THE EFFECT OF REENGINEERING WORKFLOW PROCESSES AT AN ENTERPRISE SERVICE DESK

by

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A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

Capella University

August 2008

Abstract

This descriptive research case study explored the effects that business process reengineering (BPR) can have on an enterprise service desk organization that provided information technology (IT) service support and delivery to thousands of end users throughout a wide geographical area. This study used the human performance improvement (HPI) model as the theoretical framework to examine the impact that process improvement can have in two specific areas: (a) performance metrics, measured quantitatively using the dependent variables of response time, resolution time, and turnaround time; and (b) customer satisfaction, measured qualitatively and quantitatively via interviews and customer satisfaction surveys. The implementation consisted of decentralizing a portion of the support infrastructure from the remote "one stop shop" organization down to local site managers. Data collection consisted of trouble ticket records, workflow process diagrams, interviews, and customer satisfaction surveys. Data results indicated that reengineering workflow processes may have been a contributing factor in improving service levels. Response times and turnaround times were significantly lower following the implementation, presumably due to the proximity and immediacy of local IT support. Resolution times, on the other hand, slightly increased, perhaps because of the low experience levels of the apprentice local technicians, whose primary duties were managerial rather than technical. In regards to customer satisfaction, the reengineered workflows may have contributed to the high customer satisfaction ratings realized after the implementation. The HPI model was instrumental in serving as a blueprint for this study. After determining the service desk's business goals and performance gaps, BPR was the chosen intervention tool. The HPI model further outlined

this case study's progress as the formative collected data underwent a summative evaluation, to determine whether the reengineering effort was successful in improving the service desk's performance metrics and customer satisfaction levels. Recommendations for further studies included broadening the scope of future reengineering projects, increasing communication among technicians, and enhancing the customer satisfaction survey to gather more qualitative "why" responses. Additional recommendations included increasing the number of performance metrics and adding non-training improvements such as an EPSS job aid in future studies.

Dedication

This dissertation and the accompanying doctoral degree is dedicated to the three people who worked so hard to mold me to become, as my father used to say, "a productive member of society." Their passing has been difficult but their legacies continue. They are my parents, the two women and one man who were with me every day during my formative years and beyond, who instilled in me the importance of stick-tuitive-ness and pursuing education throughout our lives.

To my mother Millie, who had the courage to give up a keypunch operator job and pursue a practical nursing profession in her mid-life years. I remember being so proud of Mom as we studied together night after night, while she made steady progress through the difficult curriculum to reach her dream. Afterwards we'd watch the Carol Burnett show and laugh together as a stress reliever. Those were wonderful evenings. Without realizing it at the time, the seeds Mom planted in me would become the driving force that resulted in the long journey that this dissertation capstones. I miss those days, Mom, and I miss your comfort as well.

To Ginny, whose misnomered "stepmother" label belies her deep love and concern she shared when part-time motherhood to three young boys was thrust upon her. Well up to the task, she took us in and became the rock-solid foundation upon which our highly dysfunctional family became anchored. As a high school teacher and sports coach in New Jersey, Ginny made lasting impressions on the lives of many young adults--and her stepsons--by her obvious commitment to excellence and standing up for what is right. Since her passing, there have been many situations where her guidance and support were sorely needed and therefore deeply missed. I think of you often, Ginny; the pain of your loss is offset only by the reassurance that you've gone to a better place.

And finally to my father, Ken, whose recent death left an emptiness that is felt every day. Not content with jumping from job to job, after being a cop walking the beat in a tough 1960s Philadelphia neighborhood, Dad made a decision that was to affect not only his livelihood but also my academic direction. In just three years, he completed all requirements for a bachelor's degree in Social Work at what was then Monmouth College, NJ. While working on this dissertation, I was often inspired by the memory of the late hours which Dad spent at the kitchen table, fresh coffee always on hand, as he painstakingly studied night after night. Without complaint, and surrounded by the clutter of textbooks and scribbled notes as he clackety-clacked away on his old manual typewriter, Dad chased his dream with the same fierce determination as Mom did with her nursing program. I regret not finishing my degree earlier so that my father could read this research study, participate in the graduation festivities, and say proudly to his campground neighbors: "Finally, my son, the doctor!"

This dissertation is dedicated to these three people whose inspiration has been my guiding light from kindergarten all the way up to standing on Capella's graduation podium. While I'll never be an Olympian, this gold medal is for them.

Acknowledgments

This research paper and the prerequisite comprehensive examination were developed over a time period in which many Life Happens events occurred. Fortunately my mentor Dr Lois Bartelme stood constant vigilance in her control tower, providing invaluable advice and steerage along the way as my little ship The Can Do Too wrestled through the stormy seas of a teenager's angst, an unforeseen job loss, a transatlantic housing move for our family of five, and the accompanying culture shock of relocating from Heidelberg, Germany to the simple life of middle Georgia, back on U.S. soil. Dr Bartelme, along with fellow committee members Dr Hardt and Dr Mike (McGivern), stuck with me through every twist and turn, reminding me that either I was on the right track or overcomplicating the writing process. (Sometimes we are our own worst enemy.) After struggling for days to write just a few short pages or even paragraphs, it was truly exhilarating to read their review comments, "Nice work, Keith!!" Moments like that were few, which made them all the more special. Thanks for everything, Lois. I was blessed to have you as my guiding light.

To my children who were patient as I continued attending class after class. Splitting parental time between kicking soccer balls and sequestering oneself in study mode is a science I've yet to master. Hopefully I found at least a workable balance. To Pierre, Tommy, and James: Education is a lifelong achievement process. Even after five decades of attending school, my pursuit of learning continues. May your dreams become rich and bear much fruit as you proceed through all your years to come.

To Tracy, who taught me what it means to be a Business Process Analyst slash Requirements Guru slash Document Dude. Just think, it all started that one simple day long ago when you stood at a white board, and with marker in hand, asked me, "Keith, as an avid cyclist, what do you do as you prepare for a bicycle ride? You make sure your tires have enough air, right? After that, you fill up some water bottles, don't you?" As you created a flow chart on the board by drawing standard process and decision boxes, I was hooked. Thanks for all your patience, Mizz Bee. You truly rock.

Carlos and Pam, you and your wonderfully extended family have been a constant encouragement for the past 20 years. The devotion you have for others is a never-ending waterfall from which loyalty and love pour forth effortlessly. Sending out warm hugs.

Alan and Deb, you have stood closely beside me for the past few years, comparing notes on parenthood, employment, and all of life's twists and turns. Thank you for being there both in great times and during some of the more challenging ones. I wish we all still lived near Heidelberg…

Gonzo, thanks for your consistent encouragement for the past year. When things got hot and heavy, you stepped up and put everything in perspective, and helped keep this train rolling down the track. I owe you big time, Bubba.

And finally, to all service desk men and women: Despite average pay and high turnover rates, you folks work tirelessly day after day doing technical triage, helping people like me who occasionally need to be reminded of the oh-en-oh-eff-eff switch. You must get frustrated at times; but all we customers hear are your friendly, courteous attitudes coming through the telephone. On behalf of all end users, I heartily salute you!

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CHAPTER 1. INTRODUCTION

Introduction to the Problem

Today's successful service desks, which strive to provide a high degree of information technology (IT) support to end users, use a variety of strategies to improve their levels of service. Among the most popular methods include merging established managerial frameworks, standardizing workflow processes, and implementing specifically-designed, highly automated software systems. However, the transition from reactive, ad hoc help desks to proactive, well organized service desks requires much more effort than merely paying lip service to the latest industry standard. One particular service desk, which provided hardware, software, and network support to a major military headquarters division, struggled to make the successful crossover. Technicians used their own efforts to resolve technical issues, rather than proven, effective, and standardized workflows in a team-based environment; this led to highly fluctuating resolution times, varying levels of service delivery, inefficient operations, and a wide range of customer satisfaction ratings. Automated tools were in use but not fully utilized. Customer satisfaction was in dire need of improvement.

This dissertation presents an evaluative case study that detailed the steps taken to improve efficiency and customer satisfaction levels at an enterprise service desk (ESD). Business processing engineering (BPR) techniques were applied to a specific series of ESD incidents, according to human performance improvement (HPI) guidelines. Industry best practices were consulted to standardize business processes. The study will describe the new workflows and processes that technicians and other stakeholders took to streamline operations. Data from observations, surveys, interviews, and performance metrics were used to determine the effectiveness of the new processes in two major areas: whether BPR can improve service desk efficiency, and whether the implementation can improve the level of end user/customer satisfaction.

Background of the Study

The importance of computing in assisting businesses to meet mission objectives and goals cannot be overstated. Corporations rely heavily on word processing, digital file transfers, presentations, and especially e-mail availability for all facets of business, from large corporations down to mom-and-pop shops. Typewriters have long since been replaced by personal computers (PCs); desks have become workstations; and "paperwork" is done electronically on monitors. Keyboards are now the writing instruments, while pencils have been relegated to note-taking and pens to signature functionality. When network connectivity becomes unavailable for any number of reasons, the loss is noticed immediately. Therefore, it is vital that businesses have solid information technology (IT) support to keep their digitized infrastructures intact.

This is especially true in military environments. Commanders use electronic means to convey orders and maintain organizational readiness via secure networks; unit leaders transfer data among all echelons to make sure their troops meet mission objectives; and on-the-ground soldiers communicate with peers and superiors to make sure they understand and properly carry out critical tasks. Radio frequency identification

(RFID) technology tracks pallets of gear for troops who deploy for training and combat, so that commanders can instantly locate precious storages of food, water, and ammunition. Virtual environments present digital displays that are used extensively in training simulations by all U.S. military branches to provide realistic and low-risk, low cost mock-ups of actual combat situations (Baxter & Hepplewhite, 1999). Electronic data are archived and accessed via network optimization models, which the U.S. Army uses to enhance career progression for its field officers (Shrimpton & Newman, 2005). Other services rely on similar databases.

With such a heavy reliance on computerization, it is critical for organizations in public and private sectors to maintain optimum performance of the IT gear. To achieve this, help desks are specifically tasked to ensure that computers remain in full operational condition. When end users have problems that degrade or threaten to degrade their service, users notify help desk personnel, who react quickly to restore the user to full productivity. In addition to problem resolution, help desks also offer training, assistance in hardware and software installations, repair services, and even provide incidental help such as informational and casual computing advice (Sundrud, 2002).

The focal point of this study stems from a U.S. Army initiative in 2001 (Schoomaker, 2005). At that time, the Chief of Staff for a major U.S. military headquarters organization directed the army to design plans to consolidate IT support services for its approximately 65,000 soldiers. A task force developed an all-encompassing IT structure that would combine commercial best practices with unique military requirements, and provide a consolidated, full service support consisting of hardware, software, and network services. In addition to standardizing support, the effort would also slash millions of U.S. taxpayer dollars in salary and equipment costs. Dedicated personnel would be organized into highly effective teams to fix computer problems. Consolidated server and network equipment would be centrally managed for end users.

A key element of this plan was the creation of a “one stop service shop” to address all end user IT issues. The objective was to transform the hundreds of disparate help desks across a wide geographical area into a single, centralized IT service desk. The result was the Enterprise Service Desk, or ESD, which had the following goals: to quickly respond and resolve end users' IT-related trouble calls; forward in-depth issues to specially-designed service areas with high levels of expertise; and become a world-class leader in IT support by utilizing industry best practices. To accomplish this, the ESD would rely heavily on automation: specially-tailored enterprise trouble ticketing software would allow personnel to track trouble calls and collect metrics to gauge the ESD’s effectiveness.

Beginning several years prior to this study, the ESD began its transition. One existing help desk, which served a major military headquarters organization, became the nucleus, and added a number of highly skilled technicians to serve the approximately 3,500 customers in the region. As the customer base increased, the ESD staffing planned to recruit new technicians. Best business practices were researched and implemented and existing technicians were trained. All resources were in place on the day of the rollout.

The ESD was thus created. End users were migrated, servers were consolidated, staffing numbers were increased to meet the expected need, and best practices implemented. Managers fashioned separate teams for hardware and software support, network maintenance, server support, web/internet, and other supporting branches such as resource management. Key stakeholders met regularly to inform each other of issues relating to their designated areas of responsibility.

The ESD became part of a larger support activity that carried out IT service delivery tasks in support of a large military headquarters unit. Besides a service desk, the support activity managed its customers' networks and servers, contained a hardware repair shop, and housed a security office. The organization had a great deal of visibility, with high-ranking officers demanding immediate 24x7 service. The users were stationed across a wide geographical territory in support of military forces, so the organization had to be prepared to deploy a large number of staff members and equipment with little or no advance warning. The organization also supported remote customers in hostile regions, where it was literally a life-or-death situation if electronic systems failed to relay vital troop movement data.

The ESD had a limited level of success in meeting its objectives. Service desk technicians used past experiences, a limited number of features of automated tools, online assistants, and each other's expertise to return customers to full usage when hardware or software downtimes threatened productivity. Server technicians performed administrative duties and used their technical expertise to ensure customers maintained access to their data. Network specialists made sure that sufficient bandwidth was available, by keeping maintenance downtimes to a minimum. Management was content.

However, as more metrics were gathered over time, it became evident that ESD services were not up to industry standards. Response time, or the total time between when a trouble ticket was opened until an ESD agent committed resources to resolve the issue, was significantly lower than commercial standards. Resolution time, or the total time between when an agent took action to resolve the issue and when the ticket was resolved, likewise fell short of management predictions: the time to fix software was twice as long as other, non-consolidated service desks. Managers noticed that many customers hung up after three or four telephone rings, presumably in frustration, before a technician could answer the call.

Statement of the Problem

In the several years since its inception, the ESD continued to struggle to achieve its business objectives. Statistics such as first call resolution, which was substantially below the industry standards of 75 to 85%, produced mediocre metrics (Coyle & Brittain, 2007). Other metrics that gauge the pulse of a service desk, such as average length of call, average wait time, and success in resolving escalated issues, according to service desk technicians, pointed to areas that needed improvement. More importantly, the major business goal of successfully turning from a reactive organization that merely responds when problems arise, into a proactive one that foresees incidents and prevents them before users experience downtimes, was not being met. The reasons for these performance blockers appeared to be inconsistent support, ineffective use of technology, and lack of standardized workflow processes.

ESD customers received inconsistent IT support from the ESD. Service desk technicians, who provided first-line support by fielding a wide variety of end user issues, were required to possess fundamental skills throughout a wide range of issues, including software, network, server, Web, voice, or BlackBerry-type hand-held devices. Regardless of the nature of the issue, technicians had to be prepared to resolve a broad range of IT issues that degraded customer productivity. ESD technicians had dissimilar technical backgrounds, inconsistent certifications, and diverse backgrounds with assorted areas of expertise. Some technicians had no more than one year of previous help desk experience. During orientation, new hires received training in first level technical support, after which they were observed over the shoulder while fielding live service calls to make sure they correctly performed assigned tasks. When customers notified the Service Desk, depending on which technician responded, the issues were resolved in different ways, resulting in varying resolution times and unpredictable levels of competency. In addition, there was no training that focused on customer service skills.

Technology helped, but only to a point. The adage that says, “If your organization is a mess, and you bring in technology to solve the problems, you will have an automated and faster mess,” applied directly to the ESD (Harrington, 1991, p. 157). A robust, expensive enterprise trouble ticketing software package was implemented for over twelve months prior to this study. Although it provided the basic tasks such as ticket tracking, technicians found it cumbersome to navigate. The system also lacked the advanced functionality required to meet managers’ requirements. An expensive enterprise suite of desktop management systems, which aimed to "lock down" administrative rights and maintain a strict baseline of applications, was all but discarded because of the lack of dedicated staffers. Furthermore, the administrator for this system recently left the company, and a replacement was never hired. The ESD showed poor release management strategies by investing heavily in various other automated tools, which either overlapped functionality or did not produce the desired results.

The business processes at the ESD were not well-defined. When new technicians were hired, they underwent an informal two-week "side saddle" training period. The trainees watched and learned during that time and took notes from their mentors, after which they were free to attempt resolutions as they saw fit. There was therefore no standard methodology in place. Although templates were written and posted in an attempt to standardize the ways by which technicians fixed user issues, technicians rarely used the job aids. There were no policies in place regarding the templates' use, and managers neither enforced nor oversaw their use.

The problems of inconsistent support, inadequate use of technology, and lack of defined processes were not exclusive to the ESD; they were endemic throughout the IT support industry. During a previous two-year data collection project, the researcher encountered hundreds of formal and ad hoc help desks within a large military theater of operations plagued by similar problems. This was presumably because help desks were often so overrun with incidents that they worked in reactive modes and did not have the time to develop sound workflow processes (McBride, Perry, & Sainsbury, n.d). Not only does technology's diversified nature tend to outpace staffing resources, but the Info-tech

Research Group (2002) states that "user questions have increased in proportion to the new software that is constantly [being] introduced" (p. 3). The result is that many IT support agencies were unable to use technology effectively (McBride, Perry, & Sainsbury, n.d). In spite of recent slight upward trends, Gartner surveys revealed that nearly half of all respondents in one poll reported that they still had not made the leap from reactive to proactive business process maturation levels (Curtis, 2006).

