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Characteristics and success of information systems development efforts in public school systems

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CHARACTERISTICS AND SUCCESS OF INFORMATION SYSTEMS

DEVELOPMENT EFFORTS IN PUBLIC SCHOOL SYSTEMS

By

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ABSTRACT

Characteristics and Success of Information Systems Development Efforts in Public School Systems

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This thesis discusses the differences between traditional businesses and schools regarding information system project management, by analyzing several project characteristics and how they affect educational end-user perceptions of system successes. While many other businesses have mastered the project management processes, school districts are just now beginning to see that such processes and techniques are even necessary.

Here we use survey data from school teachers and administrators, along with two case studies to investigate factors that impact the success of information system development projects among Nevada public schools. The results highlight areas that are either currently lacking, or need to be focused on, in school districts, such as training, type of implementation, communication, the involvement of end-users and project champions.

This study will help provide school districts and their project managers with information that can help mitigate the risks associated with information system development and implementation within school districts.

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CHAPTER 1

INTRODUCTION

Developing and implementing new information systems for schools has some unique challenges. Public schools, unlike many other businesses, are laggard organizations where changes occur slowly. For example, math and science were not curriculum areas of intense focus in the United States until a study done in 1983 showed that the United States was lacking strength in those subjects, compared to other countries (National Commision on Excellence in Education, 1983). Schools also have unique decision making processes, due to politics, because schools are within a hierarchical bureaucratic system. School boards and governmental agencies that make the decisions are often far removed from the actual needs and requirements of the individual schools that are affected by those decisions. Simply put, elected officials in Washington, D.C. create legislation that affects even the smallest educational communities, like Duckwater, NV. In addition, schools have distinct cultures that are client-centered because they are most concerned about what is best for their students, yet the overall atmosphere is staff-centered because it is quite often completely determined by the personalities of the individual staff members (Sandovnik, Cookson, & Semel, 1994).

The project management procedures that have been part of accepted business practices for many years have barely begun to become a necessity in school districts. Until recently, school districts never had to adapt to the fast paced changes that technologies today's information age require. Most technology concerns that schools faced regarded curriculum software and running programs on donated and dated hardware. School districts are "flying blind" in regards to the development and implementation of their information systems because these systems are often more technologically advanced than what they have had to use in the past. Since school districts lack technological experience, compared to other businesses, they often look within themselves, and other school districts, for answers to their technology concerns. They tend to try and re-create the procedures that are needed for the implementation of their technologies. While many other businesses have basically mastered the project management processes, school districts are just now beginning to see that such processes and techniques are even necessary.

This thesis will focus on how project characteristics affect the perceptions of success of a system within a school district. This study will begin with a literature review that focuses on some of the accepted project management processes that many businesses use today and how school districts have historically dealt with comparably managing large and/or significant changes. With this literature review, we can also see reasons for the perceptions about an information system's success or failure.

Next, we explore project characteristics and perceptions of success with a dataset of survey results from school district end-users. We developed several statistical models from the survey and the results show a number of trends. These trends highlight the end-user perceptions about a system's execution of proposed functions after implementation, the ease of their job after the implementation, their productivity, and their overall satisfaction with the system. Using these trends, we can see strengths and weaknesses in the development and implementation processes that school districts have followed.

Finally, we utilize case studies from both urban and rural school districts which explore the findings of the literature review and survey results. These case studies identify additional facts about the processes and procedures that school districts follow relating to the implementation of student information systems. These case studies allow us to make comparisons regarding the proven project management processes used by businesses and what occurs, currently, in school districts.

This study is the first paper of its kind; we will use this study to determine specific project success factors particularly relevant in school districts. We will be focusing on accepted best practice procedures that school districts are currently overlooking, and providing processes that should be considered in school districts for the development and implementation of student information systems. By understanding the history of education, acknowledging the present political environment that surrounds education today, recognizing how systems are currently implemented in schools, and observing end-user perceptions of those implemented systems, we will be able to form concrete theories about project management procedures for school districts. This study will help to determine the project characteristics or procedures that effect perceptions of system success in order to provide school districts and their project managers with information that can help mitigate the risks associated with information system development and implementation within school districts.

In chapter 2, the literature review, we will visit some of the accepted project management procedures that businesses follow, and the circumstances that have historically affected school districts, to help better understand the position of school districts and the invariable effect on their use, development, and implementation of student information systems. In chapter 3, we use a review of the literature to develop a theoretical model and hypotheses about the impact of certain project characteristics on the perception of system success. In chapters 4 and 5 we develop a research model and use a survey dataset to test perceptions of system success based on different project characteristics. In chapter 6, we utilize case studies from two Nevada school districts to corroborate our inferences about the impact of project characteristics. In chapter 7, we discuss the cases and relate what has been discovered from the real world experiences of the two districts to the findings of the survey data and literature review. In chapter 8, we summarize this thesis by bringing together all that has been shown in the literature review, survey data and analyses, and case studies.

CHAPTER 2

LITERATURE REVIEW

Very little has been written about project management procedures within school districts. There is much written describing the project management processes found in traditional businesses. In this chapter, we include the history of change, the financial resources, and the culture of school districts, all of which affect the use, development, and implementation of information systems in school districts.

When a business is preparing to implement a new information system, there are numerous accepted best practices that guide businesses as they undergo a series of essential steps. Basically, there is a need that has been identified and IT appears to be the solution. The business puts forth an issue, and alternative solutions are evaluated.

Problem Analysis

First, the problem is analyzed to see if a solution can be reached with an adjustment to business practices or if new IT is required, and then, can an existing system be minimally adjusted or is an entirely new system possibly needed (Blum, 1994).

In school districts, however, when a problem has been identified, that problem is usually analyzed by an outside governing body. Historically, changes that have taken place in school districts were as a result of changes being determined, as needed, by outside entities. Then decisions about those changes were being made by governing bodies. All of these decisions took extended periods of time to be consummated.

Technology requirements were never really a significant matter for schools to consider until recently. Basically, changes that took place regarding schools dealt with who was being taught and what they were being taught (Katz, 1971; Sandovnik, Cookson, & Semel, 1994). From the earliest of times in America, schooling consisted of boys reciting lessons in front parlors, and decisions about schools were made by the governing bodies of the area. Eventually, decisions, still being made by the government, were regarding concepts such as girls being allowed to be taught, and then Blacks being allowed to be in the public school system. Classic subjects such as philosophy were discarded for subjects more focused on the math and sciences. Governmental reports, such as "A Nation at Risk" (National Commision on Excellence in Education, 1983) consumed the nation with America's world-wide academic competitive advantage.

Eventually, simply regulating curriculum and teacher credentialing was no longer enough. Accountability became the focus of American education. The No Child Left Behind Act of 2001(NCLB) (United States Congress, 2002) became the driving force for many of today's educational changes. Instead of clarifying who was to be taught and what was to be taught, it imposed stricter teacher qualifications and mandated that all students' test scores improve annually. There are also federal reporting requirements and mandated parental involvement and accessibility requirements. "The term 'parental involvement' means the participation of parents in regular, two-way, meaningful communication involving student academic learning and other school activities… (Department Of Education, 2006)."

Although, this legislation did not state that school districts were required to implement new information systems, they were needed. Systems were needed that could compile student data for federal reporting, in the manor required by the reporting standards. Systems were also needed that could allow parents direct access to their student's information, including attendance and up to date assignment and grading information (Darby & Hughes, 2005).

Schools have traditionally remained years behind with technology. The advancement in student information systems has only boomed in about the last 15 years (McIntire, 2004). Today, many schools have implemented web based student information systems to comply with the regulations and provide "two-way, meaningful communication". Parents and students are able to access their current grades, see homework assignments, read notations from the teachers, and e-mail teachers and other school personnel. This is when it became necessary for school districts to finally be thrown into the need for project management. Student information systems needed to be developed and implemented to meet the needs of the government, the schools, and the parents.

Financial Analysis

After determining what projects may be necessary to solve their problem, the second procedure that many businesses follow is when financial considerations are weighed and measured. It is critical for a system to be properly planned and managed because financial resources are often limited (Lippert & Anandarajan, 2004). Many companies determine whether or not to first look to an IT solution when much less expensive options are frequently available. Simple process and data flow analyses can yield many opportunities for removing inefficiencies from a process, a department, an organization, etc. Other than IT infrastructure projects, business needs and requirements drive all organizational spending. Different types of projects or options to resolve the issue at hand are analyzed while focusing on cash flows and Net Present Value (NPV). A business case is developed. The business case tries to identify both the cost and the recovery aspects of a given proposed project, and should result in a proper evaluation of a return on investment (ROI). The organization can then position a project's ROI against budgets and resources to evaluate the initiatives that should be undertaken.

In school districts, budgeting and finances are also critical. Funding for urban and rural schools is differentiated by the communities' population and the number of students attending school. The state finances the school districts based upon the number of students in attendance at the schools. Additional funding can come from districts or individual schools receiving grants or donations from the community. However, urban districts often have more community resources available than rural districts do. Therefore, urban districts often have many more resources and designated IT departments. Rural districts may not have any designated IT staff. Technology decisions and maintenance can often be left in the hands of a math or science teacher (Weinberger, 2004). The school districts financial/budgeting decisions are usually left in the hands of the school board. The school board consists of elected officials from the community. Board members read reports, hear presentations, and look at budgeting and accounting records. If the board is unable to approve certain spending requests schools and/or departments are free to obtain grants or donations from other entities for their projects. Therefore, schools are often left to their own devices to fund many technology initiatives.

Project Champion

Another process that occurs is after the business's project appears sound; a member of management becomes the project's champion and provides his/her full support. It has been shown that project success is linked to management involvement (Richardson & Ives, 2004). Depending on the size of the initiative, this support can be limited to being a part time advisor, or providing multiple resource full-time participants.

School districts, on the other hand, often do not have individual administrators that will champion a project when the decisions about the project are made by the school board. Often the School Board does not fully understand the necessities of the individual schools and/or the schools can not sufficiently express their needs and expectations. The following quotation best summarizes the position that school boards are in with respect to the schools that they are overseeing: "The further managers are from the day-to-day work of the agency, the more their lives are shaped not by the tasks the operators are performing or the goals the agency is serving but by the constraints placed on that agency by its political environment (Wilson, 1989)."

Requirements Analysis

Next, the business procedures determine that specific system requirements and project risks be assessed. It is important that this process involve those that will be effected by the project (Sorensen & Vidal, 2002). Involving the users allows for coordination for necessary changes and dealing with restructuring for unexpected problems in order to ensure project success (Applegate, Austin, & McFarlan, 2003). Simply talking with users is not enough, there needs to be a deep appreciation for every aspect of the various users' needs and expectations (Drummond & Hodgson, 2003). Requirements can be established by daily tasks being observed by system developers, by means of conducting interviews with end-users, and/or holding Joint Application Development (JAD) sessions (Peffers, Gengler, & Tuunanen, 2003). The JAD methodology consists of an executive sponsor or champion that defines a project idea. Then,a neutral JAD facilitator is assigned. Next, IS participants are identified; end-user participants should be selected for their functional, business, or task-specific knowledge. During the JAD session, participants should speak for all the technological creators and end-users, that will be affected by the system (Kettelhut, 1993). The involvement of users and developers in the information systems development process can most assuredly be one of the most important factors influencing implementation success or failure (Wong & Tate, 1994). Systems designed by end-users without restraint from IT typically become too customized and functionally complex. End-users typically try to design for every possibility regardless of how rare. Whereas, systems designed by IT without sufficient guidance from end-users tend to be too technically centered, and risk being too far removed from the end-users daily needs.

