student Administration implementation (see Table 5). At the time of the on-site visit, CS-A had been operational in the Student module for just over a year, their go-live having been completed in April, 2007. During the 1 day on-site visit, the researcher collected qualitative data from a one-on-one interview with an IT project manager and from a group interview session with the ERP Implementation Team. The Implementation Team had 12 participants (including the IT manager previously interviewed individually) who were the managers and administrators representing the key functional and technical areas with a vested interest in the ERP system (see Tables 1 and 6 for interview summary information). This was the ERP Implementation Team's final meeting before disbanding and being reformed as the Enterprise Information Systems Committee. The new group is

to continue the communication and collaboration among institutional units, established during the ERP project implementation, for on-going operational and technical issues and to provide input to the CIO on ERP system issues. Modification of the committee membership was being considered to include a broader representation from across campus so that different perspectives will be heard. A third individual interview was conducted telephonically a week following the on-site visit with a participant from the Implementation Team. He did not feel comfortable sharing his opinions in the group setting with the digital audio recorder (although he signed the informed consent and agreed to be recorded) and, at the conclusion of the team interview session, asked that the researcher call him separately for his input.

State System ERP Implementation Project

CS-A was part of a state-wide ERP implementation project that was centrally managed by the state higher education governing body and its affiliated IT office. In addition to the Student module, which for the purposes of this study includes Admissions and Financial Aid, the full state ERP project also included Human Resources (HR) and Finance modules. The state divided the system schools into two cohorts so that the entire system was not attempting conversion at the same time. CS-A was a member of the first cohort.

The implementation calendar for the individual modules was determined by the state for each cohort. The ERP project implementation timeline was established to

facilitate a fast track implementation. A major incentive for the fast track was the contract price for a 3-year implementation. According to a team lead participant, “the presidents got sold on the view that if we did it quick it would be cheaper.”

The timeline utilized a phased approach whereby Finance was implemented first, followed by HR, then Student (including Admissions and Financial Aid), and lastly, the Advancement (Alumni) module. “By following the fast track strategy, [CS-A] was forced to use the system as delivered” according to CS-A’s senior project administrator. This reinforced the no local modification policy established for the project. The fast track approach also appeared to influence the decision not to conduct business process reviews prior to implementing the system.

CS-A ERP Project Management

To manage the project, at the university level, CS-A took a functional lead approach. Each team was led by a functional manager with an IT person as the co-lead to provide technical representation and advice. The governance of the project included an executive committee, a steering committee, an implementation team, individual teams for each of the modules and then multiple work teams within each module. During the course of the project, however, the steering committee removed itself from between the implementation team and the executive committee because, according to the IT project manager, “they came to the conclusion that they didn’t have much value because the real

decision making was occurring here [the implementation team] because we were closer to what was going on."

CS-A also utilized a communications team with a representative from the university marketing office as the functional lead. Although it was felt the intent behind this was good, the execution of the plan did not happen as anticipated. The difficulties in communicating the actual details and impacts of the project from the technical co-lead to the marketing representative were apparent in the negative reactions reported of those involved with the project to the articles written for the project newsletter.

These same difficulties in communicating the complexity and scope of the project to the rest of the campus who were not directly involved in the project were also seen in decisions by the CS-A senior administration leadership that negatively impacted the team members working on the project. During the course of the ERP implementation, there were two additional major projects, one technical and the other operational, that were initiated by the senior administration. A functional lead expressed, "part of the problem is that when you would move above the director level, the VP [Vice-President] wasn't seeing it." Another functional lead related "we had 7 people in our office on 13 different teams" and went on to describe how they had complaints that their office phones were always busy because they didn't have extra people to replace those who were tied up on the ERP teams. A project manager summed up the feelings expressed by the other participants:

> So, having the whole community outside those areas understanding the stressed areas,…and having the leadership very consciously try and keep people knowing… and keep the extra things off their back is a big part of having it [the project] not go off the tracks.

As previously mentioned, CS-A project management approached the ERP Student implementation from a position that no local modifications would be made to the system. As described by one team lead, "Our golden rule across the system…was no modifications." When asked by the researcher how closely they held to the zero system modifications rule, the IT project manager responded that it was 100%. However, he further elaborated on their challenge as to how modifications were defined:

> But then you get into a question of what's a modification. And so, if I add tables, is that a modification? If I put different front ends to things? If I push data into it? Are those modifications? I don't know that answer. In the traditional sense, modifications were I had to change code to change screens so the user would say I want to see this, this and this on the screen; I don't want to see the other thing. So we don't do those things. The definition of a modification has evolved over the years.

Several functional and technical team leads also shared similar views:

(a) Make sure you know that, even though the interfaces and all of those things occurred, we still had to operate under the pretense that we were not modifying existing or delivered [ERP product] software tables.

(b) We had a lot of discussion of what a mod is.

(c) Many meetings we would come back and revisit that. To this day, we don't even know what the definition is!

(d) When choosing the vendor product, how much flexibility do you have in modifying it and how is that translated? In a practical sense, if you have a link that's providing a real obscure message like "Break in attempt has occurred," you need to get rid of that, and so from the help desk perspective and communication-wise, it's worth figuring out how to get rid of it…..No mods as best we can.

Phased Implementation

The phased implementation approach was challenging in particular for the multiple elements of the Student module. For over a year following go-live of the student-specific component, parallel systems had to be maintained between the new Student ERP and the old legacy system because the Admissions and Financial Aid components had not yet been converted to the ERP. The registrar functional lead explained, "It was very difficult for all offices trying to keep two systems in sync and trying to get data converted from one to the other and having to do it multiple times." It was just the week prior to the researcher's on-site visit in July 2008 when CS-A discontinued the parallel interface with the legacy system. They did, however, have to

continue running a version of it in a smaller environment to provide for data transfer with the state system.

The phased implementation among the major modules (HR, Finance, and Student) also brought challenges for IT management with the new portal technology. The portal was brought live with the HR module and the challenge for the IT staff was getting faculty and staff to use it. According to an IT manager,

> Because we didn't have [the ERP product] integration for the students, we wound up providing some simple links to the old [legacy] system or trying to grab some stuff from the old data base to try to provide them with some information....It wasn't until this last year [after this Student ERP implementation] that we were able to keep them coming back because of registration and new student orientation.

According to the module leads, the staff were also affected by the phased implementation approach. A technical area team lead brought up a challenge experienced by the developer group:

> For my staff, the problem was not meeting the expectations of clients. Because they knew their job, they were 20/30-year COBOL programmers, you could call and get something in two hours. You call now and it could be three weeks…..Not being able to serve the client base in the manner they had, it was very stressful for them.

A functional team lead added from her perspective:

> I think it was basically exactly the same way in the functional areas. Because you're trying to maintain two systems, you're having to know two systems, you're getting new staff, you're having to train them on the old system and the new system and you're having to do all of this and you've got students and you've got faculty and they still expect certain things.

In contrast, according to the technical team lead for the server group, the phased implementations did not have the same stress impact on that team as it had on the other areas:

> It was almost like business as usual…. I mean, this is what they do every day. ERP, no ERP, we get new systems, we change servers, we design things, we try to make things better. It was almost like you were a detective. My team had the easiest job. If we weren't converting data, we were putting in servers.

Staffing

Early in the project, CS-A set aside funds to hire persons to backfill positions in offices where staff members were tasked to work on the ERP project teams. According to several participants, the method by which the backfill money was distributed did not result in the offices intimately involved in the project obtaining additional staff needed.

> They said, "Who's going to need what in their areas? We have this money going into the project to help you hire some people so you can pull some people off." We did that up front. I know in the areas near me the people that got the most

> money had nothing to do with the project. So, where it didn't work well was when it went up through the channels, it got reviewed by the vice presidents and got done because they didn't know the work. So, don't up front do that, let it be people close to the scene and have some money on the side to do it when it gets urgent.

In addition to backfill funding problems, the benefit of using temporary staff to backfill positions of those working on the project was questioned by a project manager:

> We're not a rich university, we've had some budget cuts over the years and so all of our areas basically are staffed at what we need to get the job done under normal circumstances…..And they'd say, "Well, we'll give you some backup or we'll do something." It turned out, of course, in the middle of this process you can't train anybody to do all of these things and the competent people in the area on the day-to-day work are also the competent people on the thing. So, you effectively had the key people in a number of functional areas literally working two jobs, and you had that for a long, long period of time.

Training

Training for faculty and staff was provided during the time prior to go-live. The responses from the participants indicated that although functional training was made available across campus, there were many who did not attend training or who resisted the conversion. From one functional lead, "We did a lot of in-house training for our staff, a

lot of it. I mean, I'm telling you they can't come back and tell us that we didn't do any training. We trained on every single aspect." Another participant observed as related to her office,

> You can only show them so much and you give them all the materials…they have to want to learn. And you are going to always get people that don't want to change and I hear it's the same thing in all the offices …across the campus.

The IT project manager echoed similar comments:

> It's not that we didn't have good training plans, and have good people doing it, we just didn't get it to the masses as it needed to be … despite everyone's best efforts. It wasn't that anyone let it down. It's just it was hard to pull that off and I don't think people realized it would be that hard. So … the fact that we thought people would show up, be trained, walk away knowledgeable and it just didn't happen as we envisioned it, I think there was probably some short sightedness on our part, to not understand how difficult that beast was. We should have known that one better. …. When you look … in hindsight, people had good plans, good training, excellent ideas, excellent execution of the training but it just didn't reach people. To this day, we still get people saying, "Well, you know, I don't know how to do it. It's hard. It's confusing." And you're like, "Where did we go wrong?"

Technical

CS-A has developed technical expertise that has allowed it to develop and maintain their ERP system internally while other schools in the state system have to rely on the state higher education IT office for technical support. While this has been very beneficial to CS-A, is has been problematic when technical support from the state has been needed. According to the IT project manager:

> [The other schools] didn't have the talent to be able to do that and so the [state office] had too many of those schools that were vying for the same resources to get these sorts of things done. Then when we needed help, really deep technical help from those resources, they weren't available.

The tech team for CS-A tests and installs all mods received from the state and performs system upgrades. At the beginning of the ERP project, CS-A's technical team, which includes network and database administrators (DBAs) and programmers for applications and the web, did not have the necessary skill sets for the new system. The IT project manager reflected:

> I think that was a big problem. We had people that were old COBOL programmers who had been here for 30 years,…and a couple of them made the transition. Some that were a little bit junior did a little bit better and then of course new people would drop in, share the lion's share of the load of getting things done and fortunately they were young and could do that.

While the development team did not gain any new programmer positions as a result of the project, new positions were created for network and database administrators.

As part of the state system contract, CS-A purchased a block of training hours and a block of consulting hours. The technical teams received training specific to their areas such as PL/SQL programming language and Oracle database administration. The IT project manager expanded on how they worked with consultants during the project:

> We never let a consultant do an install. We did it all. We said, "Teach us how to do it so we know how to do it when you're not around." That's kind of the approach we took. That works most of the time.

Additionally, the technical staff attended end user training for the different modules. When asked by the researcher if this was helpful for them, the IT project manager voiced a strong opinion:

> I think it's absolutely paramount that you have to have some sort of technical person involved in the end user training. There's a real belief that technical people shouldn't learn the functional users' job. I think you have to have somebody tackle it that understands both and that's hard cause they're not registrars,…but they have to know…and desire to learn to get it working and functioning properly.

The technical teams didn't experience any unusual staff turnover as a result of the project or post-implementation demands. The IT project manager characterized their

attrition as normal. “We lose people all the time for a variety of reasons. Nothing extraordinary.”

State Modification Management

The CS-A interview participants were most vocal about the issues and impacts on their implementation and post-implementation experiences caused by the state’s management of the project. An early approach taken by the state was the creation of prototype teams which included representatives from all of the schools. The purpose of these teams was to identify the commonalities, definitions, and processes that all of the schools could agree to within the delivered functionality of the new system. According to the CS-A financial aid lead who participated on one of the prototype teams, the initial concept and work on the prototype team was good. “You start to think…past your own school. Well, what’s going to work for everyone?” However, the execution of the plans from the prototype teams did not follow through as further detailed by the financial aid lead:

> Then when all this mod stuff came up it was like, ‘Did you all forget about our conversations on the prototype team? Because you want this with a mod, and you want this, and there is no compromise. Instead you’re going to make a change that could break …something else.

Although CS-A had a zero mod policy at the institutional level, there were multiple mods required by the state for all system schools. These mods were either

developed by the consulting group contracted by the state to support the implementation efforts or were developed by the state higher education IT office. The leadership and management of the state mod development were described by several of the interview participants as being very problematic. “There was no control” was a phrase repeated multiple times during the interviews.

A review process for state mods was established during the project phase. Input was solicited from school representatives by the state board IT staff and consultants from which to create the mods. A project administrator described the process:

> What the process was…is they identified the gaps...and based on that gap they determined that there is a modification that needs to be done. Then that modification goes before a group of people who then say yes or no that we need this mod and I think it’s basically at the presidential kind of level. Then once they approve it then it goes back down to the [state board] level and they, working with the schools, start drafting specifications.

A technical team lead provided a different perspective on the process:

> [Mods] were negotiated. I mean, there was a committee and…when they did the contract they identified five different mods that were absolutely necessary and that’s all we were going to need. Of course, after we finally signed off on the contract and the consulting really came along, it turned into 25 or 30.

The team leads at CS-A described how they were asked early in the project to provide input and make decisions on how the state mods would impact them without

having an understanding of how the ERP Student system actually worked. As one explained,

> There was a review process. There really was a review process and I think the state made an attempt to control it, but again, we didn't know enough about the system we were getting to even say yes or no to a mod and so, they worked with the best that they had.

To support this, an example was shared where the school representatives created "hundreds of test cases" for one of the largest state-wide mods but the cases didn't reflect the scenarios as they would work in the new system.

It was suggested by the participants that even before having the schools involved, the state board staff should have evaluated state mod requirements to determine whether or not they were still needed. As one functional lead put it,

> They should have stepped in and they should have taken some looks at some things and said, "We're not doing this anymore. There has been no payoff on this." …. Kill it before you ever spend a million bucks on a mod that's not going to work in the first place.

This comment was then validated by an example:

> Yesterday [the state board] finally admitted that [mod name],…that we probably spent half a million dollars on, …starting next year given the new interpretations of the guidelines and the changes they made, we're not going to use it anymore.

In further discussion of mod management at the state level, the CS-A participants felt that the individuals at the state were not in touch with the problems at the institutional level. As described by the project manager

> By not having local leadership, by having it at that level, we ceded [control] to the board, which is not a campus. So they don't have a registrar, you know; they don't have financial aid. So, when the financial aid mod is broken, well, the staff might have to do a few things, but "that's okay." The urgency that we feel when we actually have students not getting financial aid, or when we're having to go back and use our scholarship funds to make up for commitments we made because their mods aren't working right. They're not on a campus, so they're not seeing what is actually really urgent, and that makes it very difficult.

The participants highlighted problems in mod development by the consulting group which the state had contracted for the project implementation as further evidence of the management issues they were faced with during and after the ERP implementation. The following comment by one of the functional leads is representative of several similar opinions expressed about the consultants' development work during the project.

> We only found out much later about the lack of knowledge that the consultants had…. The other thing about this is that none of them talked to each other. There was nobody coordinating the effort. They're doing a mod over here, they're doing a mod over here, and they're doing a mod over here. This mod is stepping on both of these mods and nobody knew it. You've tested something on these mods and

> they worked great; they worked just great. Finally something works. This mod comes down the pike, steps on both of them and you go in the next day and nothing works.

Due to the fast track timeline, CS-A did not perform any formal business process reviews to determine which internal procedures may need to change to fit the functionality of the new ERP Student system. One functional lead described the impact:

> In essence, there was no business process reviewed on the front end … part of it had to do with the time line that we chose. We just had to move forward thinking that we were going to behave in the same way we did with our old system in the new system and then again create mods to fill in the gaps. But in hindsight, now what we've created is this million dollar annual expense to maintain what we had, in addition to a delay in any upgrades. Any additional functionality gets delayed … we're now up to almost a year in getting those new releases in because we have to wait on those [state] modifications to occur.

A second functional lead added:

> And …for things that were supposed to be delivered a year-and-a-half ago, we still have mod defects and they're not fixed, so [the office is] handling hundreds of records by hand.

Summarizing this discussion, a technical lead commented:

> The number one recommendation I would make is that if you're not going to do process redesign along with the implementation, why spend the millions of dollars

you're getting ready to spend? It just doesn't make sense. If you're going to do old things on a new system you're wasting your money.

The researcher inquired if there was a current review process for state mods now that CS-A was in the post-implementation environment. As described by a project manager, an awareness of the cost of maintaining the modifications is coming to the forefront now that the demands of the implementation are behind them:

> I put together a document last year that reviewed every mod, identified the module that it affected, what in essence it did and then…whether or not it could have been eliminated with something, a business process improvement, a report that we could just have done locally…..Once the presidents heard about this annual cost of maintaining those mods, the delays in us getting additional functionality, just the fact that it's just a growing black hole, there is some real desire now to reevaluate all of those mods.

The obvious frustration with the project leadership at the state level expressed by the participants can be summarized by the following statement from a member of the implementation team:

> If you don't have leadership on how you develop mods, no matter where you are, you're going to be in serious, serious trouble. They need to talk about process redesign, talk about priorities, and have somebody that's technical and understands the cost of doing something, and then be flexible about how you do things.

Use of Third-Party Software

According to CS-A's senior project administrator the post-implementation focus has most recently been on establishing workflow functionality within the system and adding third-party bolt-ons to the ERP modules. During the interviews, the IT project manager and the technical team leads identified 10 third-party bolt-ons, purchased by CS-A, that had been added either during the implementation or following go-live. These third-party products were for functionality requirements not included in the delivered ERP system. The bolt-on solutions for the Student system included address validation and correction, cashiering, course management, housing, international students, and check printing. When asked how the needs for these additional software components were identified, the functional and technical leads shared the following:

(a) They would see them at conferences and then bring the vendors on campus and demo them.

(b) Some you learned about in the training, you know, "What about this?" "Well, you got to buy a third party to do that."

(c) We didn't have the experience and we had to have something quick. So, we bought a product that did it.

(d) We've also heard about the third party applications and the softwares from listservs…

(e) A lot of these applications, the procurement of them were written in a [state] contract. So the vendor already knew on the front end that you weren't going

> to get certain things and they had it written in the contract so that you can go buy it later.

Adding third-party bolt-ons to the ERP system turned out not to be as straight forward as was expected. According to the IT project manager, "We bought some other products that were partners with [the vendor] that … turned out to be as big if not bigger than the implementations themselves." A technical lead further noted, "What we have found out is, we try to purchase products that [the vendor] says, 'These are our third-party collaborative partners', and our clients assume that … it talks to [the ERP system]. They do not." The IT project manager provided further elaboration:

> We bought all these products that came with the stamp of approval from [the vendor]. These are [product] certified. They are about as [product] certified as my shoes!....But, that was something that we never could get a handle on because of the way the state procurement rules and regulations are. You often have to talk to people that the vendor supplies…. There's very few, if no opportunities to talk to people outside of the list that the vendor gives you.

The technical lead responsible for third party systems added "So, …they're purchased by the beautiful demo they see, then it takes my staff weeks to prepare the interfaces that have to make those products work."

Although not specific to the Student ERP, but a missing component that significantly affected all of the areas was the lack of a reporting solution within the delivered ERP product. This was described by the Institutional Research functional lead

as "an 11th hour surprise." A third-party software reporting solution was purchased and CS-A took this opportunity "out of necessity" to redesign their institutional approach to reporting to make it more consistent and efficient. Development of internal reporting procedures is on-going and these new business processes are replacing the legacy system approach where "reports had arisen accidentally and disjointedly over 30 years."

Technical Post-Implementation Experience

During the first weeks following go-live by the Student system, CS-A experienced some initial technical challenges. As described by the financial aid functional lead:

> Now we were expecting it to be very busy. We were expecting a lot of students. We didn't expect the system to slow down. On the first week, sometimes whenever you all had to do something, it's like it slowed to a crawl. It's like, nobody could do anything."

The IT project manager agreed there were initial challenges, and credited the registrar for staggering student access to the Student system on the first day of classes which prevented the system from being brought "to its knees." From these early problems, described as "hiccups," the IT area "has gone to kind of a load balancing type operations which we didn't have when we first started. We just had big giant boxes, and big giant boxes work a lot of times, but not always."

When asked to provide an overall assessment of the Student go-live experience for the technical area, the IT project manager responded:

> I think we underestimated from an IT perspective how much work was actually involved. Even though we'd gone live with two other modules and we thought we had a handle on it, I think we underestimated how much work would be involved with getting the student portion live.

The manager concluded that the biggest surprise, however, was "how well it worked. I thought there would be much more problems than there were."

Functional Post-Implementation Experience

A major operational issue shared by the functional leads was the increased complexity of the data entry and the associated increase in time to accomplish the same task when compared to the legacy system. The increased complexity and requirement for manual oversight was also seen in the student grading system. The registrar lead described their current process:

> When we did grading on the old system you set off a nightly job and you came in the next morning and the grading was done. Here, you have to be here. It takes 15 hours of run time to get it done 35 steps later and you have to be there and you have to do it. You cannot implement it; you cannot put it in batch or anything. You've got to be there. You run something, you look, you check, you clean up

> 400 records. You run the next one, you look, you check, you clean up 200 records, and that's just our life with [ERP product].

Another functional lead, however, stated that she found the new system much easier to use than the legacy system.

A highlight for the functional student group was CS-A's proactive approach to the major data issue of duplicate records, which turned what could have been a major post-implementation challenge into a routine function. The student team began clean-up of duplicate data in 2005, 2 years before the student module go-live, utilizing multiple sources of data including the university data warehouse. The successful results from cleaning this data before go-live were shared by the registrar functional lead:

> [It] has turned out to be so much easier than what other schools had led us to believe it would be like. And I know that we owe the technical team a lot of thanks for that, but it hasn't been the huge, massive headache that everybody said that it was going to be."

Staff Post-Implementation Experience

When asked by the researcher "How did the project, and then go-live, affect your staff?" the participants responded immediately with laughter and very humorous responses that included "drugs, weight gain," "a lot of chocolate, a lot of Tums, a lot of weight gain" and "our previous registrar...said, 'the…project has increased my tolerance for alcohol'!"

Among the functional team leads, there was general consensus that the skill sets needed by their staff changed following the implementation of the Student ERP system. The financial aid lead explained how their office handled these changes:

> We didn't get new additional positions. We…reallocated positions when people left to data-related positions. It was the smartest thing we did because we went from running batch processes at night…to now the users are doing it, and I have five people, including myself…we do a lot of processes every day in a lot of different areas in financial aid.

As part of the first cohort group, the CS-A staff experienced an unexpected phenomenon following their go-live. They were seen as the ERP experts and schools in the second cohort group began contacting them for assistance in preparing for conversion. This occurred while CS-A was adjusting to operating in the new Student system environment. The financial aid team lead shared how they were impacted:

> We keep very busy with [the second cohort] folks asking us lots of questions. Of course, they think we're the experts already, you know. We've been through it one year, we should know everything, and we do know a lot more than what we did and we help whenever we can. So, that's a definite plus on their side, to have somebody they can go to.

A second functional team lead had a somewhat different perspective:

> The [second cohort] sort of killed us though in another way ….They sat there and then their view was, "Now you come and tell us how to do it." So we were the free trainers on top of it.

When asked about the positive aspects of the post-implementation experience, the first responses of the participants focused on the staff benefits and successes. A project administrator shared:

> I think all of us…all of the people in this room and whole lot of people on our staff and across the university understand what the other parts of the university are doing much better. We had to learn to work together and I think we understand a lot better. You know, I think a whole lot of us went into this….what the hell do they do over there anyway? Why do they have a staff there?….I think most of us have come to realize how many hard working competent people there are in other areas outside their own too. We know people, we know people's names, we have a better sense of what they do, and we appreciate the work they do a whole lot better than we did before.

A functional team lead added:

> We put up [the ERP product] in spite of all the challenges because many of the people sitting around this table have so much talent and so much expertise and they worked 24/7 and they were there for us. Anytime we needed them they were right there, so in spite of it all, these people were responsible for the actual

success and there were a lot of successes, you know, of putting up this system and keeping it running.

Other comments on post-implementation success from the participants:

(a) Cross-functional teams…I think that was probably the best successes. You know, there were people on [teams] that didn't understand the processes, but I think that was good because it forced those outside to ask questions about what was going on, but it also gave everybody a chance to have some input.

(b) I think it was painful to get there, but probably now that we're there, it is a benefit,…we have one data source. We don't have silo systems with different data sites across them; we've got one. And that's made a big difference in how we interact with one another and how we use the data."

According to the participants, CS-A's Student ERP system has had very positive results for students. In the legacy system, new student orientation and registration would take between 4 to 6 hours. With the new Student ERP, they are now finishing in 2 to 2-1/2 hours. Additionally, the new web self-service functionality for students and advisors was described as "very intuitive" and the 24 hour 7 days a week access as a "huge advantage."

Overall, CS-A's senior project manager felt that the Student ERP project has been "reasonably positive" and has gone "reasonably well."

Case Study Report - Institution B

Case study B (CS-B) is a medium-sized, private university located in a quiet community on the outskirts of a major metropolitan area. Offering a wide range of disciplines in undergraduate degree programs up through doctoral and advanced professional degrees, CS-B continues to follow its mission as defined over 100 years ago by its founder. The campus, with its well-kept grounds, is an eclectic mixture of architecture which highlights its long history.

The researcher visited the CS-B campus for 3 days in June and July, 2008 to collect interview data for this research study. Ten individual and group interview sessions with project managers, administrators and key department stakeholders were arranged by the institution which provided the researcher with a rich database of information from which to develop this report (see Tables 1 and 6 for interview summary information).

CS-B ERP Project Management

The CS-B Student ERP implementation project was part of a larger ERP implementation which included Finance and HR modules. The project was primarily IT-led with oversight from an executive team. The CIO, who served as the overall project administrator, characterized the executive support for the project as "phenomenal." An independent project management consultant was employed to provide project planning and to function as an auditor, "to make sure we were on track and reported to [the executive team] at every one of their finance meetings."