Prior to this study, there were no formal initiatives in place to improve the ESD's service delivery. One branch manager instituted weekly training sessions, but informal feedback (interviews and job performance observations) indicated lackluster results. An incentive program to recognize exceptional performers was given lip service, but there were zero honorees since its inception. A knowledge management system, which Brandenburg and Binder (1999) identified as an emerging human performance improvement (HPI) technological trend, was nonexistent at the ESD; why ESD managers, along with other company managers, failed to back this vital implementation is unclear (Maynard & Brittain, 2005; Combs & Falletta, 2000).

In what would become a springboard for this case study, the researcher recently acted as performance consultant and change agent. Using the HPI model, the researcher initially analyzed the ESD's business goals at a high level view. Next, the researcher narrowed the focus and reviewed key metrics, which revealed gaps in actual versus desired performance levels for specific types of end user incidents. Possible causes for these variants were offered, which used structured brainstorming, fishbone diagrams, and The Five Whys (Piskurich, 2002). Several incidents which were determined by technicians to present the greatest potential for BPR improvement were offered for this study. Root cause analysis of these incidents indicated workflow discrepancies, and were therefore chosen as potential candidates for a BPR intervention.

From those candidates, a single set of incidents that was expected to bring forth the most dramatic improvements in the ESD's service delivery was used for this study. The chosen incident's workflow processes were reengineered and described in this study. The intervention specifically targeted those areas just described: process standardization to produce consistent metrics, using technology to its fullest advantage, and bringing technicians' abilities to acceptable levels. By focusing on these objectives, the ESD hoped to produce the ultimate goal: to quantitatively and qualitatively increase customer satisfaction via quicker incident resolutions.

Purpose of the Study

This study investigated what many BPR proponents claim, that reengineering workflow processes can be successfully used to increase efficiency in today's IT industry (Koehler et al., 2005). This study was conducted to see whether "reengineering projects…achieve dramatic improvements in profitability, service, quality, time-to-market, responsiveness and effectiveness – where the process improvements are obvious to customers, management and employees at all levels and they can be translated to sustainable competitive advantage" (Tan, 2006, p. 3). If the ESD continued its marginal support structure, it was at risk of being replaced by other competing service desks who were poised to assume responsibility for the ESD's end users. With a greater emphasis on standardizing processes to improve customer service support, the ESD would have been all but guaranteed to continue providing support to its high level commanders and other end users. This study was done to investigate whether a reengineering intervention with a human performance improvement (HPI) framework could be used to improve end user satisfaction levels.

Research Questions

Primary Question: To what extent do reengineered workflow processes improve service delivery at an ESD?

Secondary questions:

1. To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?
2. To what extent is customer satisfaction affected by reengineered workflow processes?

Nature of the Study

This case study was designed to improve the services of an enterprise organization that rendered help desk support to thousands of end users. The case study was chosen as the study's design method because of the researcher's ability to blend together empirical research, theory, and logical inquiry (Yin, 2003). Since this particular intervention combined quantitative and qualitative data to "explore in depth a program…or process," the case study approach was the appropriate vehicle to present the intervention in its entirety (Creswell, 2003, p. 15). The mixed method approach was selected because of the ability to present a 360 degree view of the data and its analysis. In order to fully determine the effectiveness of the intervention, both numerical and narrative-based information was collected: performance metrics and customer satisfaction surveys produced quantitative data, while interviews and a free-text comments field in the satisfaction survey produced qualitative data. This strategy followed Creswell's (2003) position that mixed methods use "closed-ended measures [and] open-ended observations" to produce quality results (p. 20).

Other research methods were proposed and eventually discarded. Participatory action research (PAR) was strongly considered, but the researcher and others felt that PAR was more fitting for improving social conditions by empowering and educating local groups, not for an organizational intervention of this study. A strictly quantitative study was also suggested. The numbers alone might have produced "before" and "after" snapshots of resolution metrics and customer satisfaction Likert-based scores. But without open-ended questions, for example, asking users to describe their recent service desk interactions and their perceptions into a "How can we improve our services?" comments field, it would have been difficult to identify customer concerns, which are high value to organizations. Likewise, while a qualitative-only study might have reflected how users feel about the ESD's service levels, there was a strong need to quantify results for all stakeholders; decision-making managers regularly rely on numbers to justify service costs to business owners. Clearly, the mixed approach was the best approach for this intervention.

This case study used the human performance improvement (HPI) model as its theoretical framework, specifically the phases of intervention selection, intervention implementation, and evaluation of results. The HPI model, sanctioned by the International Society for Performance Improvement (ISPI), details the steps required to undertake a performance intervention as in this study. The researcher documented all activities that the process improvement team (PIT) performed as it worked through the various stages of the HPI model.

The PIT consisted of the ESD manager, ESD technicians, and other stakeholders as appropriate. The PIT was tasked to choose one incident that frequently reached the service desk. The PIT then created alternative workflow processes while following an HPI framework. As the intervention progressed, the PIT oversaw the other steps and ensured that proper procedures were followed. During the evaluation phase, the PIT played a pivotal role in the investigation, and was asked to provide conclusions regarding the success of the intervention. When necessary, the PIT revisited previous stages of the HPI process, which enhanced the study's results.

An HPI model was used as the foundational framework of this study, since it couples well with BPR. HPI was chosen because it offers an intervention solution that is "systematic, systemic, and results-based" (Sanders & Thiagarajan, 2001, p. vii). BPR and HPI both recommend step-by-step procedures, and provide systematic approaches that have linear and dynamic properties that were effortlessly applied to the ESD. HPI and BPR are results-based as well as results-driven; while inputs and outputs are important, especially when reengineering processes, there exists "a greater focus on outcomes and impacts" (Kusel, 2004).

HPI was also chosen because it provided a solid foundation consisting of people and processes. According to Rothwell (2004), "[human research development] professionals, operating managers, and others who care about improvement human performance" can be active contributors to an HPI study (p. 20). This aligned well with BPR, which used participants who were deeply entrenched in the organization, who "work[ed] collaboratively to observe, understand, and ultimately change the situation" (Swartz, 2006, p. 28). In order to modify business processes that resulted in drastic changes in customer service levels, internal stakeholders needed to successfully bring forth the change. The human element provided the backbone of expertise and creativity to make this case study worthwhile.

By the same token, process reengineering interventions align closely with HPI systems. "Organizational pro-action" techniques such as BPR affect an organization's ability to track such factors as cost, sustainability, and accountability (Van Tiem, Moseley, & Dessinger, 2001, p. 15). As a methodology to radically redesign an organization through revamped procedures, BPR has been used in academic, commercial, and education settings, and has become a proven technique in realigning business activities with customer-focused goals (Hammer & Champy, 1993; Fitzpatrick, Sanders, & Worthen, 2004). In fact, "reengineering projects should achieve dramatic improvements in profitability, service, quality, time-to-market, responsiveness and effectiveness – where the process improvements are obvious to customers, management and employees at all levels… can be translated to sustainable competitive advantage" (Tan, 2006, p. 3).

Data collection and analysis were performed at key strategic points in the intervention. Quantitative data in the form of performance metrics indicated the pre-intervention levels of service, while qualitative data showed how resolution workflows were currently being performed by service desk technicians. Interviews were conducted that showed baseline customer satisfaction levels prior to the intervention. Post-implementation metrics indicated the changes in the levels of service between the two periods. In addition, customers were surveyed to determine their post-implementation satisfaction levels.

Significance of the Study

This case study enhanced the literature in several ways regarding improvement efforts within IT support systems. The researcher examined whether the blending of HPI guidelines with reengineered workflows could be successfully used to improve response rates and other key factors of incident resolution at a service desk. The researcher also investigated whether a BPR team can successfully improve how end users perceive their level of service at an enterprise service desk.

Definition of Terms

Human performance intervention (HPI). A systematic, non-linear approach that seeks to improve an organization's effectiveness by enhancing performances of the organization's human resources.

Incident. An unplanned interruption of an IT service to end users. Examples are forgotten passwords, corrupted software, and loss of e-mail capability.

ITIL. Information Technology Infrastructure Library: A set of de facto best practice guidelines for managing IT services.

Response time. The total time between when a trouble ticket was opened until an ESD agent committed resources to resolve the issue

Resolution time. The total time between when an agent took action to resolve an incident and when the ticket was resolved.

Service Desk. An organization or support agency that resolves IT issues such as hardware, software, and network failures that adversely affect end users and their ability to perform IT-related functions. The role of service desk has been expanded from the former "help desk" designator to include such items as ownership of system accessibility and responsibility for backing up data.

Service desk technician. An organizational representative who uses knowledge, expertise, tools, and customer service ("people") skills to resolve issues that threaten to or already have reduced end users' productivity. Typical issues revolve around e-mail, hardware devices, software applications, web, and network problems.

Turnaround time: the total time between when a trouble ticket was opened and when it was resolved.

Units of analysis. Objects of a phenomenon being studied, which can be broken down into elements that can be studied separately (Gall et al., 2003).

Assumptions

There were certain assumptions related to this study.

Assumptions regarding technicians, which also included the site leads who assumed the role of technicians:

1. Technicians placed maximum effort into resolving issues, and input accurate data into the automated trouble ticketing database.
2. Technicians worked each issue thoroughly and quickly until resolution was

reached.

3. All technicians had adequate administrative rights and permissions on the network to access those areas necessary to complete all assigned tasks.
4. Policies were implemented and enforced to direct technicians to begin using the new processes following development and testing.
5. The more the new businesses processes were used, the more proficient the technicians became in applying those processes.
6. Technicians properly diagnosed each incident within reasonable timeframes.

Assumptions regarding end users:

1. When completing questionnaires, end users provided honest assessments when responding.
2. The end users who chose to complete the satisfaction survey represented the entire corps of end users who receive support from the ESD; in other words, the sampling was representative of the whole.
3. End users contacted the ESD as soon as possible after realizing their IT systems became degraded.
4. End users wanted their incidents resolved quickly and effectively.

In addition:

1. All issues that arrived at the ESD received trouble ticket tracking numbers, regardless of triviality or complexity.
2. End user satisfaction is an accurate gauge of the quality of IT support (Swanson, 2000).

3. Any gains or losses in levels of productivity following implementation of the new business processes were suspected as being a result of the performance intervention. When necessary, other external influences that were suspected to be causes of the spurious activity were isolated and analyzed for possible impact.

Limitations

There were certain limitations to this study, some of which dealt with participants. Individuals being observed may have performed differently than went not being observed; they may have been anxious or ill at ease. Two actions were taken to reduce these effects: (a) observations occurred during a 3- to 4-hour timeframe, which gave the technicians time to relax, acclimate, and become comfortable while being observed; and (b) there was already a solid rapport between the researcher and the technicians, which may have helped to alleviate technicians' discomfort or unease.

This study's setting may have limited its ability to be generalized across other environments with other populations. The ESD had unique mission requirements, such as deployment preparations, because it supported a large governmental group of end users; organizations with other customer types may produce different or even contradictory results. Furthermore, since the ESD staff had technicians with diverse backgrounds, other organizations with dissimilar levels of expertise may face difficulties when following the ESD procedures included in this study.

Researcher bias based on objectivity was also a limitation. The researcher was formerly an employee of the ESD, and therefore was very familiar with its organizational characteristics, such as personnel, processes, political climate, etc. Because of this familiarity, he may have tended to use emotional, preconceived assumptions based on previous interactions when interviewing or observing them. This common fundamental attribution error was reduced by the researcher, who was sensitive to the tendency. Another mitigation the researcher used was to mask the data, which helped to eliminate personal influences (Myers, 1993). Interpreting qualitative data required a substantial amount of detachment on the part of the researcher, which reduced the possibility of errors stemming from judgmental subjectivity. Data masking, already discussed, helped alleviate this subjectivity factor as well.

Time was also a limiting factor. The PIT members were officially assigned these duties after volunteering, so they were able to devote a certain amount of time to the project during their duty time. However, the ever-present risk was that unforeseen circumstances such as illness would cause staffing shortages and affect the forward motion of the BPR project. When that happened, the ESD manager and the researcher assumed the additional workload until PIT members' working schedules returned to normal. Minimal impact was achieved.

A disclaimer becomes necessary at this point. This is one study that reported on a single intervention done by one organization that may or may not be typical of other service desks. Due to a variety of factors such as technicians' ability, end users' geographic location and technical ability, as well as the ubiquitous unknown factors, this study's findings and results may or may not be replicable. Therefore, other studies of this nature may have varying results.

CHAPTER 2. LITERATURE REVIEW

The following literature review is divided into five parts: case study research, HPI, BPR, help desk/service desk support, and customer satisfaction. The first section will delve into the definition, benefits, evaluation of data, and examples of historical case studies similar to this study. The second section will set forth the justification for human performance improvement (HPI), why it was chosen for this study, and why other methodologies were considered and subsequently rejected. A discussion of when BPR started, its purpose, goals, objectives, failures, and successes will follow. After that, the history, purpose, and use of help desks and their transition to newly designated service desk organizations will be described. Strengths and weaknesses of existing and former help desks will be mapped to critical success factors per best practice guidelines. A discussion about customer satisfaction--its various definitions, methods of measurement, and ways that organizations can not just meet but exceed customer expectations--will precede the concluding section, when the researcher will explain the importance of this study and how it contributes to the existing literature.

Case Study Research

Definitions

The first item in this section will discuss case studies. Case study methodology, which gained distinction in the U.S. during the 1960s, has been defined as "descriptive research based on real-life situation, problem, or incident and cases describing situations calling for analysis, planning, decision-making, and/or action with boundaries established by the researcher" (Van Maanen, 1999, p. 33; Simon & Francis, 2001, p. 31). The term "descriptive research" indicates that case studies are a form of qualitative research, in which narrative text, graphics, charts, opinions, responses, and various forms of media such as voice recordings are used to capture data based on participants' thoughts, ideas, emotions, and other non-numerical data (Niederriter, 1999). Case studies are built around actual events in which a situation is occurring which may require a change. As an example, Leonard (2003) describes a case study in which the history of an IT branch of a large South African bank surpassed its competitors. The study included not only how end users and IT technicians became frustrated by poor managerial decisions, but it also explained the strategies, policies, and procedures that new managers implemented to return the company to solvency.

Creswell (2003) refers to case studies as in-depth explorations, which enhances the above definition by adding an intensive responsibility on the part of the researcher to uncover all pertinent facts of the issues being addressed. This matches Fitzpatrick's (2004) definition, which states that case studies "describe the how and why" of its subject matter, in addition to the basic facts of each case. Case studies are used for developing "a greater understanding of the object of the research" (Coverstone, 2002, p. 38). Other authors define a case study as deep inquiry into "instances of a phenomenon" (Gall et al., 2003, p. 436). This study follows that description, with process intervention the "phenomenon" used to improve service desk delivery. Due to their exhaustive nature, case studies may take longer to complete than other types of studies, yet the data and subsequent analysis and conclusions should be much more substantial in nature that other research types. Another author states that a well-written study is “precise” and “takes readers where they have not been before,” defining case studies as “narratives…of social science,” which tell why events occurred and by whom (Van Maanen, 1999, pp. 29, 32).

Justification

Yin (2003) offers several reasons why case studies are held in less than positive light as a legitimate, sound research strategy. Because of its relative newness as a type of research methodology, some of the case studies already produced have lacked depth, exhibited an absence of an accepted methodological plan of action, and have allowed bias to enter into the finding’s interpretations. Moreover, some researchers feel that the nature of case studies prevents the findings to be generalized within the scientific arena.

Although there may still be dissenters to case studies, its use appears to be otherwise widely accepted. In response to those arguments, it would seem that as more case studies are done, refinement would evolve, as in medicine, the creative arts, or any other discipline. This “renaissance” appears to be the case, as Gerring (2007) points out,

> The case study research design occupies a central position in anthropology, archaeology, business, education, history, medicine, political science, psychology, social work, and sociology… Arguably, we are witnessing a movement in the social sciences away from a variable-centered approach to causality and toward a case-based approach (p. 3).

As further evidence, Merriam (1998), writes that, “case studies…are prevalent throughout the field of education…this type of research has illuminated educational practice for nearly thirty years” (p. 26).

Van Maanen (1999) argues on the strength of the case study methodology and why such studies are important in today’s economy. He attributes the popularity of case studies to the rise of variable research in the social sciences, which together with sophisticated commercial-off-the-shelf (COTS) software, enables high quality case studies to be produced. Today’s so-called postmodern society as a whole appears to be moving away from concrete theories by injecting new ideas that contain “competing perspectives, contests of meaning, contextual modifiers,” which enhance the dynamic nature of scholarly literature (p. 39).

Another justification for the case study is based on the broad nature of natural and man-made events that lend themselves to further study. A simple glance at a newspaper’s front page reveals such diverse items as catastrophic flooding, uncontainable wars, widespread cultural displacements, political conflicts, steroidal enhancements in sports, and breakthroughs in the fields of medicine, education, and technology, all of which define the term “global contrast.” Case studies, more than mere numbers and statistics, help to measure the effects and explain the results of these phenomena, in which “variability rather than stability is the norm” (Van Maanen, 1999).