When considering any project, school districts already have specific requirements that they consider. Schools have goals that are significantly different from those of other businesses, and yet many schools can vaguely state what their goals are (Paul Jen-Hwa Hu, 2003; Wilson, 1989). School districts may spend many hours creating mission statements. However, those mission statements will essentially reflect the desires of the governmental legislations. With the NCLB Act leading the way, most mission statements will state that they will provide the best possible education to all students. Then, their true and ultimate goals are to meet the Acceptable Yearly Progress (AYP) requirements established by NCLB. Each and every student population and subpopulation must increase their test scores by a determined percentage amount. If those scores do not improve, schools do not meet AYP standards. If schools do not make AYP, they may be deemed "inadequate". If schools are deemed inadequate year after year, then further accountability steps are to be taken, and inevitably jobs are threatened (United States Congress, 2002). This ultimately creates an environment focused on students improving test scores.

Change Management

After determining requirements, another accepted process that businesses follow dictates that change management becomes critical and communication is essential (Chopra, 1999). A project manager will take into account risks associated with change management, as well as the project risks. A risk is "a combination of an abnormal event or failure and the consequences of that event or failure to a system's operators, users, or environment (Gluch, 1994)." Time management and risk management are key (Black, 2004). According to Wallace, et al. risk can be categorized into six dimensions. Those six dimensions of risk are organizational environment risk, user risk, requirements risk, project complexity risk, planning and control risk, and team risk (Wallace, Keil, & Rai, 2004). One example of a Risk Management Cycle consists of the following steps: identify that a risk exists, analyze the severity of the risk, plan to combat the risk based on the risk's severity and likelihood of occurrence, mitigate the risk, and track it once the risk has been mitigated to an acceptable severity level, the risk should be tracked to ensure the continued control of the risk (McManus, 2003). Besides scheduling project milestones, a project manager is scheduling frequent communications with the manager champion and the system's end-users, as well as training times. One of the early deliverables in any project is the communication plan. In the communication plan, schedules are created for as many communications as possible. One such communication could be a risk planning session, with a facilitator (McManus, 2003). "Project managers need to understand that uncertainty created by organizational change can influence a project. (Winklhofer, 2002)."

When considering school districts and change management along with risk, one realizes that the culture of a school ultimately defines what is necessary for change and risk management to be successful. The culture of a school is directly related to the teachers and staff within that school. Usually, the culture is firmly established. Teachers and staff personalities and relationships amongst themselves determine how other individuals and other ideas will be received into a school (Meranto, 1970). The demographics of the teachers in the school also add to this equation. Schools with a staff comprising of mostly older and more experienced teachers may find that newer ideas, technologies, and people are not easily accepted. As Herbert Simon said, "One does not live for months or years in a particular position in an organization, exposed to some streams of communication, shielded from others, without the most profound effects upon what he knows, believes, attends to, hopes, wishes, emphasizes, fears, and proposes (Simon, 1997)." Schools with younger and less experienced teachers may find new ideas, technologies, and people are readily accepted and often tried and used on an ever changing basis, also creating an atmosphere of instability and uncertainty. Whichever culture a school consists of, it is often the case that the culture of IT personnel and educational personnel will always be in conflict. Many educators believe that IT is a service or a process, not part of the actual instructional mission of the school (Brody).

Validation Phases

When a business's IT system is being developed, there are the validation phases, the build phases, and the entire testing cycle that is undergone. The end-users must be intimately involved in reviewing and signing off on the design, as well as working with the developers to unit/string test and again sign-off before entering the integrated system testing phase. Integrating the end-users into the testing cycles is critical for buy-in and ownership (Keen, 1991; Landles, 1987). End-users review and sign-off all along the way, this allows minor tweaks initially, which will save significant rework down the road. The closer users are to the developing products, the easier it will be for them to understand the developers concerns about changes (Garcia-Duque et al., 2006). The farther down the implementation path you are, the more costly any change will become because the developers may have possibly committed subsequent design decisions on some foundational requirements, they have probably developed all the training documentation, they have also possibly committed coding, and not to mention, testing effort to any given requirement. Changing later in the implementation cycle has ripple effects which makes changes much more costly later in the process. That is typically why late changes are taken into account in a subsequent release. Breaking-up large projects into smaller ones reduces the complexity and resistance to change from the organization (Drummond & Hodgson, 2003). Changes that occur from one stage to the next can result from deliberate business decisions or by mistake, either way, if an attempt is made to return to a previous stage it can be both expensive and risky (Rajlich & Bennett, 2000).

Implementation Phases

Finally, the information system is built, but that is rarely the end of the project. Often, the system is implemented in a trial location as a pilot program or phased into the workplace in parts or versions. Frequently, feedback from end-users is obtained and adjustments to the system are made. The feedback and continuous improvement loop is critical for ownership, as well as getting the most potential out of the investment. This process is usually formalized to ensure that on-going system change management (as opposed to people/organizational change management) is as effective as possible. It is necessary to follow-up on decisions that are made in order to ensure that the outcomes are the same as what was planned at the time of the decision (Borges, Pino, & Valle, 2005).

School districts, however, will often consult experts and legislated requirements rather than teacher end-users when they implement a system. Many teachers are trained with little to no reliance on technology, so teachers are highly reluctant to use many technologies. Specialists, like teachers, often think they are not equipped to attempt new work, and are likely to resist change. Also, their job contract is unlikely to include any mention of operating new technologies (Landles, 1987). Teachers want and need technology training (McCarthy, 2006; Paul Jen-Hwa Hu, 2003). However, findings suggest that technology acceptance will only follow after the technology has been perceived as useful and relevant to the job (Jen-Hwa Hu, Clark, & Ma, 2003). Schools with established cultures will find a great resistance to change from the teachers when trying to implement new information systems unless the teachers completely understand the usefulness of the system towards their goals of educating students.

Training

Business training sessions occur prior to full implementation and then follow-up trainings and support are usually the norm. The logistical effort in delivering the training should not be underestimated. It is a huge effort to coordinate large numbers of users. Training must be completed in the shortest amount of time possible and closest to going live, but the business must continue to run while large numbers of their people are being asked to dedicate a significant amount of time and effort to training for the new system.

In education, when the system is perceived as a useful necessity, teachers want and need to be able to understand the system and how to use it. Trainings during college courses, or in-service days, are often insufficient. A teacher's day is consumed with teaching students. Finding time to use a technology system extensively is rare. Unless teachers are extremely comfortable with a system, or have sufficient support with a system, they will remain reluctant to use the system.

The literature has shown that there are established project management best practices and there are steps and processes that should be followed to ensure successful system development and implementation. Schools have been shown to change slowly over the centuries. Decisions and financial resources are usually made for the schools by other outside entities. The cultures of the schools are usually strong and determined by those that teach within the schools. These are the end-users that are essential to the accepted use, or ultimate failure, of a district's student information system.

CHAPTER 3

THEORETICAL MODEL AND HYPOTHESES

Upon the consideration of school districts' laggard comprehension of the project management processes some general assumptions become prevalent. The following hypotheses relate concepts associated with school districts such as teachers as end-users, a district's available financial and technological resources, the different types of systems found in school districts, conditions from school districts that make the use of a system mandatory, end-users being allowed input during the development and/or implementation of IS, and the training characteristics with the end-user perceptions of a system stated as the system's execution, the ease of one's job, the end-user's productivity, and the overall satisfaction with the system. This chapter will describe these hypotheses.

Teachers as End-Users

Most teachers lack technical training and thirst for more and more training to fully understand the purpose of a system in relation to their ultimate duties to educate students. Teachers tend to believe that systems will execute (perform their intended functions) as they should. Being that the system is being purchased by other outside entities that have deemed it to be necessary; teachers that are not trained to fully understand the purpose of a system would tend to trust that it is performing as those who purchased it intended.

Hypothesis 1(a): If the end-users are teachers they are more satisfied with the system's execution.

Since teachers lack technical training their time spent trying to understand and use the system will add tasks to their already full work day. The system will be considered as an additional burden to undertake rather than a tool to make their job easier.

Hypothesis 1(b): If the end-users are teachers they are more dissatisfied with the ease of their job.

A teacher views their job from the perspective of educating students. When a system is implemented that they do not fully understand, which adds to their tasks within their daily routines, they are distracted from their ultimate goal of education and would feel as if their productivity is declining.

Hypothesis 1(c): If the end-users are teachers they are more dissatisfied with their own professional work productivity.

Teachers that are lacking training with technology will become frustrated by the use of the technology. Whether or not a system performs its functions well, those that are not accepting the system's use well will not view it satisfactorily.

Hypothesis 1(d): If the end-users are teachers they have an overall dissatisfaction with the system.

Available Financial and Technological Resources

Districts that have more financial resources usually have dedicated technology departments as well as more students. The end-users in these districts experience high work volumes, yet more resources to help them with their technological issues.

Therefore, those districts that have more available resources will be able to purchase systems that appear to meet more of the end-users needs.

Hypothesis 2(a): If the school district has more financial resources, end-users will be more satisfied with the system's execution.

Districts that have more available resources have more help available to end-users that are in need of assistance. When end-users do not need to overcompensate for problems they may be having with a system they will not see any added burdens placed on their job tasks.

Hypothesis 2(b): If the school district has more financial resources, end-users will be more satisfied with the ease of their job.

When the end-users feel as if their job is not being encroached upon by a new system because they have plenty of help available or the system has been purchased with sufficient error proof functionalities their feelings of productivity can continue to improve.

Hypothesis 2(c): If the school district has more financial resources, end-users will be more satisfied with their own professional work productivity.

When the end-users feel as if their job is not being encroached upon by a new system because they have plenty of help available or the system has been purchased with sufficient error proof functionalities their feelings of satisfaction with the system can remain positive.

Hypothesis 2(d): If the school district has more financial resources, end-users will be more satisfied with their overall satisfaction with the system.

Type of System

When considering the different types of systems that can be implemented it is imperative to remember that the end-users are educators. Since most teachers are not trained to use many technologies while in college, and due to the non-educational nature of some systems; the fact that an educators first job responsibilities are to the education of children becomes prevalent. Therefore, end-users will believe that a system will execute (perform its intended functions) as it should. Being that the system is being purchased by other outside entities that have deemed it to be necessary; those that are not trained to fully understand the purpose of a system would tend to trust that it is performing as those who purchased it intended.

Hypothesis 3(a): System types will have positive effects on the perceived success of the system's execution.