In addition to the executive team, the project governance structure included a steering committee, functional user groups for each major module area led by a designated team lead, a cross-functional team, and an ancillary systems team. The functional group meetings also included representatives from the IT shop. The IT systems manager gave credit to the strong project management structure:

> How we set up the project and operated as a project management team and how we structured our meetings throughout the project I think really helped have a positive impact on how well we kept to our timelines and how we were able to implement the systems.

Following go-live of the Student module, the teams have continued, although meeting less frequently as the operations in the Student ERP have stabilized. The scope of the steering committee is evolving from a project steering committee to a permanent overarching IT steering committee. As explained by the CIO, "we all recognize that there was a certain governance structure that we put in place for the implementation that needs to carry on for all of technology….. They're now sponsoring some projects that go beyond [the ERP]."

CS-B chose to follow an aggressive implementation schedule of 18-months in which to bring up all three major modules of the ERP system. This decision, according to the senior project administrator, was "driven primarily to keep the budget as low as possible….What we observed at other institutions is that the longer you have this window where you're doing implementation, the more money you end up spending on this whole

thing." The Student system was the first to go live and did so within the original timeline: the admissions component in 2006 and the remaining components in 2007. Both of the other major modules, Finance and Human Resources, could not meet the target timeline and came up live a year later. The CIO explained that when the project budget was built, they retained the 18-month timeline as a "stretch goal," but made sure they would have funds available if they needed to extend the timeline. "I think it was good for us to challenge ourselves and try to get through it as quickly as possible."

Implementation

The Student ERP system had several components which were brought live sequentially during the 18-month period. CS-B continued to run the legacy system in parallel to the Student ERP for a year following completion of the implementation. In fact, one of the researcher's on-site visits coincided with the day that the legacy system was turned off. Admissions was the first Student component that was implemented; however, they did not rely on the legacy system following their conversion. As explained by the admissions administrator:

> We didn't give people access in admissions to [the legacy system]. We said, "You've got to use [the Student ERP system]," and I think that's part of what admissions did right about the implementation…not allowing people to go back into that.

The student records and registration component followed admissions and they were able to successfully register students on day one. The functional manager related that it took "about 6 months" to settle in to the system. However, reliance on the legacy system that continued to be run after go-live was heavy. Data conversions continued from the legacy system to the new ERP environment until the legacy was cut off. The IT systems administrator observed:

> Student wasn't fully in production until...well, as a matter of fact, we just ran a conversion for them [two days before the legacy shut down]. It was some miscellaneous files that they…never deemed were so important until they heard the plug was being pulled on the mainframe, then they scrambled and found a couple of files they wanted converted.

In the student accounts area, CS-B had implemented a third-party cashiering application in the previous year which provided the front-end screens for data entry. This application was carried forward with the Student ERP conversion, so there was no change evident to the staff following implementation. The student accounts administrator characterized the go-live for their component July 2007 as "somewhat of a non-event…..it was a long weekend for two of us." However, student accounts was able to rely on the legacy system for the year after student accounts converted. As described by the student accounts administrator, "We had that crutch."

The 18-month implementation timeline did have a strong impact on the success of the Student implementation. The senior project administrator observed:

> It didn't make it an easy implementation, and…in retrospect…because we frankly didn't know enough about [the ERP system] at the time we were bringing Student up, I don't think they got a lot of benefit out of being first up. Certainly not as much as they expected. So if I had to do it all over again, I would say let's do it the text book way…. which is to do finance first, and then HR payroll, and then student last…. Student will have two full years to prepare, to think, to plan, to learn, and once they come up they'll be ready to hit the ground running. As it is, they came up first and have been struggling with it and are just ready to run now. I think there was a lot of pain doing it that way, that didn't give the Student, or didn't give the university, the advantage that we thought it would.

CS-B also opted not to conduct any formal business process review as part of the implementation. Project management intended that the functional areas would review their business processes following go-live. One student services administrator made the following observation on this approach:

> The best practices have been implemented in the ERP system that we purchased…and there were business processes in place with the old mainframe system. I think especially people who are very deep with the whole system really wanted to follow the same processes with the new system and that is part of the tension. Not using the best practices in [the ERP] and trying to cling to their old practice, that's been a tension.

The impact of this on the post-implementation environment was further explained by a project coordinator: "Real business process analysis…is very lengthy and time consuming….Now they're struggling with how best can we be structuring these processes with the technology that we have."

Staffing and Organization

The CS-B project provided funding for consultants, new staff, and position back-fills. Functional consultants were heavily used by the operational areas. Technical consultants were utilized by the university IT group to for training support for each module go-live. New positions, as well as staff replacements, with necessary skill sets were hired by IT. Although funding was available for functional backfills and new position hires, not all areas were able to make use of the resources. As the CIO explained:

> The intention was with some of the new hires to have people freed up to focus on implementation. Since we weren't able to get as many hires as we would have liked from outside, we backfilled with consultants largely. So the bad news is that we weren't able to hire all the positions, but the good news is that left us more money for consultants….We ended up with a lot more consultants, fewer people but more consultants than we intended.

Two functional areas, student records and financial aid, hired external persons to fill the implementation team lead roles and they were converted to permanent positions after the conversion. However, for implementation team participation, backfill was not

utilized for some of the functional areas. In an example from the registrar's office, the functional team representative position was originally supposed to have been committed to the project 75%, but in reality, as related by the student records representative, "for the most part I became all [Student ERP] very quickly."

From a slightly different perspective, the student accounts administrator shared her experience:

> I remember…the question came up, "Would you rather backfill your position and then you step out, or would you rather stay in your current position and then get somebody to do the implementation"? I guess I answered that question wrong because I got both responsibilities!

A number of CS-B participants discussed the necessary staff skill sets that changed as a result of the ERP technology. From the functional area administrators, the following comments are representative of what was shared:

(a) I think that there's additional skill sets that are required of my data processors in this system and we're just kind of going to have to wait for attrition to take a hold of that and then hire those skill sets, 'cause I don't think it's trainable right now.

(b) Departments…are struggling with the realization or struggling to even come to the realization that the people who do the jobs with the old system and with the old skills may not be the people who can take you forward with the new system that requires new skills and a new way of thinking.

(c) I need to have people or I'm hoping to hire people that have keen analytical skills, because it's all logic. In the old system it was…kind of rote, you kind of looked here and you looked there. It's not that way with this system. You need to be able to look at these things and analyze."

The IT group saw the same changes in required skill sets. The IT systems administrator described their experience:

> All the developers were mainframe, COBOL programmers, JCL. You know, they all knew the mainframe world and didn't know anything about Oracle…. they needed to learn SQL loading….We've hired two people that had the skill sets,…so it was only the four original people who needed to learn the new skill sets.

A related impact as a result of the implementation and resulting changes in staff roles and job skills was departmental reorganization. Two areas described reorganizing their office structures as part of the ERP implementation. The IT office underwent a major reorganization due in a large part to the change in position responsibilities and skill sets. The IT systems administrator related their restructuring:

> The old mainframe production control group slowly dissolved and went away. The new admin computing group sort of assimilated the production control, and we knew that's not what we want to do ultimately because now one department has ability to change the code and move it to production and that's an auditor no-no. At the end of the project,…we took the production control function from the

admin computing group and called it the new production control group and the [admin computing group] got the web programmers and a new name, application development.

The second area that restructured as part of the implementation was the graduate admissions area. A university graduate admissions office was established to coordinate the processing of all graduate applications. The graduate admissions administrator described how the reorganization impacted the individual graduate admissions offices: "They still…make the decisions on the applications. We really just handle the processing and the trouble shooting." However, this restructuring was not actually a direct result of the new ERP technology. It was based more on a change in administrative philosophy, as described the academic affairs administrator: "It was an opportunity to centralize it. Over the years, the graduate admissions' pendulum has swung from centralization to decentralization….it's just swinging back now to centralization."

While the other units did not make organizational changes, the following observations by one of the student systems business analysts are telling. In describing the impact of introducing new technology to an organization, she said, "It impacts individual persons' jobs because now they're doing their job differently, not only because you're using different technology, but it may be organized differently. And it impacts departments and department structure, and what departments need to do." She continued:

I see people struggling with this to one degree or another, both in the departments and here in IT, and in some cases, it's a situation of you really do need to

restructure your department because things have changed that much with this new system.

During the project and subsequent to go-live, CS-B experienced staff turnover, particularly in the technical areas. Several participants attributed the implementation timeline as a major contributing factor. The IT area had developers leave who did not want to have to learn the new programming languages. The student services IT group had 100% turnover. A functional administrator explained it as being, "just part of the IT business, I think, 'cause the younger people come on and they get skills in Oracle databases and in something like [the ERP system]. Then now they're more marketable and they move on." The staff turnover did not catch the senior project management group by surprise. According to the CIO, "The executives at the outset…recognized very clearly that the institution needed to staff up, that this was going to be a difficult transition, that some people were going to leave. They understood that. They expected that."

The major functional areas did not experience the same amount of turnover. When asked by the researcher about having any staff turnover related to the project, one functional area manager responded, "We haven't yet, but I really think that has to do with the [legacy system] crutch."

Training

CS-B approached training for the Student ERP project from a function based perspective. Each unit or area was responsible for training their own staff or user group, with the exception of general navigation training which was provided by IT. Consultants were (and still are) heavily relied on to work with and train the functional representatives for each area, who were then expected to train their internal staff and users. This approach presented challenges for the different student areas following go-live. The most common theme heard was lack of involvement or engagement by the majority of the office staff prior to go-live. Several participants expressed their feelings on the training issues:

(a) Training was an issue. I think we didn't train people close to go-live. I think some of the training happened earlier on and also I think not everyone was involved in the implementation initially. So when they had to use it on a day-to-day basis, since training was not adequate, it took a longer time for people to get used to it. Also, I think more people should have been brought in and more training should have been given just prior to go-live which I think we didn't do.

(b) …all of a sudden we're live. Okay, now you have to be 100% engaged. That transition to getting them engaged was not there. It really wasn't anything the team leader could do because these people didn't report to him. He couldn't say to a department head, your people have to be trained in the system. It had

to come from elsewhere and at that point you're dependent on the functional people to say, okay I need to have my department trained. So within Student getting them engaged early enough was not there.

(c) You have to run your day-to-day business and you only have one or two people who know [the ERP system]. After the system comes up,…it's too late….You see real, real struggles now because of the attitude that said we don't want to let our people out to participate on this project. We'll give you one or two persons and the rest of us are going to be back here doing our jobs and then the system turns off. They have a new system and how are they doing their jobs? So much of what you do...the decisions you make up front have such huge impact post-implementation and I do mean huge.

(d) There's still quite a bit of a learning curve that needs to take place just in the office….The functionality is there, it's built. It's just the knowledge base is not completely there where people feel comfortable knowing really how to do their jobs.

(e) I think that where part of our implementation wasn't the best, where…people weren't allowed to be introduced to the system I think early enough to have practice time and have work time and work-the-kinks-out time.

(f) We had one person per area that really did the implementation. So they were pretty good, I mean they were able to pick it up day one. But the others in the office had to be trained and get up to speed.

(g) We were trained to the point of putting in data but I don't think we were very well-trained in the nuances associated with doing things that create duplicate records.

Training participation and success in the functional areas was also influenced by the continuing availability of the legacy system after go-live. A functional area manager describes what was occurring in her office the day after the legacy system had been shut down:

> Yesterday, we turned it off for good. All of a sudden today, everyone is calling our office, saying, "Oh, how can I look up this or that" because they haven't been using [the Student ERP]. They've had that crutch….people weren't really willing to learn [the ERP]; they just kept going to the old system.

As a result of the training issues experienced and the heavy use of consultants by the functional student group, one functional manager expressed the following concern:

> I think there's too much reliance on the consultants we're using. My fear is when the consultants have to go, people won't be ready because they haven't built up their own confidence to know that they can solve their own problems.

Technical

The university IT offices interfaces with the major functional areas through the implementation team leaders, who are now identified as functional area liaisons. This

relationship reflects a trend toward decentralization of IT at CS-B. The IT systems manager described the liaison role and interaction with the central IT office:

> These team leaders…are the liaison between IT, and are the only people authorized for IT to actually take action on an end-user request. So even if our registrar wanted a change to a form or wanted a report or wanted anything out of [the Student ERP], they go to that team leader. In the [ERP] world, the end-users really have much more control than in the old world, so that changed a lot of things, too. Now, if that team leader makes a determination that their IT staff doesn't have the ability to debug the problem or write the report or modify the form which they cannot do, then that person kind of packages it up as a request to IT for action. So we really have just a few key points for all of the end-users which makes it nice for IT....we're not bothered by 55 Student users. There's only one.

ERP technical support specific to the student enrollment services division is provided by two levels of IT. The university IT office is responsible for the hardware, database administration, network, source code modifications, and application development as described in the preceding paragraph. The first level of technical support is provided by the student enrollment services IT group. The student IT group manager explained the unit's function and his role as the Student technical lead:

> We write scripts and we essentially do the IT stuff. Since I was the [ERP] Student team lead, I essentially continued with the [ERP] Student….Essentially all the

> Student-related stuff still comes through me…. If it's a student, if it interfaces with student, it has to come through me….I collaborate with everyone who's involved….I'm the interface to central IT for the [ERP] Student.

A senior systems administrator further explained, "Really, they can do anything they want, it's their system. But they can't modify source code."

The two-tiered IT support for the Student system does have drawbacks, as observed by a functional participant.

> I almost think our two levels of IT…are not the best way to do it, because I feel like both sides sometimes have their feathers up because both are afraid the other's infringing. They both think they should be responsible for the same things and sometimes, I know there's a little back-fighting between the two of them, not that it always rises to the surface. I think everyone is afraid that somebody else is going take what's their job….I think as we go in the future we have to better define which IT is responsible for which complaints.

Another functional participant shared their interaction with the two IT groups.

> University IT has a process through our portal to document...they really want to document any problems that we have with [the Student ERP]. But I'll be honest, any time I have a problem, I go to the team lead in enrollment services IT and he kind of fields it. Not the best way to go because it's not always tracked, but that's the quickest and sometimes when you're working with students, you need something done as soon as possible.

Modifications and Customizations

CS-B implemented the Student ERP with no modifications to the system. However, during the year following go-live, six modifications requiring changes to the source code were approved. These modifications were all driven by external state or federal agency requirements which the vanilla ERP could not provide. No modifications to reduce functional process steps were approved. Each CS-B modification request was vetted through a process which goes through several phases, including an analysis phase and an approval phase, before final approval by the CIO. The IT systems administrator explained that a new IT group was created in the past year to manage requests for modifications to the system. "The Client Solutions group is…a business systems analyst and two project coordinator managers and the director. So that group would basically flush out the request, the need, the cost, the money and final approval from CIO."

When the researcher inquired as to the number of requests for modifications or customizations following implementation, a project administrator responded, "We've had very few….One of the reasons is that there are plenty of user defined fields in [the ERP system] that people are able to customize…without actually modifying base code, so that's been good for us."

Use of Third-Party Software

The online application that was delivered by [the Student ERP] was initially used by undergraduate admissions during the first year. However, it required customization

prior to go-live, as described by the IT systems administrator. “We condensed some of the web pages down to one or two clicks of the mouse as opposed to 12 to get through the application, because we felt that that would be a nuisance and that might turn students off….And if it was just too many clicks to go back and forth, we felt...they just may abandon the application midstream and go to some other school, so we wanted it to be a little more user friendly.” However, after the first year, the admissions office changed over to a third-party application. When asked about the reasons for changing, the admissions administrator explained, “[The delivered application] was pretty much vanilla….The look and feel of it wasn’t what we wanted.” The graduate admissions office also evaluated the delivered application during implementation and determined it couldn’t meet their needs:

> We had actually explored the option of modifying the [ERP] web application and we had gone through [it] to see maybe what we could do to make it a little bit more efficient for our processes, but we realized…it doesn’t meet our needs even with modifications that we may or may not have done so we elected to stay with our online application vendor instead.

In addition to the online applications for undergraduate and graduate admissions, CS-B utilized several additional third-party applications and bolt-on development to meet user needs. The Student-related third-party applications included housing, parking, document imaging, and cashiering. Additional ancillary systems were for job scheduling and management, online forms, and an operational datastore plus two applications for

reporting. When asked by the researcher if there had been any effort to review the third-party applications for possible replacement by [Student ERP] functionality, the IT systems manager responded, "Oh, yes. We didn't get rid of any old ones. We took on a new one, as a matter of fact….We went with a product [for housing]."

Technical Post-Implementation Experience

Several CS-B participants shared differing perspectives on the technical experience in post-implementation. Duplicate records were a problem highlighted by more than one person. The problem was identified as the continuation of a duplicate record problem in the legacy data which was converted into the new Student system. The current situation was explained by the admissions administrator:

> Essentially we are cleaning duplicates….for the new ones since conversion, we'll be caught up by the end of July….The conversion stuff is going to take longer because there's about 2,400 from the conversion that was in the [legacy] system that came over. But, I think the duplicate issue is a universal problem; it's not something unique to [CS-B].

A technical systems analyst shared a different perspective on the duplicate record issue:

> Even while we were running parallel systems, and keeping those two systems in sync for what we thought was going to be 6 months and it ended up being 18 months, at the end of day, yeah, we ended up with a few duplicate records. That's everyone's big crisis is a duplicate record, and we had some of them, sure. But for

what we were doing and the backwards way that we approached this and still were able to come out at the end in sync, I mean, was due to honestly our in-house staff here who knew the old system, knew how to do feeds, and was learning the new system enough to understand relationships back and forth and during the process, we were very, very successful.

Security access to the [Student ERP] system is an area that has required process changes following go-live. A senior project administrator described the issue:

> We've actually had to be ratcheting down access that people…have had because it's not appropriate for their roles. It was okay in our view during implementation when they needed to make decisions and make changes rapidly…to get things in right away, but we're not doing that anymore. So now if they want to run a script to go through and clean up data they have to work with…the DBAs to get that done. So we were a little looser during implementation and we're tightening things up now. It's to prevent issues; we want to make sure that we're clean in terms of following best practices for security.

The IT systems administrator was very positive in his view of the technical post-implementation experience:

> I'm happy. I prefer the platform. The new codes, the new environment, I like it. [The Student ERP system] is much more powerful than the [legacy] system and I believe that the Student Enrollment Services folks, their IT people, are able to do much more today than they could in the old way….Now they have people that

support them that are really doing nothing but their own support, so I think that even that way is improved. It's definitely better all the way around from my perspective.

Functional Post-Implementation Experience

The functional post-implementation experiences shared by the CS-B participants were reflective of issues previously identified relating to implementation, staffing, and training. A senior project administrator characterized it as "a lot of broken glass to be swept up." He noted that they were continuing to struggle with the perception that the new system was more difficult and cumbersome, and that the data was suspect. The latter issue regarding the data was echoed in the comments of the admissions administrator. He related that admissions "pretty much had everything on day one." However, his major concern was data standards and the resulting duplicate record problem:

> People need to really understand that it's critical. If we're going to use the database and maximize the use of the database especially in any kind of trend analysis at all, the data has to be the same, or you just get garbage out at the other end and you just can't use it.

Another functional manager had a different perspective on the duplicate record data issue:

> When we first went live with [the Student ERP], there was an issue with a lot of duplicate ID's, student ID numbers. That was part of the process because things

were happening within each department instead of being centralized. It was within the last year we've greatly reduced the number of those duplicate or multiple IDs so I think for us that's been our biggest success.

A senior project manager described the way he saw the functional experience:

I think in terms of the post implementation experience, learning [the Student ERP system] has been a real challenge for a lot of the functional areas….In the scrambling to get [Student ERP] implemented people didn't think through how they really wanted [it] designed and so they recreated [the legacy system]. They made some implementation decisions that now they're in the process of revisiting because they realized, well the way I did things in [legacy] don't exactly translate into [the Student ERP] and I need to now reconfigure [it] to do it the natural way that [the ERP] wants to do it….The functional areas have not gained the experience that I think that they need to really make improvements in their business processes.

The student records office had a "surprise" on the first day of registration. The student records functional rep shared how they were advised by consultants to leave a field in the setup for course pre-requisites blank, and when they did so, students were able to register for classes that they were not eligible for. "So, I remember that first day of registration, we were like scrambling to put grades on every course."

The reality of some of the issues noted was highlighted in this comment by a functional area manager:

> I would definitely say that it was a learning process and it still is a learning process. People don't like change a lot of the time and they kept referring back to [the legacy system] and the functionality they had there, but what I noticed, too, is that changing from legacy to [the Student ERP] uncovered a lot of things that weren't done right in [legacy] anyway.

Post-Implementation Reflections

When asked to summarize their Student ERP post-implementation experiences, the CS-B participants provided several positive outcomes:

(a) Our bottom line was we had no disasters, we had no major problems. When it went live, it was running and we were running our business on it and so, in that sense, I would say that's a huge success. Sometimes I think it's overlooked and it's taken for granted.

(b) I think another good success for us, and I don't want to overlook it, is the stability of the system. We have a systems architect…who really worked with the vendor and other vendors to size and configure the hardware and the software, the redundancy, the backups. So, one thing we have not had is any performance issues.

(c) People who didn't necessarily know each other that well developed good working relationships. Or if they already had a good working relationship, then that relationship was enriched by this process because, like I said before,

it could be a very painful process and you have to have a lot of patience to work through some of these things. A lot of relationship building went on and still goes on and I think that's a success.

The researcher also asked the participants what suggestions or recommendations they might have for an improved post-implementation experience. The theme that emerged from the responses centered on process improvements:

(a) I think with our aggressive timelines that sometimes people don't stop to communicate enough. Our communication out to the community was like bare minimum, and from time to time, you'd hear somebody complain that they didn't know such and such was going on. So I don't think you can have too much communication.

(b) I would spend more of the consulting dollars up front on looking at the processes and planning, how they might be different in [the new ERP system] rather than jumping in to the implementation….I think at the end of the day, we missed having that upfront planning with each functional area about how to redesign their processes in [the ERP system] and I would advise anybody going into a project like this…to spend the time and money up front doing the redesign.

(c) Another area where maybe we weren't the best is we never really had a testing plan.

(d) I think where all ERP systems have headed in higher education and in industry, all sorts of industries, is that it's not intended anymore to be the purview of the anointed few and that everybody has the opportunity to learn, to participate in how [the ERP system] is evolving….We've talked about it, but we haven't confronted that awful truth that everybody needs to know [the Student ERP system] not just [single individuals] in the [functional offices].

(e) We have an upgrade [coming]. It's switching to a new version and it's almost like re-implementing and I think it will be very interesting to see how the university handles that. If they learn from their prior mistakes, or if they just try to push it right in, I think that'll be a very telling sign for us…how we're going to move forward in the future.

Case Study Report - Institution C

Case study C (CS-C) is a medium-sized private university, awarding baccalaureate, master's, doctoral, and professional degrees in over 100 degree programs. With tradition steeped in values and community service, CS-C shares a close relationship with its neighboring small town community. This culture of value and service was evidenced by the campus buildings and grounds, as well as the activities on-going during the 2-day on-site campus visit by the researcher in June, 2008.

At the time of the on-site visit, CS-C had been fully live in the Student ERP system for 3 years. The researcher met with 29 functional and technical participants in individual and group interview sessions to collect qualitative data on their Student ERP implementation and post-implementation experiences (see Tables 1 and 6 for interview summary information).

CS-C ERP Project Management

CS-C began its ERP system procurement activities in 2002, with the formation of a cross-functional steering committee. The purpose of this committee was to develop the requirements for the new system. At the end of the process, over 900 requirements had been identified. Final selection of the ERP system was made on the basis of scoring matrices, demonstrations, and site visits to other schools which were using the products under evaluation. The ERP that was purchased by CS-C included the three major modules: Student, Financials, and Human Resources.

The project governance structure included the steering committee, which consisted of high level administrators who provided general oversight of the project. An executive oversight committee had the responsibility for active guidance and involvement with the project, and faculty input was provided through the faculty advisory committee. A core group of cross-module functional and technical representatives met weekly to discuss implementation issues affecting their areas. In addition, the CS-C project contracted with the ERP vendor for a full-time project manager.

CS-C attempted, as much as possible, to position the ERP project as an institutional business initiative. The registrar's office was designated as the sponsor of the Student ERP system implementation. Communications about the implementation were disseminated through the members of the various governance teams, and a new website was developed to provide a source for current information about the project.

Functional team leads were dedicated 100% to the project and funding was provided in the budget to backfill their positions in the offices. Managing the team dynamics during the project was challenging, according to a senior project administrator. It took constant effort to keep the team cohesive. The management team instituted an incentive plan and a lighthearted team project status event was periodically scheduled which provided "one-half day of entertaining updates." The administrator also described that extreme flexibility was required to successfully work with the variety of skill sets among the team members.

The full project was implemented over a 3-year period. Finance was the first to go-live in summer of 2004. The first component of the Student ERP module, admissions, went live in fall, 2004 with the rest of the Student ERP module completing its go-live in summer, 2005. HR followed with its implementation a year later in summer, 2006.

An IT project manager credited the pre-planning and organization of the project with its successful outcome:

> People always say to get buy-in from the highest levels of your organization when you are doing ERP to make sure funding is there, that the functional user involvement is there, so I think the planning we did ahead of time…made sure it happened.

The commitment and buy-in of the university leadership was also highlighted by a functional end-user from a department perspective:

> I wanted to emphasize…there was funding to hire two backfill people. That freed up two very experienced registrar folks to be permanently assigned to the [project] transition team which was key to our success. And this funding support illustrates the executive support and awareness to how important this project was. I still have in my old files the letter we received with the signature…of the president of the university, the provost; the higher-ups sent us a letter and said, you know, this [ERP project] thing you're hearing about, it's for real, pay attention to it. So from the very top, it received financial support and communication support to make it work.

Implementation

CS-C brought up the Student ERP system by a phased implementation, or "a rolling go-live" as described by one participant from the registrar's office. As mentioned in the preceding section, the Finance module came up first, followed by the several components of the Student ERP system, and lastly the HR module. According to a senior manager, the project came in "on time and under budget," and further characterized it as a "pretty extraordinary" campus and team achievement.