Purposes

There are at least three purposes for case studies: to describe a phenomenon in rich detail, to produce an explanation for an event, and to evaluate a phenomenon (Gall et al., 2003). This discussion focused on the evaluative case study, since that type tied in closely with this study. Evaluative case studies, according to Merriam (1998), “involve description, explanation, and judgment” (p. 39). By describing the case study’s elements, explaining the activities associated with the case study, and judging the results, evaluative case studies can “contribute to theoretical frameworks” for studies in both academic and industry applications by “providing educational actors or decision makers…with information that will help them to judge the merit and worth of policies, programmes or institutions (Bassey, 1999, p. 13). One example is a chief information officer (CIO) of a large communications firm who has been tasked to determine whether a 10% increase in network bandwidth would be a worthwhile investment. The CIO would use other evaluative case studies of a networking nature, compare the pros and cons of those study’s results, and determine the level of applicability of those results to her own firm’s situation.

Types of designs

Case studies, according to Yin (2003) can be single or multiple in design. Single design studies are just that: one study is conducted, with a subject and participants intensively investigated in order to produce findings and conclusions. Multiple case studies, more complex by nature, are centered on replicating an experience with two or more similar subjects. Multiple case studies are like weekend music festivals: the more performers (case studies) are presented, with diverse styles and variations, the more absorbing is the experience for the festival attendee (case study researcher) (Merriam, 1998). An example of a multiple case study is to compare two service desks in different locations but with enough similarities to make predictable conclusions, such as why one location's end users appear to be more satisfied with their level of service than the other. Multiple case studies require a substantial amount of time and effort to produce a high quality product.

Single case studies, when particular criteria are met, are suitable for apprentice researchers. When a researcher desires to test a developed theory or when the case has the potential to be unique, a single case is appropriate. If the study is representative of a common occurrence found longitudinally--when the same subject is studied at different time intervals to show different results due to different conditions--a single case study can be used (Yin, 2003). An example of a longitudinal case is if ESD data were sampled every three years, with differing process improvement strategies acting as independent variables. As a one for one data comparison could be made relatively without difficulty, this would make the single case study type a good choice for beginning researchers.

Types of data sources

Case study data can originate from a variety of sources. Loosely structured interviews based on the primary and secondary research questions are often used (Atkinson & Lam, 1999). Archival records from historical data and other artifacts are often consulted as benchmarks (Coverstone, 2002). Surveys of team members and other stakeholders may be used to evoke respondents' attitudes and impressions, often by using Likert scales for some questions and open-ended text fields for other questions (Olson, 2005). Data from automated systems are often used to show a progression, especially in the case of process reengineering, in which an "evolution" of a migration, new product, or new process is desired (Bartoli et al., 2003). Observations of individuals or groups at work give researchers first-hand data of workflows, while opinions from focus groups may be considered when researchers brainstorm marketing strategies (Irlbeck, 2004; Vignali, 2004). Finally, extant data, stemming from performance reports, training assessments, and “quality control documentation,” are useful for enriching case studies (Gupta, 1999, p. 34). Extant data is also used in data mining and to “enable the practitioner to make inferences about actual performance” levels (Rossett, 1999, p. 134; Van Tiem et al., 2001, p. 11).

With a nod to extant data, Yin (1999) lists several “Sources of Evidence” which supplement and may at times replace traditional quantitative and qualitative data categories by introducing additional data dimensions to enhance case study research (p. 85). The sources most likely to be used in this particular case study are “interviews, direct observations, and documentation, ” in which there are advantages and disadvantages of each (p. 85). During interviews, pertinent topical information surfaces, although “reflexivity bias” may occur, when the responder tells interviewers what they think interviewers wish to hear. Direct observations are key elements of evidence, as they show in real time how events transpire; this is not only time-consuming, but people may act different when they know they are being observed. Documentation may include “memorandums…announcements, minutes of meetings, administrative documents, formal studies” (p. 86). These documents are generally useful to meet organizational purposes; however, they may not always be accurate, since they are often based on a single source, the author, and are thus not subject to peer review. These disadvantages were taken into account during this study.

A "grass roots" approach to case studies is supported elsewhere in the literature. In order to fully research a program or issue, the case study researcher was required to dwell in the "natural context of the participants" in order to obtain participants' perspectives (Gall et al., 2003, p. 619.) This technique greatly benefited case study findings, since it gleaned its data from the people and equipment closest to the core of the issues, who were in daily contact with the subject matter. Obtaining this hands-on data surpassed the quality of information from managers, leaders, and others, who do not regularly come in contact with issues and might have possessed political agendas.

Critical success factors

Critical success factors (CSFs), also called cost drivers, "are a set of requirements that if a firm achieves them, they are assured of business success" (Schniederjans et al., 2004, p. 164). Although the use of the word "assured" in that definition may be misleading, since other elements such as unknown external factors inevitably play a part in organizational success, these guidelines nevertheless provide blueprints of success for businesses that want their products and services to satisfy customer demands. There are several skills that experienced case study researchers possess that enable them to produce high quality studies. A keen sense of critical thinking and insight enables researchers to follow all paths that might lead to discoveries during data-gathering. Due to the inherent nature of qualitative study, upon which case studies are usually built, there is no set pattern for finding information; instead, there is a strong reliance on an individual's “intellect, ego, emotions…and [an] inquiring mind” that are necessary to realize which paths to pursue and which to redirect (Yin, 2003, p. 58).

Being a careful observer, especially listening during the data-gathering process, is also a key trait that can add much value when seeking information. This quality is so vital that Patton (1990) says that unskilled observers are to researchers as “amateur community talent show” performers are to professional entertainers (p. 95). Being attentive when observing and interviewing also helps to detect when bias may slip in and taint an otherwise high quality data interpretation (Irlbeck, 2004). Non-verbal clues may also be indicators of behind-the-scenes thought processes that may trigger a discovery. For these reasons, it can be said that the best case researchers are like crack crime investigators, as both look for clues and leave no stones unturned when examining the scenes of the “crimes.”

Upper management buy-in, a well-structured framework, and a facility to be used as the command or operations center were earmarked as effective enablers to information technology (IT) initiatives during a recent case study. A researcher who studied students enrolled in a computer security curriculum performing internships to local businesses found that without the full support from professors and business owners, the project would probably have failed (Schneider, 2006). The study used a project management framework which included regularly scheduled deliverables and in-progress reviews with stakeholders. As a physical focal point, the command center was instrumental in ensuring that all meetings, daily interaction, questions, advice, and troubleshooting efforts occurred so that the project’s schedule could move forward.

A final critical success factor deals with the data analysis process. Merriam (1998) puts forth several techniques that case study researchers can use, especially apprentice scholar-learners, to substantially increase the chances of a study's success. When performing interviews and surveys, researchers should analyze data simultaneously during the collection phase, and constantly refine the data to make sure the study stays on track with the desired outcome of the study. This can be done by making adjustments along the way, re-designing interviews based on previous data, taking copious notes, referring to literature, and continuing to visualize the end-state of the findings. Proper data management, such as sorting, coding, and retrieving, are also necessary ingredients when working with voluminous amounts of data. Among other theoretical frameworks, case studies have been effective vehicles by which human performance improvement projects have been recorded (Roehrig, 1998; Jobert-Egou, 2002). The next section will discuss HPI.

Human Performance Improvement

Human performance improvement (HPI) is a relatively new movement that is concerned with increasing the effectiveness of an organization's products and/or services. The term "performance intervention" has become the new battle cry for organizations seeking to produce higher output, increased customer service levels, or "greater efficiency from work groups" (Stolovich & Keeps, 1999, p. 5). Wise managers now look to internal resources to bring about changes to help organizations face the fierce competition that has come about within the past twenty years.

The need for these shifting paradigms is due in large part to "formidable global competition, increasingly demanding customers, [and] quantum leaps in technology" (Rummler & Brache, 1995). Economic times are changing at a rapid pace. More and more goods are produced in and exported from China, which has become the latest Asian Tiger to pursue worldwide economic dominance. South Korea's automakers experienced $32.6 billion in exports in 2006, while the dot-com era arose in a wave of excitement and exited with a crash of bewilderment, leaving the western world in its recessive wake. Consumers clearly benefited, finding that they had more choices for goods and services; crowds flocked to discount retail giants in never-before-seen numbers. Technological advancements enabled virtual transactions that when coupled with overnight and two-day express shipping, made it as convenient--if not more so--for families to obtain necessities and luxury goods. With such fierce competition, wise managers decided to look inwardly at their human resources to improve their chances of survival. Rosenberg (1996) wrote ten years ago what still holds true:

> Today change is happening faster than ever before. Work environments, operations, job functions, and processes are much more interdependent. Job, customer, and technological requirements seem to change almost daily as organizations scurry to deliver goods and services at a faster rate, with quality improvements, and at a lower cost (p. 5).

Definition

Perhaps due to its recent inception and evolving nature, scholars agree that there is currently no single definition for human performance intervention (HPI) that can be applied to all organizations (LaBonte, 2001; Rothwell et al., 2007). However, several definitions found in the literature are widely accepted and offered here to clarify the reason and purpose for HPI. One definition states that HPI is “a results-based, systematic approach…that focuses on accomplishments…to increase the quality and quantity of individual outputs” (Sanders, 2002, p. 5). The American Society for Training and Development (ASTD, 1992) defines HPI as “a systemic approach to analyzing, improving, and managing performance in the workplace through the use of appropriate and varied interventions” (p. 10). LaBonte (2001) expands on this definition: HPI is “the process used to systematically partner with clients for the purposes of identifying performance problems, analyzing root causes, selecting and designing actions, managing interventions in the workplace, measuring results, and continuously improving performance” (p. 9).

HPI elements

Elements of HPI can be defined in a number of other similar performance disciplines, which often result in researchers using a similar yet distinctly different term as their human performance approach. Stolovich and Keeps (1999) use the expression human performance technology (HPT) to label the means used to produce desired performance results with an organization’s personnel, in which human performance technologists analyze performance gaps and “design cost-effective and cost-efficient interventions that are based on analysis of data, scientific knowledge, and documented precedents, in order to close these gaps in the most desirable manner” (p. 10). Performance technology provides a roadmap for organizations to improve their staff members' productivity. According to van Tiem et al. (2001), performance technology is "the systematic process of linking business goals and strategies with the work force responsible for achieving the goals" (p. 8). Finally, performance consulting (Robinson & Robinson, 1995) offers an alternative to training, as consultants look to performance models to channel employees' performance "in the desired direction" to achieve business goals (p. 11).

Before describing the various models found in HPI literature, a brief deconstruction of modeling, including its typical components, will be discussed. All systems, like organizations, tend to be complex in nature, dynamic in function, and iterative in procedure. Models were designed to help analysts focus systemically while maintaining sight on the overall goal. Rothwell (2007) cites input, process, and output as the basic starting blocks of a model, analogous to a computer system, in which the keyboard enters data input, the central processing unit performs the activities, and a monitor or printed copy serves as the process's outputs. Another example, more suitable to this study, may be a service desk technician who receives a call for assistance from a user who forgot her password (input). The technician resets the password (process), the user retries, and can now log in to the computer (output).

Elements commonly seen in HPI models and added to this simple input-process-output model are effects and feedback (Rothwell et al., 2007). These are the results of the actions previously described, and reflect the outcomes of the aforementioned actions. To continue the service desk analogy, when the user logs back in after the password reset, she can therefore read and respond to e-mail, update a critical spreadsheet, finish word-processing an important logistics brief to an upper-level commander, and complete and submit a customer satisfaction survey back to the service desk.

Addie

The ADDIE model was a forerunner to today's HPI methodologies. ADDIE, which combines five key components into an overall human performance blueprint, led to Gilbert and Mager's contributions to improving human performance issues. Before the term human performance improvement was ever coined, yesterday's trainers and educators striving to increase the quality of its human resources looked to Instructional Systems Design (ISD) applications such as ADDIE for guidance. By utilizing well-defined steps that closely track a program's or person's effectiveness, ADDIE, which stands for Analysis, Design, Development, Implementation, and Evaluation, pinpoints precisely the level of training or intervention an organization needs to affect a positive result.

The ADDIE process is broken down into discrete steps. Analysis refers to acquiring a concrete understanding of an organization's problem or failure to meet a particular goal. Also during the Analysis stage, trainers determine the level at which a particular subject must be taught in order to meet its objectives. In the Design stage, a consultant or trainer researches the issue and creates a plan to alleviate the problem. The Development phase is the action mode, in which the consultant creates the training or HPI plan. During Implementation, training or HPI actually takes place. Evaluation occurs to determine whether training or HPI objectives have been met (Peterson, 2003).

To illustrate, a performance deficiency at a hypothetical service desk serves as an example of how the ADDIE model can be applied as a performance intervention. A service manager discovered that technicians were taking twenty minutes longer than industry standards to help users who could not print e-mail messages. The manager examined the data and determined that each technician fully researched the problem each time the issue arose, to ensure procedural accuracy (Analysis). Browsing through a software company’s technical support website, the manager decided that a working aid to be placed on each technician’s desktop would be the best solution to this problem (Design). The manager created a step-by-step job aid using graphics and text to clearly show technicians how to enable end users to print their e-mail messages (Development). The technicians first used the job aid offline, then went "live" after the technicians were successfully trained (Implementation). Finally, the manager with other managers reviewed the trouble ticket data that dealt with this issue, and concluded that the intervention was successful in reducing the resolution time (Evaluation).

The ADDIE model offers benefits that can be used as the framework for the ESD intervention. The model's systematic, step-by-step procedures allow training initiatives to be mapped to learning objectives by first determining the necessary level of skill proficiency, and then developing a plan to train the individual to reach that proficiency (Dijkstra & Seel, 2004). ADDIE is an iterative approach that permits fluid, multi-directional advancement through the five stages when adjustments are necessary (Kaufman & Watkins, 2000). The model's systemic, cradle-to-grave process is applicable in a wide variety of situations, such as evaluating training performance levels (Larson, 2003). Clearly, ADDIE links well with HPI.

HPI champions

Another significant forerunner to HPI is the work of Thomas F. Gilbert, who is considered to be a founder of the HPI movement (Rothwell et al., 2007). In his Human Competence model, Gilbert (1978), who studied under the behavioral psychologist B.F. Skinner, examined six factors that should be examined before training occurs: an organization's information, resources, environmental incentives, knowledge, capacity, and motives to improve performance (Van Tiem et al., 2001). Gupta (1999) points out that Gilbert's methodology looks at two levels of assessment: the work environment first, then at the individual, which takes a more systemic approach.

Regarding contributions to the field which would eventually lead to HPI/HPT, Gilbert's Behavioral Engineering Model (BEM) has been used extensively in organizations to troubleshoot performance problems (Rothwell et al., 2007). The BEM states that management should inform employees regarding their expectations, provide feedback to employees, and initiate a reward system to act as a motivator, which is prominently seen throughout military and civilian sectors. Gilbert's notion is that employees, who use a wide range of intellect and emotions, bring their own brand of productivity to the work center; which underpins today's culturally diverse workforce and leads to improved productivity of the team as a single unit (Holder & Walker, 1993).

The field of instructional design led to performance improvement by the acclaimed work of Robert Mager. With such a keen interest in improving human performances, Mager turned his focus to learning objectives. Objectives can be defined as those tasks necessary to complete an activity, but which employees at the present time cannot perform (Hannum, Jonassen, & Tessmer, 1999). Mager realized that in order to have trainees produce at their optimum capabilities, it was no longer acceptable for trainers designing instructional programs to ask, "What should we teach?" Instead, Mager pointed to learning objectives that must first be taken into account. Mager realized the importance of having the objectives as the central foundation point from which training should be constructed, after which strategies and tools to measure assessment can be devised (Jonassen, 2004). The outcome, or those tasks that the trainee should be able to do as a result of the training, became the critical factor in designing HPI programs. Mager's horse-before-the-cart model of instructional objectives, also called behavioral objectives, "remains the classic approach to objective writing in current instructional design literature" (p. 549).

The Instructional Objectives Model from Mager consists of three parts: performance, conditions, and criterion. Performance deals with the specific behavior that trainees or students require to successfully complete all tasks. Objectives should also be "observable, measurable, unambiguous, and explicit," (Panasuk, Stone, & Todd, 2002, p. 808). For example, verbs such as, "to understand, to appreciate, to know, and to recognize…" are unacceptable, as they cannot be quantified (Donaldson, & Scannell, 2000, p. 36). Measurable action verbs are preferable. Conditions, the second phase of Mager's model, target the circumstances under which the learning objectives must be met. This phase specifies whether the task must be completed under specific situations;

for example, if an ESD technician must be available to resolve a VIP's BlackBerry e-mail issues on a Sunday at 2 a.m. Criterion are the "standards or levels of acceptable performance" (Wilmoth, Prigmore, & Bray, 2002, p. 29). For example, a service level agreement may stipulate that a network engineer must restore local area network (LAN) connectivity to a specific group of users within five minutes of notification. Used systemically, the objectives cover the three most important facets of learning objectives: behavior, environment, and level of expertise.