Most systems that are available to educators consist of tools that are designed to make their job easier. This concept is not only referring to student information systems. Some systems have been around for a long time, such as grade keeping systems, and use of these systems is more accepted among teachers.

Hypothesis 3(b): System types will have positive effects on the perceived success of the ease of their job.

Since most systems available to educators are products like tutoring software or grade book programs, teachers can view their job as being easier to do because they do not have to do everything "by hand". When end-users view systems as a means to make their job easier, they are also able to view their productivity in a more positive light.

Hypothesis 3(c): System types will have positive effects on the perceived success of their own professional work productivity.

Most systems, like grade book programs and tutoring software, have proven themselves to be useful to educators and thus are seen satisfactorily.

Hypothesis 3(d): System types will have positive effects on the perceived success of their overall satisfaction with the system.

Mandatory Use

Making the use of a system mandatory for technologically adverse educators makes buy-in almost non-existent. Therefore, frustrations run high and perceptions of the system's performance of its intended functions will be biased and unaccepted.

Hypothesis 4(a): Mandatory use of the system negatively affects perceptions of success for the system's execution.

Frustrated end-users will multiply the burden of being required to use a system with their already full day of work tasks. They will see the mandatory system as another hurdle to jump while they are trying to educate students, since they are mandated to use the system they will not be able to see the full purpose of they system or its functionality in the overall goal of educating children.

Hypothesis 4(b): Mandatory use of the system negatively affects perceptions of success for the ease of the end-user's job.

When end-users are mandated to use a system that they do not see the purpose as improving education, but mainly just adding more work to their day, they will feel as if they have to give up some of their normal work productivity. They feel as if time spent using the mandated system is time not spent educating their children.

Hypothesis 4(c): Mandatory use of the system negatively affects perceptions of success for the end-user's own professional work productivity.

Teachers that are frustrated by the use of the mandated technology use will not be accepting of the system and will not view it satisfactorily. Whether or not the system actually helps or hinders the teachers may not be considered when a teacher is focusing on the fact that they were required to change the way they work. The system invariably becomes the reason for all the problems in ones life because the system can not be accepted by the end-user.

Hypothesis 4(d): Mandatory use of the system negatively affects perceptions of success for the end-user's overall satisfaction with the system.

Allowed Input

Allowing input involves the end-users in the development and implementation processes which creates end-user buy-in and a feeling of ownership. Therefore, end-users are predisposed to the perception that the system will perform as expected.

Hypothesis 5(a): End-user input into the development and implementation processes positively effects perceptions of success with the system's execution.

End-users that have been allowed to provide their input or feedback, are anticipating the use of the system to be exactly what they need to make their jobs easier. When one anticipates their job becoming easier it often results in seeming easier.

Hypothesis 5(b): End-user input into the development and implementation processes positively effects perceptions of success with the ease of the end-user's job.

When the end-user has already bought into the concept of the system and its use, they have already prepared to incorporate it into their daily tasks and feel as if it is helping their productivity.

Hypothesis 5(c End-user input into the development and implementation processes positively effects perceptions of success with the end-user's own professional work productivity.

After being able to have their input heard and creating a sense of buy-in, end-users would be very satisfied with the system they helped create/implement. They would feel as if the system was exactly as they had antidipated and they were well prepared to accept whatever the system produced.

Hypothesis 5(d): End-user input into the development and implementation processes positively effects perceptions of success with the end-user's overall satisfaction with the system.

Training Characteristics

End-users should be trained as close to implementation as possible. Trainings should be done prior to implementation and those that occur later will add to end-user frustrations. Educators also need as much training as possible to make up for lack of knowledge in many cases or technology aversion in other cases. Well trained end-users are also equipped with sufficient help resources. Therefore, end-users that receive plenty of training at an early enough time, with adequate assistance when needed, will understand the systems functions better and view its execution favorably.

Hypothesis 6(a): Well-trained end-users have a positive perception of success for the system's execution.

End-users that receive plenty of training at an early enough time, with adequate assistance when needed, will be able to incorporate the system's use into their daily tasks without feeling as if their job tasks have become overburdened.

Hypothesis 6(b): Well-trained end-users have a positive perception of success for the ease of their job.

When end-users receive plenty of training at an early enough time, and are provided with adequate assistance when needed, they do not have to devote additional time and energy to trying to understand or troubleshoot a new system. Their time and energy can remain focused on their job, making their job seem easier. As end-users feel their jobs have become easier they are able to view their productivity as improving as well.

Hypothesis 6(c): Well-trained end-users have a positive perception of success for their own professional work productivity.

As well-trained end-users are able to perceive their jobs as being easier and more productive, so should they then be able to view the system with an overall higher satisfaction.

Hypothesis 6(d): Well-trained end-users have a positive perception of success for their overall satisfaction with the system.

Figure 3.1 is a graphical depiction of the positive and negative associations expressed in the previous hypotheses.

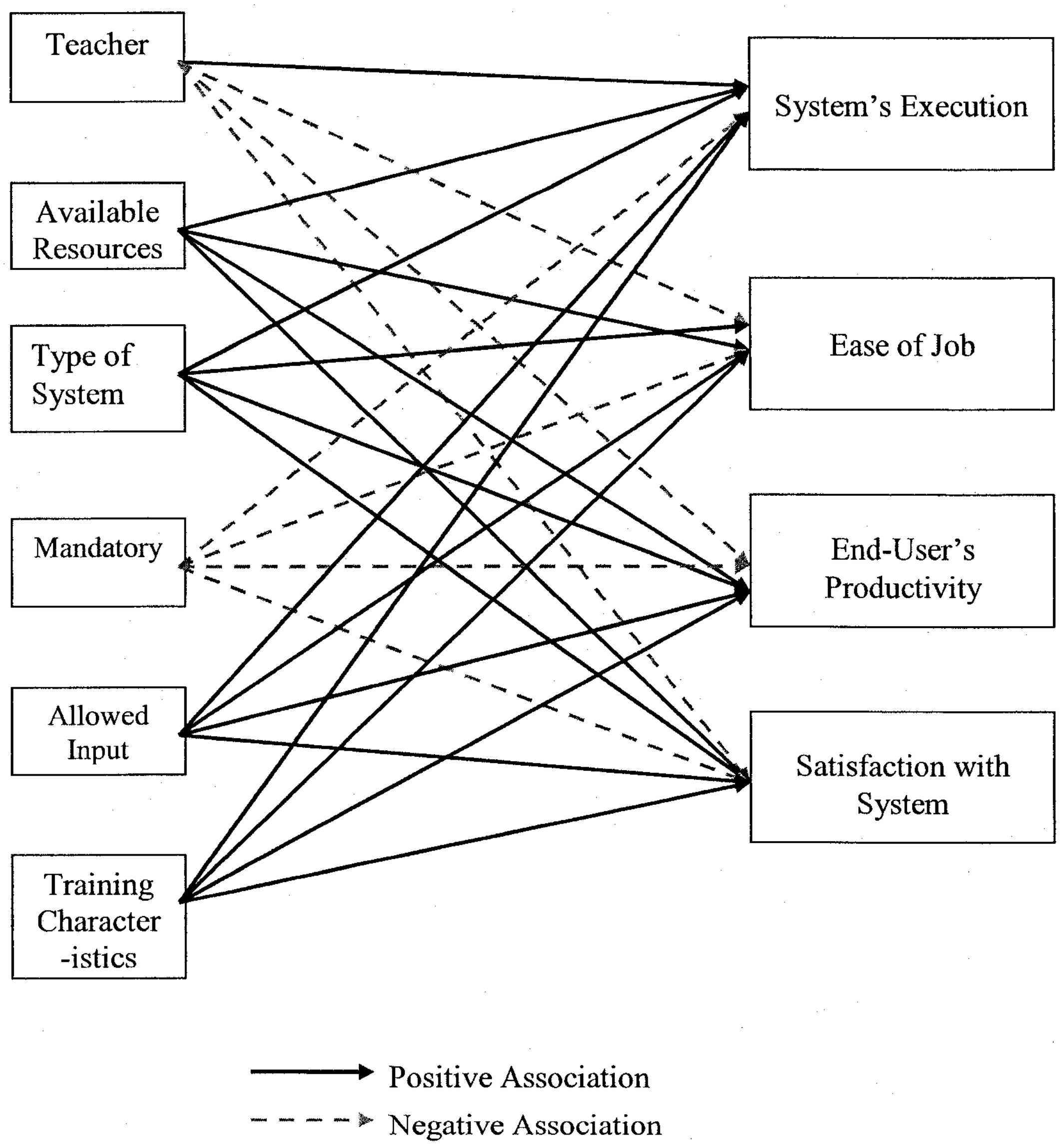

Figure 3.1 Theoretical Model for the effects of project characteristics on perceived system success

CHAPTER 4

DATA AND RESEARCH MODELS

To explore the expectations developed in the theoretical model, we obtained a dataset that resulted from a survey of teachers in Nevada. The survey was administered by Carol Hunn at a Nevada Educational Technology Leadership (NETL) conference in Reno, NV. The survey questions were regarding school district personnel experiences with the implementation of information systems (Hunn, 2006).

Survey Data

Table 4.1 shows selected sample characteristics for the respondents and system environments. The dataset included 57 observations. The average age of respondents was 49 and the average number of years of experience was 17. We broke down the age and experience data to show some additional details. We are able to see that the urban respondents are younger and less experienced than the rural respondents. This information helps us show that although the sample size of this dataset is fairly small it is still representative of the educational populations. The rural districts tend to have an older and more stable population, whereas the urban districts have a younger, more inexperienced, and more transient population. 86% of the respondents were teachers. This demonstrates that most of the end users effecting system implementation success are teachers. The dataset also contains a range of technological help that the end-users have available to them. Different system implementations were included in this survey, but since the focus of this thesis is on student information system implementations, this dataset appropriately contains a large percentage of respondents experiencing this type of system implementation. The data also contains responses that show several types of implementations. This table also includes the averages for the dependant variables.

Research Models

Like the theoretical model in chapter 3, and by the same reasoning associated with the hypotheses, Figure 4.1 shows the research model based on the variables measured by the survey data. Table 4.2 compares the theoretical concepts to the measures from the survey data, similar labels were used whenever possible. The theoretical model's concept labeled Teacher discusses teacher end-users, we use the measure labeled Teacher from the dataset for teacher respondents. We use the measures labled Urban and Size to represent the theoretical model's concept about school district available resources since these factors determine the financial and technological resources that a district might possess. We use the three dataset measures of a testing database, a classroom management system, and a student information system to represent the theoretical model's concept of different types of systems that could be found in a school district. We use the measure labeled Mandatory, for respondents who had indicated that the use of their system was mandatory, to represent the theoretical model's concept of mandatory use. We use the measure from the dataset labeled Allowed Input for responses regarding end-users having input into the development and/or implementation of a system. This measure represents the concept labeled Allowed Input in the theoretical model. We use three dataset measures called When Trained, Amount Trained, and Help to represent the theoretical model's concept labeled Training Characteristics.