CS-C implemented the Student ERP as a vanilla system. A review of business process was not formally structured at the project level and was approached differently by the functional teams:

(a) We didn't look to change a lot of process improvements. We looked to get the system up in basically the same way….If the process that we were doing in the old system didn't exist in the new system, yes we made that change that we needed to make…so that we could fill that gap. But if the process worked in the old system and we can duplicate it in the new system, we duplicated it, even though we knew it might have needed adjustment. Our goal was to make sure that we went up and we knew what we were talking about and we knew that it would be a successful go-live.

(b) Even before we went through training we…met with OIT [Office of Information Technology] like about three or four times about our process and that's how they developed a process specific to our office.

(c) As far as…business process [review], it was pretty much just…a little training session with IT. For the gap sessions, because we didn't know [the Student ERP system] well enough, our consultants helped user;…[they] did a lot with the gap analysis…for us.

(d) We did the business process analysis and there was a thought that maybe this is an opportunity to do some of that. As it went on we saw that we really…couldn't do both. You couldn't put in a new system and redesign your processes entirely at the same time, so we pretty much took the goal of just duplicating to what extent we could what we had done before.

The reluctance of some departments to become involved in the project presented additional challenges to the implementation team and project managers. A functional area administrator related their experience:

> Here we are…doing this in July. It should have been April or May or June. That was some of the organizational challenge that we felt with getting the other offices on board. Because as it got closer they realized, this really is going to happen! They weren't kidding. We're not going to be able to do some things unless we get somehow involved here. So it was great testament to [the team] that they pulled it off.

A functional team lead provided a second example:

> [A department was] invited to be a part…at the beginning and the director showed up at the very, very, very first meeting and pretty much never came back. Their

attitude was, show us the data, we'll figure it out. Wrong! There probably should have been more directive about, this is what needs to be done, rather than inviting or giving people more. I think there was too much of people given options to get out.

As a result of the "pushback" from some groups against changing their business processes to fit the vanilla Student ERP, when the system went live there were individual units that retained separate systems for their operations. One of the functional participants explained the impact:

> Some had different levels of interaction with it, but for the most part they're not fully integrated with the new ERP. They're mostly using these third party vendors and then interfacing any data back for financial aid reasons or HR reasons or whatever the case may be.

The perspectives of the go-live experience differed somewhat among the functional participants:

(a) There were no surprises on go-live day one. We did testing…and everybody was ready several weeks prior.

(b) We got stuck on the step of go-live,…but I don't know if that was communicated campus wide effectively enough….That is where I think some of the frustrations came in: why aren't there bells and whistles? This is phase one, we need to get to phase two and phase three!

(c) I really liked the [ERP] project and the implementation, putting in the ERP. I mean, that was the most fun time in my 12 years here. Now that's not the majority opinion on campus, but I really had a good time.

Staffing

CS-C provided sufficient funding in the ERP project budget for backfills to cover the positions of staff who were released 100% to the project. Several of these backfill positions were converted to permanent positions within the offices following the end of the project. One office representative described how they adapted these positions to meet new operational gaps:

> We have like three new positions out of the [Student ERP project]: the training and access, the technology and the development testing, and reporting….There was a need for training,…not just with the implementation, but from now on.…So she's in charge of making sure people do their documentation upgrades for every point release…and…to go out to the departments and train them on the different [ERP data entry screens]….We never had an actual reporting person except for a technical person who left, so now we have a dedicated reporting manager and then there's a team under her.

Transitioning the functional team leads, who had been working intensely on the project for 2 years, was an unexpected challenge. They found the jobs that they were returning to "were not the same." The experience was described by one of the team leads:

> I found it very awkward when we first came back because you did not know where you were. My position changed totally because I was a purely functional user and I came back as total system support without really any of my other responsibilities. They say, oh, you are going to have your job when you come back, and not explain exactly what that job is.

Another lead observed:

> I think it is something that caught me off guard, and I think it caught several other people off guard, the roughness of the transition from the people who were taken full-time to work on the project to kind of blend back into a new role, back into the office,…and then doing the dual role when they came back. I think that was maybe underestimated or not really thought clearly through during the implementation.

Changes in necessary skill sets and job responsibilities were not limited to the team leads. Implementation of the Student ERP system brought an overall change in how departments and staff were required to interact with the systems. Several participants described how they perceived these changes:

(a) People who did not have the skill sets to move forward with [the Student ERP] aren't here.

(b) The skill set changed significantly for the staff members that are utilizing the ERP system. Before, the knowledge level, the bar, was a lot lower and I think for staff members to be very effective in the new ERP system their knowledge

level and skill sets have to be significantly higher…. I think we started to realize that as we were going through implementation, but it really hit hard post-implementation.

(c) My title now is data integrity specialist; however, that dramatically changed with the implementation of our system. Before the system, all of our information was static and then with the new system everything became unstatic[*sic*], and so my position changed dramatically.

(d) Do we have the right type of staff with the qualities that we need for the changes that we did?....We've definitely increased the technical knowledge of people in here, whether it was training or hires. A lot because of [the Student ERP]; some because our IT office, they are just so bombarded that we started hiring our own, so we could meet deadlines and get things done in a more timely manner.

A functional team lead added, "Several of us had to learn new skills at our level, too. In doing the data conversion and checking that between systems [we] learned SQL, so we don't have to depend on OIT."

The technical team also experienced a similar shift in skill sets where knowledge of the mainframe programming languages associated with the legacy system was no longer required. They now needed Oracle and PL/SQL skills for the ERP and associated applications. When asked by the researcher if the IT experienced staff turnover related to

the changes brought on by the project, the IT managers indicated that, although they had turnover, they did not see it as related to the project:

> I don't think anybody left because of that, like I just can't deal with this technology… or the hours it's going to take. Not in IT, no….We had some people retire afterwards…who were kind of thinking of doing it anyway beforehand.

Additionally, the technical project managers highlighted that they learned project management as an additional skill set that was acquired during the implementation process. "By going through [the implementation] with different areas and then what you do with the ancillary [systems], learning project management just came with that…Just by doing that you had to learn project management."

Staff turnover was also experienced in the functional areas, but it was not necessarily perceived as negatively impacting their operations. As described by the team leads:

(a) They were nearing retirement and they decided, I'm just not going to go down that path, you know, relearning everything I've had to. We had one, two, three, four, five, and then we had a few people leave for other reasons, but I don't think they were system related. And to be honest with you, it was actually good because we were able to bring in people that had a higher level already of computer knowledge.

(b) Two people left from our office so therefore I had to step in place of one of the people, in particular, on the data and making data correct, the integrity of

the data, making sure things were coming across….So, really it was pretty important that I focused on learning all of the pieces, as much as I could.

(c) We ended up with I believe the same amount of people as we started with. We do have one more person in the office now and that's because of shifting some things around. I mean a lot of our jobs changed significantly and so a lot of our functions and job titles changed but in terms of numbers I think just one

An observation shared by a functional team lead summarizes the wider impact on campus of staffing issues related to the ERP implementation:

I tell people consistently, if we want to utilize the system that we spent $40 million on to its most effective degree than we have to have highly professionalized staff working on the system. We cannot just have data enterers…we need people who are going to really follow through on things and get good data out. There are entities on this campus and, in fact, in every campus that's ever done ERP, that have elected not to do that and they're really, really suffering today. They're just taking major blow after major blow and they sit there and they say, well why is this happening to us? It's because they just never kept up with the ERP. They never saw it as an opportunity. They saw it as…something those technical folks over there are doing.

Training

Initial general knowledge training on the Student ERP system was provided by consultants in coordination with OIT and the functional team leads. These training sessions were offered on "multiple occasions so that people could fit it into their schedule to come over to however many training sessions it took." The functional leads attended the training for all components of the Student system. The benefit was described by one of the functional participants:

> We went through all the same training so I knew their tables at the base level and how things were designed. I don't know how you would learn all of that if you weren't a part of the whole process, if we didn't all sit in on the training.

Another team lead related that participation of technical team members in functional training was a key supporting element of the project:

> A thing I think that was key in the implementation, has been key post-implementation, is the elevation of knowledge of the OIT people of the business processes. We all sat through the same training together, so when the dialogue was going on with the consultant about, what do you mean you can't do this, they started to have a greater depth of knowledge on the business process side. Our side kind of elevated on the technical side, but their side as well elevated, just as much if not more, on the business process side. So, I think we are much more on an even playing field now communication wise and depth of understanding.

After the initial formal classes, staff training on the Student ERP system became the responsibility of the functional areas. In most cases, the functional lead provided or coordinated the departmental training. Consultants were utilized to work with the leads and to assist in the development of training materials. This design, however, resulted in an uneven approach to training among the functional areas:

(a) We brought over testers and then we wanted them to test, but it was also to gain knowledge. It was probably a good 3 or 4 months before go-live that we actually started getting a lot of other people involved in testing, so that helped on day one.

(b) We kind of took the approach of "just in time" training. I think we started 6 weeks prior to go-live on some of the main training. I mean they had seen stuff earlier, but I think the real focused training was a couple of months before go-live.

(c) I thought the training was really good. It was very good for me and the support after it got in was very good. I mean [the functional lead] was great about coming over as soon as you called. We needed more people. I think that instead of just [the functional lead], we needed about four [of the lead person]. I remember it was [the lead] coming to my office almost on a weekly basis, this is how you do this, this is how you do that.

(d) We were shown screens that we will be using. That was pretty much it…. They gave us the general training,…yeah, just given an overview. But they didn't do that with the majority of us.

(e) We were trained before it went live. I just found that the way they went about the training, because I had to go through the training myself, I just found it to be pretty accurate and it was very clear,….because they had everything documented and you just tried it.

As part of the implementation process, the IT team provided formal training that "everybody needed to go through to understand Oracle, living in an Oracle world, and SQL, PL/SQL." Technical consultants were utilized by the team to provide additional training and knowledge transfer in database, operating system and module specific areas. The IT group also hired additional staff in the database administration area to increase that team's system-specific knowledge base.

Departmental responsibility for the ongoing training of current staff as well as system training for new employees in the post-implementation environment has proven to be problematic for CS-C. Reliance on departments that may or may not have been actively involved in the Student ERP project has resulted in differing levels of training provided. Several comments from functional and technical participants expanded upon the issues experienced:

(a) There was just no centralization for training, you know. Do we as a technical team do it? Well, I can train how to use [the Student ERP system] but I can't

train on the process. Whereas, [the functional lead] can advise the process, but really it should be in that smaller office.

(b) I think our group collectively thinks it really should be done in the departments, but that is just not happening because some of the departments are not really taking ownership of it, to maintain their manuals and to train their replacements and things like that….No trainer position so to speak in any of the departments or areas.

(c) Because of the lack of training, or the lack of follow through of the training at the beginning, we are now seeing such a problem with duplicate records.

(d) One of the things we struggle with is training,…keeping the staff members current and having current documentation and just refresher trainings frequently.

(e) They tried to prepare us, you know, as much as they could before we went live. But then, it's like after you go-live then you're experiencing all these other things that come up. I think that's when [our functional lead] implemented the super user meeting so that we could all discuss issues and fix things.

A departmental manager summarized the current training situation for CS-C, "Training demand skyrocketed and,…even 3 years after go-live, we are still at a higher level of training needs than we used to be, without a doubt."

Technical

Technical consultants provided CS-C's IT team with the additional knowledge base and hands-on resources needed to meet project timeline goals. In addition to initial setup and preparation of the database and hardware, the database consultant provided valuable support when CS-C decided to change platform environments 6 months before the first module go-live. The Student ERP technical consultant was a developer who provided application programming support for functional customizations that were requirements for go-live.

System synchronization presented multiple challenges for the IT team through the final module go-live. The system that provided network IDs and passwords was maintained on the legacy environment during the phased implementation period for the entire ERP project, which was approximately 2 years. The network team had to keep the legacy system synchronized with each module or component of the ERP system as it went live. Another challenge was described by an IT project manager:

> Integration was huge, because you are connecting and disconnecting systems all over the place because…everything is on Legacy system. We had people that are updating data in the Legacy system; they are updating data in the new system. We were putting new people in the new system; we were still putting new people in the old system. We had to make sure they synched up!

A second IT manager added, "One of the staff members on my team, the integration team, basically had to just about every day had to run manual processes to keep things synchronized."

In addition to synchronization efforts, the IT team included load testing in their go-live preparation. One IT manager explained: "The load testing did help us. The first time we turned on registration and people all hit the system at once and we had thousands of registrations going on, we were comfortable and we never really had a blip."

Time and resource management were issues that were especially acute for IT team managers while the ERP modules and components were going live over the two years. One manager described the challenge:

> As we were already in a post implementation, we were kind of also supporting the next person's go-live. So your users are using the software, and there is another project going on,…so I got to get ready for who is coming next. I've had all the attention on my part of the project for this amount of time and now I got to make sure the attention gets onto the next part.

Modifications and Customizations

CS-C held to the no-modification, or vanilla, model of implementing the Student ERP system. Customized bolt-ons or third-party systems were used to provide functionality not provided by the Student ERP system. During the project, even with an "extensive process for justification" which required final approval by the CIO, "we still

ended up with a hundred student customizations or something like that," as described by a technical project manager. For post-implementation, a student faculty guidance council was formed to prioritize and approve these requests. A technical manager commented on the benefits to this approval process:

> That kind of really is where that decision should be made. The IT shouldn't be saying whether or not to customize the system. The guidance council now understands the impact of doing that and how it makes it harder to go to the next version, etc., and then it takes resources and all the different alternatives you might have to making customizations. So I think we are getting to...having them taking ownership of that instead of us.

A department administrator provided a functional perspective of the guidance council review process:

> The challenge in the way we manage those things though is that we're always vying for limited support in IT. We say, ok, these are the registrar's projects, these are financial aid, these are admissions; and some things have to happen like financial aid regulatory, so they get to the front of the line. Now, in the whatever time we have left for our people, you guys can fight it out for student affairs, for admissions. A very, very big challenge there with getting resources.

CS-C took a unique approach to classifying modifications and customizations. An end-user best described this classification methodology:

> A "Big C" customization was a big no-no because it cost a lot of money and time and support and every upgrade you've got to test it. So Big C's, we shied away from. But, we did do some "Little C" customizations. It depends on your perspective of what's Big C and what's Little C.

The registrar's office had four Big C customizations to fill gaps in the delivered system and undergraduate admissions had one Big C to replicate previous functionality that supported their high school visits.

Use of Third-Party Software

In addition to modifications or customized bolt-ons, CS-C used third-party applications to augment the delivered functionality of the Student ERP. These included data transfer applications, a forms generator for student statements, and reporting software. Several of the individual admissions offices belonging to the graduate and professional schools did not convert to the Student ERP. One reason given was that it "didn't have the CRM (customer relations management) system." As a result, a number of third-party applications or stand-alone systems had to be interfaced with the Student ERP to upload the necessary student data into the system. Other student-related units that utilize third-party applications are housing, health services, and security dispatch. The registrar's office plans to change from delivered functionality to new degree audit software. The online class search also utilizes a customized third-party tool.

Limited resources have required the departments to take a pragmatic approach to requests for system enhancements or augmentations. A functional area administrator explained their department's enhancement planning:

> We have a wish list, but they're not necessarily [Student ERP system] related, like imaging. Granted [the ERP vendor] does have a product that's…basically document imaging and storage, but we need something a little more robust than that. We have a target date of next year for the installation of an imaging and reading system. One beyond that then would be a CRM system; we don't have really any kind of customer relations management.

Technical Post-Implementation Experience

CS-C has had capacity issues following go-live with the Student ERP system. Performance problems were evident to the end-users, and although improvement has been made, according to functional participants, system slow-downs continue to be a problem:

> There were slowness issues. There always are, there still are. The first year, even the first two years, it was almost every month and you just didn't know when it was going to happen. And now, I think they've resolved most of it, but heavy registration you know is going to be slow, November, March. So now at least you know the times of the year it's probably going to be slow, where the first two

years it would be hit and miss, Yeah, it would be really random. It always seemed to be at the worst times, of course.

The IT project managers discussed their surprise about the number of customization requests following go-live and the impact on the IT team:

(a) [There was] the flood of customizations after laying down the law and saying, we're going to live with this. The path to misery was trying to customize everything that didn't work just quite right and somehow the faucet, it wasn't a fire hydrant, but it was a steady stream that we just couldn't get turned off. Just to see the continual requests for customizations coming in and trying to manage that and really get down to the ones that were absolutely necessary after go-live.

(b) For some reason in my head I thought we had it licked and people were just going to fall in line and just deal with it; get us through the first year or so to be stable and then we would see stuff coming in.

Reporting was an area in post-implementation that the IT managers found to be challenging for the both technical and functional teams:

The place where we have struggled is in the reporting area. Just knowing that a lot of our functional areas in the student…wanted direct access to be able to inquiry the data and transactional database so they can…understand what is going on, and when problems are happening, they can diagnose them, that takes a lot of impact off of us. The problem that happens then is there are other abstract type things you

want to be able to deliver as an IT organization to allow people that aren't quite as familiar with the internal workings of the data and the database to be able to get good reports and good data from the system. Your functional users are so technical minded and focused on understanding that and doing all the reports from the transactional system, it creates some kind of an imbalance on what you are trying to do in the reporting realm. The way we are structured right now is that there is a reporting group; they service different areas in the university, trying to make sure they come up with reporting constructs that are helpful, and abstract enough that someone of limited expertise could figure it out.

Functional Post-Implementation Experience

Issues with data entry were mentioned by more than one participant, primarily as being more complicated or cumbersome and requiring more time to do the same work when compared to the legacy system. However, there were also contrasting comments shared which helped balance the perspectives:

(a) As far as processing applications it's much faster because a lot of that information is being pushed in so really you're just checking it. So it's definitely time wise much more efficient.

(b) We're processing more apps now in the same time, so that's perhaps an indicator that we're better off here.

(c) Processing time increased initially. Then we were able to tweak some of our interfaces a little more and… now we're kind of cleaning up some of the processes so that they're quicker, plus just having done them for you know a period of time makes them more familiar with it.

A functional administrator added his perspective on processing time:

> It is also much more demanding for my staff than it used to be. The expectation of the student and parent has become much more demanding and the system actually has helped us, but also has hurt us in that because we are more efficient, they expect us to be quicker.

Operational stability and process improvement was a common thread among many of the responses from functional participants regarding their post-implementation experience. The following comments are representative of the overall discussions:

(a) We're a little bit now to the stage where we are much more open to doing new things and looking at our processes. In fact, we're just doing a strategic plan this summer where part of that is just really to try to relook at everything we're doing and say what are we missing, what could we do better. We got to think that that's a sign of success that we're not constantly having to fight fires which, probably the first year after go-live,…was probably 75% of my job.

(b) I would say that the first year it was just trying to maintain and refining the system for all the things that you just couldn't think of during implementation.

I think after 1 year in a system, that's when you start to be able to enhance your processes. The first year the staff weren't ready cause they were just learning the system. It took over a year for staff to say, it's okay that we try to do something a little bit differently and I'm okay with doing it differently and they started telling us things that they were doing that were very manual entry. I would have liked to have started on enhancements to the system way sooner than what we did

(c) You know having strategy for moving forward is always a struggle to figure out because you get done, and it's like, okay, can this just stay the same for a while and it doesn't.

(d) It took us that first full year to into our second year of implementation that we sort of finally got back to steady state, if you will, where we were prior to the implementation at least within the [Student ERP] product.

(e) One of the things that we have done post-implementation that we did not have the opportunity to do during implementation was do some business process changes. The only ones that we were able to really do during implementations are the ones that we could not get around because we could not replicate. So, now, we are starting to have the opportunities to really take a hard look at some of the processes and really say, you know, is there a way to streamline this or is there a different way that we can do it and those are some of the paybacks we are starting to see now.

Reporting was an area of weakness for the functional areas as characterized by a team lead, "I think we all were surprised that the ERP reporting was so not existent. There was not a single standard report that they provided that we have used. The software company basically admits…that they do not do reporting." Another team lead added:

> I do not think we put enough emphasis into the reporting during implementation, but I think where we are now is not atypical…because you have got to get to a certain level of stabilization before that data is going to be valid without a lot of jury rigging.

The following reflection of a participant from the registrar' office is indicative of the overall post-implementation experiences of the key functional areas involved in the ERP project:

> We still had a lot of work post go-live. I wouldn't say it was things that we said, Oh no! We forgot all about this! It was more like, well, we knew this was coming and we had to prioritize what we were going to get ready for the go-live. We did that and now we have all these other things; they're critical, but they weren't go-live critical and so now we have to fix them. Those items I think have pretty much all been resolved with the exception of maybe the transcript. The transcript is one issue that we just work on extensively and we seem to continually have it as an evolving project that just never ends.

Post-Implementation Reflections

Reflecting on the overall post-implementation experience and the project decisions that impacted the outcome, a senior project manager stated if he were to do this again, he would put more emphasis on reporting and take a more holistic approach to future business processes. Expectations should also be managed so that the user community understands that full functionality, or other components such as reporting, is not to be expected at go-live, but will be "out in the next 12 months."

When asked by the researcher for their overall impressions of their post-implementation experiences, the participants shared a variety of thoughts which are reflected by the following selection:

(a) The most impressive thing was the dedication of the staff to make this implementation transparent to the student, you know, so we didn't have students go "like this is the best system you ever had." The goal was that the students would really not notice or they would get exactly what they expected and I think we delivered that.

(b) You can't help but get closer to people and understand their goals and understand what their daily challenges are by sitting in their office with them during implementation and living through the first year and going through all the bumps and bruises.

(c) I think that one of the things that we did a good job of but I think we did not do the greatest job of was getting people to a higher knowledge level prior to

the go-live and I think that would have helped in regards to having more processes change more quickly post implementation.

(d) People have sent me long e-mails saying, thank you. It went exactly like you guys trained us. You prepared us properly. I'm not saying it's euphoria because people weren't jubilant about the new functionality. We took a lot of steps backward on functionality, but people were really happy that it worked. And we went live with capabilities out of the gate that some institutions going with this particular software don't go-live with.

(e) I don't think we can emphasize enough of getting the functionals involved through the whole process as opposed to it being an IT process. It never felt like [the Student ERP] was an IT project. It was a university project, and I think that was the best thing they did.

Case Study Report - Institution D

Case study D (CS-D) is a small, public university that is part of a Board of Regents state college and university system. Located in a large metropolitan area, CS-D is a research-focused institution, awarding baccalaureate, master's, doctoral, and professional degrees in science-related disciplines.

The CS-D campus does not have the traditional look of a university. Its urban setting, which has expanded with new facilities to accommodate growing research in specialized fields, complements its mission of research for public service. During a 1 day site visit, qualitative data were collected by the researcher from five individual and group interview sessions. A total of 13 representatives from project management, technical, and functional departments participated in the interviews (see Tables 1 and 6 for interview summary information).

CS-D ERP Project Management

The Student ERP system was the focus of CS-D's implementation project. This system included the components of admissions, student financial aid, accounts receivable, and student records and registration. CS-D did not convert their Finance and HR systems which were running on an application by a different vendor. Although it is part of a state higher education system, CS-D's decision to purchase the ERP product was made by its internal project team and was not directed by the state board of regents. The 3-year project was completed on schedule in July 2006 with the go-live for student

records and registration and accounts receivable. Admissions had been the first component to go-live, which occurred over Labor Day weekend in September, 2005, followed by student financial aid in January, 2006.

CS-D's project leadership was functionally led with a technical counterpart for advisement and IT oversight. The vice-president of Enrollment and Student Services, representing the functional areas, was the project owner, while the CIO was the technical sponsor. For overall day-to-day management of the project, CS-D hired an experienced external project manager with a heavy technical background, "who understood people and the academic environment" (senior program administrator). A technical project manager from CS-D's IT unit was appointed to oversee the technical team.

The governance structure for the Student ERP project included an executive steering committee which met bi-weekly. The Dean's Council and the Provost were also very involved in the project oversight. CS-D had a very mature project support office with four staff members who held PMP (Project Management Professional) certifications. The primary working group was a large core team, comprised of functional and technical representatives. A technical manager attributed the effectiveness of the core team to its inclusiveness:

> We comprised it of anybody we felt was significant across the departments that was going to be impacted heavily.... [The team meetings] were large…I'm sure some thought they were too large…but it worked out great because you got a lot of feedback on different things…. people would pipe up and say, "Well you

didn't think about this." So that worked really good having the big core team meetings.

A new governance team was created for the post-implementation environment to manage requests for changes or enhancements to the ERP system. According to a technical manager, "We were getting so many requests…we needed somebody to field these and say whether or not we really want to do them and if we do…to prioritize them." The change advisory board (CAB) included the implementation project team leads, now called data stewards, IT managers, and representatives from other areas not under the scope of the data stewards. All requests for technical support on the Student ERP, including requests for reports, are required to go through the CAB for approval.

Communications for the Student ERP implementation project used different mediums depending upon the group to whom the information was being provided. A secure project website was utilized for members of the implementation teams and other project groups to access documentation and "to see what was going on where." Campus communications were accomplished through articles or notices in the campus newspaper and also through email notifications to departments within the university.

Implementation

Prior to the actual start of the implementation project, CS-D took a year to secure funding for the project. The project team used this time to conduct an extensive business process review, identifying and mapping 100 functional processes from across the

Enrollment and Student Services division. The process was described by the technical project manager. “Meetings were set up to handle a set number of business processes a month and the teams met weekly until they documented everything and then they were formally submitted.” A business systems analyst added, “It really helped to review those business processes up front because then it was fresh in their minds when they hit the module and said, oh, oh, ours didn’t work this way, so it was really good for that.”

The participants also discussed an additional benefit to this business process review phase. All of the departments and separate professional schools were involved in the review of processes that involved their unit. This served a two-fold purpose: (a) to communicate information about the Student ERP system to a wider campus group and solicit buy-in to the project, and (b) to identify shadow systems that had been built and maintained by the departments and schools, so that IT could eliminate these databases as part of the ERP conversion.