HPI categories

Rosenberg (1990) identified four categories of HPI. Human resources development focuses on improving individual performances. Organizational development targets team-building and other efforts to assist performance within groups. Human resource management, closely related to HR development, seeks to coach and manage employees. Finally, environmental engineering techniques such as job aids, shared knowledge, and building enthusiasm are often done in organizations.

The HPI model

The HPI model used in this study is from Sanders & Thiagarajan (2001), and referenced by Dent & Anderson (2000). See Figure 1. The model consists of seven major parts. In a cyclical fashion, the model first analyzes business needs and performance needs stemming from detected gaps, after which a root cause is determined. At that point, an intervention is selected, implemented, and evaluated to determine the implementation’s success. Finally, the entire process is overseen by systematically managing the change.

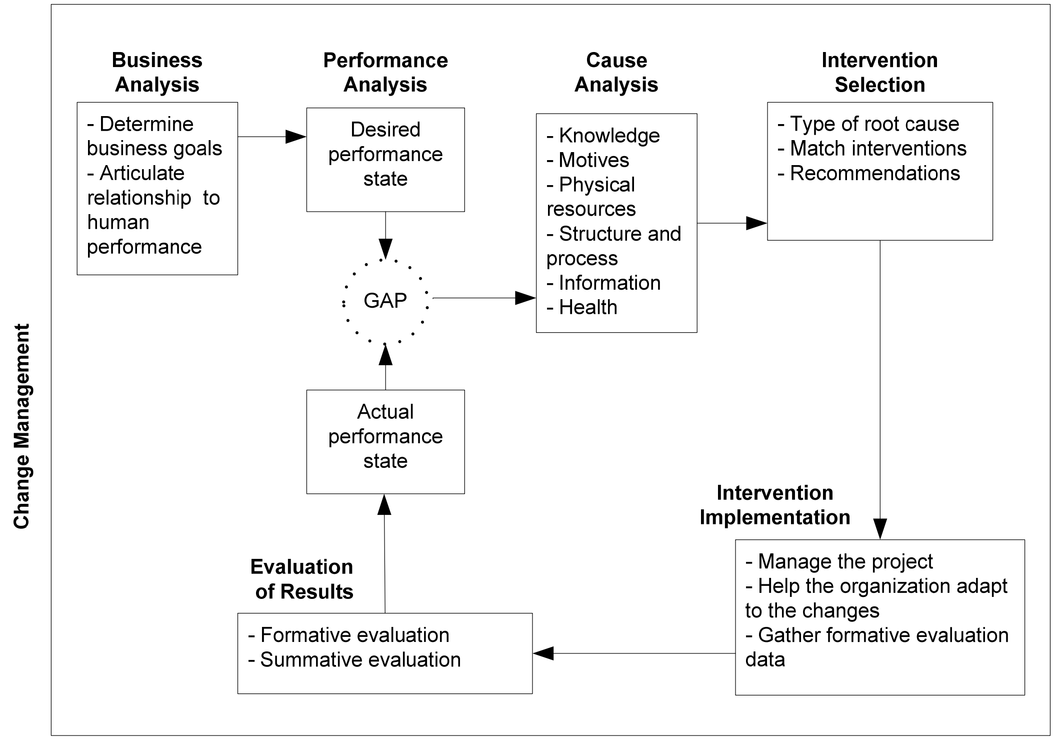

Figure 1. The HPI model methodology

Source: Performance Intervention Maps, p. viii by E. S. Sanders and S. Thiagarajan

Critical success factors

The following critical success factors (CSFs) of performance improvement measures were adapted from Brache's and Popoff's (1994) "seven deadly sins." Applications will be made to generic organizations to illustrate each CSF's importance.

1. Tie strategic issues to business objectives. How organizations meet the needs of its customers should be tied to the levels of service determined by the business objectives.
2. The effort should involve all stakeholders, including management. The authors caution against overusing external sources for key roles within

organizations. Although outsourcing is well documented in the literature as a best practice, Brache and Popoff feel that outsourcers' roles "[do] not entail doing the analysis and redesign," since, by the nature of unfamiliarity with the organization, their "thoroughness" and "wisdom" is of questionable value; key decisions should be made by "people involved in the process, including customers and suppliers." Additionally, high level managers should follow what may be called the GRAMPS method: guide the team through critical points, remove all obstacles, approve feasible suggestions and recommendations, manage the implementation, provide an overall strategy of success, and set the course of the project (Rosenberg, 1996).

3. Organizations need a clear charter and accountability to fulfill the charter. Clarity is a necessary ingredient for any special projects team to fulfill its roles and responsibilities. Teams need to know the deadline for all deliverables, constraints, limitations, timelines, and other personnel concerns, while not falling into the trap of over analysis.

4. Inform management that a top-to-bottom, front-to-back reorganization is not necessary to realize significant improvements. Some managers mistakenly think that the only way to see performance changes is to get employees' attention in a drastic way. However, this is not always the case. Organizational goals may be to demonstrate to upper management how incremental changes can ultimately lead to better service across departmental lines.

5. Process designers need to be empathetic. A great plan will fall if the ability to carry it out is absent. Process designers must work closely other personnel to ensure that the new processes are doable and likely to be applied successfully.
6. Focus on the implementation, not the design. Overplanning the design is a known downfall of many implementations. The author has witnessed one particular consolidation project that cost millions of taxpayer dollars to design plans to stand up a server farm, only to see the project scrapped before the first set of cables were installed.
7. Evaluation must be done using adequate measurement systems. The final stage of evaluation is the yardstick of the reengineering plan. Qualitative and quantitative measurements must track at agreed-upon intervals to make sure the intervention does what it is designed to do.

Business Process Reengineering

One way to bring about a positive change in human performance improvement is to reengineer the procedures so that employees become more proficient. A popular model for accomplishing this is business process reengineering (BPR). Hammer and Champy (1993) designed the methodology to use IT resources to make revolutionary changes to an organization's productivity. BPR "is a drastic undertaking in that it peels back layers of history, tradition, and practices in order to examine an organization's root processes with the goal of simplifying them" (Reif, 2001).

Definition and purpose

The founders of BPR, Hammer and Champy (1993), defined BPR very specifically: to radically redesign or reorganize business processes and practices “to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed” (p. 35). Key words in the definition are radical and dramatic, which infer that BPR targets major organizational transformations. BPR is a ground-up approach, and therefore requires complete redesign instead of fine-tuning or streamlining old processes. The BPR approach continues the process-approach of its predecessors, but takes a much more extreme line of attack: substantial improvements are necessary to achieve organizational objectives (Beckford, 1998).

The purpose of BPR is to cover customer needs, reduce costs, use IT to its fullest advantages, and allow companies to grow. Since the intent of improving processes is to satisfy customers, the goal of reengineering processes is then to realign a company’s resources to better meet the needs of the customer (Hammer & Champy, 1993). One of the objectives is “process time reduction,” in order to offer, as Davenport (1993) says, “a competitive advantage” (p. 3). The purpose of BPR is also to relate information systems to business objectives. In a meta-review of BPR literature, researchers concluded that BPR’s purpose is “to facilitate the match between market opportunities and corporate capabilities, and in so doing, ensure corporate growth” (O’Neill & Sohal, 1999, p. 572). BPR is also “a means to restructure aging bureaucratized processes in an attempt to achieve the strategic objectives of increased efficiency, reduced costs, improved quality, and greater customer satisfaction” (Grover & Kettinger, 1995, Abstract). Process integration along with optimization were recognized as best practices by the Gartner Group (Scott et al., 2006).

There are disappointing levels of BPR project success rates found in the literature. It is well known in BPR circles that up to 70% of American projects fail to meet their objectives, for only a 30% success rate (Hammer & Champy, 1993). Internationally, a 55% success rate was found in one particular study, which averaged 61% in the U.S. and 49% European organizations (Al-Mashari, et al., 2001). One study implied that Michael Hammer's goals of significant decreases in cycle time and costs, and increases in "customer satisfaction, quality, and revenue," and a substantial "growth in market share" have fallen far short of their marks (O'Neill & Sohal, 1999, p. 577).

However, these figures may be misleading. With the passage of time, one might expect more sophisticated practices and hence higher success rates. As M. E. Smith (2002) points out, there was a 100% increase, from 30% to 60%, in the number of BPR successes recorded between 1996 and 1997 than between 1990 and 1994. However, the data is inconclusive, and other factors such as falling costs of technology, economic climate, global competition, and a host of other causes may have contributed to the success rate's spike.

There are several well-documented reasons for BPR's failure to reach objectives. O'Neill and Sohal (1999) fault senior managers for not relinquishing control, saying that, "the problem, it would seem, is that reengineering of the corporation is not extending to actual management practice," where perhaps reengineering would be the most beneficial (p. 577). Many times, executives give seemingly wholehearted approval, only to lose faith in the project's outcomes as time goes by. Lack of resources when beginning the project may obstruct a reengineering effort from going forward. Furthermore, Fenelon (2002), while performing a meta-analysis of medium-sized organizations involved in BPR projects, found that in-fighting and politics, "unwillingness to bear the pain (financial, personal, and emotional) of the change," and a refusal to implement changes are also major BPR hindrances (p. 125).

Some BPR projects are actually less than full reengineering undertakings, based on Hammer and Champy's "radical" definition. Companies seem to be confused regarding the definition and extent of modifications which BPR demands. The nature of reengineering allows business entities to implement changes within a wide range, either in very small increments or across entire organizations. A 50-company study by the Forrester Group found only 30% of surveyed companies which reportedly engaged in reengineering efforts were actual BPR events; 42% more were incremental, not radical changes, while 28% were not reengineering at all (Obolensky, 1994, as cited in Metchick, 1999). Reengineering to one company may be mere incremental improvements to another. See Figure 2.

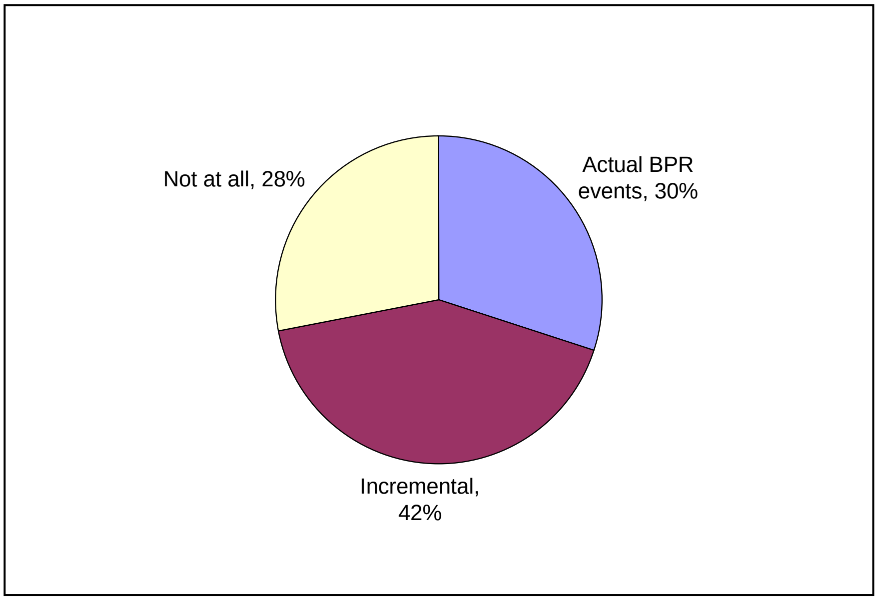

Figure 2. Claimed BPR projects versus actual

A lack of upper-management commitment and communication with stakeholders, flawed methodology, and a marked lack of planning have been found to sharply decrease the rate of BPR's success (Al-Mashari, 2002; Fernandes et al, 2001; Kitchen, 2001). In addition, an inflexible corporate culture, weak alignment of business processes with objectives, poorly defined projects, unclear roles and responsibilities, and a misunderstanding of company's goals have also been found to contribute to poor results from BPR initiatives (Flint et al., 2005; Tingey & Mok, 2004).

History

The idea of improving work conditions is hardly new. The roots of process improvement can be traced to the 18th century work of Adam Smith, an economist who saw the value of dividing labor into segments synergistically to increase factory outputs. Henry Ford added to Smith's developments by offering higher compensation and profitsharing benefits to workers to boost its production. Both Smith and Ford are linked to BPR because they divided work tasks into finite subtasks (“task specialization”) to allow managers to track the manufacturing processes (Kezsbom, 1996; Danesh-Pajou, 2005).

Some scholars see Frederick W. Taylor’s managerial innovations during the Industrial Revolution as a viable precursor to improving conditions of quality in the workplace, because Taylor first shed light on the importance of procedures in manufacturing (Scherr, 1993; DeLuca, 2003; Eatock, et al., 2002). Other authors (Weicher et al., 1995) credit the management strategist Henri Fayo as a forerunner of BPR, since he looked to using “all available resources,” including task reengineering, for optimal productivity. Breaking down tasks worked well when the demand for products was limited; however, as the population exploded, ignited by baby boomers following World War II, the need for improved processes was not only met but exceeded by the proliferation of technology (Ferguson, Weir, & Wilson, 1999)

The advent of computerized automation in the 1950s served as the major catalyst for the current business process movement. As companies began to slowly implement first generation IT solutions, government agencies and auto manufacturers looked to companies like UNIVAC and Underwood for making their tasks more efficient and productive (Bergeron, Raymond & Rivard, 2002). Information Age assets made formerly cumbersome tasks such as word processing, database management, and arithmetic functions accessible to even the smallest businesses, which sought to maximize productivity at the lowest cost. Dictation machines, for example, replaced laborious note-taking from secretaries, who became available to perform other, just as important business processes. Certainly e-mail, with the help of ever-widening network connectivity speeds, has made great strides in streamlining the communication pipeline; its split-second delivery enhances efficiency more than traditional postal services could ever dream.

TQM

The evolution of organizational management strategies led to the most visible forerunner of BPR, thanks to the work of Dr. E. Deming, often seen as the founder of the quality movement. TQM is considered a breakthrough management tool, because for the first time management sent out a broadcast message to urge employees to look for ways to improve performance across all organizational levels (DeSimone et al., 2002). TQM introduced sound change management practices into organizations to increase customer satisfaction levels. With assistance from Juran and Ishikawa, Deming devised his so-called Fourteen Points which were pivotal in showing businesses the importance of quality over productivity (Deming, 1982). Several of Deming's principles are paramount to BPR success, such as breaking down departmental barriers, instilling pride of ownership and workmanship, promoting education and self-improvement, and empowering company employees to be stakeholders in a business's transformation to the new philosophy (Deming, 1982). A commitment to continuously improve service processes was the central theme of TQM, with the expected outcomes of reduced costs, increased customer satisfaction, and greater output, profits, and job security for the entire organization (Schuler & Harris, 1991; Danesh-Pajou, 2005). Finally, TQM perceives organizations as "processes that can cross all organizational functions, which can best be improved by incorporating the knowledge and experience of workers" (DeLuca, 2003).

Deming's theories are seen as de rigueur for quality-focused leadership throughout various communities. In the private sector, industry giants Xerox and Corning Glass were able to transform its operations based on Deming's teachings (Schuler & Harris, 1991). Constructs such as visionary leadership, process management, and continuous improvement were deemed applicable to the health industry, U.S. automakers, and defense contractors (Douglas & Fredendall, 2004; Smith, L. R., 2005). His "Plan, Do, Check, and Act" business process cycle can be seen in many organizational plans of action. In educational circles, students can register for many courses throughout the U.S. that deal in the subject of quality, and the schools themselves have adopted TQM techniques to increase their competitiveness (Lillrank & Holopainen, 1998). In public sectors as well as the military, government agencies look to quality management to improve service quality and thus increase its effectiveness in police departments, motor vehicle agencies, customs offices, and others, across the U.S. and the European Union (EU) (Galloway, 1994; Edvardsson & Enquist, 2006).

Six Sigma

Six Sigma quantified TQM's customer-oriented focus and customer needs satisfaction by reducing product defects (De Feo, 2003). The creation of Six Sigma answered the need for quality control with the arrival of the Digital Age in the 1980s and 1990s. American consumerism radically shifted and forced U.S. companies to relook at their quality standards, as Americans spent millions for Japanese portable products to satiate their appetite for inexpensive, high quality digital products such as portable stereos and compact disc players. When they realized that Japanese-built electronic items were far superior to their own, leaders of the U.S. company Motorola spearheaded a new approach to quality. Six Sigma made significant inroads on the quality movement by attempting to eliminate defects or errors in organization performances (Huehn-Brown, 2006). The initial tasks of Six Sigma were twofold: map customer requirements to the purchased products, and raise quality levels to near 100% perfection (Pande, 2000). Many other companies have since succeeded using this approach and have fine-tuned this predecessor to BPR.