Table 4.1 Survey Data Demographics

N							57
	Urban 58%		Rural 42%		Full Sample		
	Age	Experience	Age	Experience	Age	Experience	
Minimum	21	1	37	4	21	1	
25th percentile	42	8	47	15	47	10	
50th percentile	52	14	52	20	52	15	
75th percentile	57	21	57	26	57	24	
Maximum	65	33	65	40	65	40	
Median	52	14	52	20	47	15	
Mean	47.8	14.2	52.0	20.6	49.5	16.9	
Position							
Teacher							86%
Other							12%
School Staff							2%
Available Help							
School tech. dept.							37%
District tech. dept.							37%
Teacher							32%
Other (i.e. librarians, retired professional, etc.)							9%
Outside vendor							2%
Type of system that was implemented							
Student Information System (i.e. SASI or PowerSchool)							72%
Classroom management software (i.e. Grade Pro)							39%
Other (i.e. office automation, accounting, or human resources)							12%
Testing Database (i.e. IDEA)							7%
Type of implementation							
Cold Turkey							49%
Parallel							19%
Phased							19%

Dependant Variable	**Scale**	**Average**
System's Execution	0 – 4	2.28
Ease of Job	0 – 4	1.88
End-User's Productivity	0 – 4	1.70
Satisfaction with System	0 – 4	1.72

Table 4.2 Mapping Theoretical Concepts to Measures in The Research Data

Theoretical Model Concept	Measures from Dataset
Teacher	Teacher
Available Resources	Urban
Available Resources	Size (school)
Type of System	Student Information System
Type of System	Testing DataBase
Type of System	Classroom Management System
Mandatory	Mandatory
Allowed Input	Allowed Input
Training Characteristics	When Trained
Training Characteristics	Amount Trained
Training Characteristics	Help (available)

In the research model shown graphically in Figure 4.1, we mapped the conceptual variables to measures observed in the dataset. From teacher respondents, we expect to see positive associations to Execution with the remaining as negative associations. From urban and large school respondents the associations should all be positive. Respondents experiencing implementations of student information systems should produce positive associations with Execution while the rest are negative. Respondents experiencing implementations of testing databases should have positive associations with Execution, and Productivity with the remaining as negative associations. Respondents experiencing classroom management systems are expected to have associations that would be positive. Mandatory use respondents should have associations that should be negative. The independent variables When Trained, Amount Trained, Help, and Allowed Input should each produce a positive association with each of the dependent variables.

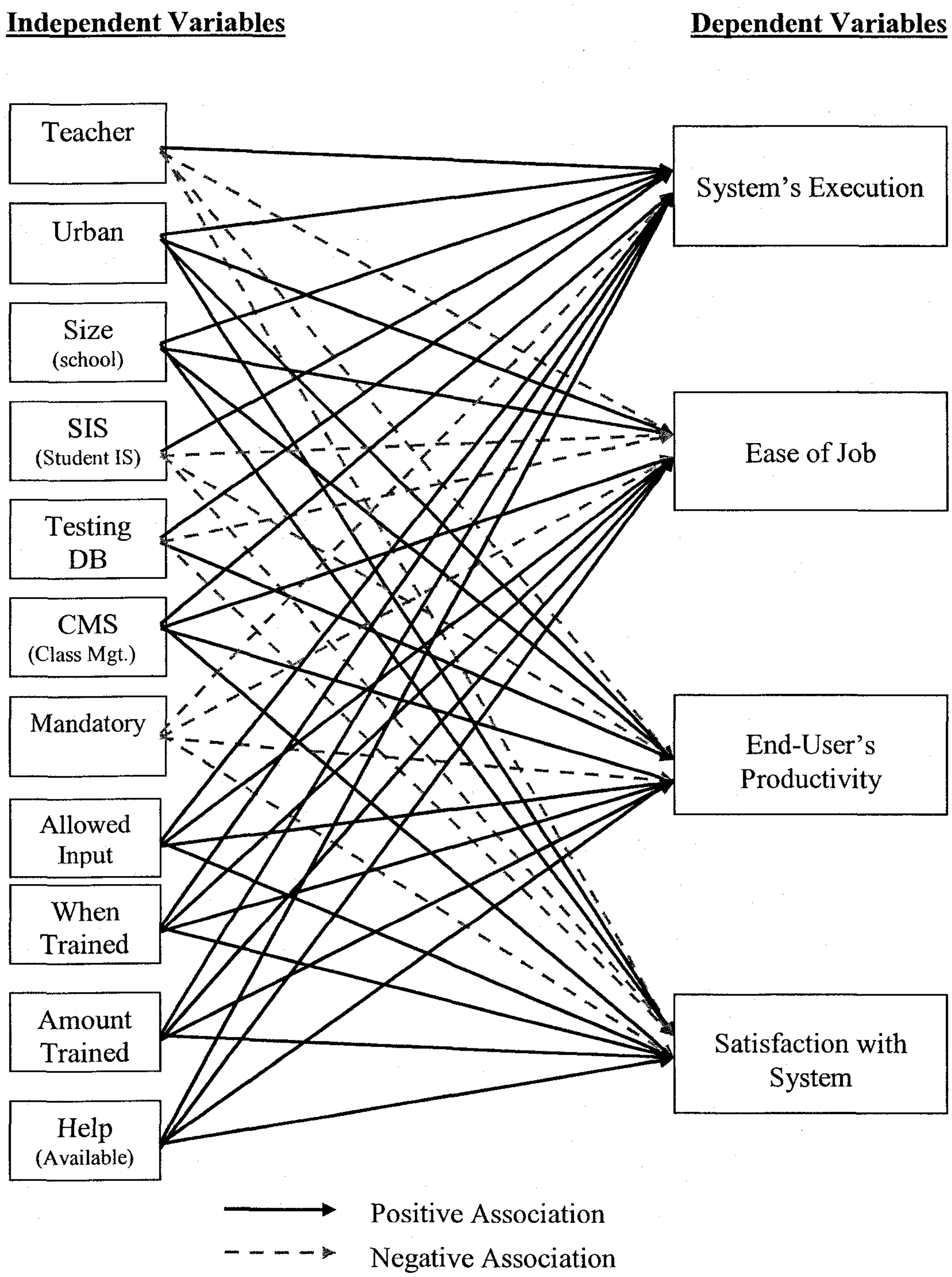

Figure 4.1 Research Model for the effects of project characteristics on perceived system success using survey measures

CHAPTER 5

ANALYSIS AND RESULTS

To analyze the data using our research model we developed the following four linear models. This chapter shows the linear regression models and the resulting values from their calculations. By analyzing these values we can deduce reasons for the trends found in the results.

The following research models (1 – 4) are linear regression equations. “Full” linear regression calculations were created for each dependent variable using all of the independent variables.

$$EX_i = \beta_0 + \beta_1 T_i + \beta_2 U_i + \beta_3 S_i + \beta_4 SIS_i + \beta_5 TD_i + \beta_6 CMS_i + \beta_7 M_i + \beta_8 W_i + \beta_9 A_i + \beta_{10} H_i + \beta_{11} I_i + \varepsilon_i \tag{1}$$

$$EA_i = \beta_0 + \beta_1 T_i + \beta_2 U_i + \beta_3 S_i + \beta_4 SIS_i + \beta_5 TD_i + \beta_6 CMS_i + \beta_7 M_i + \beta_8 W_i + \beta_9 A_i + \beta_{10} H_i + \beta_{11} I_i + \varepsilon_i \tag{2}$$

$$PR_i = \beta_0 + \beta_1 T_i + \beta_2 U_i + \beta_3 S_i + \beta_4 SIS_i + \beta_5 TD_i + \beta_6 CMS_i + \beta_7 M_i + \beta_8 W_i + \beta_9 A_i + \beta_{10} H_i + \beta_{11} I_i + \varepsilon_i \tag{3}$$

$$SA_i = \beta_0 + \beta_1 T_i + \beta_2 U_i + \beta_3 S_i + \beta_4 SIS_i + \beta_5 TD_i + \beta_6 CMS_i + \beta_7 M_i + \beta_8 W_i + \beta_9 A_i + \beta_{10} H_i + \beta_{11} I_i + \varepsilon_i \tag{4}$$

Where:

EX_i is the respondent’s perception that the system performed as expected.

EA_i is the respondent’s perception that the system made their job easier.

PR_i is the respondent’s perception that the system made them productive.

SA_i is the respondent's perception of the overall satisfaction with the system.

β_0 is the coefficient for the constant intercept.

T_i is 1 if the respondent is a teacher, 0 otherwise.

U_i is 1 if the respondent is from an urban district, 0 otherwise.

S_i is the interpolated school size, by number of students.

SIS_i is 1 if the respondent experienced a Student Information System implementation, 0 otherwise.

TD_i is 1 if the respondent experienced a Testing Data Base implementation, 0 otherwise.

CMS_i is 1 if the respondent experienced a Classroom Management System implementation, 0 otherwise.

M_i is 1 if the use of the system is mandatory, 0 otherwise.

W_i is the estimated number of months after the implementation.

A_i is the estimated number of hours of training received.

H_i is the amount of technological support/help a respondent has available on a scale of 0 to 3.

I_i is the amount of input a respondent had about the system that was allowed either before or after the implementation on a scale of 0 to 4.

The results of this analysis are shown in Table 5.1. The results suggest that employees in urban districts perceived that the resulting system made their jobs easier and overall they were satisfied with the system. They also imply that the employees in a larger size school perceived that the system made them more productive. The negative result suggests that employees experiencing an implementation of a testing database were overall not satisfied with the system. The results also recommend that employees perceived that the resulting system performed its intended functions (execution) when they received training prior to the system's implementation. They also propose that employees that have available technological help perceived that the system had acceptable execution as well as overall satisfaction with the system. Results for the remaining measures were not statistically significantly different than zero.