The Student ERP system at CS-D was implemented in phases. The project team felt that was “far less painful” than a big bang implementation, which would have brought all of the components in the system live at the same time. A project manager described the experience of going live with the admissions component:

> It was a very interactive supportive experience. I think that was what was good about it was that the functional users were there and they didn’t feel like they were in it alone because we had the technical, the developers and the business

systems analyst and I was there and the project manager was there and we stayed as long as they wanted to stay that day until they felt comfortable.

Each functional component was required to provide a formal sign-off to IT following their go-live stating that they were live in production with the module.

The phased approach presented challenges for the IT group. The technical participants shared their observations:

(a) The technical team never had a chance to say, okay, we're going to take two weeks or a month and make sure this is working solid before we throw something else in.

(b) I think we would slow down some of the phases to clean up some stuff before we had to go-live with the next phase.

(c) We were on such a tight schedule…six months in between each one.

The technical participants further explained the impact of the phased implementation on prioritization of work tasks:

(a) So what we would run into is management would have to make a decision, do we convert data or do we fix this nice to have kind of thing?

(b) At go-live, I was trying to convert data, but at the same time trying to create reports for people that were already live.

When the functional group was asked to describe their go-live experience, "scary" was a word used by more than one team lead. One area had only gone through training the week prior to their go-live. "We were so rushed to get everything done, so it was kind

of like trial by fire….The consultant that we had at the time was supposed to be there through our go-live, but wasn't." Another area experienced problems with security, but the team lead considered that a "minor" problem and stated that it "was just a matter of them going in and giving people the rights that they needed. Other than that, we were able to do our processing and everything."

The accounts receivable module experienced problems at go-live related to the online payment system that was installed concurrently to interface with the ERP. The AR team lead explained their implementation experience:

> To test online payments, you can only go so far in testing and then you just have to rely on production to make those things work….Once we got past I would say probably the first month or two, we were in good shape, but I don't think any of us were prepared for the amount of work that came with implementing [the ERP system] and [the online payment application] together, so it was sort of a shock.

Although the Student ERP system was implemented vanilla with no modifications, the functional participants characterized the implementation as "incredibly complex." To ease the transition, efforts were made by the team leads and the trainer "to figure out ways that people wouldn't have to modify their procedures too much,…to make [the ERP system] work for them because we knew it wasn't just for us but for the campus."

Staffing

CS-D project management provided funding for backfill positions during the project, although "very few" team leads were released 100% to the project. The student financial aid area was without a director during the implementation phase, so the assistant director was required to do "double duty," running the office as interim director and working as the functional lead on the implementation team. One issue concerning backfills observed by the interview participants was that "you always have to get backfill people up to speed…so you still had people putting in a lot of hours." Due to the amount of overtime being worked by hourly staff in the functional offices, the project administrators also had to address getting funds to pay for the extra hours. The technical team did not have the same work load conflicts because they were dedicated to the implementation project as their primary duty.

New permanent positions were also funded by the project. The IT area hired a programmer and a new database administrator (DBA), both of whom were hired with the new application knowledge required by the ERP system. The functional positions, such as the associate registrar, were hired with the intention that they would act as backfill in the office for the team leads.

Changes in necessary job skill sets were noted by participants from both the functional and technical areas:

(a) I think it does require a different skill set because this system is much more cumbersome than our old system.

(b) Most of the time before we had [the Student ERP] it was clerical work.

(c) You definitely find out which of your staff are able to go and research and solve a problem on their own and which ones can only do what you have given detailed instructions on how to do it.

(d) Not only does it take more people but it also takes a different knowledge base. We took the same people thinking, okay now once we switch over, it will be fine, but we didn't have report writers and now we have to have Crystal reports writers. We didn't have the database people that we needed. Even though we added a few people, we did not add enough and we did not add enough of the type of skills that we needed.

CS-D also experienced some staff turnover that coincided with the go-live of the system and shortly into post-implementation. The functional areas reported having key staff members retire either right before or shortly after going live with the Student system.

In the post-implementation environment, the technical team is no longer staffed at the same level as during the implementation; it has staff appropriate for on-going maintenance of the system. Their staffing resources have reinforced the need for CAB to review, approve and prioritize all requests for changes to the system.

Training

Training for the Student ERP system was provided through consultants and a new full-time trainer position at CS-D. The trainer provided lunchtime information sessions

that were open to the university community, including students, faculty and staff. Additionally, this position supported functional training in the departments and development of training materials, including business processes. Security access was tied to training, as described by a functional lead:

> Throughout the project, the team would be trained first, you know through formal training by [the vendor] or however we did it, then [the trainer] would develop training plans and bring in the users. Before we would give a user access to the system, they had to be trained and signed off on. They had to…be in her class…and then they would get access to the system.

Following go-live in post-implementation, the demand for training has tapered off so that it is now conducted as needed on an individual basis. Development of online training material, reduced staff turnover, and departments handling their own training are major contributing factors to this change. As a result, the trainer's position has now expanded to include assisting with testing system releases and validating reports development.

The technical team received training through formal classes and individual knowledge transfer from the consultants. New hires, or other individuals who missed out on the formal classes, obtained their training from the other technical team members. The state board of regents OIT staff were also a training resource used by the team. The technical staff was encouraged to participate in "any functional training that we wanted to be involved in, just from the standpoint of seeing the system and knowing it and getting

our hands on it." In addition, they used remote tech support for 4 to 5 months following the last module go-live.

The consistency and quality of the training consultants was an issue, especially for the functional groups. One of the participants described their challenge:

> We had a hard time finding a person that had skills with both AR and financial aid. We really struggled there and then when we did get one we'd only get him for a week at a time or two or three days and…we would have to explain things over again to get him up to speed.

A technical team member made the following observation regarding the functional consultants: "I wish we could have been more picky. I think their knowledge base wasn't probably as strong as it should have been and we were so new we didn't know the right questions to even ask."

Modifications and Customizations

CS-D's implementation was "very vanilla" according to a senior project manager. Necessary enhancements, however, were handled with bolt-ons. The "no mod" approach was supported by the senior administration at the university.

The individual professional schools at CS-D generated the largest number of customizations or bolt-ons to support their operations. Special processes had to be modified to load applications, photos and other data from these schools into the Student

ERP system and, according to the technical participants, they are still doing customizations to support them.

There were other additional areas for which customizations or bolt-ons were developed. A custom form (data entry page) had to be created for transfer articulations, because the delivered one "wasn't quite working." Two additional bolt-ons were developed to support web-enabled access for applicants to view their application in the ERP and for a financial aid online application, neither of which was delivered as part of the Student system.

Reporting and other data submissions required by the state board of regents often results in new releases sent by the state. These state releases often require customizations so that the data can be extracted from the Student ERP system as directed by the state governing board.

Use of Third-Party Software

CS-D did not use the delivered admissions application that came with the Student ERP system. They currently have "three different kinds of applications feeding into [the Student ERP], done by three different companies." The three separate applications are used by the admissions offices for undergraduate, graduate, and one of the professional schools.

Third-party applications are being used by other areas of the Student system to include a data transfer program for loading admissions data, online payments, cashiering,

and third-party credit card servicing. A third-party solution was also purchased to support initial reporting needs. However, there have been problems with the selected product. As described by a technical manager:

> We didn't know the shortcomings of it at the time….It wasn't specifically recommended. [The ERP vendor] had a list of ones you could use. You couldn't find any particular school that was just in love with any particular item so we found [one] that was going to have an enterprise edition and we could buy that and we did….You can't produce the [reports] fast enough to replace the hundreds that they had in the legacy system, so it wasn't the best ad hoc tool.

Additional third-party solutions are being implemented by CS-D in post-implementation. These included document imaging, workflow and a data warehouse for reporting. A senior project administrator commented that as CS-D becomes established in the Student ERP environment, they are looking at other product options to replace some of the delivered functionality.

Technical Post-Implementation Experience

Relatively few technical issues were mentioned by the participants as being experienced after go-live. Occasional performance issues occurred as well as dropped sessions, but those were quickly corrected. Transitioning the relationship between the functional users and the technical team from a project orientation to on-going operations

was characterized as “difficult” by the technical team participants. They discussed their experience:

(a) One of the things I recall that was very difficult after we went live was the users sometimes would pick up the phone and call different people.

(b) I think because we all work so close during the training and the testing phases…those end users still wanted to contact the same people they had been dealing with for testing and they didn’t want to start going through the formal process.

(c) Yet somebody else would get a ticket and start working on it so we were duplicating effort for a while.

They went on to explain that they resolved this issue through better communication among the technical group as well as with the functional users. Formation of the CAB and a job ticketing system for documenting all production changes aided in the transition to the current change management process.

Data conversion was major problem area that was discussed by the participants. For converting data, CS-D used the vendor’s conversion tool kit. The technical project manager described the experience:

> Conversion took a long time…. it was months. We thought that the conversion tool kit would just be our lifesaver and it ended up there was a serious learning curve….We did have some technical help come in and help us before we had a conversion, you know, got a conversion plan together.

A technical team member added:

> We had a few things that we converted, I would say incorrectly. But we didn't realize how the system was truly going to utilize it until we started using the system. So we had to make a few modifications to the way we converted data, to do some DBIs or database interventions after the fact.

The project manager also explained that a contributing factor to the lengthy data conversion process was issues with data validity.

> Part of it was the process once we got it converted over. The users had to clean it up. Our legacy system had a lot of trash data, blanks, things that weren't there. You couldn't convert it because it had nothing there to convert from….a lot of their time was cleaning up the data. There came a time when we decided to go-live with a certain amount of data.

Another observation was shared by a technical team participant:

> I think one of the things that has probably bitten us mostly is not converting admissions data. Because now, in hindsight, when we go back and try to pull reports and so forth and compare them, we don't have the data unless we go to our legacy system and pull from there. Then you're having to use the current system and legacy and pull the data together that way.

Reporting is the other major issue discussed by the technical group. The functional leads are the only users outside of IT with access to report development due to the limitations of the reporting software. This has placed the burden of report

development on the technical team. “We ran very late on delivering reports of all kinds. So if I had to start over on another project of this size and magnitude, we would probably want to address somebody just to handle reports.” This comment was supported by the observation of another technical participant who described requests for reports “coming out of the woodwork” immediately following go-live. The scope of the reporting issue was best described by one of the IT report writers, “It’s been three years now, but still to have 260 in-house developed reports, that shows you how much we’ve had to really focus on reporting after the fact. When we went live, we went live with nine reports.”

Functional Post-Implementation Experience

Data entry for the functional areas was considered cumbersome. An example of how current processing was affected was shared by the student records team lead:

> A simple task of requesting a transcript, which we might get 30 or 40 requests a day, where it might have taken 2 minutes, now it takes 5 or 10. You have to look at three or four different screens where before I had one screen that told me everything.

Having independent professional schools which did not convert to the Student ERP system on the same timeline as the university project added another layer of complexity for the functional offices to work with in post-implementation. One of the schools did not fully convert to the ERP system until July, 2007, a full year after the

university Student ERP project had completed its implementation. “They didn’t want to get rid of their shadow system.”

The functional participants discussed data conversion issues as they impacted post-implementation. One participant described,

> We didn’t have all the historical converted. We knew we were dealing with different systems and just had to know where to go….As of this date, now go to [the Student ERP] for the information, but if it’s prior to that, go to the other system.

Due to the data quality issues stemming from the conversion, the student records office put a business process in place that required a manual review of every transcript that included historical data. A business systems analyst described the process:

> Even now, all transcripts are on hold and before they release the transcript, if they are pulling it out of the historical data, they review it first. They feel much better about the transcripts now than they did but there was no way to review all transcripts before go-live. There was just no way, there were too many. So the registrar made the decision that everything would be put on hold, as far as a transcript request, and as they were requested from students…they would be reviewed then and released. So that is the way we have been dealing with that.

Reporting was also another major area of discussion by the functional participants. It was referred to as “the biggest mar on our post-implementation.” The following comments are representative of the discussion:

(a) We can get all the info in but we can't get any info out because [the reporting software], which we thought would be our salvation, kept getting reworked and reworked….

(b) We just did not… have enough reporting. We are getting closer to that now, but…we are two and a half years beyond our implementation.

(c) You can get the information in, but it is a bear getting it out. And I think that one of the bad things for us…we were not able to go in and write our own reports. IT would not allow us the access that we would need if we wanted to write our own reports. We have the access now, but we don't have time to write our own reports. But at least we are more knowledgeable now and we can work with the report writers.

Other functional participants shared different experiences:

(a) What we tried to do with our reporting is put reports in place to keep problems from happening, to see what is coming and go ahead and solve the problem up front before it becomes a bigger problem.

(b) On a positive side, since we went to [the Student ERP], I like reports better. I mean I can find stuff out. When [my supervisor] walks into my office holding a piece of paper,… I know he is going to want to know something, and in the old days under [the legacy system] it was like….I could tell him how many we had hand counted and now I can type in a report. I know instantly and I can tell him exactly….I love it. I feel a lot better.

The functional team summarized their post-implementation experience with the following observations:

(a) It is a continuing process and as we get updates and things, there is not a stable platform. In other words, it is not like you can just sit and get used to what you have because it's going to change.

(b) Today, I can say that we really like the system. It is much more user friendly and I think that we are definitely way ahead of anything that I could have ever imagined when it comes to technology and payment processing….When you look at where we were and where we are, it is amazing and it was totally worth it. It was totally worth everything that we went through.

(c) We haven't really had any time to go back and, you know when you implement something, you want to go back and look at it and say, well how effective was it? We haven't really had the opportunity to do that because we are moving right on to something else. It would be nice to have some breathing room.

Post-Implementation Reflections

When asked to summarize their Student ERP post-implementation experiences, the CS-D participants provided several positive aspects that contributed to the success of the project:

(a) Overall, I think our customer service to the students is so much better. I mean, we just had to do it because we were in the 19th century. It has really brought us up.

(b) It worked due to the work of these people [the functional team leads]… they did an incredible amount of work and it went off pretty much without a hitch, in my opinion.

(c) There was incredible teamwork in spite of the odds….When they would sit down and work, they were always trying to find the most efficient way to make it happen and they worked with each other in great depth.

(d) The users being involved and the whole team involvement. What was great about this is we didn't have just people in the offices, the admissions and the registrar's office, we had their top level involvement. We had the directors, the registrar involved. They were the ones that wanted to be hands on and they pulled in their staff but they wanted to know and they wanted to be involved.

(e) We met all of our deadlines. I mean that was huge to where [the students] could see all their information.

(f) The whole conversion process. I mean what we went from in the quality of that data and what we had to go through to get it into a form that [the Student ERP] could use was just...I mean it's pretty massive, so I think that…was a real success.

(g) I think the relationships that were developed between the users and the technical team was huge. We each have a different respect for each other versus before. We…have a better understanding and more respect for what everybody did, so I think it definitely enlightened everybody and made it more tolerant to work across the groups.

The participants also shared the challenges they faced or things they would do differently to improve the post-implementation experience:

(a) Have the correct staffing initially.

(b) Make sure you have consultants and the same consultants. It's difficult because the consultants, they think differently. One will have you doing something this way…and then a new one comes in and wants to change all of that, and says, no, no, no, you can do better this way. It is a lot of time wasted doing things that way.

(c) Our communication. We needed somebody just to work on communications and we didn't have that. That would have made a big difference if they had somebody just doing communication.

(d) The security was not anticipated and how complex it was going to get.

(e) So the complications of it all, the fact that it took different skill sets, the fact that we thought it was going to be a light switch and we were going to see results, people were disappointed because it did not happen immediately.

(f) We would have probably addressed reports with an FTE sooner. From the inception I would have liked to hire somebody…to sit over there and code reports. That was, of course, the final bang that everybody complained about. It doesn't matter if the system works if you can't get the information out of it.

(g) Some of the gaps between the ERP and the business processes were harder to close than anticipated.

A senior project administrator summarized the CS-D post-implementation experience and the future direction of the Student ERP system:

> The ERP implementations were absolutely necessary to build a firm foundation of back office management systems. However, the university struggles to wring the value out of them due to the complexity of the required upgrades. We need to exploit the inherent functionality to a much greater degree, but that is resource intensive. Additionally, while the ERP systems are the sources of data on which to build management/decision support systems, but since they are notoriously horrible for reporting, we also are investing in building appropriate data stores/data warehousing on top of them to enable better access to management information. This too is resource intensive and expensive.

Case Study Report - Institution E

Case study E (CS-E) is a small, private liberal arts university with a research focus, awarding undergraduate degrees and graduate degrees up through the doctoral level. A tour of the campus during the researcher's 1 day on-site visit in July, 2008, revealed a rich cultural heritage evidenced through much of its infrastructure. CS-E has combined its IT support with the library services to create a single technology division.

CS-E has been in the ERP post-implementation environment the longest of the case study institutions in this research project. It had been just over 4 years at the time of the on-site visit and they were in the beginning phases of their project plan for a major version upgrade of their ERP system at the end of 2008. The researcher conducted a group interview session with 6 administrators and managers who were key stakeholders in the ERP Student Administration system (see Tables 1 and 6 for interview summary information). Prior to the group interview, the researcher and the IT administrative systems manager (who was also a participant in the group interview session) had an informal discussion which enriched the researcher's understanding of CS-E's academic and IT culture. This discussion provided the researcher with an informed foundation which aided her facilitation of the subsequent group interview.

CS-E ERP Project Management

CS-E began its ERP project with the purchase of the selected product in 1999. The university then contracted with a small consulting company to partner with for the

management of the project. In addition to the leadership of the implementation consulting group, there was a strong collaborative effort between key functional stakeholder offices and the IT department. The project management team structure consisted of an executive team, a core team, functional teams, working teams and liaisons among the teams. The executive team provided budgetary oversight, while the core team was a primary work group. In addition to the core team activities, each member of the core would also work individually with [the implementation consulting group] in their functional areas.

The core team was also vested with significant decision-making authority. As related by a functional core team member:

> I think an important point here is…because we're small we've tried to avoid bureaucracy in making decisions. That's really what enabled us to get through the implementation to begin with and keep running. We could get a small group in a room and actually make decisions about setup.

An IT manager added, "I think we know when it has to escalate to a higher level and we don't escalate things that don't need to be escalated."

According to the CIO, the management team, "picked the things it had to do" and went forward with the philosophy that CS-E would "start using the new system" at go-live.

Phased Implementation

CS-E used a phased implementation approach. The Finance ERP module was first in 2001, followed by the HR module in 2002, and then by the Student Administration module which completed go-live in 2004. Within the Student system, the Admissions and Student Accounts components went live in 2003, followed by the Student Records component in 2004. The official implementation timeline for the Student ERP system was 18 months and characterized as "very aggressive" by one of the functional administrators. Although the Student module was brought up in "lightning speed," a contributing factor to meeting the deadline was the groundwork done on the application by the implementation consulting group prior to the official start date for the 18-month project. According to the CTO (Chief Technology Officer), "they did a lot of research and really built the architecture much in advance, so that kind of design work started much earlier."

The impact of the 18-month timeline was also indicated by the student accounts administrator when asked by the researcher if they had run any parallel systems for testing prior to go-live. "We didn't really run parallel systems; we just jumped. Had we been running parallel systems you would have had to have the time to go back and look at the same account in a different system and understand it." He also added, "There wasn't much time to learn what the new software could do for us."

Characterizing CS-E's overall implementation, a senior program administrator said "the tech part was easy, the people part was hard." An example was related where a

single senior administrator "stonewalled" the project and prevented it from making any progress until that individual left CS-E. In addition to the "people part," there were "tech part" challenges as well. A major change in the scope of the Student ERP project occurred during the 18-month build up to go-live. As explained by the Student Records administrator:

> The 18 months originally was not meant to encompass admissions, so this was really originally just student records and student financials. A decision was made part-way through that admissions should be part of it and the ramifications of that was that they didn't have time to do any sort of business process review. So they recreated what they originally had [in the legacy system]."

It was further explained that the reason for the change was driven by budgetary concerns and to also take advantage of the expertise of the implementation consulting group while on contract at CS-E.

This decision had far-reaching effects following go-live. The admissions component was re-implemented over an 8 month period, 2 years after it initially went live. One participant explained that the re-implementation "was due to a better understanding of the system, a changeover of the implementation team, and a change in the marketing paradigm." The business analyst, who worked on the project, detailed the effort:

> Their existing business processes didn't agree with their online application and so we needed to adjust some of the business processes. But more importantly, we

had to kind of tear that application apart and put it back together so that it would complement their processes and work closer to what they needed.

Additional comments on the impact of the phased implementation were shared:

(a) Implementations are never done.

(b) The implementation itself was sort of a rolling implementation, so that in and of itself creates some issues. Because as you're rolling it out, you're having to work on that, actually use what you've rolled out and deal with those issues, while you're getting other things ready.

(c) We never had a plan to continue the implementation, to continue to roll the system out.

CS-E's experience with the phased implementation approach has influenced their planning for the version upgrade scheduled for go-live in November, 2008: "We're going whole hog and not a partial rolling implementation roll out."

Staffing

One of the early project management decisions was that CS-E was "staffed appropriately" for the ERP implementation project. No additional staff positions were provided for the functional offices, however the IT department added new positions and was able to fill them with individuals who had prior knowledge of the new ERP application. As the CTO explained, "That's how we've managed to stay as small as we have because we've been lucky with being able to find talent." The IT manager also hired

a functional crossover business analyst as part of IT to interface with operational offices. She felt strongly about this based upon her previous implementation experiences at other institutions. “This is needed and if the other [functional] offices won’t do it, then I will.” Even with the additional positions, the CTO commented:

> We really haven’t been able to grow our technical staff in support of the growing number of environments, so that also continues to be a challenge. In some areas, we don’t have enough depth. One person leaves and we immediately struggle, and it’s visible, it’s palpable. There’s only one area that we’ve been able to build a back up of, that’s the database administration, but everywhere else we could probably use easily twice the number of people we have.

Limits on staffing resources for IT projects are also felt by the functional offices on campus. The IT business analyst described what he had learned, working with the business offices:

> People continue to be surprised [at] the amount of resources they need to ante up with to see some of the projects that they think they want come to fruition. And the fact that when they don’t have the resources to put in to it, that they’re not getting some of the projects that normally they might have gotten.

Backfill positions were not funded for any of the offices. This lack of backfill for temporary help during implementation had a ripple effect in post-implementation according to the student records administrator:

> The entire implementation was additional work on top of our normal jobs. So of course you cut corners on everything and that had an impact with post-implementation because again we were trying to roll out things just in time, just as you need them, trying to survive day-to-day.

Training

As related by the interview participants, training on the ERP student system was "a really big problem for us." Echoes of "It still is!" by more than one participant indicated that training has continued to be an on-going issue for CS-E in post-implementation. The early functional training was obtained from [the vendor] and from CS-E's implementation consultant group. The IT manager provided this observation on the vendor-provided training: "The fundamental problem I have with [the vendor] training is it's not training you to register a student or to admit a student; it's training you in how to set up your system so you can register a student."

The interview participants detailed some of the major training issues:

(a) We trained each other, but we really were undertrained and…we also started having staff turnover. We didn't have a lot of things documented. So…as we brought up the new system everybody's trying to learn it,…and the documentation really took a back seat. Then people would leave, and now no one knew how to do their jobs when…a new person would come in.

(b) For most of the training we actually relied on our partners, [consulting group], to provide. We've tried the train-the-trainer approach where you train some folks in the office and they go back and train the others. That works to some extent. The difficulty is that typically you'd be trying to do your training so far in advance of when you're going live that it really wasn't worth it.

(c) Most people got trained by having to do it that day.

In contrast, for his area, the student accounts administrator felt the training for that office was satisfactory. He related, "I think training went well….Once we understood it and just started working with [the system], it came pretty easily."

Training for general end users across campus also presented challenges that had repercussions in post-implementation:

(a) We tried to do a couple sessions with faculty and students and nobody showed up! Seven, eight people showed up in three sessions….. very disappointing. But actually it's understandable because their expectations based on what we had done previously was that the system would be pretty self explanatory, is not that difficult, and it'll be fine! Lo and behold, it wasn't quite as intuitive as it should have been.

(b) The training had been sort of on and off because some of us had been doing a lot of training doing setup for the actual implementation. For functional people, we tried to do sessions just a couple of weeks before we went live, but again, it's hard to find the time. And again, we tried to train a lot of the people

in academic services and advisors, folks who'd been using the old system to get some information. But unless you're using the system consistently, it doesn't stick. We still see that now.

(c) I think one of the problems we've had is we haven't been consistent in doing [training] year after year and there's been turnover, so people don't really use it that much. So it comes back to the training and how regularly we can train some of the end users. You know, I think with faculty and students, the idea is that the system itself is supposed to be intuitive.

Following go-live, efforts to address the training issues have been undertaken:

(a) We've improved some cross-training and identified areas where cross-training is really needed, because you can't have somebody leave and no one knows how to do some incredibly important job…that's still ongoing.

(b) Next week, we are having a class on query training for a number of people across campus and that will be a big improvement, but, Wow!, it's been a long time coming.

Training needs for the technical area were alleviated somewhat by their ability to hire individuals with prior experience in the specific ERP product. Additional training and project work was accomplished primarily through consulting. Although, according to the IT manager, consultants were used on a limited basis, for specific tasks and projects, "because they're not going to be here forever."

Modifications and Customizations

CS-E did not use a vanilla-only approach as part of their ERP project implementation strategy. They were willing to make customizations or modifications to the delivered application to meet existing business process requirements or to make the system more user friendly. The CS-E definition of a modification was summarized by the CTO:

> We aren't talking about big modifications; we're talking about relatively small adjustments…. We always avoid touching, changing the table structure of the delivered [ERP product]. We do modifications on kind of the outside, which are much easier to migrate, but they are still modifications.

For major operational modules that were missing from the delivered application, such as housing and health services, these were developed and added as bolt-ons to the ERP student system. Cosmetic changes to the front-end user views were a large part of the initial modification efforts. The student records administrator described this approach:

> A lot of the modifications have to do with how the information's presented, because the interface, the delivered is not good. So how you present the information to your customer is critical, and so a lot of the mods, what I would call mods or customizations, are really meant [to fix this]. We implemented the advisement module after we had gone live and there were lots of modifications, customizations around that because the delivered presentation sucks, but again because we were able to build that ourselves, it works! And we could come up

with something good that was based off the table structure that exists, but it's presented as [CS-E] wants it.