Along with eliminating errors, Six Sigma also strives to streamline business operations and improve quality levels (Harry & Schroeder, 1999). Measures, metrics, and statistical methods of determining the standard deviation--hence the Greek letter Sigma--are used to pinpoint the accuracy of an organization's targets, to the extremely narrow margin of only 3.4 defects or rejects for every million activities (Pande, Neuman, & Cavanagh, 2000; Pande, 2001; Brussee, 2004). Specifically, the roadmap to Six Sigma success has two key ingredients: the use of the DMAIC methodology of Define, Measure, Analyze, Improve, and Control, combined with mandatory buy-in from top-level stakeholders with a strong strategic vision and the resolve to see that strategy through to completion (Brussee, 2004; Burton, 2004). The attraction of Six Sigma lies in the fact that DMAIC can be applied to any organizational problem, regardless of the level of impact (Burton, 2004). And with today's inexpensive software, commercial-off-the-shelf

(COTS) programs allow non-statisticians to arrive at “bottom line” results as simply as tax preparation software has become an annual purchase for American taxpayers.

Six Sigma has gone through several important iterations since its inception, with one in particular. The term “Lean, ” which can be traced back to Henry Ford and his company’s then-new mass production principles, was added as a way to designate “the elimination of waste and the increase of speed and flow” (Dirgo, 2005; Goldsby, 2005). By combining the two terms, Lean Six Sigma focuses on accelerating process flows to deliver the quickest and most efficient delivery to customers by removing or reducing delay times. The result, if done properly, is a significantly larger return on investment (ROI) (George, 2003). Lean Six Sigma began in manufacturing, especially the vehicle industry, but it has been applied to many other fields as well (George, 2003).

Six Sigma (both standard and Lean) and TQM share many precepts, yet also have their differences. Customer focus, process focus, collaboration, organizational learning, benchmarking, a change in culture, and quality in service are common denominators of quality management (Goeke & Offodile, 2005; Pande, Neuman, & Cavanagh, 2000). Additionally, documentation, modifications, predictability, and plans to implement solutions are shared by these and other quality improvement systems (Tomczyk, (2005). But there are also differences between the two methodologies. Some argue that Six Sigma is more specific, as it brings in statistical analysis and four stages of development: measurement, analysis, improvement, and control (Dahlgaard-Park, 2006). There are no levels of attaining TQM certification per se, but there are green belt, black belt practictioner, and master black belt levels associated with Six Sigma (Pyzdek, 2003). Six

Sigma also utilizes business tools to a greater extent than TQM for metrics gathering, such as determining process costs and resolution times in a service desk; it also provides a more systemic perspective throughout an organization and takes into account other business goals to help assure positive outcomes (Quezada, 2005).

As attractive as empowering employees and strongly considering customer satisfaction may be, there are criticisms of TQM and Six Sigma that bear consideration. Some claim that these approaches merely serve the best interests of management, and treat workers as ineffective instruments rather than key players and stakeholders (Potterfield, 1999). Military and similar organizations, with a strong, rigid culture and relatively short two to three year tours of duty for rotating personnel, do not lend themselves particularly well to creative management styles. This is especially true when mission requirements focus on extreme goals such as winning wars, defending territory, and risking human lives. After initial high hopes about employees becoming pseudo-partners in decision-making and expecting to be empowered, in the final analyses, often no cultural changes take place and TQM initiatives fall away, leaving employees more skeptical than before (Dawson, 2002). In both approaches, change agents sometimes fail to effectively reach team members who are resistant to change, whose numbers can be as high as 80% of any workforce (De Feo, 2003; Benner, 2002; Anton et al., 2002). Improper planning, lack of focus, weak buy-in from top level management, and poor information flows often plague company improvement efforts.

Emergence of BPR

The emergence of BPR was the result of several economic developments in the 1990s. One reason was the explosion of IT's usage in the workforce, and the need for corporations to use IT to reinvent business processes to help meet organizational objectives (Khosrow-Pour, 2006). "Business processes are the key to building a bridge" between managers and IT personnel (Scherr, 1993). Companies therefore rely heavily on the latest digitally automated iterations, such as knowledge management systems and collaboration software, to rework business strategies that seek the most effective ways to meet customer needs (In, 2004; Moreno, 2001). Another reason for the emergence of BPR was changing business needs. Companies needed to change the way they conducted business, and they needed to do it quickly. Global paradigms such as manufacturing overseas for reduced production costs forced many companies to move "from sustainable competitive advantage to extremely temporary competitive advantage, and from control to empowerment and teamwork" (Basu, 2000, p. 13).

Another reason for the birth of BPR was that customers in the 1990s became more informed and hence more demanding. With the Internet opening up technological windows to the world for millions of users, customers were better equipped to review products, compare retail distributors, and cast their economic votes to those corporations with the most effective product and service delivery (Al-Mashari et al., 2001). No longer did traditional department stores have the upper hand; customers were now able to choose between discount retailers, online and television shopping vendors, and the more traditional family-owned mom-and-pop stores. For example, Dell introduced reengineering strategies into its delivery process to stave off the competition on three fronts: price, quality, and speed (Turban et al., 2001). Fearing bankruptcy by competitors' undercutting, Dell used a just-in-time approach, combined with proximity warehousing, heavy reliance on Web-based ordering and eCommerce, outsourced testing, and employee vigilance in maintaining strict quality control and high productivity levels.

However, IT-related initiatives linked with process reengineer efforts should be carefully planned and carried out; many BPR-IT projects fail for various reasons. Nearly 42% of all information systems "are canceled before completion" (Kuilboer & Ashrafi, 2006). One study at Utah State University documented the events concerning the implementation of a new technology into a research foundation; resistance to change prevented the project from reaching completion. As one consultant put it, "Basically, IT [technicians] had strongly resisted the implementation because they feared that they would lose power over controlling the data and systems" (Wang & Paper, 2006, p. 13). In one study of an IT implementation effort that attempted to introduce automation into a social agency service, the project failed miserably, resulting in a waste of 32 million taxpayer dollars. Insufficient planning, failure to realize the complexities involved in the undertaking nature of the undertaking, absence of risk management considerations, lack of feasibility studies, and opposition to the concept of teamwork were identified as barriers to success (Kuilboer & Ashrafi, 2006). In India, a large banking organization was unsuccessful in rolling new technology into their processes, because senior managers were unaware of the roles and process involved in bringing about change management

(Banerjee, 2006). These are just a few of the examples in the literature of reengineered IT initiatives that did not conclude as hoped.

BPR and technology

Although the inclusion of technology into BPR efforts produces three major benefits--cost, availability, and compatibility--and plays a key role in BPR designs, its use is no guarantee of successful results (Wells, 1998). Business owners may refuse to let go of outdated legacy systems. Organizations may purchase a tool that turned out to be inadequate for the tasks, or the technology was a victim of poor design (Tingey & Mok, 2004; Akamavi, 2004). The technological tools purchased or leased need to fit the intended purpose; in fact, some organizations place more emphasis on the tool than on the larger scope of the reengineering effort itself. This oversight merely accelerates an organization's problems, and can infect other business concerns as well: "Automating a mess just produces a faster mess" (Harrington, 1991, p. 157). In some cases, once implemented, the proper scientific principles and techniques to correctly utilize the technology to effectively automate or solve the problem were sorely missed (Schon, 1984).

BPR and training

It is essential that training requirements are strongly considered during BPR projects. According to Weicher and others (1995), "no reengineering effort will succeed without first reeducating and retraining the people who will ultimately work with the new process" (p. 72). This is especially true in the IT environment, in which users must learn new techniques to manipulate often complicated hardware and software equipment effectively, according to the newly revamped design. Without adequate training, the entire effort is placed at risk.

Conducting training assessments is important in interventions in which training plays a role. Often the training involves behavior modification, which can be measured by determining the actual versus desired levels of behavioral change (Rothwell et al., 2007). This can be done in two ways: via questionnaires and structured observations (Rothwell et al., 2007). The researcher witnessed these vehicles used successfully while serving as a long-term technical trainer. Following graduation and reassignment, questionnaires were sent to field sites, where unit supervisors observed the newly assigned subordinates and reported back to the training facility the answer this question: "To what extent were your subordinates able to complete critical hands-on tasks they were taught at our facility?"

Limitations

Because BPR has its limitations, not all companies or organizational issues lend themselves to reengineering interventions, especially international efforts. American BPR victories may produce different results when replicated in the Far East, due to cultural group-versus-individual differences and organizational perceptions (Murphy, 2002). The literature produces conflicting indications of whether American success stories can be duplicated abroad. In Europe, for example, Basu (2000) cites several research studies which took place in German and Swiss corporations and among international managers; the implications were that care should be taken when attempting to practice American theories across borders, since foreign business strategies and operational constraints may greatly hinder process redesign effectiveness. Employee dissatisfaction may impede BPR success, since “changes in job redesign and organizational development do not always affect individuals the way they are intended” (Ardito, 2000, p. 24).

Critical success factors

The ability to properly document processes and take a holistic view are also required. Individual within organizations must be familiar with diagramming processes; otherwise it will be difficult for the processes to be effectively illustrated for proper analysis, thus impeding the reengineering activity (Devane, 2001). If companies do not have a holistic operational view, and departments are isolated from one another, the effort may fail, since by nature reengineering requires active participation of all company services. It is best to “incorporate whole-systems thinking so that process performance is aligned with other organizational variables such as overall strategy, competitive pressures, and activities in other parts of the organization” (p. 155).

This holistic view is best seen in Rummler-Brache’s process improvement and management methodology. This methodology is a five-phased approach to process improvement (Rummler & Brache, 1995). The first phase is for planning, interestingly numbered “zero” rather than “one,” perhaps indicating that the authors see this phase as a necessary prelude to the action phases that follow. During planning, done at the operational level, a strategy is established, and critical success factors are used to determine the organization’s core business processes. Phases one through three are done at the organization’s functional levels. Phase one is project definition, when the process improvement team is formed, which in turn identifies the project goal, assumptions, limitations, and other project management functions. Process analysis and design is phase two, when the team determines the "as is" baseline, performs gap analysis, and develops an implementation plan that answers the question, "How can we get to where we need to go?" During phase three, implementation, the team determines the project's impact, conducts implementation training with the staff, performs risk analysis, and pilots the process. Finally, during phase four, process management, post-implementation techniques for evaluating, such as measuring the implementation's effectiveness, are conducted . See Figure 3.

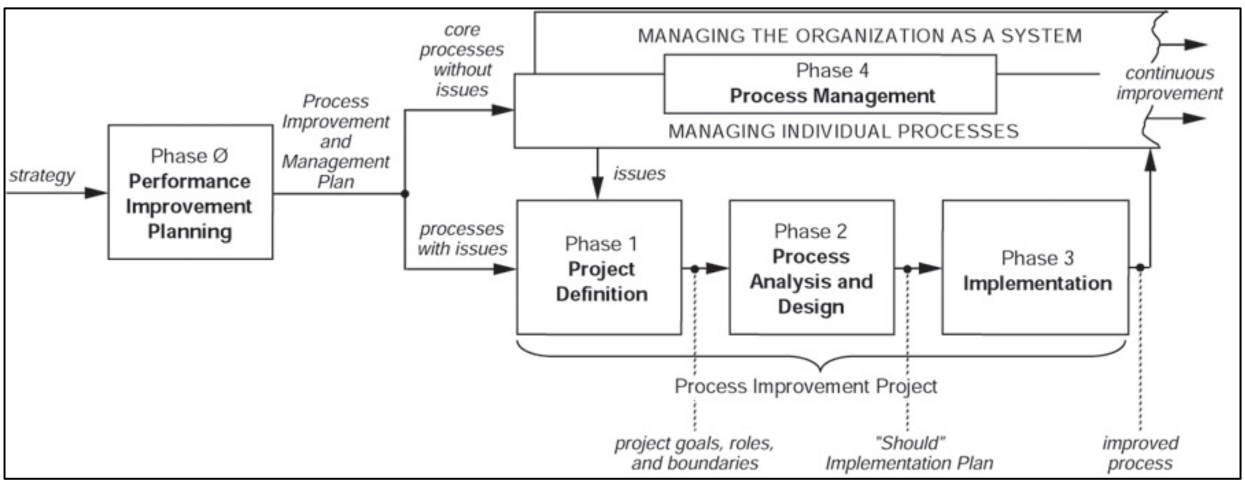

Figure 3. Rummler-Brache Process Improvement and Management Methodology

From Improving Performance: How to Manage the White Space on the Organization Chart, Second Edition, p. 116 by G.A. Rummler and A. P. Brache. Reprinted with permission.

Table 1. BPR Critical Success Factors

Critical Success Factor	Purpose or Mitigation
For Management	
Top level buy-in and commitment is uppermost (Bergeron et al., 1998; Hammer & Champy, 1993)	Company leaders must actively back the project throughout the entire reengineering effort; the leaders should not be about to leave or retire from the organization (Weicher et al., 1995)
Use a proven methodology (Basu, 2000)	Reinventing the wheel is not necessary, and can increase the chance of failure (Wells, 1998)
Do not overlook the importance of human resources	Focus on people as well as IT resources
Be willing to take risks (O'Neill & Sohal, 1999)	Any radical change requires a certain risk
BPR must be accompanied by strategic planning (Weicher et al., 1995)	BPR is a long-term strategy; sticking to fundamental process designs can mitigate the confused perception that BPR offers a quick fix (Gonsalves, 2002)
Use benchmarking as a vital tool to track milestones (Gonsalves, 2002)	Identifies goals, hits, and misses
Customer satisfaction must be the target goal (Weicher et al., 1995)	This is the ultimate goal and must remain in company sights throughout the BPR cycle
Stay the course	Losing momentum when challenges arise can be avoided by long-term commitment to the project
Keep stakeholders engaged	Communication at all levels is key
For Employees/Teams	
Reengineering team should consist of 5-10 people (Gonsalves, 2002)	Team should consist of both internal ("insiders") and external ("outsiders") (Gonsalves, 2002; Harrington, 1991)
Members must be open-minded, energetic, and free thinkers	Thinking out of the box is critical to successfully implementing major changes to a corporation
Team members must be educated regarding their roles in the BPR process, and must be actively involved in the process (Flint et al., 2005; Ardito, 2000)	Clearly defined responsibilities are paramount to project success
Coach the Process Team, rather than manage	Encouraging teams to be creative and empowered will enhance their effectiveness

Table 1. (*continued*) BPR Critical Success Factors

For Information Technology	
Critical Success Factor	Purpose or Mitigation
For Information Technology	
Use IT as an enabler, not as process driver (Davenport & Short, 1990)	Using technology as a tool can increase return on investment (ROI) by as much as 1000% (Harrington, BPI Workbook).
Be vigilant in using an IT approach that integrates well with the affected business processes (Eatock et al., 2002)	How the chosen IT solution "behaves" has a direct bearing on the project's success
Use metrics to determine whether initiatives are successful (Coyle, 2006a).	"Use metrics to establish performance baselines and measure progress" (Devane, 2001, p. 155).
Eclectic mix of skills and strengths	Technicians, professionals, problem-solvers and communicators address expected variety and complexity of BPR efforts (Van Osdol, 1998; DeLuca, 2003)

Process improvement teams (PITs), also known as process action teams (PATs) are brought together to oversee the BPR project (Harrington, 1991). The members are usually hand-picked for their expected contributions, and consist of both internal and external participants. The team members must be able to see the big picture, how to get there, develop vision, and have realistic expectations about the effort (Van Osdol, 1998). PIT members must be taught about process flows and the importance of diagramming, brainstorming, and HPI fundamentals (Harrington et al., 1997). Team building activities are conducted often, to increase the efficiency of the effort (Van Osdol, 1998).

In spite of reported lackluster results, managers still desire "cross functionality"; up to 60% of corporations are expected to look to business processes as a critical way to achieve key objectives (Flint et al., 2005). Companies continue to reexamine and fundamentally change the way they do business. Intense competitive pressures and a sluggish economy provide the motivation for continued efforts to "deliver more with less." Properly executed, reengineering can be an effective tool for organizations striving to operate as effectively and efficiently as possible (Stoica et al., 2004).

Justification

BPR has been used successfully in other service desk interventions. For example, Coyle (2006) reports one large organization that turned itself around by reengineering the way it conducted business. After realizing that a major undertaking would fail because management could not control processes across divisions, the IT corporation cut its losses and shelved an expensive implementation project halfway through its development at considerable cost. Insiders aware of the debacle quickly became cynical of IT operations, which is an ever-present danger. In a last ditch attempt, project managers, with leadership buy-in, instituted sweeping process improvement actions that included reliance on industry best practices, measurements of service levels of quality, and standardizing business processes. A process team became empowered to do the repairs, and improvements such as a 25% reduction in resolution time were the results of the initiative (Coyle, 1999).

Help Desk/Service Desk

Purpose and use

Help desk support is essential in today's electronic world. With the explosive use of computerization, a high demand was created for originally two- and three-person shops to rescue workers whose computers needed repair (Moncarz, 2001). With the ability to automate more and more processes instantly, the need for effective IT support arose in the 1990s to ensure that computers remain in optimum condition and keep users at full productivity (Brittain, 2004). Also known as call centers, contact centers, and computer support teams, help desks were originally and still are designed to assist users with technology-related concerns (Sundrud, 2002). In addition to hardware and software issues, help desks also manage telephone incidents, security concerns, communication links, and monitor environments in which new IT systems have been put into service (Ripple, 1992; McBride, Perry, & Sainsbury, n.d.). Due to a focus shift from merely keeping systems running to providing high quality customer satisfaction vis-à-vis proactive processes, the added value of IT support has seen a major status upgrade. No longer viewed as a "soft" operational cost, IT offices have become a major business entity, and are now key players on many organizational charts (Van Grembergen, 2001).