Table 5.1 Analysis Results of The Full Regression Models

	Execution Beta Sig. (t value)	Easier Beta Sig. (t value)	Productive Beta Sig. (t value)	Satisfaction Beta Sig. (t value)
Teacher	0.052 (0.407)	-0.007 (-0.050)	0.149 (1.004)	0.179 (1.571)
Urban	0.224 (1.475)	**0.395** ** **(2.340)**	0.271 (1.535)	**0.396** *** **(2.933)**
Size	0.198 (1.619)	0.173 (1.274)	**0.270** * **(1.901)**	0.072 (0.666)
SIS	0.137 (1.096)	0.052 (0.372)	-0.073 (-0.503)	-0.101 (-0.907)
Testing DB	-0.032 (-0.276)	-0.213 (-1.627)	-0.118 (-0.866)	**-0.257** ** **(-2.460)**
CMS	0.197 (1.380)	-0.016 (-0.098)	0.097 (0.586)	-0.111 (-0.874)
Mandatory	-0.170 (-1.361)	-0.064 (-0.461)	-0.141 (-0.974)	-0.112 (-1.009)
When Trained	**-0.273** ** **(-2.047)**	-0.068 (-0.462)	-0.222 (-1.433)	-0.146 (-1.233)
Amt Trained	-0.096 (-0.767)	-0.068 (-0.488)	-0.043 (-0.292)	0.005 (0.043)
Help	**0.386** *** **(2.813)**	0.158 (1.032)	0.120 (0.753)	**0.714** *** **(5.855)**
Allowed Input	-0.049 (-0.341)	0.152 (0.956)	-0.005 (-0.032)	-0.158 (-1.238)
R^2	0.453	0.323	0.261	0.567
F statistic	3.393	1.951	1.445	5.361
F significance	0.002	0.057	0.187	0.000

Significance: *<0.1 **<0.05 ***<0.01

We proceeded in a stepwise fashion to remove one independent variable at a time, the least significant, until all of the remaining estimated coefficients were significant at a "p" value greater than 0.1. The resulting regression models (5 – 8) are shown here.

$$EX_i = \beta_0 + \beta_1 U_i + \beta_2 W_i + \beta_3 H_i + \varepsilon_i \tag{5}$$

$$EA_i = \beta_0 + \beta_1 U_i + \beta_2 TD_i + \beta_3 H_i + \varepsilon_i \tag{6}$$

$$PR_i = \beta_0 + \beta_1 U_i + \beta_2 S_i + \varepsilon_i \tag{7}$$

$$SA_i = \beta_0 + \beta_1 U_i + \beta_2 TD_i + \beta_3 H_i + \varepsilon_i \tag{8}$$

The result of this analysis is shown in Table 5.2. Those variables that had a strong significance before reducing the equations became even stronger after, as well as other additional variables shown as significant. Results suggest that systems are perceived to perform as intended by urban district employees, by end-users that were trained early, and by employees that have acceptable technology resources/help available to them. This would seem to demonstrate that urban districts train earlier because they have more schools to train. Those urban districts also train more people and thus often train trainers or at least have more people to choose from within the schools to provide help. With more people trained sooner and available to help others there are more feelings of comfort with the system and thus that the system performs as intended.

The results also suggest that systems are perceived to make ones work easier by urban district employees, and by employees that have technological help available to them, but not by users that have experienced a testing database system implementation. Urban districts have more resources and help available – making work easier. The negative result with the testing database system respondents shows that educational end-users do not perceive this type of system as one that makes performing ones work easier.

The results suggest that employees from urban districts and from large schools both perceived the resulting system as making them more productive. Although there isn't a strong relation, systems in a large school and district could be perceived as assisting the users and making them more productive (because they have more resources). Also, individuals in large urban schools may be more willing to accept change and claim it makes them more effective (willing to allow a system to get the credit for some of their productiveness).

The results also suggest that systems are perceived to create overall satisfaction by urban district employees, and by employees that have technological help available to them, but not by users that have experienced a testing database system implementation. Like making ones job easier, more resources and help are available in urban districts thereby increasing satisfaction with the system. Also, considering the testing database system, most individuals that use new ones find that it often takes more effort to create a test from a database than create one manually or use a pre-made one. Thus, satisfaction is lacking when considering a new testing database system.

When considering the R^2 statistics, the model appears to "explain" more than 50% of the variation in employee satisfaction with the resulting system, more than 15% of the variation in employee productiveness, more than 26% of the variation in employee perceptions of their jobs being easier, and more than 35% of the variation in employee perception of the system's execution. The high "F statistics" suggest that overall the models are strongly significant.

Table 5.2 Analysis Results of The Reduced Regression Models

	Execution Beta Sig. (t value)	Easier Beta Sig. (t value)	Productive Beta Sig. (t value)	Satisfaction Beta Sig. (t value)
Teacher				
Urban	**0.371 ***** (3.274)	**0.441 ***** (3.639)	**0.262 **** (2.086)	**0.291 ***** (2.910)
Size			**0.273 **** (2.179)	
SIS				
Testing DB		**-0.221 *** (-1.825)		**-0.219 **** (-2.196)
CMS				
Mandatory				
When Trained	**-0.209 **** (-1.800)			
Amt Trained				
Help	**0.438 ***** (3.844)	**0.299 **** (2.529)		**0.649 ***** (6.680)
Allowed Input				
R^2	0.353	0.269	0.154	0.504
F statistic	9.642	6.501	4.923	17.965
F significance	0.000	0.001	0.011	0.000

Significance: *<0.1 **<0.05 ***<0.01

Next, we used factor analysis, with extraction at 0.8, and produced a rotated component matrix. Those factors that showed high loadings are displayed in Table 5.3. The variables were combined into what are called factor loaded components. The rotated component matrix shows that some of the independent variables created some more influential results for the dependent variables when they could be combined.

Table 5.3 shows the seven factors that were formed.

Factor 1, labeled "T", the respondent is a teacher.

Factor 2, labeled "UCMS", the respondent is from an urban district and experienced the implementation of a classroom management system.

Factor 3, labeled "LP", the respondent is from a large school with plenty of technological help available.

Factor 4, labeled "EPY", the respondent was trained early, has plenty of help available, and was allowed to add their input either before or after the system's implementation.

Factor 5, labeled "MSIS", the respondent experienced a student information system implementation that consisted of mandatory use.

Factor 6, labeled "TestDB", the respondent experienced a testing database implementation.

Factor 7, labeled "W", the respondent had a large amount of training.

Table 5.3 Rotated Component Matrix after factor analysis

	T	UCMS	LP	EPY	MSIS	TestDB	W
Teacher	0.948						
Urban		0.864					
CMS		0.816					
Size			0.894				
Help			0.546	0.640			
When Trained				-0.684			
Allowed Input				0.830			
SIS					0.860		
Mandatory					0.671		
Testing DB						0.979	
Amt Trained							0.935

We developed equations (9 – 12) using the factor loadings.

$$EX_i = \beta_0 + \beta_1 UCMS_i + \beta_2 EPY_i + \beta_3 MSIS_i + \beta_4 LP_i + \beta_5 T_i + \beta_6 W_i + \beta_7 TD_i + \varepsilon_i \quad (9)$$

$$EA_i = \beta_0 + \beta_1 UCMS_i + \beta_2 EPY_i + \beta_3 MSIS_i + \beta_4 LP_i + \beta_5 T_i + \beta_6 W_i + \beta_7 TD_i + \varepsilon_i \quad (10)$$

$$PR_i = \beta_0 + \beta_1 UCMS_i + \beta_2 EPY_i + \beta_3 MSIS_i + \beta_4 LP_i + \beta_5 T_i + \beta_6 W_i + \beta_7 TD_i + \varepsilon_i \tag{11}$$

$$SA_i = \beta_0 + \beta_1 UCMS_i + \beta_2 EPY_i + \beta_3 MSIS_i + \beta_4 LP_i + \beta_5 T_i + \beta_6 W_i + \beta_7 TD_i + \varepsilon \tag{12}$$

Where:

EX_i is the respondent's perception that the system performed as expected.

EA_i is the respondent's perception that the system made their job easier.

PR_i is the respondent's perception that the system made them productive.

SA_i is the respondent's perception of the overall satisfaction with the system.

β_0 is the coefficient for the constant intercept.

T_i is a respondent who is a teacher.

$UCMS_i$ is a respondent who is from an urban district and responding about the implementation of a classroom management system.

LP_i is respondent from a large school with plenty of help available.

$MSIS_i$ is a survey responding to a student information system implementation that consisted of mandatory use.

TD_i is a response about a testing database implementation.

W_i is a respondent who was well trained with a large amount of training.

EPY_i is a respondent who was trained early, has plenty of help available, and was allowed to add their input either before or after the implementation.

Table 5.4 shows results of the analysis using these models. The results suggest that employees in urban districts that experienced the implementation of a classroom management system perceived that the resulting system performed its intended functions (execution), made their jobs easier, and made them more productive. The results also suggest that employees who were trained early, have plenty of help available, and were allowed to add their input either before or after the implementation perceived that the resulting system performed its intended functions and with overall satisfaction. The results suggest that end-users from large schools with plenty of technological help available to them perceived that the resulting system performed its intended functions, made them more productive, and created overall satisfaction. The negative result suggests that employees experiencing an implementation of a testing database were not satisfied with the system overall. Results for the remaining factors were not statistically significantly different than zero.

Table 5.4 Analysis Results of The Full Regression Models using loaded components

	Execution Beta Sig. (t value)	Easier Beta Sig. (t value)	Productive Beta Sig. (t value)	Satisfaction Beta Sig. (t value)
UCMS	0.311 ** (2.603)	0.352 *** (2.699)	0.296 ** (2.199)	0.127 (1.055)
EPY	0.315 ** (2.395)	0.197 (1.373)	0.142 (0.957)	0.292 ** (2.213)
MSIS	0.018 (0.148)	0.014 (0.107)	-0.114 (-0.848)	-0.189 (-1.583)
LP	0.300 ** (2.298)	0.192 (1.347)	0.261 * (1.771)	0.369 *** (2.808)
T	0.047 (0.394)	-0.058 (-0.450)	0.106 (0.795)	0.090 (0.752)
W	-0.175 (-1.485)	-0.071 (-0.548)	-0.060 (-0.453)	-0.153 (-1.292)
TestDB	-0.052 (-0.456)	-0.174 (-1.393)	-0.106 (-0.818)	-0.228 * (-1.980)
R^2	0.395	0.279	0.229	0.389
F statistic	4.566	2.703	2.081	4.459
F significance	0.001	0.019	0.063	0.001

Significance: *<0.1 **<0.05 ***<0.01

We proceeded in a stepwise fashion to remove one loaded component factor at a time, the least significant, until all of the remaining estimated coefficients were significant at a "p" value greater than 0.1. The resulting reduced regression models (13 – 16) are shown here.

$$EX_i = \beta_0 + \beta_1 UCMS_i + \beta_2 EPY_i + \beta_3 LP_i + \varepsilon_i \tag{13}$$

$$EA_i = \beta_0 + \beta_1 UCMS_i + \beta_2 LP_i + \varepsilon_i \tag{14}$$

$$PR_i = \beta_0 + \beta_1 UCMS_i + \beta_2 LP_i + \varepsilon_i \tag{15}$$

$$SA_i = \beta_0 + \beta_1 EPY_i + \beta_2 LP_i + \varepsilon_i \tag{16}$$

The results of this analysis are shown in Table 5.5. Those variables that had a strong significance before reducing the equations became even stronger after, as well as other additional variables shown as significant. The results suggest that employees in urban districts that experienced the implementation of a classroom management system perceived that the resulting system performed its intended functions (execution), made their jobs easier, and made them more productive. Urban Classroom Management System users would have more choices of systems (different grading programs and lesson planning programs are more available in urban districts) therefore execution perception of these systems would increase. In addition, the old ways of doing things no longer seem more appealing and the new systems are allowed (by the end-users) to make things work easier and make them feel more productive.

The results also suggest that employees who were trained early, have plenty of help available, and were allowed to add their input either before or after the implementation perceived that the resulting system performed its intended functions and with overall satisfaction. Those individuals that are trained early, have plenty of help available to them, and are allowed to have input about the system will feel as if the system performs well because they have an easier time using it and can offer suggestions for improvement and feel as if they are being heard.