Following go-live in the Student ERP system, additional requests for customizations or modifications continued. The CIO's response to these requests was quoted by one of the participants: "He [the CIO] used to always say each time people wanted a change in the system, 'Well, wait a year. Use it for a year and then let's talk', which worked in a number of situations quite well actually." When asked by the researcher how the requests for modifications are managed, the IT manager described their approach:

> We actually changed it a little bit. When I first got here, we essentially tracked any requests in an Excel spreadsheet. I think there was a larger form developed that explained what it was, why we needed it and what objects were being touched. Currently, …we've got a WIKI site set up where we documented all the project work there, so the business requirements are there. Functionally, all of our modifications, whether they're big ones, small ones, bolt-ons, or whatever, it's a dialogue, between the end users requesting it and our office, to figure out what's the best way to do this. Should we be doing this? Should we not be doing this? Can we do it now? Can we do it later? But it's all conversation, to make sure we're doing what's best for [CS-E] and what's going to be maintainable. Because my big concern is being able to maintain whatever we do for the lifecycle of this software; not do crazy stuff that we can't maintain.

The student record administrator's comment on modifications was an appropriate summary of CS-E's non-vanilla approach and maintenance of the Student ERP system:

> It's a long process to recreate all the support mechanisms and information that you have with your old systems. Well, those have to be recreated; customizations have to happen….So the things we've modified have worked well because they fit our business practices and how our users expect them to work. So as we've added on to the system, we've made improvements, I think, on it. When we get into the upgrade with the new version, there'll be further improvements.

Use of Third-Party Software

CS-E does most of its customization development and support in-house. There were very few third-party applications mentioned during the interviews. Reporting was one area that was indicated as requiring a separate system. However, the use of one third-party application was resoundingly endorsed by the student accounts administrator. The student financial aid office did not convert to using the delivered vendor product; they had been using a best of breed product for a number of years in their previous student system. When asked if there were any future plans to use the delivered product, the student accounts administrator replied, "Absolutely not! Thank, God and never will!....[The third-party software] is a very precise database and easy to manage, at least from our standpoint." He went on to explain that he had heard about major problems with

the delivered product, and institutions that had used it successfully had only done so "with a ton of staff."

The IT manager supported his position. Although she had used the delivered Student Financial Aid component successfully at other schools, she explained:

> We attempted to use [the ERP] financial aid in a school that was [using the third-party software], and quickly recognized that was dumb and went back to [the third-party software]. And when I got here, they sort of asked casually, "So, should we convert?" and I said "No."

Technical Post-Implementation Experience

CS-E experienced system performance issues following go-live. The CTO described the problems they confronted:

> We had some hiccups at the very beginning when we first made the online registration available. We under configured the system just a tiny bit. Fortunately, we caught that before we actually went live, and were able to fix that. We were surprised how quickly the databases kept growing and how much disk space we had to keep adding….As we continued to implement the modules it became more and more of a headache to maintain the various environments that are required to be maintained between the vanilla, the caches, the development, the various test stages, the conversions, the test pre-production, production, everything. For each

> module we have close to 10 environments, and each requires its own infrastructure.

The system performance problems were also mentioned as impacting the functional users. “People were surprised by its slowness…..And that it’s unpredictably slow. There are times when you’ll get something right away and there’re times when you’re just sitting there. So slowness is at the top of the list.”

Reporting was another major issue faced during post-implementation that crossed both technical and functional areas. As described by the IT systems coordinator:

> The reporting tool for [the ERP product] is primarily query, and query is not a tool that’s possible to put in the hands of just anyone. And the table structures were exponentially more complicated than in [CS-E’s legacy system]. We have a system that has now a ton of very important data, interesting data, and very few people who actually can get that data out in an accurate and predictable and reliable fashion. And that’s still the case….. We lost a whole bunch of reports and then we had to rebuild them all. But that was the last thing we did, it wasn’t the first thing we did.

She further commented that a good thing would have been “for each office to have a person who’s devoted to information access, data access and to be able to get that on day one, to really understand how to get the data.” The student record administrator added, “That should have been part of the implementation.”

Functional Post-Implementation Experience

Two different perspectives from the functional offices emerged during the group interview session. The student accounts administrator described the experiences for Student Accounts and Student Financial Aid offices:

> From our experience, 'cause we were using a separate software for financial aid, thank God, it went fairly smoothly. I mean we were literally here 'til midnight or past to get the first bill out, but once we got that process going, ….. I'm still not comfortable that I know all of the abilities of our software,… but all in all I think it was a fairly positive experience from our standpoint.

The student records administrator shared his account:

> The [ERP student] environment was very different. It's much more demanding in terms of data entry; it's much slower data entry. It's capturing more data itself, so there was much more work involved. It took us a long time to adjust to that and learn the details so that they become second nature, you know, how to withdraw a student and not mess up the bill. But that first year when you're going live with just the basic functions, that was not fun. There are many advantages compared to our old system, but it is…a change. Because you are trying to capture information, there is much greater workload and because they're so interconnected, [our] actions have much more impact on [other departments] than they would have had in [the previous student system].

When asked by the researcher when it felt like his office was actually doing business as usual, he responded that they were operational at go-live, but added:

> Comfortable, I would say, it probably took 2 years. You have to get at least through a full cycle to know what you're facing, because you run different processes at different points. So, yeah, I'd say at 2 years we started to get comfortable. The CIO had a wonderful line: that you start off, you crawl, you walk, you run. Well, yeah now we're probably running.

Both functional administrators agreed on their surprise at the complexity of the ERP Student system. "It was much more complicated than what we'd had before with best of breed…. that was the biggest surprise for us, was how complex that became." "I think in general to me the level of complexity in some of the way it works is way beyond what our needs are. I have a sense it was created for much larger institutions than ours."

Security was an area where the student records administrator utilized new functionality in the delivered system to improve efficiency.

> We seized the opportunity to do something different which was to allow my office to have more control over the assignment of security…we have access to assign security roles to people to update their access….It's made things much easier to deal with, so I think it's been an improvement.

Staff Post-Implementation Experience

The post-implementation environment at CS-E has changed the skill sets needed for many staff positions. According to the student records administrator:

> I think you have to hire different people from what you had before; the expectations have to be different…. I need folks who can think enough to ask the question to get at what the issue is. They have to be able to look at the data that they're seeing on the screen and think about the relationships and say, understand, this is related to that, so the problem might be over here even though you're seeing the effect here. So it's a higher level of analysis than you had before.

The CTO supported this from the technical perspective:

> It's analytical thinking. And also almost like an aptitude at some level…for technology. … We need for people to have this ability to… make the connections, if they've done it this way here, they might be able to do it the same way here, or they can use that piece of data here and it will mean the same thing or a different thing, depends upon the situation.

The student systems coordinator offered an additional perspective on the staffing changes seen in the post-implementation environment:

> We have to have a larger number of specialists for a greater, for a broader number of technical areas. Ok, so now we have somebody who's just in charge of security and someone who's just doing networking and someone who's just doing all these various things. …. Some of those jobs were shared before, and the number of

people that we had doing them probably fewer, we had fewer programmers, we had fewer people.

The collaborative working environment between the functional and technical areas that was indicated in the project management structure during implementation continued in post-implementation according to observations from the interview participants:

(a) The basic working relationship that my office has held with the IT group has been the same….We've always worked quite closely with them and I think it's been a pretty productive relationship.

(b) I think it's better than it's ever been…there's a lot more of a feeling of camaraderie and of wanting to solve the problems, and less politics…so that's all good.

Post-Implementation Reflections

In reflecting on the post-implementation experience from the project management perspective, the theme of managing expectations of the campus community emerged. The participants in the group acknowledged that there may have not been sufficient input or communication from across all campus areas affected by the implementation. As one participant expressed:

I guess there has been a disconnect, particularly for those who are not the major stakeholders and offices. [The major stakeholders] have been in their places right

> from the start; they had their say as to how the system was going to be configured and used…. But there were many, many offices that were not and they heard things and they learned things or they were told things, not necessarily by authoritative sources and they developed an opinion and it's not always positive. So we're dealing with those now.

An example of this was shared as currently related to reporting in the budget office, although it was explained that this was applicable across ERP modules:

> There is this huge need, and now acknowledged, but it wasn't acknowledged for a long time and it should have been part of the plan from the start….I don't know if it was possible to include every single group like that in the initial planning, but it would have made for a better implementation.

Other participants added:

(a) I think just having a broader base of engagement earlier on. So I think what we're finding now is that we didn't engage for example the academic administrators.

(b) More transparency…

(c) But I think…we needed in a way to keep to serving the core, you know the stakeholders, first before we could open up to start including those other groups.

(d) The broader user community made certain assumptions about how [the student ERP system] was supposed to work, and then was upset that it didn't work that way.

(e) There are many offices, particularly those that weren't the core part of the implementation that still have misconceptions, unmet expectations.

Efforts to be more inclusive, stemming from the successful collaboration between the functional and IT offices during the implementation project, resulted in the establishment of a 40-plus member users group. Started by the IT systems coordinator, the group consists of "directors and associate directors and the data people involved in the business of operating the administrative offices" and it serves as an established problem-solving group and a source for accurate information.

This statement by the student records administrator is very representative of the post-implementation experiences shared by the interview participants: "In fact, the reality of actually making the business work is very different than what you do for implementation, making decisions."

Case Study Report - Institution F

Case study F (CS-F) is a large, public land-grant university with a long history of tradition. CS-F provides a comprehensive curriculum combining applied sciences and arts, awarding bachelor, master's, doctoral, and professional degrees in a wide variety of disciplines. Across the campus there were many visual tributes to CS-F's pride and traditions.

The researcher visited the CS-F campus in July, 2008. During the 2-day visit, 12 individual and group interview sessions were conducted with a total of 33 participants. The participants represented a full spectrum of job areas that were impacted by the Student ERP implementation and provided the researcher with a rich information base from which to develop the case study (see Tables 1 and 6 for interview summary information).

CS-F ERP Project Management

CS-F initiated the ERP implementation project to replace their legacy system because vendor support for the system was being phased out. The decision was made to purchase the new ERP from the same vendor who provided the legacy system, with the thought that "the transition would be easier," according to a steering committee member.

Governance of the project was accomplished through a hierarchical committee structure. The executive committee, which included the provost and the executive vice-

president among others, was the policy-making body and provided budget approval. A steering committee, with representatives from all areas across campus, met monthly to review university-level issues, and an oversight committee, which included team leads and directors from all modules, met weekly to discuss project-specific issues. Each ERP module had its own implementation team for detailed focus on the specific tasks associated with that module. A representative from CS-F's internal audit was included on all implementation committees, including the steering committee. According to the project managers, the auditor provided "a different perspective…from a control standpoint," and process changes were made during the project based upon auditor input.

CS-F also hired a full-time project manager from the ERP vendor, who was moved to the campus location for the term of the contract. The project manager collaborated with CS-F's executive project manager, worked with all implementation teams, and managed the consulting engagements. A functional area administrator provided this observation on the effectiveness of the governance structure, comparing it to the legacy system implementation several years previous, "We had much more involvement from our campus community on every level, and I think that was what contributed to the degree of success that we had when we turned [the Student ERP] on."

The project management group also made student participation integral to the implementation process. A project manager emphasized the portal page and other areas where, "we involved the student government, students, as well as getting them to come in and do testing prior to registrations. We had actual students do it so we could get their

feedback." Involving the students was reflective of the overall management philosophy for the Student ERP project, as described by a senior project manager: "The student system has to take into consideration a broad range of people because you cannot do the job without them."

CS-F committed funding for the project so they would "not try to do this on a shoestring." This made is possible to have "adequate training and adequate consulting on site," throughout the project. However, the decision was made early in the project that backfill positions would not be funded for the individuals involved on the implementation teams. According to a senior manager:

> The higher ups decided that people would do their jobs, as well as this, and I never heard any suggestions to do it any other way. In the very first meeting that we had with the former director of OIT…his response [was], "That is just not an avenue that we are going to take. We are going to do both."

The project timeline was based on a 4-year schedule from initial planning to full implementation. This timeline was for all three major ERP modules: Finance, HR, and Student. Go-live for the several components in the Student ERP was staggered over approximately 18 months to coincide with activities for the 2007-2008 academic year. Undergraduate admissions went live in summer, 2006 for the 2007 freshman class admissions process. This was followed by student financial aid in February, 2007. The remaining components phased live until the Student ERP system was fully live in fall, 2007. A functional manager described the Student go-live cycle, "First, you turn on the

application process, and then you turn on the catalogue process, and then you turn on the scheduling process for the following year,…it takes 18 months just to run through a cycle."

Communications proved to be a challenge for the management team. According to one project manager, "We could have done better on that. We actually tried to get the office of communications and marketing to develop a plan for us but that did not turn out to be too successful." The steps taken to disseminate project information to the teams and across campus were further described:

> Communication between the members of the oversight team we did via e-mail, if there was something urgent. Trying to communicate to the campus, there were two means that we would try to do. One was through [the daily email] that goes to all employees here...and [publication name] which is a printed magazine…that goes out weekly. Those are two and then as we went live with different aspects, especially Student, we used [the] portal which is the webpage to get to all and we could post different notices on that. Again, trying to use different media to get to people. I don't know how successful it was, but it was the means that we chose.

Following post-implementation, different elements of the project governance structure have evolved into permanent groups to meet the need for managing the technological infrastructure of CS-F. The oversight and steering committees were replaced with a university-wide information systems committee which will continue regular reviews of IT projects. The student implementation team is continuing, but as a

smaller management team, to handle the on-going maintenance and enhancements of the Student ERP system.

Implementation

The Student ERP system implementation was phased in over several months, beginning with undergraduate admissions in summer, 2006. The admissions office used the delivered ERP online application, with "a few minor tweaks" and, according to the functional administrator, "It was pretty much ready. We've continued to refine things as we've gone along;…continuing to review and make changes that best fit us is what we continue to do."

Concurrent with the implementation, CS-F changed policy to discontinue the use of social security numbers (SSN) as the student identifier. This change to a unique CS-F student ID within the ERP system was incorporated as part of the implementation. Undergraduate admissions was the only Student area to comment on how this impacted their business processes. "We have to query our students a little bit further now. It makes it a little interesting and I think that initially met with a little unhappiness," (functional area manager).

The student financial aid team lead described the implementation, "in and of itself,…it went fairly smoothly. There were no major issues. Of course, there were some hiccups along the way, but overall I would say they went fairly smooth." The student accounts go-live was "a little bumpy" according to a functional area manager. "I think it

was mainly a learning curve for the staff more than anything. We went live in mid-July and it took until probably, about six weeks, the early part of September, for doing business as usual."

Student records had several elements that were phased in live according to the academic year cycle. The first live registration in the Student ERP system was for the fall, 2007 term and, beginning in March, it occurred simultaneously with the summer, 2007 registration which was being done in the legacy system. According to student record participants, this caused the office to have to double key data into both systems for 9 months. Other issues that surfaced during the implementation and subsequent go-live were described by one of the participants:

> We were going plain vanilla as much as possible. There were two things that we didn't anticipate. One was the magnitude of some of the tasks due to the nature of the conversion. The two that primarily come to mind are the transcripts…and the amount of time that would be involved in some of the [Student ERP system] processes themselves. Some of the processes are more involved than they were in our previous system and it's not just making a change here that takes care of things. You've got to know to change here, here, here, here, here, check here and then do this to it.

As mentioned in the preceding paragraph, data conversion for the Student module was a major effort for the components and was problematic in some cases. A significant amount of historical data was converted to support operations in the Student ERP,

particularly in anticipation of the loss of access to data in the legacy system, which was turned off in March, 2008, approximately 9 months after the Student ERP module was fully live.

Student financial aid converted all award history from 1999 forward. According to the team lead:

> We converted all award history, which a lot of schools don't do. I think the reason for that is that they can depend on their legacy system, but we knew that it wouldn't be long until [our legacy] went away and we would have no access to it So we had no choice, we had to convert it.

Student accounts also converted a large amount of data from the legacy system. Over 6 million records of account detail back through fall 2003 were brought into the Student ERP system.

The challenge to the student records office in converting data was the unexpected workload required for testing and validation. Members of the student records team described the problems they faced:

(a) I don't think any of us had any idea the amount of work that was going to be required and that 100% audit is 100% audit on things.

(b) A lot of [the data] is converted into [the Student ERP system] but a lot of it is not. Some of it you have to kind of marry it together, and we don't know where to look.

(c) The 100% audit...that's when we found errors in the whole system, not just on a transcript. That's when we realized that our [student group classification] didn't convert. We knew how many items 109,000 were; we just didn't understand the time involved. We didn't realize the errors we were going to find. So if I was telling anybody, if the [ERP] consultant in all honesty said, you need 2 months, give yourself 6 months.

An additional aspect of the data conversion difficulties was highlighted by a project participant: "Dirty data has been one of the biggest problems that we had; some of the data in our old system was dirty in and of itself. There were times when the conversion process trashed some of the data."

A senior student administrator provided the following summary on the outcome of the implementation and go-live process:

> We're at a point now where we are virtually fully implemented.…We are ending the first summer term under [the Student ERP system] and once we have finished this term out within the next two to three weeks we will have been a full cycle on [the Student system]. There is still a lot of learning to be done. We're still learning every day things that we have to figure out how to do.

A department end-user provided this perspective on the implementation and go-live: "As far as the student component goes, getting our classes, building our schedules, and registering students, I think it really went better than I expected."

Staffing

There were no major staffing issues faced by CS-F during the project and following into post-implementation, as related by the team leads and other participants across the functional and technical areas. When asked by the researcher about staff turnover related to the project, similar responses were received from the project and area managers:

(a) Some people retired. Some people jumped on board and said, let's get it done. I think that's very typical. Those that just can't do it are going to retire. I don't think we saw as much in Student as we did in other areas….Maybe the people that were going to run away from it had run.

(b) We had some turn over in the office early in the project and ended up [losing] two separate people,…both of whom were theoretically supposed to be key [Student ERP] implementation people. One left and one moved to another office during a reorganization at the university. So we lost that knowledge and had to go back and regain it.

(c) I think no more than any other change. You know, a few unhappy folks here and there, but again it's just change.

(d) It didn't cause anybody to retire,…for the most part they took it on the chin and kept going. Some took it much better than others….We had a little bit more struggle with the older employees, but as time went on they adapted to it. I told them in the very beginning, "You know, a year from now, you're not

going to remember anything about the old system." And pretty much that's how it is.

(e) I replaced the person who basically said, I can retire. I don't want to do this new stuff, thank you kindly. We actually had some staff members…that actually saw it as an opportunity to change units and change areas.

Few new positions were created in the functional areas as a result of the Student ERP system implementation. For example, in student accounts, they were able to write processes that would populate data in the new system in lieu of hiring additional staff to do so. Student records gained one IT position and a second data position. However, as explained by a senior records administrator:

> [The data position] was added with a great caveat on it; we were given two additional responsibilities that this office never had that are enormous. One is [degree audit] and the other is the transfer articulation project. So it's not as if we added a position there, it's that we added a boat load of work and got a person to do it!

Additionally, changes in staff skill sets as a result of implementing the Student ERP system was not a significant issue to the functional teams. None of the team leads identified any new knowledge base or skills that they felt were needed by their respective area employees.

The IT programming group for Student hired two new developers during the project, but they were not new positions. One was a replacement and the other went into

an unfilled, but funded position. The DBA group, however, "had a massive expansion," growing from 3 to 8 positions after the ERP project was in post-implementation. An IT supervisor explained:

> It was like three DBAs just worked day and night, weekends, 24/7. Part of that is the way that this institution is organized. Some of the things that are in the DBA group here are actually distributed to the programming group [in other places], but here it is very concentrated. They are also the system administrators.

As previously mentioned in the Project Management section of this report, CS-F did not fund any backfill positions for implementation team members. From the viewpoint of a senior project manager, this was a positive position:

> Having the team working both in their day-to-day jobs and working on this implementation team and picking up chores, was something I personally liked, because it keeps them aware of the kinds of questions, the kinds of issues that come up. If you get away too long from the registrar's office, you forget."

Training

Technical training for the IT developers in new Oracle and PL/SQL skill sets was provided through the ERP vendor and consultants. The IT team also attended functional training concurrently with most of the functional areas, and in some cases the functional team leads attended the technical training sessions for their area along with the IT group.

User training for the Student ERP system was functionally-based, and was accomplished separately by each Student ERP component area. At go-live, completion of required training was a pre-requisite for security authorization to access the system. Initially, general overview training was conducted by consultants early in the project cycle for the combined admissions and student records offices. Participants were introduced to the ERP functionality and encouraged to practice in the sample environment set aside for this purpose. This occurred about 18 months prior to the Student go-live. The value of training this early was questioned by the participants involved, as represented by the following comments:

(a) When we went live, they're going, "oh my God, well, you were trained." Well, yeah, 18 months ago!

(b) The initial training, most of it to me, was figuring out how things were going to be processed. I have old notes in there and we were going to do it this way. I bet I can throw away 75% of my notes because things change, and then they go, no, we're going to do it this way, and so it was.

Following the early training, the team leads for the individual areas conducted internal training within a few months of their respective go-lives. The student records area, however, was an exception. The Student module project manager negotiated with the project team to hire a full-time faculty member who had a background in instructional design and adult learning. She joined the project for a year as a member of the Student implementation team. In addition to preparing training materials and providing training

for the student records' area, she also conducted hands-on training for staff, faculty and administrators across campus who would be using the new Student system. All of the comments shared by interview participants specific to student training were very positive as represented by the following:

(a) I think it was very smart to take a professor in education and [who] works with adult learners and this kind of material, to take her out of her normal role and make her the trainer.

(b) She understood our lingo. She understood how to teach us and…that's a positive.

(c) That was much better than bringing in somebody from [the vendor] or whatever to try to do it.

(d) The lady who did most of the training did an exceptional job of the training.

(e) She was excellent. She was well prepared; the material was well prepared. I mean I can't see how you could not learn it from her. We could e-mail her and follow-up if you miss something or you didn't understand it when you left

Technical and functional consultants were heavily relied on to supplement gaps in knowledge and to provide process specific training and programming support to the functional areas. Several consultants were carried over beyond go-live to continue support into the post-implementation environment. To prevent problems associated with turnover, the project management, early in the process, signed a two-year contract to lock in a functional consultant and a technical consultant for the Student implementation. The

senior project manager reflected, “We wound up having to pay a little more but it was well worth the money to have the continuity. They were scheduled. That was their only assignment.”

Technical

The technical issues faced during implementation and go-live focused primarily around data conversion and the resulting interface with the functional areas. A technical student consultant was hired to convert the student data. The major problem, from IT team perspective, was the lack of testing of the data by some of the student areas. According to an IT participant, this was indicative of a larger problem among the student functional teams:

> With Student, it’s such a large module with so many various responsible parties a lot of that clear responsibility, at the direct day to day, really wasn’t that clear and that sometimes caused some issues on whose responsibility lies with an individual to make sure that things were done.

The team also related some difficulties in the student areas understanding their business processes in the ERP system:

> The users, in some cases, knew their business, they knew what [the ERP system] would do, and they worked on the gaps between. Whereas in other areas, they really just said, I want it to work like the previous system did, and in many cases our users really could not help us do our jobs. We had to actually go and work

> with the consultant and say at least tell me how [the Student ERP system] works, not how the user wants [the Student system] to work, give me a baseline of what it does.

In preparation for go-live, the IT team conducted load testing primarily for registration processing. The IT project manager "worked with the DBA group on setting that up because we really wanted to have a win and did not want us to fall flat on our face." He further described how additional testing was completed:

> Everything else has been in a training session where the users go in and they run their jobs, which at the beginning they did not have all of the data there. And as we have actually added more data, more students were admitted, more students were registered, you started seeing some small performance drops.

The number and availability of database instances available to the users for testing is an area that evolved for the IT team during the implementation and into post-implementation. As described by an IT participant:

> One of the things that kind of changed as we went from pre-implementation to implementation was actually having a test system for our users to work in. On mainframe you really have one test system and the data would get really stale. Whereas with the implementation we had users who were beginning to do their first grading cycle, so the registrar's office might want a test system that is everyone who is registered right now. Whereas you may have another area that is like, no I need to do this. So, at one point we almost had a test system probably

> for each individual area of student or multiples. Now that we are post-implementation we have actually gone down the number of systems. We have one system that everyone uses, not just student,… that is refreshed once a week. Then we have a system that student uses almost exclusively that is refreshed at the beginning of each semester.

A general project manager expanded on this issue:

> We have to define what each instance of the software is supposed to be used for and forcing people to use the instances properly. That's been a pretty major conflict just because the users, some users, want to have it this way and then we have to stand up for OIT; it only has so many resources so you have to do a balancing act between those two.

Modifications and Customizations

CS-F implemented the Student ERP as a vanilla system. The functional team leads discussed the individual approaches each area took for business process reviews. As much as possible, business processes were changed to fit the delivered ERP process. Vendor or third-party software was utilized to help fill in the gaps, as related by an admissions administrator: "Where we could handle something on one or two [legacy] screens, now we might have to use multiple [Student ERP] screens and we link them together using [workflow software] so that really helped us accomplish that."

Although there almost no modifications to the core code made, there were several customizations that were added to enhance the usability of the delivered system. Requests for customizations were required to go through an extensive approval process. A project manager described the process: "We set up an oversight team. They had to go through a committee and had to have certain criteria and aim for certain standard questions before it would be considered." Not all requests were approved. Some requests "did not even get as far as the oversight committee. On a number of occasions, we sent people back to say, there are other ways to do this. You need to consider that." The approval process for system IT projects was continued in post-implementation with the establishment of the priorities committee (see the *Technical Post-Implementation Experience* section in this report for more detail on the committee).

One modification to the Student ERP system that was approved was the programming necessary to mask the Social Security Number in compliance with the policy change regarding university student identification numbers. Examples of customizations include the addition of essay questions to the undergraduate application and adjustments to the adviser role in self-service.