Because computers have become such a necessary fixture of modern society, help desk assistance is found in all segments of society. Major computing firms like Dell and HP, electronic giants such as Texas Instruments, defense contractors such as Lockheed-Martin and Science Applications International Corporation (SAIC), as well as financial, corporate, and academic institutions, have dedicated 24x7 teams to assist users in desktop support (Ripple, 1992; O'Shea, 2005; Anton, 2002; Sundrud, 2002). The military also utilizes help desks to ensure that its personnel remain connected and are able to participate in robust, shared knowledge management systems, such as the U.S. Army's Army Knowledge Online Help Desk and Navy Knowledge Online (AKO, 2002).

History

Help desk support appears to be conducive to process reengineering efforts, since the objective of a help desk organization is to provide IT support to end users by using efficient processes and procedures to repair computer problems. End user computing support came about during the 1970s and 1980s, when personal computers (formerly known as "IBM compatible") became affordable and easy to use. Information systems (IS) teams were created to reduce the number of backlogs that appeared as systems grew in size and users demanded increased performance and functionality (Nilsen & Sein, 2002). The goal of these IS organizations was and still is to use leading edge technology to reduce support costs and increase user satisfaction (Couture, 2001).

Consolidations

Recently, a shift from reactive, standalone help desks to proactive, consolidated service desks has occurred, based primarily on the need for increased efficiency and reduction of costs. In the 1990s, with the standardization of computers in the workplace, IT help desks became inundated with support requests, and the need for keeping track of help desk calls was born (Brittain, 2005). Soon afterward, larger companies began to realize the importance of leveraging economies of scale by combining all support operations into a single operation (Holland, 2003). In addition to the traditional telephone and face-to-face contact, help desks used available technology by allowing electronic means of customer notification, such as fax, e-mail, and web-based tools. These strategies reduced costs and helped companies gain an advantage over competitors (Holland, 2003). No longer did technicians wait for the phone to ring and jump into action; they instead "integrated other aspects of network, systems, application, change, and asset management to identify developing and potential problems before they [could] impact network and personnel operations" (Inverso, 2003, p. 5). Thus, with forward-looking IT support, consolidated or enterprise service desks (CSDs or ESDs) came into existence.

Commercial off-the-shelf (COTS) software is in place to combat the high cost of help desk calls. These COTS tools log and track trouble calls, identify trends, alert management when service level agreements approach breaching levels, automatically distribute customer surveys after incident closure, and have templates to easily print out reports that gauge the effectiveness of help desks (Inverso, 2003). Remote control software packages allow technicians to "take over" desktop functions, so that help desk personnel electronically access users' personal computers (PCs) and troubleshoot software malfunctions, just as easily as the users themselves. The financial return for this type of software is normally very high, considering that the cost to dispatch a technician was between $95 and $795 per issue in 2000 (Strovink et al., 1998). Knowledge technologies offer such features as intelligent text retrieval, which downloads newly updated online support information into a local database; case-based reasoning, which scans historical incidents to find resolutions that may fit similar problems; and decision trees, an electronic version similar to a fishbone diagram, in which problems go through cause-and-effect debugging programs to arrive at quick solutions (Barr, 1992; Piskurich, 2002).

Critical success factors

One of the reasons for many service desks' success is the underpinning of ITIL on organizational support activity. The IT Infrastructure Library (ITIL), developed in the United Kingdom, is the de facto standard of IT service management. ITIL is a culmination of industry best practices, and was created because industry recognized that business processes relied increasingly more on IT services and technology to fulfill its objectives (Van Bon, Kemmerling, & Pondman, 2002; Robinson, 2005). ITIL practices are based on extensive research, and companies incorporate these guidelines into their own business practices, which reassures clients by building their confidence (Freedman, 2004). Two corporation giants, Hewlett-Packard (HP) and Microsoft, both look to ITIL standards for process templates. One of Microsoft's vice president's was quoted as saying, "We know that helping customers develop open, well-designed operational processes is critical. By bringing together the best practices of ITIL, we can answer the challenges our customer face in IT operations" (Freedman, 2004).

Service desks have embraced ITIL with large success. In a study of small organizations with less than 1,000 employees, the Gartner group, the universally recognized premier research firm in information technology (IT) environments, found that companies that implemented ITIL standards were highly successful in resolving customer issues. One company in particular, that was only able to resolve 20% of its customer issues, applied ITIL guidelines and was able to resolve 80% of the issues during initial contact (Longwood, Brittain, & Matlus, 2005). One large service desk, faced with a massive loss of market share, decided to base its operational processes on ITIL standards. The results were threefold: (a) staffing was reduced by ten personnel, who actually resolved more incidents than the year before; (b) initial contact resolution was a "best-in-class performance standard;" and (c) the service desk experienced a zero employee attrition rate for almost two years, a metric unheard of in an industry in which 25% of its help desk staffers annually leave their company (Brittain, 2004). The importance of ITIL in European service desks is "rapidly becoming a 'must have' rather than a market differentiator," while the practices are migrating from their native UK origin across the European continent (Tramacere, 2005, p. 4). Finally, in a study conducted at a help desk in South Africa, which used an instrument that measured customer expectations with post-resolution customer satisfaction, data indicated a strong correlation in the areas of service quality and performance metrics due to the insertion of ITIL practices into the organization (Potgieter, Botha, & Lew, 2004).

Service desks also need to gauge customer satisfaction levels. Although many service desk managers look to quantitative metrics generated by COTS software to glean user contentment, these are "indirect and are only approximations of customer opinion and could easily be overstated" (D'Ausilio, 2005, p. 33). The only true indicator is to survey end users directly via so-called "transaction-based surveys," which are administered immediately after users' incidents are resolved (Coyle & Brittain, 2006). Proper planning should precede issuing the first survey, with a clear strategy of the desired data, its purpose, and the actions to be taken from that data (Coyle & Brittain, 2006). Focus on the customer is essential, not just the level of service provided (Conway & Cassidy, 2000; Gliedman, 2005).

Customer Satisfaction

Definition

The best way for service desks to gauge their quality of service and find ways to increase their revenue is to ask end users for their input (Kolsky, 2006). Customer satisfaction surveys are a primary tool for this task. Defining customer satisfaction may appear elementary: "if you get what you want you are satisfied, [and] if you don't you are not" (Szwarc, 2005). Customer satisfaction is synonymous with meeting customer expectations, and measures whether customers are pleased with the business relationship (Gerson, 1993; Herschel & Steenstrup, 2004). This is an oversimplification: more factors are involved in pleasing customers than mere likes or dislikes. Fehl (2006) speaks of emotional impacts and consequential elements of contented customers, while others claim that satisfaction is not a stand alone metric, but instead is based on the value that consumers place on a particular set of transactions, such as cost, quality, and loyalty (Pitta et al., 2006). It is also said that customer satisfaction is a combination of two expectations: the quality of the initial purchase and the use or consumption of the product or service (Barnes, 2000). This premise is backed by the Expectation Disconfirmation Theory, which maintains that the level of satisfaction is determined by the intensity and the gap between a customer's expectations and the perceived performance of the product or service (Oliver and DeSarbo, 1988).

Regarding IT usage, end user satisfaction can be defined as "the overall affective evaluation an end user has regarding their [sic] experience related with the information system" (Chin & Lee, 1997, p. 2). It is also the extent to which the available information services are able to meet a user's need (Somers, 2003). In addition, end user satisfaction is achieved when an IT staff successfully "maximize[s] the level of service while minimizing user downtime" (ITRG, 2002). Conversely, satisfaction can also be pitted against frustration levels. Ceaparu et al. (2003) not only looked at satisfying customers by the completion of a task or goal, but also by the elimination of frustration, which acts as a barrier when end users cannot achieve the goals promised by various levels of automation. Customers quickly become frustrated by software applications that were poorly designed, internet links that go nowhere, and cheaply-produced hardware, all of which subtract value from the organization and raise operating costs by infringing on users' time and energy (Peebles & Antolovic, 1999).

Barriers

In striving to provide a high level of IT support, there are several barriers that hinder effective customer satisfaction. Some of these are new users with varying technical abilities; advanced, expensive, and overlapping technology often exacerbated by questionable purchasing decisions; and broadened responsibilities for IT technologists (Whiting, 1997). In addition, there has been a long-standing, rocky relationship between IS organizations and users. A "power imbalance" often exists, in which underlying conflict tend to promote an us-against-them mentality. For example, system failures, restricted access, a perceived and often real lack of customer service skills on the part of the IS technicians, and both sides thinking the other is inadequate, all merge to produce an adversarial relationship (Khosrow-Pour, 2005).

Other unpleasant circumstances are often falsely attributed to IT support work sections. Customers become quickly frustrated by software error messages, which are often so cryptic in nature that even highly skilled users are perplexed; confusion quickly turns to anger when a system shuts down and must be restarted, forcing the user to stop productivity and possibly lose valuable data. Failed network connections, even those rapidly repaired by service technicians, stoke the fires of polarization. Finally, when users do need to contact their support team and are placed in a waiting queue or bounced from one technician to another, users often will bypass their formal support infrastructure and seek other avenues to have their issues resolved (Ceaparu et al., 2002). This results in more down time and increased user dissatisfaction.

Critical success factors

There is a variety of CSFs found in the literature concerning customer satisfaction for IT users. One CSF was uncovered in a study of call center representatives. During periods of conflict when user anxiety was elevated, an accomodating/collaborating conflict management style was found to satisfy the most customers when compared with other managerial approaches (Wade, 2007). Call center reps used their professional skills to put the caller’s welfare first and foremost; collaboration between users and technicians resulted in reaching the common goal of a resolved issue to the end user’s delight. Another important CSF is to keep customers informed of service changes such as upcoming network maintenance and other events that can affect end users’ ability to utilize their IT equipment. The four C's--communicating the changes clearly and consistently--are vital to all stakeholders, but especially customers, so they will be well informed of current developments and business practices and not be unpleasantly surprised (Ibet, 2006).

Many IT organizations have begun outsourcing and consolidating their resources in an effort to increase customer satisfaction levels. Outsourcing presents the advantages of lowering the total cost of ownership and standardizing levels of service quality. The latter tends to also work as a disadvantage: any deterioration in service quality is immediately seen by a large number of users, who in turn are quick to voice their discontent to business managers (Mieritz & Kirwin, 2005; McNeill & Ragsdale, 2004). One way to mitigate the inherent dangers in outsourcing is to create and manage a sound transition plan, which includes areas such as communication, technical migration, and legal and financial areas (Huntley & Maurer, 2005). Consolidating support, the "rallying cry for today's IT organization," is the centralization of multiple service desk resources such as staffers, servers, and networks into a single one-stop shop that remotely serves many user locations (McGarahan, 2000). Centralization also provides standardized workflow processes that help users maintain high productivity rates and significantly reduce operating costs (Scott et al., 2006). Consolidation also provides end user convenience by having a single point of contact for support, and then branching out from that nucleus for escalated issues. Yet again, the drawback is that massive planning and implementation efforts need to be meticulously followed; an action team in place that regularly feeds progress reports to project stakeholders is also an industry best practice. If this be the case, users can expect to receive equal-or-better service, at which point customer loyalty is reached. If the consolidation plan fails, this can be especially damaging since "the cost of attracting a new customer far exceeds the cost of retaining an existing one. Some authorities put it as high as 200:1" (Conway & Cassidy, 2000, p. 1).

Another success factor that attempts to bridge the gap in satisfying users' IT needs is centered on the use of best practices such as ITIL, previously discussed but still warrants mention here as well. ITIL has become globally recognized as the service management "rulebook" for IT support organizations. ITIL is a combination of industry best practices that provide the managerial framework for providing IT service delivery. Potgieter et al. (2004) used a scale of quality factors that indicated a correlation between ITIL, service quality, and empathy, assurance, reliability, responsiveness, resolution times, and conflict resolution. The authors concluded that "both customer satisfaction and operational performance improve as the activities in the ITIL framework increases" (p. 166). Instituting business standards for asset, problem, and knowledge management, for which ITIL offers well-used solutions, resulted in the implementation being extremely successful in decreasing time for all help desk procedures for a large technology company with a three billion dollar expense account (Kalia et al., 2005).

One success factor targets elevating customer expectations. There is a current emphasis on delighting the customer which surpasses merely satisfying the customer; the result is an "over-delivery of expectations" (Ibet, 2006). These delights are seen as an added bonus, and can be grouped into two types: either they evoke more expectation, surprise, and emotional response from the customer, or are seen as a one-time offer

(Koskela, 2002; Kumar, 1996). The "delight" movement may indicate the extent to which organizations listen to its customers, match business requirements with expectations, and use feedback to improve quality of service (Kanji, 2002). The intent of a delighted customer to make repurchases and thus positively affect loyalty may be higher from those customers who are quote-unquote "merely satisfied" (Kumar, 1996).

However, the trend of customer delight is not without its critics. Higher costs and unpredictable outcomes quickly become primary considerations (Herschel & Steenstrup, 2004). When customer expectations increase, this upgraded service then becomes the norm, making it difficult for companies to continue delivering exceptional service consistently; this can quickly lead to long-term damage (Rush & Oliver, 2000). Customers also tend to forget one-time experiences and are more apt to remember formulated opinions and attitudes from multiple transactions. In the worst case scenarios, customers will expect more and more and may in the end abandon the delighted source, returning to an acceptable degree of satisfaction with what is perceived as a dependable competitor.

A final success factor in increasing customer satisfaction is perhaps the most important. When organizations implement--and follow through with--customer feedback surveys, profits can increase by as much as 15-20% (Kolsky, 2006). The surveys should have short, yes-no and Likert-type questions, and if immediately administered, have been found to be 40% more effective than after waiting 24 hours (Kolsky, 2006; Davis, 2007). Surveys must address customer satisfaction items and have the customer's best interests in mind during its design (Swarzc, 2005). Customer satisfaction must also be managed proactively, including knowing your customers, empowering staffers, measuring quality, and implementing incentive systems (Gerson, 1993). A fourth success factor is to remember that customers like to feel like the service or product is making their life easier, that they are in the driver's seat, and that they matter (Holland, 2003).

Measuring customer satisfaction

It is imperative that customer satisfaction be measured in order for business managers to know the status of their customer support. In today's global economy of the Information Age, managers are being pressured more and more by stockholders and stakeholders to show that their organizations are continuing to deliver high quality service and products. A customer feedback program provides managers immediate, objective, and helpful criticism, and if properly conducted, can be an excellent tool by which to make quality decisions (Ives et al., 1983). The key to customer satisfaction is in the numbers: if it isn't measured, it can't be improved. Without quantifying results, it is difficult if not impossible to accurately gauge whether customers feel they are receiving quality products or services.

The literature contains many benefits to organizations that measure customer contentment levels. Among those advantages are higher profits produced, reduced cost of ownership, strengthened market positions, increased customer retention levels, and ability to project trends and develop effective marketing strategies (Conway & Cassidy, 2000; Zeithaml et al., 1988). Whether a software application was successfully rolled out can also be indicated through measuring customer satisfaction (Somers, 2003; Doll & Torkzadeh, 1988). Knowing customers' likes and dislikes is important for companies to meet their needs, and feedback from surveys is invaluable if managers properly react to it (Gliedman, 2005). Evaluating behaviors associated with actions is also important, as some organizations collect important data regarding the nature and number of complaints received (Khosrow-Pour, 2005).

Measuring satisfaction itself, however, is no guarantee for success. The Gartner Research group states three reasons why service desk organizations with customer survey systems do not get adequate results: timing, poor questions, and failure to react to feedback (Kolsky, 2006). Since "feedback collected immediately after an event is 40% more accurate than feedback collected 24 hours after the event," gathering end user data immediately after service is rendered is paramount to collecting sound, high quality data (Kolsky ,p. 2). Asking the right questions will get organizations the data they need; otherwise, the data may be discarded or stored in archives and quickly forgotten. When the final quadrant of Deming's Plan, Do, Check, and Act model is taken into account, and organizations properly react to customer feedback, resources are well utilized and customers' perception of the service remains high.

Regarding best practices, surveys sent automatically by e-mail immediately following a service desk's ticket closure have the best chance to achieve high results (Potgieter et al., 2004; Coyle & Brittain, 2006). Random or 100% sampling is used in industry to reduce the possibility of bias, which can skew results (Szwarc, 2005). Feedback should be solicited often and not be a one-time snapshot, so that trends such as upward or downward slopes can be shown to managers for their action (Gliedman, 2005). Brief surveys or questions are better tools for overall assessments, since generally speaking, the longer it takes a user to complete a survey, the less responses may be returned (Ives et al., 1983). In fact, Gartner recommends only three to seven questions (Kolsky, 2006). Likert scales are a preferred way to give end users a range of responses, although individual interpretations should be taken into account during the analysis (Hsu, 2003; Ives et al., 1983). Yes or no questions are also desirable. Acceptable response rates conflict in the literature, and range from 25 to 50% (Van Der Zee, 2002; Potgieber et al., 2004; McHaney et al., 2001; Ives et al., 1983).