The results also suggest that end-users from large schools with plenty of technological help available to them perceived that the resulting system performed its intended functions, made their jobs easier, made them more productive, and created overall satisfaction. Large schools and plenty of technological help really do go hand in hand, and educators in this type of situation would feel very comfortable and accepting of a new system.

When considering the R^2 statistics, the model appears to "explain" more than 27% of the variation in employee satisfaction with the resulting system, 19% of the variation in employee productiveness, 21% of the variation in employee perceptions of their jobs being easier, and more than 36% of the variation in employee perception of the system's execution. The high "F statistics" suggest that overall the models are strongly significant.

Table 5.5 Analysis Results of The Reduced Regression Model using loaded components

	Execution Beta Sig. (t value)	Easier Beta Sig. (t value)	Productive Beta Sig. (t value)	Satisfaction Beta Sig. (t value)
Ucms	**0.328** *** **(2.974)**	**0.316** ** **(2.608)**	**0.306** ** **(2.496)**	
EPY	**0.280** ** **(2.216)**			**0.228** * **(1.720)**
Msis				
LP	**0.305** ** **(2.414)**	**0.316** ** **(2.609)**	**0.296** ** **(2.412)**	**0.377** *** **(2.840)**
T				
H				
Testdb				
R^2	0.363	0.210	0.190	0.278
F statistic	10.052	7.171	6.349	10.398
F significance	0.000	0.002	0.003	0.000

Significance: *<0.1 **<0.05 ***<0.01

Figure 5.1 shows the results of these analyses graphically. All of the regression models remained consistent and showed the same types of resulting suggestions whether the variables were alone or combined into loaded factors. The loaded factors just made the results stronger. This model shows the final associations supported by the data analysis of the independent variables and the dependent variables discussed throughout this chapter. This model, when compared to the research model in figure 4.1, shows that only 7 out of the 11 independent variables that were used from the dataset had significant associations to the dependant variables. As anticipated, Urban, Size, and Help had positive associations with the dependant variables Execution, Easier, Productivity, and Satisfaction. There were no significant positive associations with Testing Database systems, but the two negative associations that were anticipated were with Easier and Satisfaction. The two positive associations with CMS with Execution and Productivity were correctly anticipated. However, CMS was negatively associated with Easier which is not what was expected. This could be because the CMS variable had no significant results by itself, only when combined with Urban. Alone, the survey respondents do not appear to view CMS as a means of making their jobs easier. Once again, this relates back to the initial discussion about the demographics of the survey respondents (average age of 49 and average years of experience at 17), these respondents are quite possibly still not familiar with or comfortable with CMS as anticipated by the fact that Classroom Management programs have been around for a long time. Surprisingly, unlike what was anticipated, When Trained is negatively associated to both Execution and Satisfaction. When considering that the later one is trained the more frustrated they become with the system, however, explains why this result is found. Lastly, as anticipated, those individuals that are allowed input have positive associations with their perspective of the system's execution and their overall satisfaction with the system.

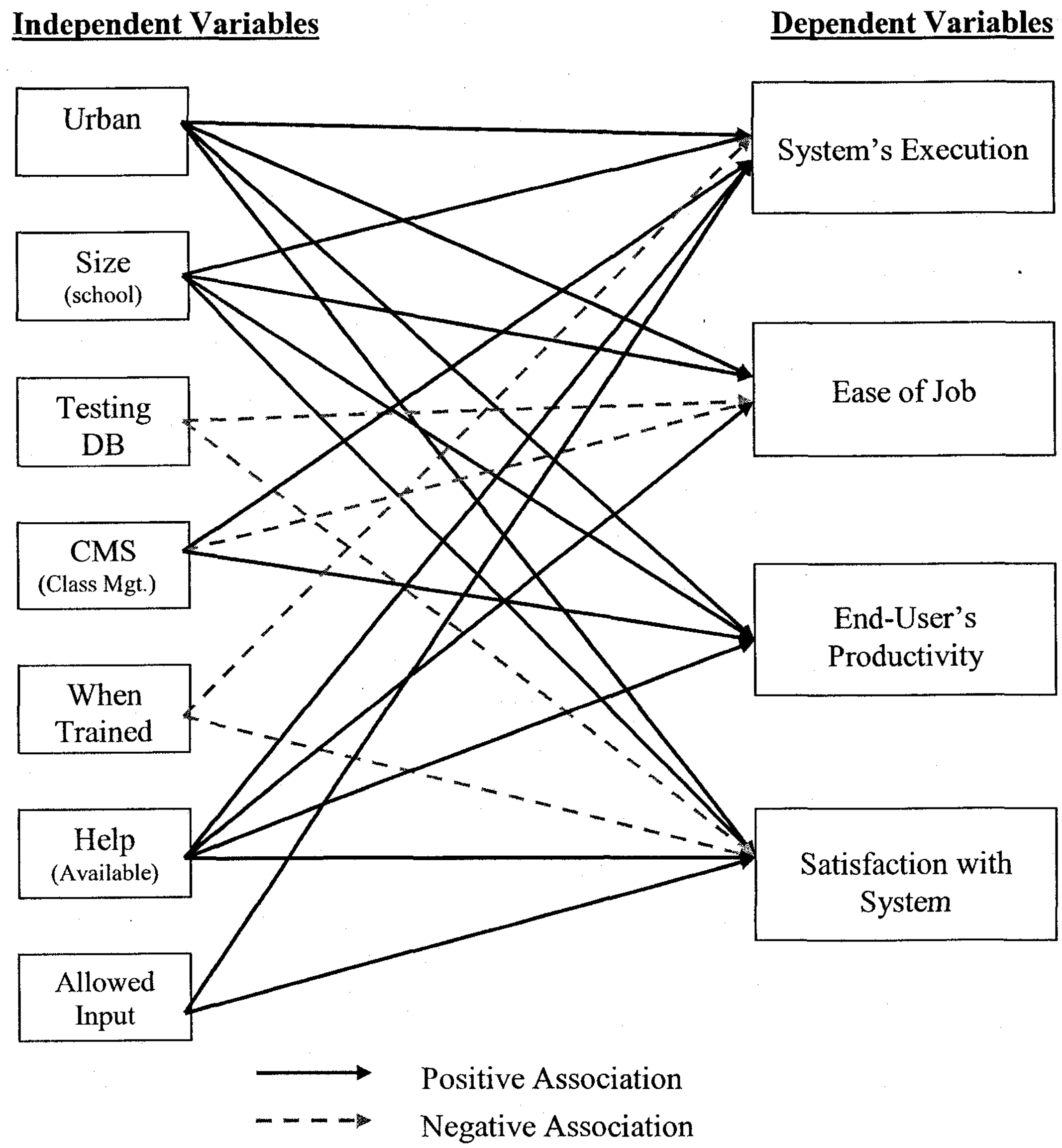

Figure 5.1 Final Model of Survey Data showing significant associations

CHAPTER 6

CASE STUDIES

In this chapter, we are exploring two case studies. We will be able to interpret the previous chapters' quantitative results and confirm their accuracy by understanding what currently occurs in school districts.

This chapter consists of the description of two Nevada school districts, Nye County and Clark County School Districts (Figure 6.1 shows their location and physical size within the state of Nevada). The cases contain background information about the school districts and what they were looking for in regards to a student information system. There is some information about the systems and the processes the school districts followed while implementing their current student information system.

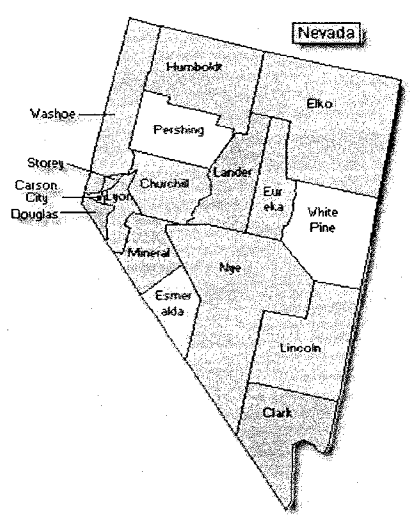

Figure 6.1 Map of School Districts in Nevada

Clark County School District Case Study

The fastest-growing county in the country is Clark County in Nevada. Clark County provides regional services for more than 1.8 million residents and 38.2 million tourists a year and occupies an area larger than New Jersey. The county itself was named for William Andrews Clark , who established the railroad between Los Angeles and Salt Lake City (Nevada Department of Education, 2006)." The Clark County School District (CCSD) is the 5th largest in the United States, it covers 7,910 square miles and operates 1,279 buses. The district consists of the following cities: Boulder City, Bunkerville, Glendale, Goodsprings, Henderson, Indian Springs, Las Vegas, Laughlin, Logandale, Mesquite, Mount Charleston, North Las Vegas, Overton, Sandy Valley, and Searchlight (Henderson, Las Vegas, and North Las Vegas constitute the largest populations). CCSD opened 10 new schools in August 2006. The district operates 199 Elementary Schools, 85 year-round Elementary Schools, 55 Middle Schools, 41 High Schools, 31 Alternative schools/Special Schools, and 17 magnet schools and programs. The official 2006-2007 enrollment is 302,763 students and CCSD employs 17,125 teachers (Clark County School District, 2006). Table 6.1 shows CCSD student to teacher ratios by grade level and subjects.

Table 6.1 CCSD Student to Teacher Ratios

Student enrollment			302,763			
Employed teachers			17,125			
Total operating schools			428			
Average number of students per school			708			
CCSD Student to Teacher Ratios						
All Schools 22:1	Kindergarten 26:1	Grade 1 17:1	Grade 2 18:1	Grade 3 20:1	Grade 4 28:1	Grade 5 29:1
Ave. Class Sizes for classes where students rotate to different teachers for different subjects.						
English: 25	Math: 27		Science: 28		Social Studies: 27	

Facts of the Case

Until the early 1990s, CCSD had a large mainframe student information system. The state of Nevada implemented an automated information system with a centralized database which school districts uploaded student information to on a regular basis. When the Y2K concerns became ever increasing, it had been determined that a new system was needed. CCSD purchased the only student information system that had made any major emergence on the market – Pearson School Systems' SASI. CCSD looked at what was available and observed the successful use of SASI in the Houston, Texas area schools. The individual in charge of finding the system had a business background, so he created a proposal with estimates and a project plan. State funds and bonds were issued to pay for the new student information system project. A project manager was hired and the project management process began. However, "politics" played a key role in getting tasks accomplished. The school board requirements and approvals were obtained, and in the midst of the implementation, a new CCSD Superintendent was named who did not provide his full support to the project. This caused friction amongst the IT department, the administration, and the schools.

The vendor, Pearson School Systems, sent personnel in to help set up the system. At the time of implementation, with the consultants and other technology department personnel, there were approximately 25 individuals working on the project. Today, there are 10 individuals, from the 160 person CCSD technology department, working solely with the SASI system. A committee was created using the implementation personnel as well as some district school principals. Extensive hardware needs were met by installing servers into all of the schools. The SASI system was first piloted in one area of the district. Then, the implementation was phased into the rest of the district. The elementary schools received the new system first and then the secondary schools finished the entire implementation process. The CCSD personnel from the project team trained thousands of end-users. Politics prevented solid support of the system and the change management process was inhibited.