Following their business process review, the student records office made the decision not to do any customizations. They adapted their processes to fit the Student ERP or developed work arounds, as needed, to accomplish a given task.

Use of Third-Party Software

Several third-party solutions are used by CS-F to enhance or supplement the delivered Student ERP functionality. A forms generator is used by student records to produce transcripts as a work around for the delivered transcript, which was "unacceptable for the university." A CRM product was used by admissions for reporting. However, the functional manager reported that they were in the process of transitioning their reporting to the Student ERP system.

Vendor or other third-party bolt-ons have been purchased for letter generation, electronic bill presentation, degree audit, data reporting, international education, and student housing. New interfaces were built to continue using existing third-party services for student financial aid loan processing, awards and disbursement. Additional third-party enhancements are planned for an NCAA database interface and classroom scheduling software.

An IT manager provided a perspective on CS-F's usage of third-party applications:

> In our mainframe system we were very limited on when we could actually export out data…to our users, whereas now, with the current system we pretty much can do that 24/7 on a greater regularity. So in many cases the opportunity to provide more services was there. I am not sure which came first: the want for the services, therefore we went to [the Student ERP]; or [the Student ERP] is here, now we can provide the services as an institution.

Technical Post-Implementation Experience

Following go-live, there were occasional performance problems experienced by the end-users. One team lead related:

> Sometimes, when you got all the freshmen in the system trying to buy football tickets at the same time, or trying to register at the same time, there's some slight slow down issues. I think it crashed one time that I can remember; it was down maybe half a day. That was probably the worst performance issue that we had that I can remember.

The IT manager provided elaboration on the performance issues:

> We have had issues with performance where we have actually had to change one of the tools that we were using. We were using a reporting tool from [vendor] initially, and as based on the data and how it was organized and the user's expectations, we have had to for the most part abandon that tool unless we have a clear need. Because the performance of that tool, versus using some of our other tools we had available, is abysmal.

In the current Student ERP post-implementation environment, the IT developers no longer have access to run production jobs, which they were able to in the legacy system. The IT team lead commented on the change, "It is a user driven, user controlled system. So they have to understand the process."

An unexpected increase in job requests occurred immediately following the cutoff of the legacy mainframe in March, 2008. As explained by an IT team member, the

requests were from people "who should have been submitting requests a year ago or even at the onset of implementation. When [the legacy system] finally went away, they finally started submitting requests, 'I need this. I need this to do my job.'" To help manage IT requests following go-live, a priorities committee was formed. This committee, which includes key functional users and technical representatives, meets regularly to evaluate requests and prioritize them based upon resources and alternative solution options.

Functional Post-Implementation Experience

Although several areas were mentioned in the post-implementation discussions with the functional participants, issues surrounding changes in security access were the most prevalent. CS-F used the Student ERP implementation to develop a new security structure that was more conservative than was in the previous legacy system "Security was a concern and it was a thread throughout the whole project. That came from higher up. They were really concerned about security. It did ruffle some feathers with people that had had access before no longer could have the same access." The project manager continued with an example for the some of the reasons behind the security changes: the number of people with security to change classes in the legacy system was over 900; it was reduced to approximately 100 in the Student ERP.

Many expressed strong feelings about the impact of the security changes. The following are representative of the comments shared:

(a) Getting accustomed to it being web based and passwords and layers of security and that type thing still poses challenges today

(b) There are times when this may not be [the Student ERP] itself, but the folks who are implementing it here aren't quite always aware of what the users need or how to get that to them as quickly as possible.

(c) Some things would be on there one day and then you couldn't access them. And they would turn things on and off, and so it was kind of frustrating because it worked yesterday, but not today and you need to find a new way to get that same information. But again that was at the beginning. Now, most of the bugs are worked out to where I can navigate it without a problem.

One of the outcomes of the security changes was an identity management group, which controls security at the university level and coordinates access with the provost's office.

The user friendliness of the system received mixed reviews from among the participants.

(a) Okay, I do like the new system. It takes a little bit of getting used to knowing the different screens to go to and it's getting more and more user friendly as we go.

(b) I think it is an excellent system and each day gets a little better. It does take a lot longer. You have to go to four, five, six different screens to get what you want instead of one. One of our advisers made the comment, "What used to

take us 30 seconds [in legacy] now takes us 4 minutes." But I guess the more we know it, the more we settle into it, the easier it gets

(c) Data entry time has tripled at least, and it's not because the system is new, it's because the system is lousy. It's more work, too many steps. It's complicated.

(d) The main thing for me was learning the system. It's to me a very cumbersome, very difficult, non-intuitive system even with the training that I had. Unless you are using that stuff a lot, you just forget it all very quickly.

A senior student records administrator shared issues that their department was dealing with: "We still have many, many components of the system that we are limping by without being fully implemented at this point. We'll get them soon. I mean we're still hand typing enrollment verifications because…we haven't got that to where we'd like to be." A second area they are addressing in post-implementation is transfer credit, which was described as "an after the fact dilemma that we're really just now coming to grips with." It involved multiple areas within the university and, with consulting help, they feel they've found a workable solution.

Reporting was also another issue that received mixed reviews, depending upon security of the user. The description used for reporting ranged from "frustrating" and "non-existent" to "great" and "100 times better." The following comments expand on the chasm between viewpoints:

(a) We were asked to come up with the reports that we needed and to kind of develop a general ranking of what was most important and that list was given

to the student team and they were going to work on it. It started before going live and so far all we've gotten [are two reports].

(b) [Reporting] has changed in that [the Student ERP] has a lot more. It gives the user the ability to run reports and you can actually extract data,…whereas in the old system you'd have to get somebody with direct table access to pull it for you. In [the Student ERP] you've got a lot more features that you can just pull these reports yourself. So, that's lessened our dependency on OIT.

Staff Post-Implementation Experience

Department end-users of the Student ERP system share a variety of perspectives on their post-implementation experiences:

(a) The biggest frustration was we had all been on our jobs for years. We knew how to do our jobs blindfolded and then bam, you know, we have a new system, and we have one component after another so you are just barely grasping one thing and you have a new thing.

(b) We got through it.

(c) I'm the office administrator and my role is everything. I do the financial part, the HR part, schedule building and registration of students. So I do everything and it is overwhelming.

(d) I used the old system too, so I have to say [the Student ERP] sucks.

(e) We took a step backwards in the system.

(f) I love [the Student ERP] I have access to so much more than I did before information-wise. And the way it's gathered, so much easier. But one thing I noticed is this: we don't have access to everything. Somebody has to give you access to certain screens.

A student records manager also described the post-implementation impact on the office staff related to the number of employees in the department:

> This is a fairly lean operation and there is not a lot of redundancy. That creates some issues for us…that we have had through the process. Not having that larger staff with a lot of redundancy that you'll find on many institutions of this size probably contributed some to the post [implementation] stress syndrome.

Post-Implementation Reflections

The CS-F interview participants were asked to share their reflections on the overall post-implementation experience. The project management team provided their observations on the project:

(a) If I had to use one word, I would say successful, and that can be attributed to the leadership on the student side. The way I was judging it was if students could register successfully in a timely manner the first time they signed on then we were successful and that was the case.

(b) By and large it has been successful. The implementation team was able to work together to resolve questions. They missed some of the questions as they

came through the first time and have been willing to go back and pick them up…they made good decisions.

Several observations were made by the participants that they would recommend to improve the post-implementation experience.

(a) Better business processes analysis. Not just the catch phrase business process analysis, but make the people write down what they really do at an abstract level not I go to screen such and such, go to line three and type in X, plus the time of day. They need to say, I'm operating on a student record and I'm going in to register [a student] for a special class that needs permission from the dean. I need to be able to do that. I need to register them beyond the normal constraints.

(b) Forced documentation early on about what decision was made, why it was made; what system setting was made, why it was made. We didn't do that when we started.

(c) I would call several schools who did recent implementations….I would want to know where those minefields were that we really didn't know were there and they really work. Again, the system, the implementation was smooth but the minefields were there; the volume and the complexity of the things that we had to do that we just simply were not aware were going to change our world the way they did. I think people need to be aware that they've got to

communicate to their institution the level of support that's going to be required to make an implementation successful.

(d) The major thing I would change if I were doing this differently would be the way that I communicated. I got overwhelmed with e-mail and so did a lot of other people. I should have used the wiki or something else as a project management tool.

(e) Do as many test conversions as possible. Get the on-site consultant time, if you can afford it. And I would also recommend, this might be a budget constraint too, but if you can,….try to find a position where you can be free from your old system, old job, and just focus on implementing the new system….Those three things.

CHAPTER V
ANALYSIS AND CONCLUSIONS

A summary of the results of this research study with analysis and conclusions are provided in this chapter. Following an overview of the study's purpose and research methodology, the research findings are presented. Conclusions based upon the research analysis and findings are explained, and the chapter is then concluded with recommendations for future research.

Summary of Research

This research study was undertaken to investigate the post-implementation experiences of higher education institutions following the initial implementation of a Student Administration ERP system. The literature reviewed revealed a small base of post-implementation research, but there was limited research on this topic specific to the experiences in higher education. Existing research included recommendations for future studies to investigate industry specific post-implementation experiences. Because the effects and benefits of an ERP implementation are not widely recognized until the post-implementation phase, this study explored answers to the question: "How have higher education institutions used the post-implementation phase to maximize the benefits from their ERP Student Administration system?" The following overarching research questions bounded the study:

1. What are the ERP Student Administration module post-implementation experiences among higher education institutions?
2. How have post-implementation activities supplemented, improved, or addressed issues created by or not resolved by the initial implementation?

Methodology

A mixed-method approach was utilized to collect the data required for this study. The CIOs or leading technology administrators of U.S. higher education institutions with a Fall 2007 IPEDS headcount of 2,000 or greater were invited to participate in an online survey of institutional ERP characteristics. The resulting survey response data were used to identify those institutions which met the selection criteria: (a) completion of an initial ERP Student Administration module implementation, and (b) completion of the implementation within the last 4 years. Follow-up phone interviews were then conducted with the survey respondents from those institutions. A purposive sample of six institutions were selected to be the case studies for this study based upon the phone interview responses, the interest and willingness of the institutional respondent to support participation as a case study, and the institution's potential to add to a broad range of experiences by which this study would be enriched.

On-site campus visits were conducted by the researcher with the visits ranging from 1 to 3 days according to the activity schedule arranged by the case study institutions. Individual and group interviews were conducted at each location, and

supplemental data for triangulation were also collected or reviewed as part of each visit. Verbatim transcriptions were created and then coded at several levels for analysis. The individual case study reports, found in Chapter IV of this study, were developed utilizing within-case analysis methodology.

Research Findings

The following section summarizes the findings of the case study research, including cross-case analyses as applicable, to each research question. The findings were also evaluated in context with previous research as described in Chapter II of this study.

Findings under both Research Questions 1 and 2 support the conclusions of Okunoye, et al. (2006), based upon case study research of ERP selection and implementation in higher education institutions, and Pollock, et al. (2003), based upon studies of higher education ERP implementations in the United Kingdom, that higher education has areas of differentiation that do not fit neatly into delivered ERP system processes traditionally designed for commercial business environments. Consistently, the student records and admissions components of the Student ERP module reported more difficulties in post-implementation and longer periods to return to stable operations following go-live than were reported by student accounts or student financial aid. The number of customizations and enhancements completed or under consideration by the case study institutions indicate that there are many areas in which current Student ERP systems do not fit the needs of higher education institutions. These findings also

challenge the ERP vendor marketing claim that the Student ERP system is a compilation of industry best practices, as noted in the literature (Brehm, et al. 2001; Markus & Tanis, 2000; Pollock et al., 2003; Wagner et al., 2006). From a different theoretical approach, the research question findings are also supported by Nielsen's (2005) study on CSFs specific to higher education which found that while there is much commonality in ERP system experiences across industry sectors, particularly in the implementation phase, there are also unique differences in the higher education environment.

Research Question 1

Research question 1: What are the ERP Student Administration module post-implementation experiences among higher education institutions?

The overall post-implementation experiences of the six case study institutions were similar in nature, regardless of institution size. This finding supports the earlier research of Ferratt (2006), who conducted survey research on best practices among commercial ERP users, and Cramer (2005), who conducted case study research on a university ERP implementation, both of which concluded organizational size was not a determinant in the experiences or outcomes of ERP projects. This is in contrast with existing literature that suggests organizational size may affect ERP project outcomes and benefits (Hawking, et al., 2004; Mabert, Soni & Venkataramanan, 2003; Markus, et al., 2000).

While the individual institutions emphasized different aspects of the project implementation that impacted their post-implementation, these influences yielded post-implementation characteristics that were shared in varying degree among all case studies. These shared post-implementation experiences included:

(a) the continuance of some form of the cross-functional ERP project governance teams initially created for the implementation project.

(b) the use of customizations, bolt-ons, or third-party software to enhance functionality or fill in gaps in the delivered ERP software.

(c) the need to increase user understanding of delivered business processes within the Student ERP system.

(d) the challenge to balance technical resources and coordinate among functional areas during phased implementation of the several components of the Student ERP, where one or more components would be in post-implementation and other components would still be preparing to go-live.

Although not specifically reported by all institutions, there were many post-implementation experiences shared among several of the case studies. The following summarizes post-implementation experiences detailed by two or more of the case studies.

(a) Changes in functional skill sets requiring staff to become more analytical and more technically adept were described by all but one case study.

(b) Staff turnover in both functional and technical areas was described by five of the six case studies as not extraordinary or unexpected and resulted primarily

from retirement, either at the beginning of the project or immediately following go-live. Only one unit reported having 100% turnover during the course of the project and into post-implementation.

(c) User training in post-implementation varied among the institutions, but all approaches could be classified into one of two diverging directions: (a) the need for formal training of the system users had tapered off and the responsibility for on-going training was delegated to individuals or department efforts; or (b) the need to develop or increase on-going formal training to support and improve user understanding of the Student ERP system was identified. The approach to user training taken by the institution during the project phase prior to go live appeared to have a direct effect on the post-implementation training needs. Generally in the case studies, those institutions that invested in a formal plan for user training during the project phase followed direction (a) in post-implementation; those that did not have a focused training approach during the project phase were heading in direction (b) in their post-implementation experience.

(d) Functional or technical consultant support was retained by three institutions for up to two years following go-live depending upon the needs of the institution.

(e) Functional users in five case studies experienced considerable increases in time to complete data entry tasks.

(f) Duplicate records and other major conversion data issues caused manual data validation processes to be put in place for operational transactions (e.g. manual review of each transcript before being released) at three of the case study institutions.

(g) Two case studies described internal workarounds developed by users to compensate for delivered functionality that had not yet been implemented.

(h) Having all data located in one system changed the level of interactions between the functional and technical areas, as well as among the functional departments, to more open, collaborative communications.

(i) System performance problems, such as instability, slow downs, and dropped sessions, were experienced in post-implementation by five case studies; however, the severity and the longevity of the problems varied among the institutions.

(j) Due to political pressures or system limitations, individual schools or departments within two case study institutions were allowed to maintain their own student systems and interface the data into the Student ERP; this created additional problems and increased the workload for the IT areas.

(k) All but one case study specifically identified the lack of reporting functionality within the delivered ERP as a problem that required focused solutions immediately following go-live.

Research Question 2

Research question 2: How have post-implementation activities supplemented, improved, or addressed issues created by or not resolved by the initial implementation?

Brehm et al. (2001) identified how institutions respond to gaps between the delivered ERP system and functional business processes: (a) change internal business processes to conform to those required by the ERP, (b) accept the gaps and develop workarounds to accomplish the needed business process, and (c) apply customizations or enhancements to the delivered ERP in combination with changed business processes to provide optimal solutions. Although all but one of the case studies characterized their implementation as a vanilla implementation, all three approaches to gap management were seen in the case studies and all nine types in Brehm's ERP tailoring typology were utilized among the six institutions in post-implementation to resolve the gaps in functionality not provided by the Student ERP system. Examples of gap resolutions are provided in the following findings.

Only one of the case studies using the vanilla approach reported making source code modifications (six) in post-implementation to meet state and federal regulatory agency reporting requirements. Two institutions described being surprised by the volume of user requests for customizations that were received immediately following go-live in post-implementation. Bolt-on functionality was used heavily among the institutions to meet customization needs. Specific customizations as detailed by the institutions (the

number of case studies implementing each customization is indicated in parentheses) are listed below:

(a) state, federal or other regulatory reporting requirements (3)

(b) custom applications, including photos, for graduate admissions and professional schools (2)

(c) online functionality for admissions, advisors, and student financial aid (4)

(d) masking social security numbers (1)

(e) data entry pages (2)

The use of customizations to improve user data entry varied widely among the institutions, ranging from implementing workflow to reduce the number of required key strokes to not adopting any customizations that would reduce functional process steps.

Third-party software was used by all case studies for operational needs not met by the delivered Student ERP application. The areas of third-party application functionality are listed below in descending order by the number of case studies institutions (indicated in parentheses) utilizing them:

(a) reporting (6)

(b) housing (5)

(c) cashiering (3)

(d) admissions applications (2)

(e) CRM (2)

(f) data transfer programs for loading admissions data (2)

(g) degree audit (2)

(h) health services (2)

(i) address validation and corrections (1)

(j) course management (1)

(k) credit card servicing (1)

(l) forms generator for transcripts (1)

(m) international education (1)

(n) international student administration (1)

(o) letter generation (1)

(p) online class schedule search (1)

(q) online payments (1)

Additional third-party applications implemented by the case study institutions that were not specific to the Student ERP included job scheduling and management, online forms, parking, security dispatch, and check printing.

Although widely used among the case studies, third-party applications were not necessarily an easy solution. Technical managers at two institutions specifically commented on the amount and complexity of the work associated with implementing some third-party applications, even when the applications where promoted as being certified for compatibility with the Student system by the ERP vendor.

Efforts to use specific delivered functionality during the first year of post-implementation, but subsequently changing to third-party applications were detailed in

two case studies. The decisions to make these changes were due to limitations in the Student ERP and the institution's inability to sufficiently alter the desired business needs to fit the delivered process. These functionalities included the admissions application and the degree audit.

One institution described how they re-implemented the admissions component 2 years after the initial go-live due to a better understanding of the Student ERP system and to better meet a paradigm shift in marketing. Half of the case study schools continued to run their legacy system in parallel with the Student ERP for up to a year following go-live so that data conversions could be completed, or functionality not critical for go-live could be converted to the Student ERP. One case study was limited in its ability to move forward with post-implementation enhancements due to delivery delays in required modifications being developed by the state IT office.

The Student ERP system implementation was used by two case studies to incorporate changes to existing internal policies and organizational structures for post-implementation. Both institutions re-evaluated data security access and implemented policy changes to tighten access by faculty and staff to student data. Additionally, one school also changed from using social security numbers to a unique student identification number. The other institution reorganized certain department structures to better accommodate the changes brought by the Student system.

Future Customizations or Third-Party Enhancements

Future planned customizations or enhancements with third-party software were detailed by three institutions. One institution in its second year of post-implementation indicated that, having become stable in the ERP environment, it was evaluating other products to replace parts of the delivered functionality. The other case studies indicated that many of the additional planned acquisitions were peripheral applications, not designed to replace Student ERP functionality, but to interface with the system to enhance overall operations. The expectations were that these additions would increase the usability of the Student system. The targeted functionality included document imaging, a data warehouse, NCAA (National Collegiate Athletic Association) database interface, and classroom scheduling software.

User Satisfaction

Although all six case studies reported fairly robust post-implementation activities in establishing continuity or adding enhancements, half of the institutions specifically commented that the pace of their implementation did not provide the opportunity to satisfactorily learn the system before going live. In post-implementation, they did not have the opportunity to assess the new Student ERP functionality for effectiveness or to systematically evaluate its impact. It was strongly felt by many that they needed the first year of post-implementation to learn the new system before going right on to something else or before making decisions on necessary customizations or business process changes.

The user frustration with the ERP system that was shared in the case study reports is reflective of the findings in the study on end-user satisfaction by Calisir and Calisir (2004), who found that ease of learning and perceived usefulness of the system were high-level determinants in user satisfaction with the system. The users that were the most dissatisfied with the Student ERP system did not find it easy to use or were unable to see the benefits in implementing the new system. The level of dissatisfaction that was evidenced in some of the reports is an indicator that a stronger change management model, such as that proposed by Aladwani (2001), should be included as part of an ERP project. The six case study institutions, to varying degrees, incorporated aspects of phases one and two of Aladwani's model into their projects. User attitudes toward the system were anticipated or assessed in various ways, followed by communications, training, project participation and other activities to promote a positive acceptance of the system. However, none of the case study institutions developed phase three of the model, which was establishing a feedback mechanism to measure the effectiveness of their change strategies. If a complete three-phase change management model had been in place, the end-user dissatisfaction may have been identified much earlier in the process and the steps necessary to change the problems could have been taken.

Conclusions and Implications for Practice

In considering the answers to the research question, "How have higher education institutions used the post-implementation phase to maximize the benefits from their ERP Student Administration system?" the researcher has concluded the following:

1. The ability to maximize ERP benefits can vary widely among the different components and departments within a single institution. The case study experiences show that the activities and characteristics associated with the Shakedown and the Onward and Upward phases from the Markus and Tanis (2000) framework can occur simultaneously among the several functional components in the post-implementation environment This conclusion suggests that elements of the Shakedown phase and the Onward and Upward phase should not just be evaluated holistically at the project level, but administrators and managers should consider the implications at each individual component level to better evaluate the post-implementation impacts and benefits for each institutional unit.
2. The size of an institution does not have a material influence on the project outcome or post-implementation experience. There were no consequential differences in post-implementation experiences or ability to maximize ERP benefits based upon institutional size.
3. Formal business process reviews and the length of the implementation project did not have a material impact on the post-implementation experiences of the

case study institutions. Generally, the experiences were consistent among the case study institutions regardless of whether or not business process reviews had been conducted prior to go-live or regardless of the amount of time allocated to the project. Some component areas were able to transition more smoothly and more easily into enhancements and changes to gain greater benefit from the ERP, but that appeared to be more contingent upon the area's leadership and staff, rather than any other one factor. This conclusion is supported by the study on operational effectiveness causal chains of Yu (2005) where he concludes that having the right individuals in project leadership roles is critical to the outcome of the project and should be the first concern of administration at the start of an ERP project.

4. Approaches to training influence user satisfaction and acceptance of the Student ERP. Successful training is dependent upon the knowledge, skills and ability of the trainer, not the level at which it is conducted. Consultant training was used effectively for specific projects or one-on-one, but the case studies suggest that consultant training is not as effective for in-house functional or end-user training on performing institutional business processes within the delivered Student ERP system.
5. Budget factors continue to be a driving force in maximizing ERP benefits in post-implementation, with effects on staffing, resource allocation, and acquisition of third-party software solutions. The funding for and use of

backfills to release key staff to work on the project full-time was not adopted by all of the case study institutions. The decisions to use or not use backfills was not only a budgetary decision, but also a philosophical one by some of the schools. The implication for practice, however, is that the key functional staff who work on the project prior to go-live continue to have ERP-project demands on their time in post-implementation. This can create a drain on resources, both human and financial, to provide operational continuity while simultaneously resolving functional and technical issues with the ERP system.

6. Cross-functional interaction among functional and technical areas, staff, faculty and administration is a continuing necessity in post-implementation. Cross-module IT governance and management of IT project requests is an important factor in assuring all areas receive equal consideration of customization and enhancement requests.
7. Training or hiring functional and technical staff with the analytical or programming skill sets necessary to successfully work with the ERP system is critical to maximizing the benefits of the Student ERP.
8. It may not be feasible or possible for an institution to take full advantage of all the capabilities of a Student ERP system. The number of customizations and enhancements completed or under consideration by the case study institutions indicate that there are many areas in which current Student ERP systems do not fit the needs of higher education institutions. Higher education

administrators need to be aware that the ERP system will not be a solution in and of itself, but that it is one major component of an overall technology plan to meet the needs of the institutions and its students.

9. There is no one single definition or criteria by which to measure the post-implementation success of a Student Administration ERP project. The experiences of the case study institutions in this study validate the findings of Markus, et al. (2000), who stated that the definition of success can vary depending upon the point of view from which it is evaluated and also by the point in time by which it is measured. Many varying measures, indicators, and definitions of success, or lack thereof, were shared by the case study interview participants. The responses reflected their experiences with the Student ERP system up to the point in time of the interview. The job area of the participant and their level of direct involvement in the project appeared to directly influence their view of post-implementation success. Administrators and managers who desire to quantify the post-implementation success of a Student ERP system should consider the dynamic and evolving environment of this technology. This researcher recommends the five viewpoints by which to measure success proffered by Markus, et al. (2000) be considered in the development of ERP post-implementation success measures: (a) technical aspects, (b) economic, financial, or strategic business terms; (c) the extent to which business operations run smoothly, (d) the perceptions of an

organization's managers and employees, and (e) the perceptions of the organizations' customers and other external stakeholders.

Recommendations for Future Research

The following recommendations for future research are based upon review of the literature and analysis of the research conducted for this study.

1. Conduct a replication study allowing for follow-up with the case study institutions on their next subsequent major upgrade or conversion and compare with the post-implementation experiences as identified in this study to determine what, if any, differences there are and why the differences may have occurred.
2. Study higher education institutions with ERP systems to determine how the continuing consolidation of major vendors is impacting ERP upgrade and maintenance decisions, particularly in periods of reduced funding.
3. Evaluate how higher education institutions are using the ERP platform to interface with the third-party applications and how this impacts institutional IT departments.
4. Research higher education institutions that are purchasing third-party applications to determine how purchasing decisions are being made and if different types of technologies, such as open source and best of breed, are being acquired more frequently as a result of reduced funding or other factors.

5. Conduct case study research on higher education institutions that have matured with their Student ERP systems, having completed several upgrades or conversions, to determine how the ERP has influenced or evolved the institutional culture and identify whether their experiences are different or similar to those of the institutions in this study.