Summary of Chapter 2

A single documented study that united case study research, HPI, service desks, BPR, and customer satisfaction may bring this literature review full circle. One particular call center experienced very substandard customer service due to blatant hostility, relentless in-fighting, poor management, and a pessimistic culture. To improve its service, managers hired a performance consultant to turn the organization around. After studying the call center's metrics, the human performance practitioner quickly discovered, among other problems, a large degree of negative reinforcement, a lack of suitable guidelines, and poor incident procedures as key drivers for the organization's troubles. The consultant recommended and eventually implemented the following strategies: new call center tools, a competency model for the technicians, regularly scheduled team-building exercises, and employee-centered coaching techniques. With the total commitment of the call center leader and the organization, customer satisfaction rose significantly as a result of the HPI effort (Rothwell, 2007).

CHAPTER 3. METHODOLOGY

Introduction

This chapter will explain the research approach that was used in this study. Not only will the methodology components be described, but they will also be linked to the research questions, to provide a rationale for why the particular components were used in this study. To review, there were three research questions that drove this study. The primary question was “To what extent do reengineered workflow processes improve service delivery at an ESD?” The secondary questions were, “To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?” and “To what extent is customer satisfaction affected by reengineered workflow processes?”

Following the introduction, this chapter will follow a logical flow by first reminding the reader of the study’s purpose and why the case study was the appropriate choice of methodology. The benefits of using HPI and the mixed methodology approach for this study will follow. Afterwards, the study’s setting and its subjects--the organization and its members--followed by the methodology steps used in this study will be described. After describing the instrumentation used, this chapter will present the data collection and data analysis methodologies and procedures. Discussions centering on data assessment, validity and reliability, and ethics will round out this chapter.

The purpose of this case study was to investigate whether reengineered workflow processes increase efficiency and customer satisfaction at an enterprise service desk (ESD). This study evaluated the effects of a BPR implementation in an IT environment to determine whether reengineering processes lead to greater profits, levels of service, and effectiveness (Tan, 2006). As the BPR project went through its lifecycle, the steps with corresponding results were properly documented. Quantitative and qualitative data were analyzed to determine whether a change occurred in service metrics and customer satisfaction. All collected data were analyzed in near real-time, after which findings were explained.

The Case Study

Justification

The case study method was chosen because that type of report lends itself to a process reengineering study. As a descriptive research project based on organizational situation, this study required data collection, analysis, and critical business decisions by managers; these criteria fulfill case study requirements (Simon & Francis, 2001). Moreover, case study authors describe the essential properties of a case study by having several characteristics: (a) particularistic, or studies which target a specific particular organizational situation or phenomenon; (b) descriptive, in which the product is a detailed account of the situation studied, which generally takes place over a specific period of time using methodological data collection and analysis strategies; and (c) heuristic, in which the researcher investigates a problem so that the discoveries can add more knowledge to a known issue or field of study (Merriam, 1998; Stake, 1995).

This case study was labeled descriptive, because it explained an intervention in which a real-life situation occurred (Irlbeck, 2004). All efforts were made to properly describe the elements of the BPR project from its beginnings to the post-implementation review. The researcher strove for a "thick description," using contextual meanings to fully depict all relative situations (Gall et al., 2003, p. 439). Constructs and themes helped to draw and hold the reader's attention, so that when completed, this case study provided the reader with a fully descriptive report that will enhance existing literature.

Foundational characteristics

All research studies require a foundation which "forms the scaffolding or underlying structure" of the study (Merriam, 1998, p. 2). The framework provides structural guidelines that hold together the concepts, values, procedures, discussion points, arguments, decisions, or any other item of value found within quality research articles. Like a ship without its shell or an organization without a mission statement, a case study needs a strong foundation to stay on course and weather the storms that invariably occur during the various phases of a case study's development and delivery (Yin, 2003). Therefore, a proven framework was observed in this study.

The underpinning used for this study was based on a proven method called a "case study protocol," (Yin, 2003, p. 69). The four main sections are displayed in quadrants. See Figure 4. The first quadrant provided an overview of the study, consisting of background information relevant to this project. In this case study the overview found that business processing reengineering techniques could work at an enterprise service desk to improve resolution metrics and increase customer satisfaction. The second quadrant applied to the field procedures, in this case the service desk. The quadrant focuses on "credentials,…access to study locations,…and sources of information" (p. 69).

The researcher, with his advanced working knowledge of service desk support, had a solid working relationship with performance intervention team (PIT) members and had ready access to all end user survey and interview data.

The third and fourth quadrants of the case study protocol were tied to the research questions and the subsequent analysis of the data. To review, the primary question of this study was "To what extent do reengineered workflow processes improve service delivery at an ESD?" The secondary questions were, "To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?" and "To what extent is customer satisfaction affected by reengineered workflow processes?" In the fourth quadrant, the quantitative data in this study were analyzed using the descriptive statistical functions of mean, min, max, and standard deviation using Microsoft Excel; more sophisticated statistical runs such as the *t* test and Chi Square were also utilized. Qualitative data were placed into themed groups and presented.

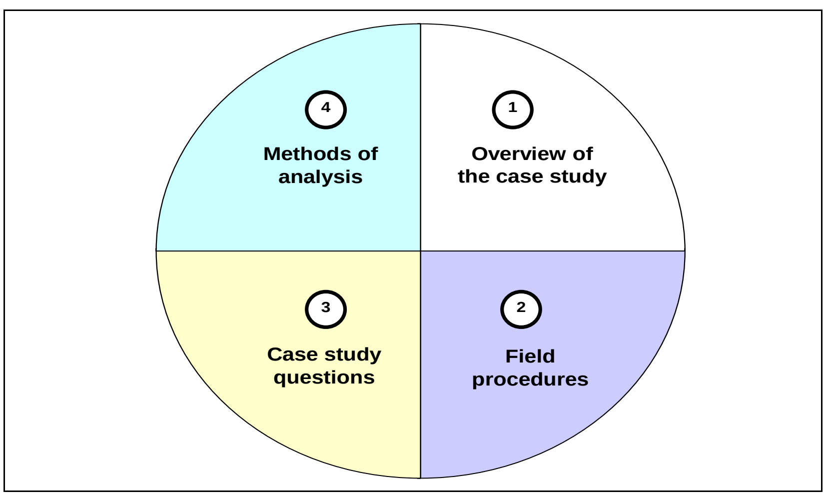

Figure 4. Stages of Case Study Protocol

Source: Case Study Research, p. 69, R. K. Yin

HPI as the Framework

Sanders and Thiagarajan's HPI model

Sanders and Thiagarajan (2001) classify HPI interventions based on the known or suspected root cause(s) of a problem or issue that the intervention is targeting. These categories overlapped for this study. *Improving Structure and Process* targeted "the structure and sequence of workflow processes," as the process improvement team (PIT) redesigned the workflows to improve resolution efficiencies (p. xi). Suitability of this approach prior to the implementation were threefold: (a) the ESD was experiencing a "lack of accountability" in its incident management practices; (b) technicians used nonstandard, "redundant, and incomplete work processes" when attempting to resolve incidents; and (c) resolution steps were "inefficient" (p. xii).

Secondary categories of Sanders' and Thiagarajan's (2001) model were also realized in this study. As the PIT began to implement the newly designed workflows, ESD technicians engaged in *Improving Knowledge and Skills* as they trained and coached the site leads, who assumed the roles of technicians while becoming familiar with the new processes. This study *Improve[d] Motives* as technicians realized that customer satisfaction might improve and workloads may be reduced by this intervention. The improved usage of the automated trouble ticketing system together with knowledge management tools, which enabled sharing of information across ESD branches, satisfied *Improve Physical Resources* and *Improve Information*).

All data were analyzed and evaluated per the human performance improvement (HPI) methodology. The last two tenets of the HPI model--*Intervention Implementation* and *Evaluation of Results*--were especially important, as they were the key focuses of this investigation. Since the model has been used as “a diagnostic and strategic tool for improving workplace performance,” HPI served as this intervention’s theoretical framework (van Tiem et al., 2001, p. 8).

The findings of this study generated knowledge and produced results via the “people themselves [who] own the entire process from beginning to end” (Park, 1999, p. 143). Service desk technicians took ownership and championed the project, by first gathering all the necessary data to draw the baseline. As the project moved forward, the team tailored the HPI steps to serve as guidelines. The model consists of seven major parts: business analysis, performance analysis, cause analysis, intervention selections, intervention implementation, and evaluation of results, all residing under the umbrella of change management. How this study mapped to each of these elements is shown in Figure 5. As the ESD manager facilitated the proceedings, technicians designed and implemented quicker ways to resolve issues. In the end, response times were reduced and customer satisfaction, when compared to pre-BPR levels, increased.

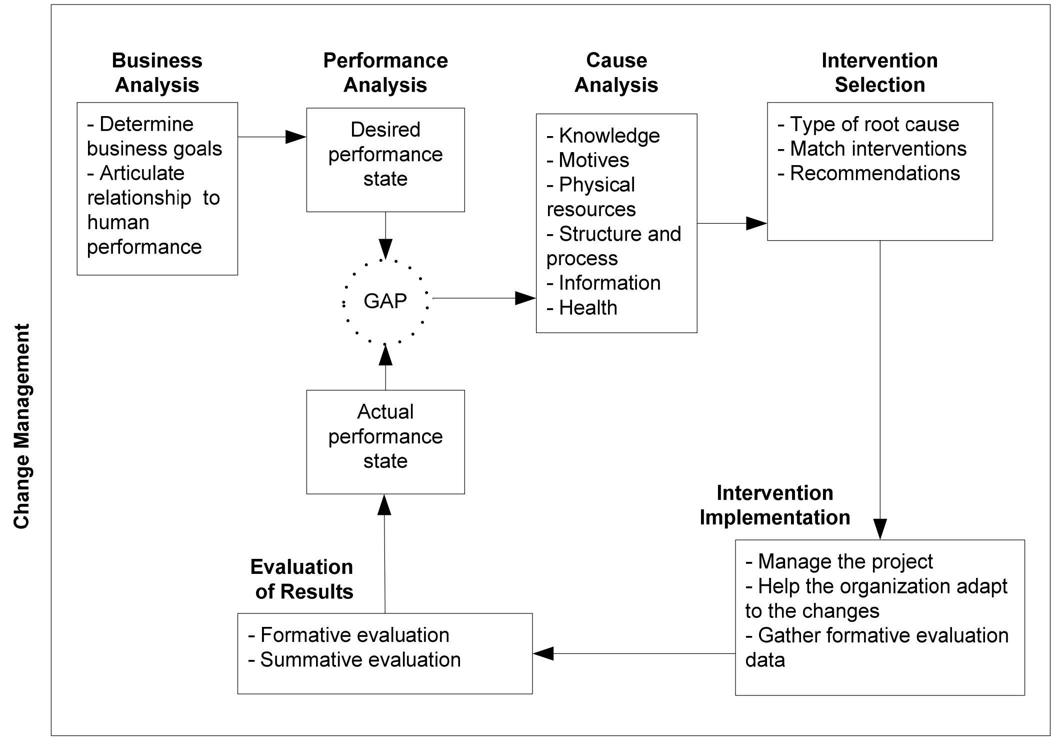

Figure 5. The HPI Model Methodology

Source: Performance Intervention Maps, p. viii by E. S. Sanders & S. Thiagarajan

The first four phases of the HPI model--business analysis, performance analysis, cause analysis, and intervention selection--were done prior to this case study. During business analysis, the ESD managers assembled a dedicated group to determine the mission statement of the organization. The effort produced an overarching goal that declared that the organization was to provide the highest level of IT support and service delivery to its end users. During performance analysis, when metrics were compared to best practices, managers discovered that ESD service levels fell short of industry standards. The differences became the performance gaps that drove the next HPI stages.

During the cause analysis, the ESD discovered the reason for the performance gaps. A cause-and-effect technique revealed that technicians performed resolutions in three different ways, with very little standardization. Some would terminated the call, research the problem then call the user back, while others kept the user on the phone the entire time. Some technicians logged every issue, some logged very few, and still others logged most issues. One technician immediately escalated nearly all service calls to more experienced technicians. These different resolution approaches resulted in frustrated users and managers who were dissatisfied with the lack of consistent service levels.

In the fourth phase of the HPI model, intervention selection, the ESD decided to institute a process intervention to improve its levels of service delivery and support. The fifth and six phases of HPI model, intervention implementation and evaluation of results, are the heart of this study, and are explained in other sections of this chapter. The seventh phase is change management, which is designed to allow changes to an infrastructure or organization with as little adverse impact on IT services as possible (Van Bon, 2005). This phase served as a cautionary reminder when site leads assumed resolution ownership for a particular group of incidents. The ESD ensured that the organization was not negatively impacted by this change.

Gilbert's behavior engineering model

Gilbert's Behavior Engineering Model (BEM) model became this study's HPI cornerstone. The BEM model consists of six factors: data and information; resources, tools, and environmental supports; consequences, incentives, and rewards; skills and knowledge; individual capacity; and motives (Rothwell et al., 2007). These factors were mapped to end users, site leads, and the PIT. By including the information to help those entities perform the new workflow processes, the BEM served as a roles and responsibilities road map to outline the required behavior modifications. See Table 2.

Table 2. BEM Application to BPR Study

Factors	Answers question:	For end users	For site leads	For the PIT
Data and information	What steps need to be done?	- Contact site leads when problems arise - Provide all incident information to site lead - Know new procedures	- Sell concept to site members - Communicate change to site members - Learn/test incident resolution procedures - Provide feedback (metrics) to ESD - Learn to use trouble ticket system	- Sell the concept to site leads - Communicate change - Document resolution procedures - Give feedback (metrics) to ESD manager of project's success rate
Resources, tools, and environmental supports	Which items are needed to be successful?	- Be able to contact site lead by phone or in person	- Provide process map to site members - Have admin privileges for all site members - Have backup plan if issues cannot be fixed - Access to trouble ticketing system - 24/7 contact with ESD - Distribute survey data to ESD	- Ensure site leads have admin privileges for all site members - Provide job aids to site leads - Provide survey to site leads - Retrieve completed satisfaction surveys; enter results into database - 24/7 contact with site leads
Consequences, incentives, and rewards	What are the results of the action?	- Be able to log timesheet information much quicker than previously - Receive consistent service - Higher customer satisfaction	- Ensure members can log data - Reduced turnaround time for issues - Increase visibility of members logging timesheet information - Greater chance of 100% policy compliance - Provide consistent service	Help to bring about: - Reduced workload - Lower cost of ownership - Higher morale - Increase customer satisfaction - Possibly bring in new customers
Skills and knowledge	How will skills be obtained?	- Site leads disseminate new process info at meetings and via e-mail	- ESD will train site leads - Site leads will ensure that all training materials are available	- Make sure that site leads are trained - Create job aids
Individual capacity	Do performers have aptitude and willingness?	- Yes; users are IT professionals who want issues resolved quickly	- Yes; site leads are required to possess adequate IT skills to navigate program - Also want issues resolved as quickly as possible	- Yes; PIT has trainers on board to ensure site leads can do resolutions - Want issues resolved as quickly as possible
Motives	Why are we doing this?	- Comply with timesheet reporting policy - Innate desire to do what's right - Increased morale	- Ensure employees comply with policy - Innate desire to assist subordinates - Increased morale	- Raise level of quality for users - Site leads are in better positions to assist users

Mixed Methodology Approach

A mixed methodology approach was used under the human performance intervention (HPI) framework. Quantitative data were generated from an automatic trouble ticketing system and customer satisfaction surveys, the latter also generating qualitative data via open-ended questions. Technicians produced more qualitative data that helped to determine current and future workflow processes. This approach was intentional, "to allow for interpreted results from inferential statistics as well as descriptive information from qualitative data" (Niederriter, 1999, p. 76).

The mixed approach held distinct advantages when considering the questions this study sought to answer. Workflow reengineering, to include mapping the processes, produced both fixed time values (hours, minutes, and seconds) and verbal explanations for why each particular step was taken. Quantitative and qualitative data were produced. The same held true for measuring customer satisfaction. Not only did end users will have the ability to choose ratings of 1 through 5 to indicate their agreement or disagreement with carefully worded evaluation questions, but open-ended text fields solicited comments, suggestions, and explanations that related to each survey question.

Setting of the Study

The environment of the study was a recently consolidated service desk that tried yet fell short of meeting industry standards. The ESD provided information technology (IT) support to thousands of users within a very large footprint. In addition to resolving hardware and software issues, the ESD also maintained classified and unclassified network and e-mail servers with state-of-the-art architecture designed specifically to support an enterprise-wide environment. Because of their military affiliation, the ESD's customers had unique needs such as late- or no-notice deployments for front-line rotations. Due primarily to nonstandardized workflows, the ESD's service levels were inconsistent, to the point that other IT support agencies threatened to take over and assume control of the ESD's end user base.

The recipients of the ESD support formed an eclectic mix. The thousands of end users were government users, active military personnel of all ranks, civil service employees, or internal company personnel. Many users were based at U.S. locations, while others supported national defense at posts overseas. The ESD also received trouble calls from areas of conflict. All users were assumed to possess a high school diploma and were computer-literate to the extent of using e-mail and word-processing applications.