Today, SASI is constantly being improved upon by the CCSD IT department. There are very few end-user requests for improvements any more. There are still some bugs in the system, that seem to be permanent, dealing with data integrity, but the problems can not be replicated so a solution can not be obtained. Future plans for the SASI system include online registration and more parental access to daily student information.

Nye County School District Case Study

Geographically, Nye County School District (NCSD) is one of the largest school districts in the country. Rustic, historic portions of the Old West can still be seen in the new modern Tonopah, which lies mid-point between Reno and Las Vegas and as such is the site of many state-sponsored conventions. Nye county is home to the Nellis Range, parts of the Nevada Test Site, the Stealth Bomber Group (of Gulf War fame), and the Yomba and Duckwater Indian Reservations (Nevada Department of Education, 2006).

"Our district is geographically one of the largest in the United States and clearly one of the most diverse. From our one room school house in Duckwater, the isolated but close community of Gabbs, the gold mining community of Round Mountain, historical Tonopah, the gateway to Death Valley through Beatty, the agricultural oasis of Amargosa to the expanding community of Pahrump, our school district covers some of the most interesting territory in the West (Nye County School District, 2006)."

Nye County has an area of 18,400 square miles, making it larger than the state of Maryland, and a population of 42,068. The seven communities which make up NCSD (Amargosa, Beatty, Duckwater, Gabbs, Pahrump, Round Mountain, and Tonopah) have a total student enrollment of 5471. The largest population is located in Pahrump. Tables 6.2 and 6.3 are district facts from 2006-2007 that can be compared to the CCSD facts.

Table 6.2 NCSD Student to Teacher Ratios

District-Wide Student/Teacher Ratio		Average Class Size: Grades 6 – 12	
Kindergarten	1/13	English	13
1^{st} Grade	1/17	Math	17
2^{nd} Grade	1/18	Science	19
3^{rd} Grade	1/20	Social Studies	22
4^{th} Grade	1/21		
5^{th} Grade	1/21		

Table 6.3 NCSD School Populations

School Populations			Pahrump Schools		
Amargosa	K – 8	194	Manse Elementary	K-5	512
Beatty Elementary	K-8	105	J.G. Johnson Elementary	K-5	658
Beatty High School	9-12	134	Hafen Elementary	K-5	586
Duckwater	K-8	8	Mt. Charleston Elementary	K-5	559
Gabbs	K-12	58	Rosemary Clarke Middle School	6-8	1261
Round Mountain Elementary	K-5	156	Pahrump Valley High School	9-12	1370
Round Mountain High	6-12	198	Pathways	6-12	134
Silver Rim Elem.-Tonopah	K-5	115	Early Childhood	3-5 yr	103
Tonopah Elementary	K-8	223			
Tonopah High School	9-12	162			
Classified Personnel		374			
Certified Personnel		433			
Administrators		27			

Facts of the Case

When it was determined that a new student information system was needed, NCSD had a total of two individuals who comprised the district's technology team. This team helped the district determine that there was a need to replace the old student information system (SASI). The DOS based SASI information system had been a thorn in the side of NCSD personnel since it was implemented in the early 1990's. Although NCSD was able to utilize its functions to a better degree than some other districts, the SASI system is still better suited for, and apparently designed for, school districts with student populations over 50,000. Although the geographical area of NCSD is one of the largest in the country, the student population is not quite 6,000. Therefore, SASI required constant managing and troubleshooting, and demanded the attention of an on-site technology department with the ability to perform programming adjustments.

Additionally, the district had an ever increasing demand from the State Department of Education to supply numerous reports. Every time a new type of report had to be created, the SASI system needed to be reprogrammed in order to produce the reports. As well, in accordance with NCSD's mission statement, and the NCLB Act of 2001, it was necessary that there be a method for families and communities to be involved with the education of their children. SASI was strictly an intranet based system that only school personnel could have limited access.

The process for which it was determined what requirements were essential for the new system was extremely simplified, and inadequate. The only requirements that they had determined to be essential for purchasing the system were that the system needed to be Web-based, for parental access, and the system already had to be in use somewhere within the state of Nevada. The search for a new system was limited very quickly, when it was established that the State was unofficially in support of the use of PowerSchool. They found that three other counties were using PowerSchool. The committee discussed the system with two other counties in the state that were already using the system. Those two counties were Lyon and Pershing counties. They obtained positive feedback, so they requested information and had a salesperson sent out. In December 2003, a sales demonstration was given to the school board, and approval was given for the purchase of PowerSchool which was to be implemented the following school year.

Description of the PowerSchool System

According to its website, at the time of NCSD's implementation, PowerSchool is a web-based student information system from Apple (PowerSchool is now owned and operated by Pearson Technologies) that provides real-time information to all stakeholders – over the internet. PowerSchool is platform independent, it can be accessed from any Windows or Mac computer with a web browser and supports Windows and Mac server platforms.

PowerSchool is a web-based application that resides on a centralized server, at the district office, and is accessed through an Internet or intranet connection. As a web-based, centralized application, PowerSchool delivers real-time information. As soon as any information is added or changed it's available to everyone. PowerSchool allows for all functions to be available at one time by navigating as you would within any website.

PowerSchool is designed for self-guided installation, rapid deployment, and easy upgrades and maintenance. For more complex deployments, PowerSchool offers a range of services to ensure successful installation and implementation. PowerSchool offers support services, training, and implementation services.

PowerGrade is a separate application, integrated into the PowerSchool system. Teachers use PowerGrade to manage student grades, attendance, progress reports, assignments, parent comments, and more.

PowerSchool Teacher is where teachers take attendance, view student information, print school reports, and record assignments and scores.

Parents and students use confidential school-assigned usernames and passwords via the internet to:

- Check student attendance, current grades and assignments, teacher comments, and lunch account balances.
- Email a teacher.
- Request automatic progress reports to be sent by email.

The PowerSchool reporting capabilities are state approved. PowerSchool also has the capability to link teacher's assignments and lessons to the Nevada State Standards. However, those standards have to be input into the system by the technology department.

The Implementation of PowerSchool

First, after the district had purchased the system, the state required that the updated 4.0 version be used. This suggestion came two weeks prior to the start of the new school year.

Next, PowerSchool sent implementation guidelines and procedures and held phone conferences to walk the technology individuals through the implementation process. Not all the suggestions were followed by the school district technology administrators. In addition, only secretaries were asked to supply input regarding report formats. The technology department, which by this time consisted of four individuals, spent two weeks solid updating every NCSD site, from Pahrump to Duckwater.

Then, approximately one week before school began, a core group, consisting of school administrators, site technology liaisons, and key teachers went to an in-depth two day training session, with the hope that they would become the experts for their individual schools. PowerSchool sent individuals to train the end-users and later training sessions were conducted by the school district's technology department.

Approximately three days before school was to begin, all teachers attended a half-day training session. A parallel implementation was taking place, as teachers were informed that they would still have to keep their own handwritten record books, and use the old carbon copy report cards for this first year using PowerSchool.

Finally, after about 5 weeks of using the system, there was another half-day training to assist teachers that had specific problems or questions.

The following are some of the comments made by individual teachers:

- "What is the purpose of getting a new system if it doesn't do what the old system could?"
- "I thought this system was suppose to make our lives a little easier, why do I need to keep track of everything in 3 different places?"
- "If the system is supposed to have all of these wonderful progress reports, why don't we [teachers] have access to them?"

- “I like that whatever is entered into Power Teacher is automatically integrated into PowerSchool.”
- “I’m sure it is a wonderful system, however, after that one day of training, I forgot about, or even how to use, most of the features they told us were available.”

For the first year after implementation teachers were required to keep a manual record book as well as the computerized system and they created report cards by hand. Manual record books were phased out during the second year of implementation. Handwritten report cards continued until the third year. Now, in the third year of implementation, there continues to be synchronization issues between PowerGrade and PowerSchool, report card aesthetics are often called into question, and frustrations often continue to arise from the teachers.

CHAPTER 7

DISCUSSION

This chapter consists of a discussion about the two case studies. It will be relating what is found in the cases to what was mentioned in the literature review. Then, those same discoveries will be related to the resulting trends from the survey data analysis. Finally, we will be able to discuss the thesis hypotheses and determine if they were supported by the provided information.

One of the first things that appear relevant about the two school districts' implementations of their student information systems is the fact that the school districts' technology departments take on the ownership and responsibility of their respective systems almost immediately with little to no use of the outside vendors' support. Clark County used the vendor during implementation but after that they completely in-sourced the maintenance of and improvements to the system. Nye County scarcely used the vendor, even during the implementation. This realism can be related to the fact that survey respondents have better feelings about system implementations when there is plenty of help available to them. When a district does not take full advantage of vendor assistance, they are limiting the available help with a system until the district themselves can supply the sufficient help.

Next, it is noteworthy to mention that both Clark and Nye Counties determined the worth of their system choice based on the success of the system in another school district.

This factor seemed to be replacing the necessary process of matching the system to the districts' actual end-user needs and fundamental system requirements. Both districts' systems were essentially purchased as an off-the-shelf system with minimal site specific requirements. It was expected that the district technology departments were going to have to do their own adjustments as needs arose. No vendor IT specialists developed the systems based on any observations of district daily routines. Major end-user populations were never consulted during these implementations. Nye County only spoke with secretaries and at just one meeting. Clark County only included a small group of principals in their meetings to discuss the system's features. These discoveries can be related back to the data analysis results that show that when end-users are allowed to have some input into the system there is better acceptance of the system.

Neither district had a true project champion supporting the system implementation. The projects were laid squarely on the shoulders of the technology departments. Educators and technology personnel do not speak the same language and they do not appear to one another to have the same goals and objectives. The systems were, therefore, going to be immediately viewed by the end-users as simply a technology department's project. With no clear support from a champion the end-users can associate with, buy-in was doomed from the start. Although the CCSD case did not specify the end-users issues with the system, it has been nearly 17 years that this system has been used and only recently has the end-user complaints and/or suggestions subsided. That is also because the 10 person team dedicated to the system has been able to troubleshoot the issues over the past 17 years and build a better sense of satisfaction with the system. CCSD had a 17-year-long-process that could have been minimized in the very beginning with end-user buy-in from the start. Once again, this discovery relates back to the fact that the survey respondents demonstrated that having plenty of help available associates with better acceptance of a system.

One positive note about Clark County's implementation process is that they used a phased implementation of the system throughout the district. Unlike Nye County, Clark County was able to make adjustments during each implementation phase. Although this information was not included in the linear regression analyses, it was mentioned in the survey demographics information. 49% of respondents stated that their system's implementation was "Cold Turkey" and only 19% each were either Parallel or Phased implementations. This fact alone can be extremely revealing about school district project management processes. Businesses have already proven that piloted or phased implementations are the accepted best practice method for implementing a new information system. Seeing such small percentages utilizing these methods in school districts immediately draws our attention to an area that future school district project managers should notice.