APPENDIX A: ERP CHARACTERISTICS ONLINE SURVEY

Institutional Enterprise Resource Planning (ERP) Characteristic Survey

Welcome from Linda Sullivan, University of Central Florida

Thank you for taking the time to participate in this short (less than 5 minute) survey. As a leading technology administrator, you are uniquely positioned to provide insight into your institution's ERP plans and/or experiences.

The purpose of this survey is to collect information on the current status of ERP implementations at public and private higher education institutions in the United States.

The results from your responses will contribute to research on ERP post-implementation experiences in higher education institutions.

Agreement to Participate

Participation:
You will be asked to respond to a short series of questions about the status of your institution's ERP system plans and/or implementations. The survey should take no more than 5 minutes to complete. All of your answers will be treated as confidential; analysis will be in aggregate form and individual responses will not be published.

Your participation (or decision not to participate) is completely voluntary. You may choose not to respond to any question on the survey and you are free to withdraw from completing the survey at any time.

Survey Availability:
The survey will available online through February 8, 2008.

Contact information:
If you have any questions about this research project, please contact me, Linda Sullivan, at (407)721-4025 or by email at lindas@mail.ucf.edu. My faculty supervisor, Dr. William Bozeman, may be contacted at (407)823-1471 or bozeman@mail.ucf.edu.

IRB Approval:
This dissertation research study has been reviewed and approved by the UCF Institutional Review Board. Questions or concerns about research participants' rights may be directed to the UCF IRB Office, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246. The telephone numbers are (407)882-2276 and (407)823-2901.

* **1. I acknowledge that I am 18 years of age or older, understand the statements above, and voluntarily agree to participate in this survey. I understand there are no anticipated risks, compensation, or direct benefits to me.**

Click on the "I Agree" button to begin the survey.

- ○ I Agree
- ○ I Do Not Agree

Institution Name and Headcount

2. Name of Institution:

Page 1

Institutional Enterprise Resource Planning (ERP) Characteristic Survey

3. Fall 2007 Student Headcount (Unduplicated):

Institutional ERP System Characteristics

*Note: Questions 4-7 in this section of the survey were adapted with permission from the 2006 EDUCAUSE Core Data Service. This study is in no way affiliated with the EDUCAUSE Core Data Service or endorsed by EDUCAUSE.

4. Please check the appropriate statement for your campus regarding ERP systems:*

- We have no plans for an ERP implementation. (Skip to question 8)
- We are considering an ERP implementation.
- We are in the RFP stage of an ERP implementation.
- We have an ERP implementation in process.
- We have completed an ERP implementation or completed the modules we have chosen to implement.

5. Please indicate the implementation status for the major ERP information systems on your campus.*

	Plan initial implementation in the next 3 Years	Have completed initial implementation	Plan to upgrade module in the next 3 Years	No plans to implement this module
Student	☐	☐	☐	☐
Financial	☐	☐	☐	☐
Human Resources	☐	☐	☐	☐
Other	☐	☐	☐	☐
None of the above	☐	☐	☐	☐

6. Please indicate implementation and/or upgrade years for each module.*

	Year Initially Implemented	Year of Last Upgrade
Student		
Financial		
Human Resources		
Other		
None of the above		

7. Please indicate ERP product information for each module by entering Vendor & Product Name; or "Open Source" & Product Name; or "Homegrown", as appropriate.*

Student	
Financial	
Human Resources	
Other	
None	

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Institutional Enterprise Resource Planning (ERP) Characteristic Survey

Follow-up Information

8. Please indicate if you would be willing to participate in a follow-up discussion of your institution's post-implementation experience.

- ☐ Interested
- ☐ Not interested
- ☐ Need more information

9. Comments about your ERP experiences are appreciated.

10. Phone/Email:

Phone:

Email:

11. Additional information:

Name:

Address:

Address 2:

City:

State:

ZIP:

Survey Completed

Thank you for completing the survey. Your time and support are most gratefully acknowledged and appreciated!

APPENDIX B: COPYRIGHT USE PERMISSION

EDUCAUSE Copyright Use Permission

From: "Julie Rudy" <jrudy@educause.edu>
To: "Linda Sullivan" <lindas@mail.ucf.edu>
Date: 11/9/2007 5:35 PM
Subject: RE: Permission Request for Dissertation Research

Hi, Linda.

Thanks for your interest in using a couple of questions from the EDUCAUSE core data survey for your dissertation research survey.

You have our permission to use the questions, provided that you use the following accompanying statement as a footnote within the actual survey instrument:

"Questions 6 and 7 of this survey were adapted with permission from the 2006 EDUCAUSE Core Data Service. This permission was granted under the condition that the present survey explicitly state that this study is in no way affiliated with the EDUCAUSE Core Data Service or endorsed by EDUCAUSE."

You may send your survey to the schools listed in the appendix of our current summary report, but please do not identify our report as the source of the list you are using or reference their participation in our program as the reason for your having selected the school. Again, we want to ensure that there is no reference to EDUCAUSE in your communications to avoid the misperception that your research is affiliated with or endorsed by EDUCAUSE in any way. As a matter of policy we do not endorse such surveys or allow the use of the EDUCAUSE name in affiliation with them. But we are happy to have you use our survey questions under the conditions stated.

Good luck with your study and your dissertation!

Julie

==========

Julia A. Rudy
Core Data Service Program Coordinator
EDUCAUSE
4772 Walnut Street, Suite 206
Boulder, CO 80301
303-939-0308 (direct line)
303-440-0461 (office fax)
jrudy@educause.edu

-----Original Message-----

From: Linda Sullivan [mailto:lindas@mail.ucf.edu]
Sent: Thursday, November 08, 2007 10:07 PM
To: Julie Rudy
Subject: Permission Request for Dissertation Research

Hi, Julie,

I am working on finalizing my dissertation proposal. My dissertation methodology is using a mixed-method approach, which will include a short online institutional characteristic survey followed by in-depth case study of 6 institutions.

I would like to request permission to use questions 1 and 4 from the Informations Systems section of the 2005 EDUCAUSE CDS survey as part of my online institutional characteristic survey. I've attached a sample showing how the questions would be used (they are highlighted); you'll see that I've modified question 1 to better fit the needs of my study.

Please let me know if you need additional information from me for this request.

Thank you very much for your help on my study!
Linda Sullivan

APPENDIX C: INSTITUTIONAL REVIEW BOARD (IRB) APPROVALS

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Notice of Expedited Initial Review and Approval

From : **UCF Institutional Review Board**
FWA00000351, Exp. 5/07/10, IRB00001138

To : **Linda S. Sullivan**

Date : **December 14, 2007**

IRB Number: **SBE-07-05354**

Study Title: **Post-Implementation Success Factors for Enterprise Resource Planning (ERP) Systems in Higher Education Institutions**

Dear Researcher:

Your research protocol noted above was approved by **expedited** review by the UCF IRB Chair on 12/14/2007. **The expiration date is 12/13/2008.** Your study was determined to be minimal risk for human subjects and expeditable per federal regulations, 45 CFR 46.110. The category for which this study qualifies as expeditable research is as follows:

> 7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

A **waiver of documentation of consent** has been approved for all subjects. Participants do not have to sign a consent form, but the IRB requires that you give participants a copy of the IRB-approved consent form, letter, information sheet, or statement of voluntary consent at the top of the survey.

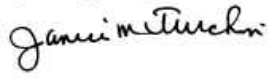
All data, which may include signed consent form documents, must be retained in a locked file cabinet for a minimum of three years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained on a password-protected computer if electronic information is used. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

To continue this research beyond the expiration date, a Continuing Review Form must be submitted 2 – 4 weeks prior to the expiration date. Advise the IRB if you receive a subpoena for the release of this information, or if a breach of confidentiality occurs. Also report any unanticipated problems or serious adverse events (within 5 working days). Do not make changes to the protocol methodology or consent form before obtaining IRB approval. Changes can be submitted for IRB review using the Addendum/Modification Request Form. An Addendum/Modification Request Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at http://iris.research.ucf.edu .

Failure to provide a continuing review report could lead to study suspension, a loss of funding and/or publication possibilities, or reporting of noncompliance to sponsors or funding agencies. The IRB maintains the authority under 45 CFR 46.110(e) to observe or have a third party observe the consent process and the research.

On behalf of Tracy Dietz, Ph.D., UCF IRB Chair, this letter is signed by:

Signature applied by Janice Turchin on 12/14/2007 02:57:37 PM EST



IRB Coordinator

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2012 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Notice of Expedited Review and Approval of Requested Addendum/Modification Changes

From: **UCF Institutional Review Board**
FWA00000351, Exp. 5/07/10, IRB00001138

To: **Linda S Sullivan**

Date: **May 01, 2008**

IRB Number: **SBE-07-05354**

Study Title: **Post-Implementation Success Factors for Enterprise Resource Planning (ERP) Student Administration Systems in Higher Education Institutions**

Dear Researcher:

Your requested addendum/modification changes to your study noted above which were submitted to the IRB on 04/29/2008 03:16:16 PM EDT were approved by **expedited** review on 05/30/2008.

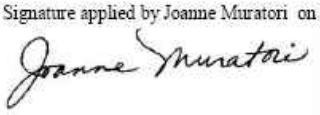
Per federal regulations, 45 CFR 46.110, the expeditable modifications were determined to be minor changes in previously approved research during the period for which approval was authorized.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Subjects or their representatives must receive a copy of the consent form(s).

This addendum approval does NOT extend the IRB approval period or replace the Continuing Review form for renewal of the study.

On behalf of Tracy Dietz, Ph.D., IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 05/01/2008 10:14:07 AM EDT



IRB Coordinator

Internal IRB Submission Reference Number: 002916

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2012 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

EXPEDITED CONTINUING REVIEW APPROVAL NOTICE

From : **UCF Institutional Review Board**
FWA00000351, Exp. 10/8/11, IRB00001138

To : **Linda S Sullivan**

Date : **November 10, 2008**

IRB Number: SBE-07-05354

Study Title: **Post-Implementation Success Factors for Enterprise Resource Planning (ERP) Student Administration Systems in Higher Education Institutions**

Dear Researcher,

This letter serves to notify you that the continuing review application for the above study was reviewed and approved by the IRB Vice-chair on **11/6/2008** through the expedited review process according to 45 CFR 46 (and/or 21 CFR 50/56 if FDA-regulated).

Continuation of this study has been approved for a one-year period. The expiration date is 11/5/2009. This study was determined to be no more than minimal risk and the category for which this study qualified for expedited review is:

6. Collection of data from voice, video, digital, or image recordings made for research purposes.

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

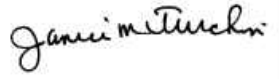
Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Subjects or their representatives must receive a copy of the consent form(s).

All data must be retained in a locked file cabinet for a minimum of three years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained on a password-protected computer if electronic information is used. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

To continue this research beyond the expiration date, a Continuing Review Form must be submitted 2 – 4 weeks prior to the expiration date. Use the Unanticipated Problem Report Form or the Serious Adverse Event Form (within 5 working days of event or knowledge of event) to report problems or events to the IRB. Do not make changes to the study (i.e., protocol methodology, consent form, personnel, site, etc.) before obtaining IRB approval. Changes can be submitted for IRB review using the Addendum/Modification Request Form. An Addendum/Modification Request Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

On behalf of Tracy Dietz, Ph.D., UCF IRB Chair, this letter is signed by:

Signature applied by Janice Turchin on 11/10/2008 03:21:31 PM EST



IRB Coordinator

APPENDIX D: PILOT SURVEY

Email Text for Pilot Survey Participation

Subject: Pilot Survey for Dissertation Research

Hi,
As part of my dissertation research, I've developed an online survey to collect data on the current status of ERP implementations at public and private higher education institutions in the U.S. Over 700 CIOs or other institutional technology administrators will be invited to complete the survey.

Before administering the survey, I need to have a pilot group test it and provide feedback. I am inviting you to be part of this pilot group due to your leadership in technology administration at UCF.

The main survey has 11 questions; the pilot version which you will be testing has an additional 6 questions regarding your experience in completing the main survey.

The survey can be accessed at the following link:
http://www.surveymonkey.com/s.aspx?sm=VJx3kPxLGjL8o7n_2bCHFLZA_3d_3d

Thank you very much for your time and help with this! I would like to complete the pilot testing by *(specified date)*.

Please feel free to contact me if you have any questions!

Thanks,
Linda

Pilot Survey Evaluation Questions

Pilot: Institutional ERP Characteristic Survey

11. Phone/Email Contact Information:

Phone:

Email:

Survey Completed

Thank you for completing the survey. Your time and support is most gratefully acknowledged and appreciated!

****

This is the last page of the survey that respondents will see.

Please continue to the next page to answer a few questions regarding your experience in taking this survey.

Pilot Survey Review

12. Approximately how long did it take you to complete the survey?

○ Less than 5 minutes ○ 5 to 10 minutes ○ Longer than 10 minutes

Comments:

13. Was the introductory page with the purpose of the survey clear and understandable?

	1	2	3	4	5
Rank clarity of page by rating 1-5 with 1 being poor and 5 being excellent.	○	○	○	○	○

Comment

Page 4

Pilot: Institutional ERP Characteristic Survey

14. Was the Informed Consent information page clear and understandable?

	1	2	3	4	5
Rank clarity of page by rating 1-5 with 1 being poor and 5 being excellent.	○	○	○	○	○

Comments

15. Were there any questions on the Institutional ERP Systems Characteristics page that were unclear or difficult to complete?

○ Yes
○ No

Comments:

16. If you answered 'Yes' to Question 15 above, can you please explain which questions were difficult and why?

17. Please add any additional comments or suggestions that may be helpful in improving this survey.

Pilot Survey Completed

Thank you so much for your time and comments about this survey. I really appreciate your input and support.

Linda

Page 5

APPENDIX E: ONLINE SURVEY CORRESPONDENCE

Text for Initial Contact Email
Institutional ERP Characteristics Survey
* Email contact information was obtained through institutional websites and online staff directories.

“ Dear _____:

As a leading technology administrator for your institution, you are invited to participate in short survey to collect information on the current status of ERP implementations at public and private higher education institutions in the United States.

The survey will take less than 5 minutes to complete and the results from your responses will contribute to research on ERP post-implementation experiences in higher education institutions.

The survey can be accessed through the following link:

This dissertation research study has been reviewed and approved by the UCF Institutional Review Board. Questions or concerns about research participants' rights may be directed to the UCF IRB Office, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246. The telephone numbers are (407)882-2276 and (407)823-2901.

My faculty supervisor, Dr. William Bozeman, may be contacted at (407) 823-1471 or bozeman@mail.ucf.edu.

Your time and participation is greatly appreciated.

Sincerely,

Linda S. Sullivan
Associate Director, Institutional Research and
Doctoral Candidate
University of Central Florida

Text for Follow-up Reminder Email(s)
Institutional ERP Characteristics Survey
* Email contact information was obtained through institutional websites and online staff directories.

“ Dear _____:

This is a gentle reminder - if you've not had the opportunity to complete the higher education ERP survey, your valuable input is still needed. The 5-minute survey will be available until February 8 and can be accessed by the link below.

Thank you again for your time and support.
Linda Sullivan

APPENDIX F: ERP PRODUCTS USED BY SURVEY INSTITUTIONS

ERP Products by Module Categories Used in Survey Institutions
Survey Question 7

Product	Student	Finance	Human Resources	Other
Acrux/eNucleus, Pro Books		1	1	
Advancement - BSR Advance				1
AMG		1		
BiTech		1	1	
Blackbaud Raiser's Edge				1
CGI Advantage		1		
Datatel	16	14	13	9
Eden Systems		1	1	
Homegrown/Custom	10	5	5	3
Hyperion				1
IA		1	1	
Inform	1			
Jenzabar	6	5	5	2
Open Source		1		1
Oracle/PeopleSoft	28	35	38	7
Powerfaids				1
SAP	1	5	5	1
SunGard/SCT Banner/SIS Plus	58	48	49	29
Web/CT Vista				1
Undecided	2	1	1	1
No Response	27	29	29	91

APPENDIX G: SURVEY COMMENTS ON ERP EXPERIENCE

Institutional Comments on ERP Experience
Survey Question 9

"We are very satisfied."

"This was lead by the system level operations."

"Our campus is under the umbrella of the [university system's] IT office. They are the ones that make decisions on ERP."

"Our HR & Finance implementation was well planned and executed. Our Student implementation was not given the time required and as a result was a little rocky."

"Most Schools underestimate training and conversion costs."

"The implementations sold as very easy, they are not. Also the constant upgrades and bundles/patches do add a lot of cost. Need to [have] buy in from upper management. Unlike old mainframe systems, these systems need a lot of end user involvement. That is a total change in the culture of the college."

"Extra work on the beginning of the project can greatly reduce problems latter [*sic*] in the project."

"The process has been long and difficult, but reasonably successful. Most would attribute the success of the project to the fact that we avoided framing it as an IT project. IT was positioned as the implementor of new systems for the various functional groups who will be using the system."

[University] completed a successful technical implementation of [product] in December 2007. We are still in the process of turning on all the features … and using the functionality of [product] to improve our business and academic processes. This 'post implementation process improvement' stage will likely take another two years, but the University has set aside some funds from the implementation budget to fund this 'post implementation' phase. Some areas, such as Enrollment Services and Graduate Admissions, have already made significant process improvements, while others, such as Finance and HR, are just beginning their process improvements."

“Experience was complicated by merger of [two institutions] requiring integration from dual legacy systems.”

“Expensive and staff intensive.”

“ERP support has become a non-event. Major event during implementation 10 years ago.”

“Long and difficult process. Joint implementation with 2 other campuses coordinated by System office.”

“An ERP should not be a static one-time implementation. As your business changes, so should your ERP.”

“A very difficult year pre go-live. A very difficult year post go-live. Stating [*sic*] to see the fruits of our labor as our users are growing more comfortable and the software matures.”

“Our [first product] implementation was central (one for the entire university) and considered very successful. We implemented the base financial systems in 14 months. We delayed the HR implementation an additional 9 months to start on the calendar year. We have upgraded and augmented both several times with good success. We are very happy with the product from a technical perspective and most people are very happy from a functional perspective. It does what our university needs, plus what many customers want beyond the needs. We are planning to implement [new product] at each of our campuses in a coordinated fashion so we can roll up data for central reporting.

“The overall process has gone well. While we have had bumps, we are progressing well.”

“ERP's are large and complex systems. Their great virtue is their centralization and standardization of information. They are often a bit rigid and difficult for non technical users to learn to use.”

“Our implementation came in on time and under budget...however it was very stressful and not without losing some employees.”

“ERP is no longer viewed by most as an ‘either or’ decision, there are numerous hybrid approaches which combine facets of various technology solutions to maximize benefit and return. Irrespective of the technology choice, major implementations are incredibly

resource intensive, and managing expectations and setting the context for continuous process improvement is critical to long term success."

“We initially implemented in 1994 …. This was before web access to many types of users was ever considered. This means our database design creates challenges. It also means thousands of custom tables and reports built by us because the ERP software hadn't yet got there. As the ERP software gradually catches up with us, we are trying to unwind years of customization. Those who are just now implementing ERPs are leapfrogging us. We really need to re-implement, but the weight of almost 15 years of customization is a huge barrier.”

“Never easy. Technology transfusion, change management. Need good project management structure, including decision-making, budget and executive engagement.”

“ERP Systems in Higher Ed are 5-10 years behind other industries.”

“After initial implementation, we have learned to operate the system and keep most users pacified. [Product] … is somewhat cumbersome. Updates occur frequently and require significant resources.”

“On Time and On Budget Strong User Leadership.”

“The ERP implementations were absolutely necessary to build a firm foundation of ‘back office’ management systems. However, the university struggles to ‘wring the value’ out of them due to the complexity of the required upgrades. We need to exploit the inherent functionality to a much greater degree, but that is resource intensive. Additionally, while the ERP systems are the sources of data on which to build management/decision support systems, but since they are notoriously horrible for reporting, we also are investing in building appropriate data stores/data warehousing on top of them to enable better access to management information. This too is resource intensive.”

“Functional business areas need to be ‘in charge’ - difficult to automate chaos.”

“Highly successful implementation, on time and in budget.”

“Our ERP is homegrown. It is comprehensive, fully integrated, web-enabled and continues to evolve.”

“We seem to be driven by constant upgrades,patches and fixes. Next we face the challenges of what will [new product] mean and what will we do when it is available.”

“[University] is on a strategic direction to seriously evaluate the open/community source alternatives for all ERP modules.”

“While initial implementation was done in 1998, modules continue to be upgraded on a yearly basis. In addition, we continue to add more functionality with upgrades such as web portals, assessment software, etc.”

“Long, difficult, exciting, built team, creative effort, must always talk to improve.”

“Our intent is to implement and utilize open source initiatives to drive our integrated administrative applications.”

“Initial implementations were difficult and costly, as were the first upgrades. But now we're managing upgrades better.”

APPENDIX H: FOLLOW-UP PHONE PROTOCOL AND CORRESPONDENCE

Protocol for Phone Follow-up with Selected Institutions

Purpose: The purpose of the follow-up phone call screening is to collect additional information on selected institutions so that final determination of the six case study institutions can be made by the researcher. The phone call discussion will focus on the following areas:

1. Confirm data from selected survey responses.

2. Have respondent expand on survey responses by answering questions in this protocol to collect additional information on institutional post-implementation experience.

3. Determine respondent's level of interest in being the primary institutional contact for the case study and providing internal support for arranging on-site interviews if the respondent's institution is selected by the researcher to be a case study as part of this research project.

Phone Follow-up:
Date:
Time:

Institution Name: (pre-populated from survey data)

Survey Respondent Name: (pre-populated from survey data)

Respondent Contact Information: (pre-populated from survey data)

I. Introductory Script

Hello, this is Linda Sullivan. I appreciate you taking the time to talk with me a bit further about your ERP Student Administration system post-implementation experiences. This discussion is a follow-up to your responses on the Institutional ERP Characteristics survey which you completed earlier this year.

As a reminder, the survey and your responses today are part of a dissertation research study on ERP post-implementation experiences in higher education, with a specific focus on Student Administration systems. You were selected to be part of the phone follow-up group based upon the institutional responses you provided in the survey.

All of your answers will be treated as confidential. Your participation (or decision not to participate) is completely voluntary. You may choose not to respond to any question and you are free to discontinue our discussion at any time.

II. Confirmation of Survey Data

"First, I'd like to confirm a few of the survey responses you provided."

Completion Year of Student Administration Initial Implementation: (pre-populated from survey data)

Survey Comments on ERP Implementation: (pre-populated from survey data)

Interest in follow-up discussion on post-implementation experience: (pre-populated from survey data)

III. Screening Questions Specific to Student Administration ERP System

"Now, I have a few questions specific to your Student Administration system."

1. Can you please generally describe the ERP Student Administration post-implementation experience for your institution?

2. Would you describe your Student Administration system as being fully operational or are there functional areas currently being modified or under consideration for modification?

3. What are the institution's upgrade plans, if any, for the Student Administration system?

4. What type of technical support did your institution use during post-implementation?

IV. Institutional Case Study Support

"Following completion of the phone call discussions, I will be selecting six institutions for individual case studies as the main part of my dissertation research. This will include a two-day on-site campus visit to conduct interviews with individuals involved with the Student Administration post-implementation."

1. If *(name of institution)* is selected, would you be willing to support this on your campus?

2. Would you serve as primary institutional contact?

V. Closing

1. Do you have any questions or concerns that I can answer?

"Thank you very much for your time and support of this project."

Text for Survey Follow-up Email to Selected Institutions

*Note: Contact Name and Email address voluntarily provided as responses in researcher's survey referenced in body of this email text are used for the follow-up email contact; in cases where respondent detail information not provided in the survey, the name and email of the individual to whom the survey was sent was used.

Request for Follow-up Information on ERP Implementation

"Dear *(Survey Respondent's Name)*:

Thank you for completing the Institutional ERP Characteristics Survey earlier this year.

As part of my dissertation research study on ERP post-implementation experiences in higher education institutions, I will be conducting case study research on six institutions which have completed an initial implementation of a Student Administration ERP system within the past three years.

The survey responses you provided indicate that *(institution name)* may meet the institutional selection criteria for this dissertation research study.

I would like to contact you by phone at time convenient for you during the next two weeks to ask you a few additional questions about your institution's post-implementation experience, and also to discuss the possibility of including *(institution name)* as a case study institution in my dissertation research.

If you have a preference as to when I should call you, please contact me by email, lindas@mail.ucf.edu or by phone, (407) 721-4025.

This dissertation research study has been reviewed and approved by the UCF Institutional Review Board. Questions or concerns about research participants' rights may be directed to the UCF IRB Office, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246. The telephone numbers are (407) 882-2276 and (407) 823-2901.

My faculty supervisor, Dr. William Bozeman, may be contacted at (407) 823-1471 or bozeman@mail.ucf.edu.

Thank you very much for your time and support with this project.

Sincerely,

Linda S. Sullivan
Associate Director, Institutional Research and
Doctoral Candidate
University of Central Florida

APPENDIX I: ON-SITE CAMPUS VISIT CORRESPONDENCE

Invitation for Case Study Participation Email Text

Dear (*Name*):

I would like to thank you for your time and support that you've so generously provided for my ERP research project.

Based on our phone conversation, I would like to include (*institution name*) as one of the case study institutions for my research.

If you are still willing, I'd like to plan for a 2-day on-site campus visit to conduct interviews and review any applicable documents and archival records. Right now, my travel schedule for June is fairly flexible. I've listed some suggested dates below, but will be happy to adjust as needed to accommodate interview scheduling.

(*Dates*)
(*Dates*)

The areas and individuals I'm interested in talking with are administrators, staff and faculty directly and indirectly involved in the ERP Student Administration system project. These individuals may include the Project Manager, Registrar, Director of Admissions (Graduate and Undergraduate), Director of Student Financial Aid, IT developers, functional end-users of the Student Administration module, academic advisors and faculty members.

I've also attached a summary statement describing the purpose of the research. Please feel free to share this with anyone who might be interested.

Please let me know if there is any additional information that I can provide or help with at this point.

I'm very grateful for your support of this project and am looking forward to visiting your campus to learn more about your Student Administration ERP experience!

Thank you,
Linda Sullivan
cell: (xxx-xxx-xxxx)

Research Summary Statement Attachment

Post-Implementation Success Factors for Enterprise Resource Planning (ERP) Student Administration Systems in Higher Education Institutions

(Principal Investigator: Linda Sullivan)

The purpose of this research study is to explore the post-implementation experiences of selected institutions, and to present their successes and challenges so that higher education administrators and leaders can use the case study institution experiences to determine what actions they may need to take at their institutions for a successful post-implementation experience.

The research will also offer useful insights into the continuing impact of an ERP implementation project on the higher education institutional environment following go-live.

Because the effects and benefits of an ERP implementation are not widely recognized until the post-implementation phase, this study will address the question: "How have higher education institutions used the post-implementation phase to maximize the benefits from their ERP system?"

The following are the overarching research questions which will bound the study's focus:

1. What are the ERP Student Administration module post-implementation experiences among higher education institutions?

2. How have post-implementation activities supplemented, improved, or addressed issues created by or not resolved by the initial implementation?

APPENDIX J: ON-SITE CAMPUS VISIT INTERVIEW PROTOCOL

ERP Student Administration System On-Site Interview Protocol

Written authorization of informed consent will be obtained from each individual prior to their interview. The interviews will be conducted individually or in small groups as appropriate.

Written field notes by the researcher will be the primary means of interview data collection. Digital voice recordings may be used in addition to the field notes if the technology is unobtrusive and does not appear to affect the respondent's interaction with the researcher. All audio recordings will be transcribed verbatim by the researcher into hard copy which will be provided to the participant for review and validation.

Institution Name: _____

Participant Name: _____

Participant Contact Information: _____

Title: _____

Role in Student Administration Post-Implementation:

_____

_____

Date and Time of Interview: _____

I. Introduction

The researcher will introduce herself and thank the participant for his or her time and support of this research project. The researcher will review the nature and purpose of the study with the participant. The participant will also be reminded of the confidentiality of his or her responses.

Permission to record the interview will be requested by the interviewer and the recorder will be activated accordingly. The participant will be informed that they will receive a hard copy verbatim transcription of the interview from the researcher for their review and validation.

The researcher will ask the participant if he or she has any questions or concerns about the interview process before proceeding to the interview questions.

II. Focused Interview Questions

Each on-site interview participant will be asked to respond to the initial questions listed below.

Based upon the respondent's answers, the researcher will supplement the general inquiries with additional probes to draw out the details necessary to identify emerging themes and provide rich data for analysis from which the answers to the research questions of this study will be developed.

1. Describe the institution's ERP Student Administration implementation experience from your perspective.

2. Describe your experience with the ERP Student Administration implementation.

3. Describe the ERP Student Administration go-live experience from your perspective.

4. What has been the institution's post-implementation experience from go-live to present from your perspective?

5. What has been your post-implementation experience from go-live to present?

6. How would you describe the current status of the ERP Student Administration module?

III. Closing

The participant will be provided with the opportunity to add any additional information that they think may be helpful to the study that was not covered by the researcher's questions.

The researcher will ask the participant for the names of other individuals who should be interviewed as part of the case study research so that the broadest range of data may be captured.

The interview participant will be informed that follow-up discussions may be conducted telephonically and via e-mail for the purposes of clarification and review of personal interview transcriptions, as well as a later review of their institution's draft case study report.

The researcher will again thank the interviewee for his or her participation in the case study research project.

APPENDIX K: INFORMED CONSENT FOR ON-SITE INTERVIEWS

Informed Consent for On-Site Interviews for ERP Student Administration Post-Implementation Experiences in Higher Education.

Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You are being invited to take part in a research study which will include about 50 people at different campus locations. You can ask questions about the research. You can read this form and agree to take part right now, or take the form home with you to study before you decide. You will be told if any new information is learned which may affect your willingness to continue taking part in this study. You have been asked to take part in this research study because you are an administrator, staff member or faculty directly or indirectly involved in your institution's ERP Student Administration system project. You must be 18 years of age or older to be included in the research study and sign this form.

The person doing this research is Linda Sullivan, a doctoral candidate with the Department of Educational Research, Technology, and Leadership in the College of Education at UCF. Because the researcher is a graduate student, she is being guided by Dr. William Bozeman, a UCF faculty supervisor in the Department of Educational Research, Technology, and Leadership in the College of Education.

Study title: Post-Implementation Success Factors for Enterprise Resource Planning (ERP) Student Administration Systems in Higher Education Institutions

Purpose of the research study: The purpose of this research study is to explore the post-implementation experiences of selected institutions, and to present their successes and challenges so that higher education administrators and leaders can use the case study institution experiences to determine what actions they may need to take at their institutions for a successful post-implementation experience. This study will add to the small body of research focused on the higher education post-implementation and ERP experience, as well as contributing to the growing area of ERP post-implementation research in general. The research will also offer useful insights into the continuing impact of an ERP implementation project on the higher education institutional environment following go-live.

What you will be asked to do in the study: You will be asked to participate in either an individual or group interview to discuss your perceptions of the institution's Student Administration ERP system post-implementation experience.

Voluntary participation: You should take part in this study only because you want to. There is no penalty for not taking part, and you will not lose any benefits. You have the right to stop at any time. Just tell the researcher that you want to stop. You will be told if

any new information is learned which may affect your willingness to continue taking part in this study.

Location: The researcher will be conducting the interviews at your campus location during a pre-rearranged on-site visit. Follow-up discussions as needed for clarification and validation will be accomplished via phone and/or email.

Time required: The initial interview should take only 1 to 1-1/2 hours. Additional time required for validating interview transcription, responding to clarification questions, and reviewing the draft case study report should not exceed an additional 1 to 2 hours.

Audio recording:

You will be asked for permission to have your interview recorded using a digital voice recorder. If you permit audio recording, the recorded file will be downloaded to a secure personal computer and password protected, accessible only by the researcher, until what you say has been transcribed verbatim. Once it is transcribed and validated, the recording will be erased or destroyed.

Risks:

There are no expected risks for taking part in this study. You do not have to answer every question or complete every task. You will not lose any benefits if you skip questions or tasks.

Benefits:

As a research participant you may not benefit directly from this research. However, the research will offer useful insights into the continuing impact of an ERP implementation project on the higher education institutional environment following go-live which may be beneficial to your institution.

Compensation or payment:

As an interview participant, you will be given a pen as a gift of thanks for your time and support of this research project.

Confidentiality: Your identity will be kept confidential. The researcher will make every effort to prevent anyone who is not on the research team from knowing that you provided information, or what that information is. For example, your name will be kept separate from the information you give, and these two things will be stored in different places.

Your information will be assigned a code number. The file connecting your name to this number will be saved in a password protected computer accessible only by the researcher. When the study is done and the data have been analyzed, the list will be destroyed. Your information will be combined with information from other people who took part in this study. When the researcher writes about this study to share what was learned with other researchers, she will write about this combined information. Your name will not be used in any report, so people will not know how you answered or what you did.

There are times when the researcher may have to show your information to other people. The researcher may have to show your identity to people who check to be sure the research was done right. These may be people from the University of Central Florida or state, federal or local agencies.

Study contact for questions about the study or to report a problem: Linda Sullivan, Doctoral Candidate, Educational Leadership Program in the College of Education, at (407) 721-4025 or by email at lindas@mail.ucf.edu; or Dr. William Bozeman, Faculty Supervisor, Department of Educational Research, Technology, and Leadership at (407) 823-1471 or by email at bozeman@mail.ucf.edu.

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

How to return this consent form to the researcher: Please sign and return this consent form to the researcher prior to the start of the interview. A second copy is provided for your records.

☐ I have read the procedure described above ☐ I agree to be audio taped

☐ I voluntarily agree to take part in the procedure

☐ I am at least 18 years of age or older ☐ I do not agree to be audio or video taped

_____	_____	_____
Signature of participant	Printed name of participant	Date

_____	_____
Principal Investigator	Date

APPENDIX L: LISTING OF INTERVIEW PROBES USED

Sample Listing of Interview Probes Used

Q: How did you decide what modifications or customizations were needed?

Q: After you went live, in addition to [third party software] were there any other additional customizations or modifications or bolt-ons that you needed to have added to the system so you could do your job?

Q: So were any requests for customizations or modifications approved?

Q: What would you say in looking back on the post implementation experience, is there anything that you would have done differently to better impact your post implementation process?

Q: What were the things that stood out to you as positives, as good things in the way the project was done and the post implementation results of those efforts?

Q: Is there anything from your viewpoint that you would have done differently during the project phase leading up to Go-Live to affect the outcome of post implementation?

Q: How were these changes communicated to the campus?

Q: How was the project timeline of 18 months established?

Q: Was the decision to purchase [third-party software] made as part of the project plan or was that an after-the-fact purchase?

Q: Did the interfaces cause any problems going live or after?

Q: Can you describe what your current role is and what your role was during the implementation?

Q: What kind of planning would you like to see done or what would you have done?

Q: Did you have any faculty involvement on any of these teams?

Q: How long did that take you?

Q: Your clean-up...what did that entail?

Q: How have the multiple upgrades impacted your office?

Q: And that came from the provost office down?

Q: And that's still continuing?

Q: And when that was discovered how did you respond to that?

Q: By auditing, do you mean checking the new transcript against the old?

Q: Do you remember how soon afterwards that that was formed?

Q: How did you work through that?

Q: How would you do it differently then?

Q: Is that the 100% audit that you were referring to?

Q: You mentioned the university commitment to not doing [the project] on a shoestring. Did you have anyone from your area that was dedicated 100% to the project and backfilled?

Q: From a faculty perspective, were there any unique concerns from the faculty viewpoint that were issues?

Q: So you were able to just adapt and go forward with it?

Q: Was that something you were expecting or did you discover that as you went along?

Q: How were they involved?

Q: What impact did that have?

Q: How has this changed since Go-Live?

Q: Did you run into any surprises, unexpected, when you went live in any of the modules?

Q: You said you stayed in IT a year after the go live...can you expand a little bit on what you did during that time and what were some challenges?

Q: Did you create that after Go-Live?

Q: How would you characterize the status of the Admissions module piece of it following go-live: would you say you were functional immediately - you were able to do business, or did it take some time to get to that point, other than the online application?

Q: I've picked up on some already, but what would you say were the surprises that occurred after you went live that weren't identified in the fit-gaps.

Q: So you've been using the delivered online application to this point but it's not working for what you need?

Q: Talking about upgrades and enhancements, do you have a wish list that you've created or are you satisfied with the product…. with your system as it is now?

Q: You mentioned individuals were needing help after go-live….what kind of support was provided to the campus for questions and problems?

Q: You mentioned particularly in the Registrar's Office that for a while right after go-live, it was just trying to catch up, things were slow in getting done. How long do you think would you say that it took your office to feel like you'd really caught your breath and you were actually operational, doing business?

Q: You mentioned you were using different software for Financial Aid. Are you still doing that?

Q: And speaking of system, after going live, did you experience any performance issues on this system at all?

Q: How did you handle things during that first six months then?

Q: I've been told that there have been a number of upgrades and patches during some of the implementations and afterwards. How has that impacted your areas?

Q: How long from go-live to when that was discovered and implemented?

Q: How were these errors found?

Q: If you have problems with the system, how is that reported? What's the process for getting it resolved?

Q: You mentioned phase two a couple of times….can you explain what your phase two is?

Q: So, am I to understand that you are just living with those kinds of things in the system?

Q: You had mentioned after GoLive that you had to take some steps backwards. Can you expand on that a little bit more?

Q: How were the decisions made on things that were originally supposed to be part of the GoLive to slide them to later?

Q: You mentioned that you did a few mods for GoLive. What did you have to do?

Q: Is there anything within OIT that in hindsight you would have done or should have done differently that would have addressed some of the challenges that you had afterwards?

Q: What were some of the biggest challenges?

Q: The aspect that you were describing earlier about the phased implementation, the shifting of focus, was that something that came as a surprise or was that something that you were anticipating you would have to deal with?

Q: What's the goal of your strategic planning group?

Q: By phases . . . what type of phases are you referring to?

Q: Did your area do any business process analysis or business process review prior to implementation as far as changes that may occur with [product]?

Q: How long did it take to feel like you were actually doing business as usual?

Q: How did you reconcile the [institution] way versus the Banner way, especially since you were striving for a Vanilla implementation?

Q: In that example, how does the committee function?

Q: Was that policy made by the oversight committee?

Q: What role is the oversight and steering committee going to have now in post-implementation?

Q: How was the relationship between the functional users and IT prior to project and did it change or evolve after the project?

Q: You mentioned problems with reporting. What's happening with reporting now?

Q: You mentioned the reporting team. Who makes up the reporting team? How did it evolve?

Q: When you said the resources were not really there, what kind of resources are you referring to?

Q: Were there any specific challenges that would be unique to IT as far as managing resources, especially when you were supporting multiple conversions where one group was in post implementation and another was getting ready for go-live?

Q: Now you just said that your roles have changed since post implementation. Can you expand on that a little bit?

Q: You mentioned that the roles changed. How have the skill sets needed by your staff changed?

Q: How are you managing security?

Q: How would you characterize the impact, particularly the post-implementation, on your staff?

Q: If I'm understanding correctly then, your position was a new position added because of the implementation?

Q: Did you experience any turnover of staff due to the conversion and the new technology?

Q: Did you have technical consulting support either before or after the GoLive for student?

Q: Has [product] changed the skills or the type of individual that you are looking for to fill the positions?

Q: What role did the technical consultants fill for you when they were here?

Q: Training was mentioned briefly. How was training your staff - both technical and end user staff - accomplished before, and leading up to go-live, and since afterwards?

Q: Did you have to modify any of your training after going live?

Q: What were your biggest challenges in the training?

Q: Who developed the training?

Q: Is there anything that we didn't bring up that you think is important that I should know or include?

APPENDIX M: ON-SITE CAMPUS VISIT FOLLOW-UP CORRESPONDENCE

Site Visit Thank You Email Text

Dear (*Name)*:

It was a pleasure to meet you last week during my visit to (*institution name)*. I really appreciate the time you spent to meet with me and to share your insights on the Student ERP post-implementation experience. The information will make a valuable contribution to my research project.

As a reminder, I'll be sending you a transcription of our meeting for your review and feedback.

Please feel free to contact me if you have any questions.

Thank you again and best wishes,

Linda Sullivan

Email Text for Interview Transcription Review

Dear (*Name)*,

I hope this email finds all well with you!

As promised when I visited [*institution name*] back in June for my research on ERP post-implementation experiences, I have attached a verbatim transcription of the interview session you participated in for your review and feedback. I had planned to have the transcription to you by the end of summer, but it took much longer than I expected to complete the transcriptions!

The document is password protected. Please use [*password*] (case-sensitive) when prompted. Also, please note that individual names have either been removed from the transcription or coded for identity protection.

Your participation and feedback on my research has been invaluable. If you have any additional comments, or feedback on the interview session after reviewing the transcript, I would be most grateful to receive it by December 1.

Again, my sincere thanks for your participation and support.

Warmest regards,
Linda Sullivan
lindas@mail.ucf.edu
cell: 407-721-4025

APPENDIX N: SAMPLE INTERVIEW TRANSCRIPTION

Sample Interview Transcription

561493616 Session-1 (Folder 1, Message 08061200)
June 12, 2008
9:00-10:15am (Admissions)
Recording Time Start: 09:10am
Actual Recording Time: 01:03:17

Q. So really, if I'm hearing correctly, the only customizations really done then since your go-live and in post-implementation really is the online application. Or no, it's not customization, it's just gone to a 3-d party.

B. Yea, since go live I don't think we've asked for any new customizations or anything different.

Q. Any bolt-ons or anything that you've had added to the system to meet needs after go-live?

A. The high school visit……..

B. Oh yea, that's a good point…. I guess that's a "Big C," that'd be a "Big C," I guess. What we do in the fall is recruit students – we travel a lot around the country to recruit students. In the old system we had this, basically, a travel management system where we could plug in the schools, the high schools we were visiting, dates and times, where we're staying, how we're getting there , and which would then would generate letters out of it saying, "Dear Mr. [X], I'm visiting [ABC] High School on October 4th at 11am." Just so you know… and we could generate thank you letters saying thank you for letting me visit,

A. Itineraries… posters

B. Itineraries, posters…..right….pretty robust

A. It was a system that was 20 years old probably; so for 20 years ago it was pretty sophisticated and it worked pretty well. It wasn't the most user friendly, but …..

B. And that's something that [product] had nothing at all remotely close to that we essentially had to build. Now we use [product], self-service [product] architecture, the web architecture of [product] to build it. We had a tech person here to help us go through that and design it so we tried to use the baseline [product] to build it instead of buying a 3d party, we tried to stay with [product]. We did that a year after go-live; well not quite a year – about 9 months after go-live before the next fall, we actually built that in to use….. and it pretty much provides the same type of functionality as the other system.

Q. What's the process that you use here with [institution] and IT staff when you identify an issue like this that you need a bolt-on…. What's the process for requesting it for getting it approved, because it ties up resources, so how does that work?

APPENDIX O: RESEARCH DATA CODES

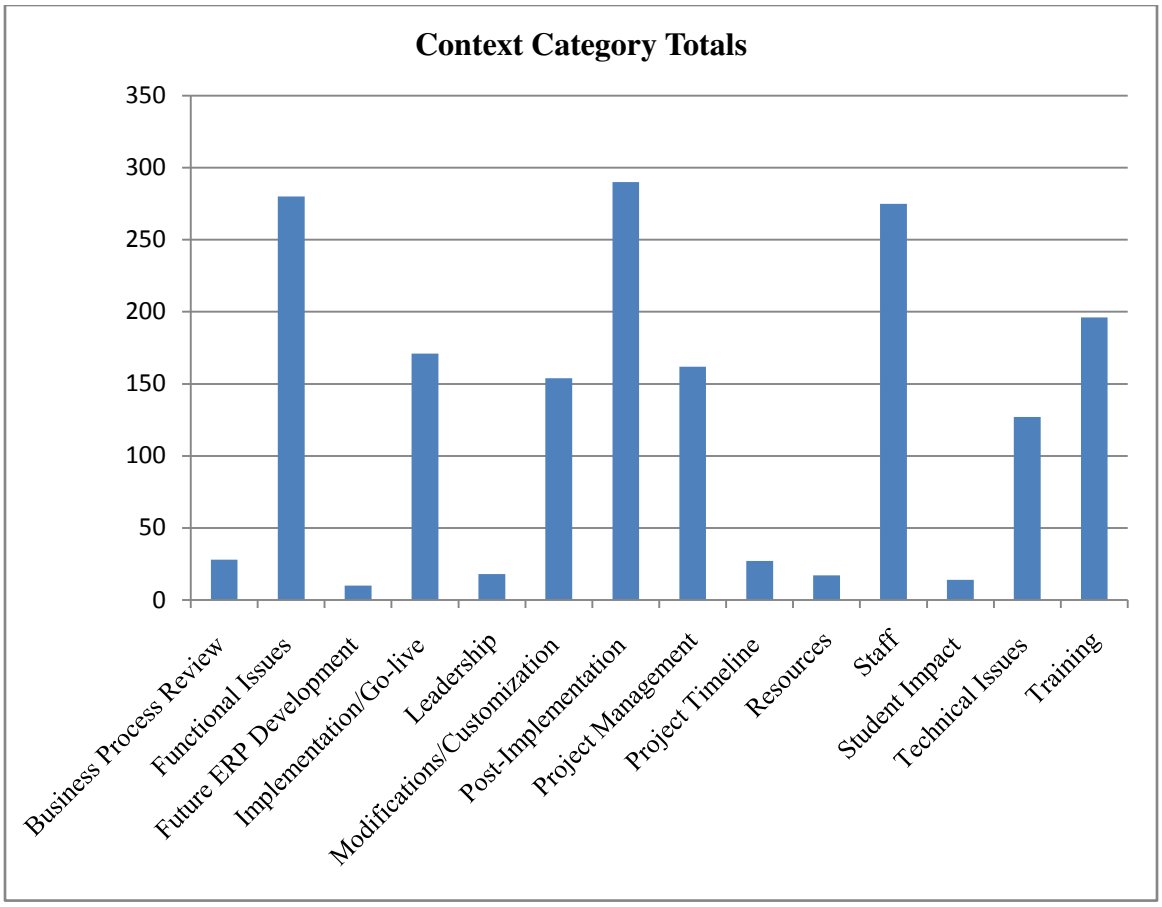
Participant Job Category Codes		
ANC:F&A ANC:HR ANC:IR PM SA-F:AA/Fac SA-F:Admit Admin	SA-F:Dept End-Users SA-F:Reg Admin SA-F:Security Admin SA-F:SFA Admin SA-F:StAcct Admin	SA-F:Tng SA-T:CIO/CTO SA-T:IT Mgt SA-T:IT Proj Mgt SA-T:IT Technical

Major Category Codes		
Business Process Review Functional Issues Future ERP Development Implementation/Go-live Leadership	Modifications/Customization Post-Implementation Project Management Project Timeline Resources	Staff Student Impact Technical Issues Training

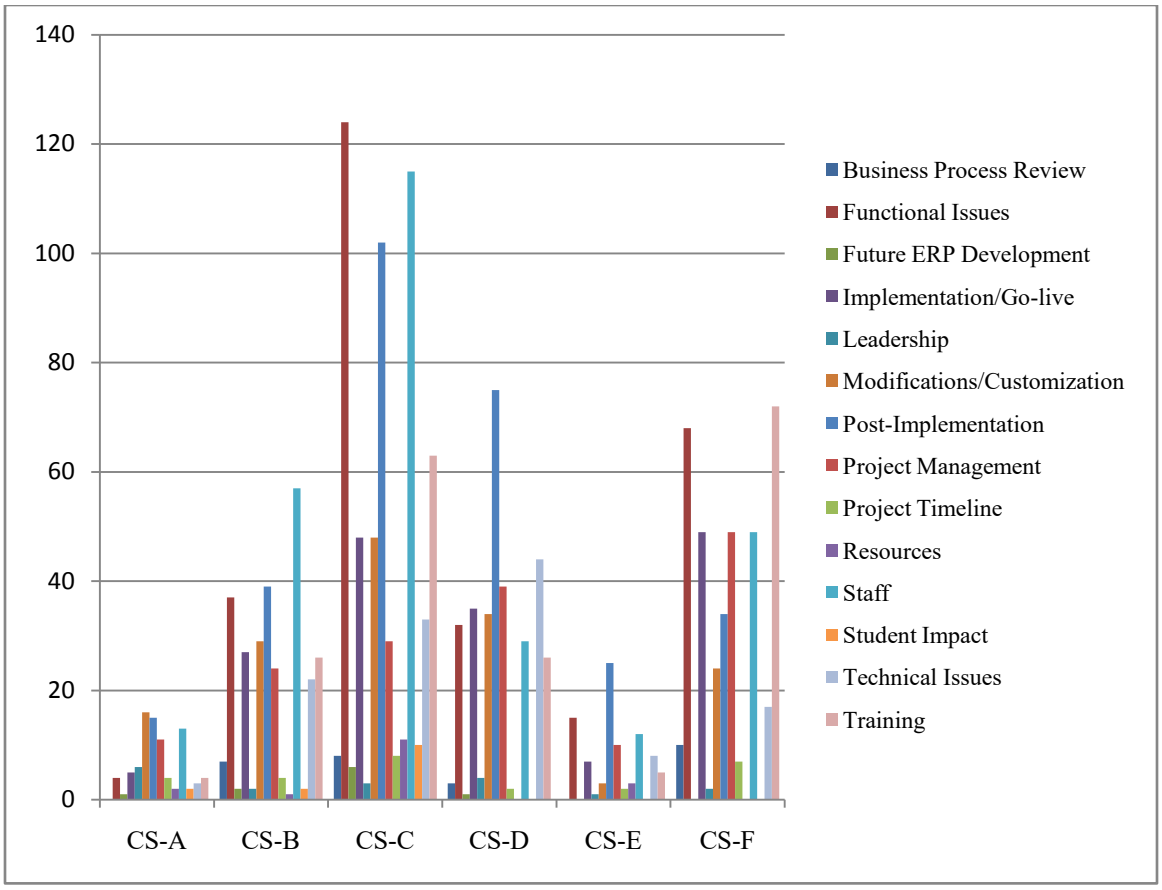
Detail Category Codes		
ADMINISTRATION ADMINISTRATION:=policy ADMINISTRATION:=politics APPLICATION APPLICATION:=delivered APPLICATION:=hardware APPLICATION:=performance APPLICATION:=tools BUDGET BUDGET:=resources CHALLENGES CHARACTERIZE CHARACTERIZE:=experience COMMUNICATION COMMUNICATION:=listserv, web CUSTOMIZATION:=bolt ons CUSTOMIZATION:=mods CUSTOMIZATION:=third party CUSTOMIZATIONS DO_DIFFERENTLY FUNCTIONAL:=functionality FUNCTIONAL:=users	GO-LIVE IMPLEMENTATION IMPLEMENTATION:=software IMPLEMENTATION:=Vanilla ISSUES MISC:=important MISC:=timeframes MISC:=timeline OFFICE:=Admit OFFICE:=Bursar OFFICE:=Fin Aid OFFICE:=HR OFFICE:=Registrar ORGANIZATION:=structure POST-IMPLEMENTATION POST-IMPLEMENTATION:=surprises PROCESS PROCESS:=BPA, BPR PROCESS:=changes PROCESS:=decisions PROCESS:=planning PROJECT	REPORTING SECURITY STAFF STAFF:=knowl* STAFF:=position* STAFF:=relationships STAFF:=skill* STAFF:=turnover SUCCESSES SUPPORT:=consult* SUPPORT:=helpdesk SUPPORT:=testing TEAMS TEAMS:=committees TEAMS:=feedback TEAMS:=meetings TECHNICAL TECHNICAL:=DBA TECHNICAL:=developers TECHNICAL:=interface TECHNICAL:=server TRAINING UPGRADE

APPENDIX P: RESEARCH DATA CODING RESULTS

Total Case Study Institution Coded Responses by Major Category Code Area



Major Category Coding Results by Case Study Institution



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