After analyzing the survey data and focusing purely on the implementation of student information systems, we have seen that positive perceptions of implemented systems occur in larger schools or urban school districts. We have also determined that when training takes place later, there are negative perceptions about a system's performance. Educational end-users have also demonstrated that the more technological help that they have available the better their perceptions of a system's performance become. In addition, we have seen that positive associations exist with the perceptions of system successes when end-users are allowed to have input regarding a system. The differences alluded to during the survey data analysis became real when comparing these urban and rural school districts. The first notable difference is the size of the technology departments. During the student information system implementations Clark County had 25 individuals devoted to the project and Nye County had 4. Next, as each phase of implementation took place, CCSD had more and more individuals able to train and or assist new users with problems. NCSD had two half-day in-service training sessions, one three days before going live and one five weeks after implementation had occurred. Leaving NCSD end-users to fend for themselves in order to figure out the system or find competent help. This emphasizes the fact that every dependant variable was significantly associated to the Available Help variables (either individually or in combination as a loaded factor) as well as the Urban factor being significant for positive survey responses.

The hypotheses results based on the information discussed in the literature review, survey data analyses, and case studies are listed in Table 7.1. Hypotheses 1 (a – d) were not supported by the survey data analyses. However, the case studies did support the negative associations for the teacher perceptions of the ease of their job and their overall satisfaction with their system. The negative NCSD teacher perceptions were more prevalent than the CCSD teacher perceptions because they were stated outright within the case. Still, it was noted in the CCSD case that the teacher concerns had only recently subsided after 17 years with the system in place. Hypotheses 2 (a – d) were all supported through the survey data analyses. The literature review and the case studies also supported these positive associations. Hypotheses 3 (a and c) were only supported through the survey data analysis when the classroom management system was considered. The other hypotheses (b and d) were actually not upheld due to the consideration of the testing database system. Hypotheses 4 (a – d) were not completely supported by the literature, survey data, nor the case studies. Although the literature and case studies alluded to this concept the assumptions that followed can not be concluded as supporting the hypotheses. Hypotheses 5 (a – d) would seem to have been supported by the literature, however only 5a and 5d were verified by means of the survey data analyses. Hypotheses 6 (a – d) were supported by the survey data analyses only with the variable labeled Help.

Table 7.1 Hypothesis Support

Hypothesis	Independent Variable(s)	Dependent Variable	Expected Association	Supported?
1a	Teacher	Execution	+	No
1b	Teacher	Ease of Job	-	Yes
1c	Teacher	Productivity	-	No
1d	Teacher	Satisfaction	-	Yes
2a	Urban, Size	Execution	+	Yes
2b	Urban, Size	Ease of Job	+	Yes
2c	Urban, Size	Productivity	+	Yes
2d	Urban, Size	Satisfaction	+	Yes
3a	SIS, Testing DB, CMS	Execution	+	Yes, only with CMS
3b	SIS, Testing DB, CMS	Ease of Job	+	No
3c	SIS, Testing DB, CMS	Productivity	+	Yes, only with CMS
3d	SIS, Testing DB, CMS	Satisfaction	+	No
4a	Mandatory	Execution	-	No
4b	Mandatory	Ease of Job	-	No
4c	Mandatory	Productivity	-	No
4d	Mandatory	Satisfaction	-	No
5a	Allowed Input	Execution	+	Yes
5b	Allowed Input	Ease of Job	+	No
5c	Allowed Input	Productivity	+	No
5d	Allowed Input	Satisfaction	+	Yes
6a	When Trained, Amount Trained, Help	Execution	+	Yes, only with Help
6b	When Trained, Amount Trained, Help	Ease of Job	+	Yes, only with Help
6c	When Trained, Amount Trained, Help	Productivity	+	Yes, only with Help
6d	When Trained, Amount Trained, Help	Satisfaction	+	Yes, only with Help

CHAPTER 8

SUMMARY AND CONCLUSION

When developing and implementing an information system, there are some best practices that are widely accepted in the business world. Schools, being laggard organizations, have only just begun to enter the technology realm where project management is a necessity.

Using two different methodologies, we were able to analyze the current situation with student information system implementations. The literature review explained some of businesses accepted project management procedures as well as the situation that school districts are in based on the history of education. By analyzing survey data regarding system implementation perceptions we were able to determine that there are some trends. There is a positive association with end-user perceptions about system execution, ease of job, productivity, and overall satisfaction with the system for urban end-users, the larger school end-users, and the end-users that have more help available. When end-users are allowed to have input regarding a system being implemented there is a positive association to perceptions of system execution and overall satisfaction. Also, there are negative associations between when end-users are trained and their perceptions of both the system's execution and their overall satisfaction with the system. By using case studies of two Nevada school districts (urban and rural), we were able to compare two student information system implementations to accepted business project management processes which also verified the findings from the survey responses.

We should note here the limitations of the survey dataset. With such a small sample size the data is not representative of the entire educational end-user population. It also does not allow for explanations for a wide range of situations other than those experienced by the respondents. Although the results that we were able to obtain were revealing and significant, having a much larger sample size would be able to show even more significant associations.

We have shown throughout this study some of the accepted project management processes in traditional businesses, and how those processes can be affected by the public school district organization, and how some information systems are currently implemented in public school districts. We have addressed the problem about how project characteristics effect the perception of success of a system. When future project managers try to develop and implement a new student information system into a school district they should pay close attention to those areas shown to be important and lacking in the school districts today. First, school districts need to have project champions, not just technology departments implementing a system. Second, communication is critical with the end-users. In addition to receiving communications regarding the development and implementation of a student information system, end-users need to be involved throughout all of the phases of the project. Next, projects need to be either phased or pilot implementations. Finally, school districts need a great emphasis placed on training. There needs to be plenty of training opportunities and they need to be conducted as close to going live as possible – not too early and not too late.

APPENDIX

Figure A.1 Survey Questionnaire page 1

Information Systems Implementation in Schools Survey

Directions: Although you may have experienced numerous implementation processes for new information systems, for the purpose of this survey, please only focus on one implementation. You are encouraged to fill out another survey regarding other system implementation experiences.

1. Position (check one) ☐ Teacher ☐ Principal ☐ District Admin. ☐ State Admin. ☐ School Staff ☐ Other

2. School District ______________________

3. What is your age? ☐ 18-24 ☐ 25-29 ☐ 30-34 ☐ 35-39 ☐ 40-44 ☐ 45-49 ☐ 50-54 ☐ 55-59 ☐ 60+

4. Years of experience ____________

5. Size of school (approx. enrollment) ☐0-100 ☐101-500 ☐501-1000 ☐1001-1500 ☐1501-2000 ☐2000-

6. Type of system that was implemented
   ☐ Student Information System (i.e. SASI or PowerSchool)
   ☐ Testing Database (i.e. IDEA)
   ☐ Classroom management software (i.e. Grade Pro)
   ☐ Other (i.e. office automation, accounting, or human resources)

7. Describe in your own words, the intended use of the system.______________________

8. How well does it perform its intended use?
   ☐ Not at all ☐ To some extent ☐ Pretty much ☐ Very well ☐ Extremely well

9. Who was the system intended to benefit? (check all that apply)
   ☐ Office staff ☐ Administrators ☐ Teachers ☐ Students ☐ Parents ☐ State Dept. ☐ Federal Dept.

10. Who did the system actually benefit?
   ☐ Office staff ☐ Administrators ☐ Teachers ☐ Students ☐ Parents ☐ State Dept. ☐ Federal Dept.

11. Where did the idea for the new system come from?
   ☐ Teachers ☐ Students ☐ Parents ☐ Tech. dept. ☐ Administration ☐ Legislation ☐ I don't know

12. Is the use of the system ☐ mandatory or ☐ voluntary?

13. Compared to the previous system, or the way things were done before, does the system make things easier?
   ☐ Not at all ☐ To some extent ☐ Pretty much more ☐ Very much more ☐ Extremely more

14. Did this system make you more effective?
   ☐ Not at all ☐ To some extent ☐ Pretty much more ☐ Very much more ☐ Extremely more

15. Since the implementation of the system, the time spent on work while away from work has…
   ☐ disappeared
   ☐ greatly decreased
   ☐ somewhat decreased
   ☐ no effect
   ☐ increased
   ☐ greatly increased
   ☐ become unbearable

Figure 8A.2 Survey Questionnaire page 2

16. Over all, how satisfied are you with the system?
    ☐ Completely dissatisfied ☐ somewhat dissatisfied ☐ satisfied ☐ very satisfied ☐ extremely satisfied

17. When did you know the system was being implemented?
    ☐ well in advance ☐ shortly before ☐ shortly after ☐ well after

18. Who installed the system? ☐ teacher ☐ outside vendor ☐ school tech. dept. ☐ district tech. dept. ☐ other

19. Type of implementation used for this system
    ☐ Cold Turkey (the system was installed and used immediately)
    ☐ Parallel (the old system/ways and the new system were being used at the same time)
    ☐ Phased (different parts of the system were used in different stages – building up to a full use, eventually)

20. Were you allowed to offer input, opinions or suggestions, <u>before</u> the system was implemented? ☐ Yes ☐ No

21. Were you allowed to offer input, opinions or suggestions, <u>after</u> the system was implemented? ☐ Yes ☐ No

22. Was your input *specifically requested* <u>before</u> the system was implemented? ☐ Yes ☐ No

23. Was your input *specifically requested* <u>after</u> the system was implemented? ☐ Yes ☐ No

24. Do you know anyone whose input was *specifically requested* <u>before</u> the system was implemented? ☐Yes ☐No

25. Do you know anyone whose input was *specifically requested* <u>after</u> the system was implemented? ☐Yes ☐No

25. When did you receive training about the system?
    ☐ 6+ months before implementation
    ☐ 1-5 months before implementation
    ☐ 0-4 weeks before implementation
    ☐ 0-4 weeks after implementation
    ☐ 1-5 months after implementation
    ☐ 6+ months after implementation

27. Amount of training you received ☐ 0-3 hours ☐ 4-8 hours ☐ 2-3 days ☐ 4-7 days ☐ week+

28. Who provided the training? ☐ teacher ☐outside vendor ☐school tech. dept. ☐district tech. dept. ☐other

29. If parents also use this system, how well were the parents trained?
    ☐ very inadequately ☐ inadequately ☐ adequately ☐ extremely well

30. Who provided their training? ☐ teacher ☐outside vendor ☐school tech. dept. ☐district tech. dept. ☐other

31. Would the system be easier to use if "non-techy" terminology was used during trainings? ☐ Yes ☐ No

32. Who provides help with system? ☐teacher ☐outside vendor ☐school tech. dept. ☐district tech. dept. ☐other

33. Amount of available help ☐ very inadequate ☐ inadequate ☐ adequate ☐ excellent

34. Did you have occasion to ask for help with this system? ☐ Yes ☐ No

35. If yes, how helpful was this support? ☐ very inadequate ☐ inadequate ☐ adequate ☐ excellent

Thank you for taking the time to fill out this survey, your input is greatly appreciated!

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