ESD managers recently mandated a performance initiative. The managers announced that a performance improvement team (PIT) was to be formed, which would reengineer workflow processes as a way to mitigate the potential business calamity just described, namely the risk of a business takeover. Because of this decision, the researcher chose the ESD as the setting that formed the basis to determine whether reengineered workflows could affect performance metrics and enhance customer satisfaction.

Participants of the Study

The PIT was composed of the ESD manager, service desk technicians, the researcher, and other stakeholders as necessary. The ESD manager assumed the position of coach/facilitator, and followed the roles of "technical expert, facilitating participant, and change agent" in varying degrees (Kautz et al., 2001, p. 8). These overlapping roles helped guide the ESD's participants during the reengineering processes. As a technical expert, the ESD manager, who himself received coaching from the researcher from time to time, assisted the PIT with performing the procedures and using the automated trouble ticketing tools to their fullest extent, which were integral in bringing about positive BPR results. By facilitating the participants, the ESD manager helped the group "to assume responsibility and to take the lead" during the project (Bens, 2000, p. 7). The manager assisted the effort by helping the PIT define and meet its goals and objectives, and to carry out the needs assessments correctly. In addition, the manager guided the group's discussions and interacted with stakeholders regularly regarding the intervention's progress. As the change agent, the manager was the driving force to cause the necessary behavior modifications that improved the ESD's service and support delivery.

Service desk technicians also played a pivotal role. As the intervention participants, the technicians used their technical expertise to design measures that led to the improved methods of service delivery. As practitioners, they used their insight to study, correct, implement, and adjust the procedures appropriately to best fit their work environment. Therefore, most of the PIT consisted of service desk technicians.

Purposeful sampling, or using individuals with the required experience to enhance a case study's results, played a key role during the selection of suitable ESD technicians to serve as PIT participants (Chein, 1981). Technicians who possessed characteristics matching BPR critical success factors were selected, since their unique skills and talents were suitable to this study (Gall et al., 2003). By matching this study's criterion--a high level of expertise in diverse technical areas, open-mindedness, high energy, fairness, and the tendency to work well in teams, among others--these technicians played a major part in producing a successful reengineering effort. The technicians were able to apply keen insight into the PIT's productivity, since they were insiders who worked daily with the subject matter. With proper coaching and guidance, the technicians brought much value to the project, not only in the technical realm but also by their talent in so-called softer skills such as administration, project management, and human resource development.

The final group of participants was site leads, another term for field site managers. Throughout the company, site leads were positioned at each location to ensure that administrative and technical needs of site personnel and government customers were met. The site leads were the points of contact who made sure that employees were properly supported, such as responding to employee concerns and that their skill levels remained consistent with mission requirements. Site leads were also the liaison between the employees and upper management.

Site leads assumed an additional role during this project. In addition to the above-mentioned functions, the site leads acted as frontline system administrators for a small group of incidents that ESD technicians regularly managed. Using limited account privileges, the site leads modified account information that allowed site users to use a software management system to report their timesheets, thus replacing ESD technicians for resolving this particular set of incidents. This was a new role, which required training to ensure that resolution processes were followed correctly, and that the account information's integrity was maintained. This added role increased functionality of site leads that allowed users to have their issues resolved in minutes rather than days, as was previously the case. As a result, the leads' onsite importance along with their technical abilities was measurably enhanced.

The researcher also took an active part in the intervention. He acted as consultant and assisted the PIT in its tasks. He helped the ESD manager when needed, sometimes coaching the participants and managing the proceedings. For the most part, the researcher maintained adequate distance to enable the stakeholders to assume ownership of the intervention process. When necessary, the researcher interceded appropriately.

Methodology steps

The following steps took place during the intervention as it proceeded through its phases. See Figure 6.

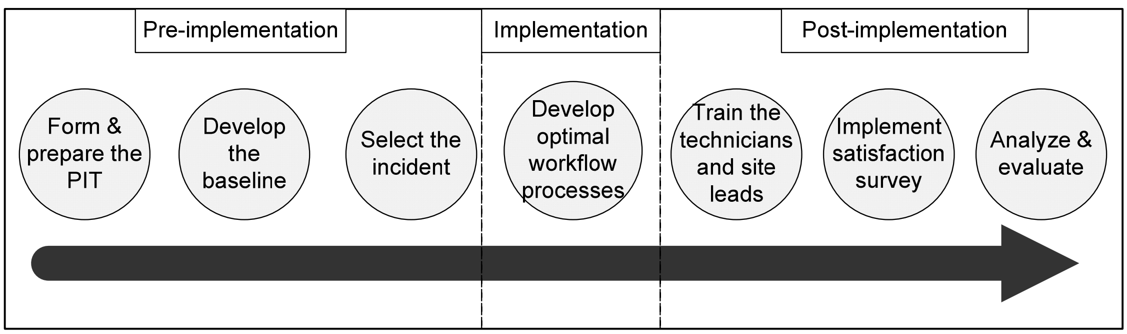

Figure 6. Methodology steps

1. Form and prepare the PIT. The ESD manager, with the assistance of the researcher, formed and prepared the PIT (Harrington et al., 1997). Open-minded and energetic technicians were asked to join the reengineering team, after which they were briefed on the PIT's charter, including deliverables, limitations, etc., why the project was begun, and what it sought to produce. The ESD manager prepared the PIT for this intervention by discussing benefits of process flowcharting and the definition, purpose, and benefits of BPR. Critical success factors and workflow diagramming techniques were discussed. Team-

building specifics based on Thompson et al. (2000) rounded out the PIT member preparation.

2. Develop the baseline. The baseline consisted of three units of analysis: resolution metrics, customer satisfaction data, and current workflows.

   a. A quantitative baseline showing current metrics, customer base, etc., was developed from the automated trouble ticketing system by the ESD manager, who acted as the PIT facilitator. The PIT determined which metrics were to be used, with response and resolution times as key indicators. The researcher acted as consultant based on his previous experience.

   b. The level of customer satisfaction based on qualitative and quantitative data was also documented and added to the baseline.

   c. The ESD manager and other PIT members observed ESD technicians to determine their current workflow processes. These observations were drafted with standard flowcharting symbols in Microsoft Visio such as process rectangles and decision triangles, with arrowed connectors linking them. During this time, the PIT annotated the qualitative and quantitative data, and recorded such data as time markers for resolution steps, how the technicians served the customer, the levels of courtesy, etc. The PIT, with the assistance of the researcher, decided which observable parameters would be most beneficial to record.

3. Select the incident. Participants selected the incident that was expected to produce the most significant results through reengineering. The two

prospective issues were ranked on a weighted scale using five criteria: customer impact, changeability, performance status, business impact, and work impact. The issue with the greatest value was chosen.

4. Develop optimal workflow processes. The PIT developed new workflow processes that incorporated best practices with ESD-specific requirements. If a unique military need existed that affect the workflows, such as the ability to rapidly deploy, those requirements were considered and migrated into the workflows. Peer and management reviews played key roles in this stage.

5. Train the technicians and site leads. After the workflows were reengineered, the PIT developed the necessary training programs to advance the project.

    a. All site leads/technicians were trained to use the proven, most efficient workflow processes to resolve the incidents. The researcher took an active role in the training's development, which allowed the PIT to concentrate on other daily functions.

    b. All site leads were trained to administer user accounts and make the necessary modifications. The minimal steps to successfully make the modifications were laid out in clearly-defined step-by-step instructions. The PIT, via telephone calls and e-mail messages, ensured the site leads performed the necessary tasks without error.

6. Create and implement satisfaction survey. The researcher and the PIT developed the customer satisfaction survey that conformed to best practices and met the criteria of the critical factors discussed earlier. The survey questions were linked to business processes, and were expected to produce data

that best indicated the overall ESD effectiveness levels. Best practices including ITIL guidelines were consulted, which enhanced the quality of the survey. The survey was pilot-tested on a small scale. After the managers declared the pilot successful, the survey was sent to all users immediately following incident resolutions. This practice produced acceptable response rates.

7. Analyze and evaluate. The PIT gathered post-implementation metrics and mapped them to the baseline, which determined the level of effectiveness of the intervention. The PIT then analyzed each milestone and evaluated whether the BPR initiative appeared successful. The researcher assisted this effort.

Instrumentation and Tools

The instruments and tools used in this case study were an automated trouble ticketing system and its associated database, a spreadsheet containing the trouble ticket data, interviews and observations with technicians, workflow diagrams, and customer satisfaction surveys. These devices worked dynamically to produce data that provided answers to the research questions. The ticketing system generated reports to show increases or decreases in resolution times during several key data collection periods, while the interviews and satisfaction survey were analyzed to show whether end users were more pleased with the levels of service following the implementation.

The automated trouble ticketing system had been in use for several years at the ESD. When technicians opened tickets, they completed the mandatory fields such as user contact information, nature of incident, and comments related to the incident. This information was automatically entered into a ticketing database when technicians opened the tickets. The data was then used to generate reports that displayed the collected metrics.

During the observations, interviews, and surveys, the PIT gathered the appropriate data used for the project. During the initial phase when the baseline of workflow processes was developed, the PIT observed the technicians going through the incidents' processes and subprocesses. The technicians were asked the purpose and intended results of each step, and whether alternative steps made sense. Both qualitative and quantitative data were encouraged, for two reasons: to clearly and accurately diagram the processes, and to properly scrutinize the processes individually and holistically when the PIT reengineered the workflows. During the interviews, the respondents were asked open-ended questions, which encouraged the respondent to provide qualitative data regarding their interaction with the ESD. The customer satisfaction survey contained questions that dealt with satisfaction levels, technician effectiveness, and timeliness of the resolution. In following best practices, the survey contained the minimum number of questions to encourage potential responders to complete the form (Kolsky, 2006). When users completed the form, they were asked to return the form via e-mail to the ESD. See Appendix A for the customer satisfaction survey.

Data Collection Methodology

Data for this study was gathered at four different points in time, using three different instruments, from three sources, in three distinct ways. At the start of the intervention implementation, the ESD manager obtained quantitative metrics on selected parameters from an automated trouble ticketing database. Since the data was electronically generated, the numerical values were exported from a database into a spreadsheet to utilize Excel's sorting and filtering features. The bottom line totals were printed in reports, reviewed by PIT members and other ESD stakeholders, and labeled "Baseline Metrics Data." This served as one half of the baseline against which post-implementation data was measured. The rest of the data were collected at various times during the implementation. See Table 3.

Data Collection Procedures

Process workflows

Workflow process data were gathered via an existing process map, validated while observing "live" technicians, and developed into a new process map which was expected to streamline resolution procedures. First, a pre-exiting process map was produced. PIT members then observed and annotated all associated activities as service desk technicians performed real time resolutions for end users. The PIT members' notes were transferred to computer and underwent a series of technical and peer reviews. The map was biangulated and later validated because the diagrammed steps corresponded with actual procedures. From the existing processes, a new map was developed by the PIT and other stakeholders to increase efficiency and ultimately higher levels of customer satisfaction. Microsoft Visio was the software mapping tool.

Table 3. Data Collection Matrix

Type of data	Type of Data	Instrument	Purpose	Collected from?	Collected when?	Expected population/ sample size
Workflow Processes	Observational and Qualitative	Process mapping software	To streamline processes and increase efficiency	Service desk technicians resolving issues	Prior to implementation	Small
Performance metrics	Quantitative	Trouble ticket database	To determine pre-implementation service levels	Automated trouble ticketed system	6 weeks prior to implementation	100% of incident-related data
Customer interviews	Qualitative and quantitative	Interviews	To determine pre-implementation level of customer satisfaction	End users who had issues resolved within past year	Prior to implementation	Small; less than five
Performance metrics	Quantitative	Trouble ticket database	To determine post-implementation service levels	Automated trouble ticketed system	6 weeks after implementation	100% of incident-related data
Customer Satisfaction Surveys	Mixed	Customer Satisfaction Surveys	To determine post-implementation level of customer satisfaction	End users	Post-implementation	100% of incident-related data

Pre- and post-implementation performance metrics

Performance metrics data in the form of quantitative trouble ticket information were gathered from users after their incidents were resolved. Trouble tickets tracked all service desk activity in order to provide performance measurements to managers, customers, and other stakeholders. Prior to the implementation, the ESD manager compiled six weeks' worth of trouble ticket data and exported the data from the trouble ticketing database into Microsoft Excel. After the export, the ESD manager checked the data for integrity and renamed the file to reflect the collection period, posted it onto a shared network workspace, and notified the PIT that the data was ready for analysis. Six weeks after the implementation, the ESD manager performed the same steps with the new set of data.

Pre-implementation interviews

To overcome the lack of customer satisfaction surveys prior to the implementation, which made it difficult to accurately pinpoint pre-implementation customer satisfaction levels, the researcher conducted interviews with several end users. The only prerequisite was that users had to have contacted the ESD for service within the past year. Of the three interviews, two were conducted in person while the third was conducted by phone. All primary interviews lasted thirty minutes. Two follow-up interviews were also needed, which lasted a shorter period of time than the previous interview and clarified major and minor points raised in the interviews. The researcher used pen and paper to record the answers initially, after which the notes were transferred to computerized format. Each interview was saved as "Interview One, Two, or Three," with backup files sent via e-mail to the researcher's place of employment, so that in case of emergency, off-site data storage would provide continuity in case the original files became lost or corrupted. No data was lost during this study, so these backup files in the end were not needed.

Post-Implementation satisfaction surveys – quantitative and qualitative

After the implementation, when trouble tickets neared closure, users were asked to complete a newly developed customer satisfaction survey. The survey was Excel-based and adhered to industry standards by containing only six Likert-based questions and one open-ended question for comments and suggestions (Conway & Cassidy, 2000; Kolsky, 2006). Immediately after their tickets were closed, users were e-mailed the survey and asked to indicate their satisfaction levels based on the incident just resolved. When users did comply with the request, they sent their completed surveys to a specially designated e-mail account within the ESD, which acted as the central data repository. The ESD manager printed all the surveys and saved the data onto a compact disc (CD) labeled "Survey Results," which together were overnight expressed to the researcher to perform the analysis.

Data Analysis Methodology

Data analysis was done systematically during this study. The following admonition of Yin (2003) was observed: "The analysis of case study evidence is one of the least developed and most difficult aspects of doing case studies" (p. 109). Sound methodologies were used at appropriate stages of this study. Because this study used a mixed methodology, the analysis procedures of both qualitative and quantitative data are described in this section.

As interview and survey data were collected, themes were identified and labeled based on Yin's analysis techniques (2003). The researcher looked for patterns that revealed meaning from the data. This was done with both the quantitative and qualitative data sets. Once patterns were determined, explanations were discussed during PIT meetings to generate meaning (Gupta, 1999).

This stage finished the cycle of the data analysis process. After the brainstorming, conceptualizing, and analyzing were done, conclusions were drawn. Interpretations that stemmed from the researchers' experiences or came from data similarities were used to form theories as to how and why customer satisfaction levels had changed. The researcher and the ESD manager analyzed the data and reviewed for data discrepancies and outliers.

It is highly beneficial during a case study to analyze all data, especially qualitative, during rather than after data collection (Merriam (1998). The researcher for this study performed all analysis immediately following each data collection, so that the ESD manager was kept informed about the collected information during all stages of the gathering process. Another benefit was to prevent gaps in data themes, which are sometimes discovered well after the data collection periods have ended. When this happens, subsequent data collections become necessary, which necessitates laborious rescheduling with participants, extension of the study's timeline, and delay of the study's results. Performing data analysis during the collection period rather than after also prevented the researcher from what Merriam (1998) calls "drowning in the data," which happens when researchers become overwhelmed and discouraged when analyzing mountains of surveys, interviews, and handwritten notes of collected data with no clear guidance (p. 161).

The collected data was presented non-sequentially, which enhanced the value of this study by linking data results to this study's research questions. During data analysis, similar data sets were grouped together to allow the reader to make "before and after" data set comparisons that were similar in type, instrumentation, and intent. The collections were done as the data became available: data sets 1 and 2 were gathered during the pre-implementation period, while sets 3 and 4 were gathered post-implementation. This strategy showed the difference in performance metrics before and after the implementation, reflecting the effect of reengineering to service delivery in clear, numerical terms. Likewise, data sets 2 and 4 showed the effects of reengineering expressed qualitatively with interview data before the implementation and evaluated customer survey data following the implementation. See Figure 7.

Process workflow data

Workflow process data, which was qualitative in the form of diagrammed workflows with corresponding text, underwent process analysis. This strategy was done in accordance with Barksdale and Lund's model (2001), which required the PIT to evaluate the inputs, outputs, and processes to ensure that the technicians performed the steps correctly. Each process was broken into sub-processes and examined to determine whether each step was necessary, whether all technicians used the process in the same sequence, and whether best practices were used. When more efficient methods of workflows were designed, a risk analysis was done which pinpointed all impacts, risks, and dependencies of the proposed sub-process. The end result of the data analysis was a new, streamlined workflow process that was designed to give users more efficient resolutions for their issues.

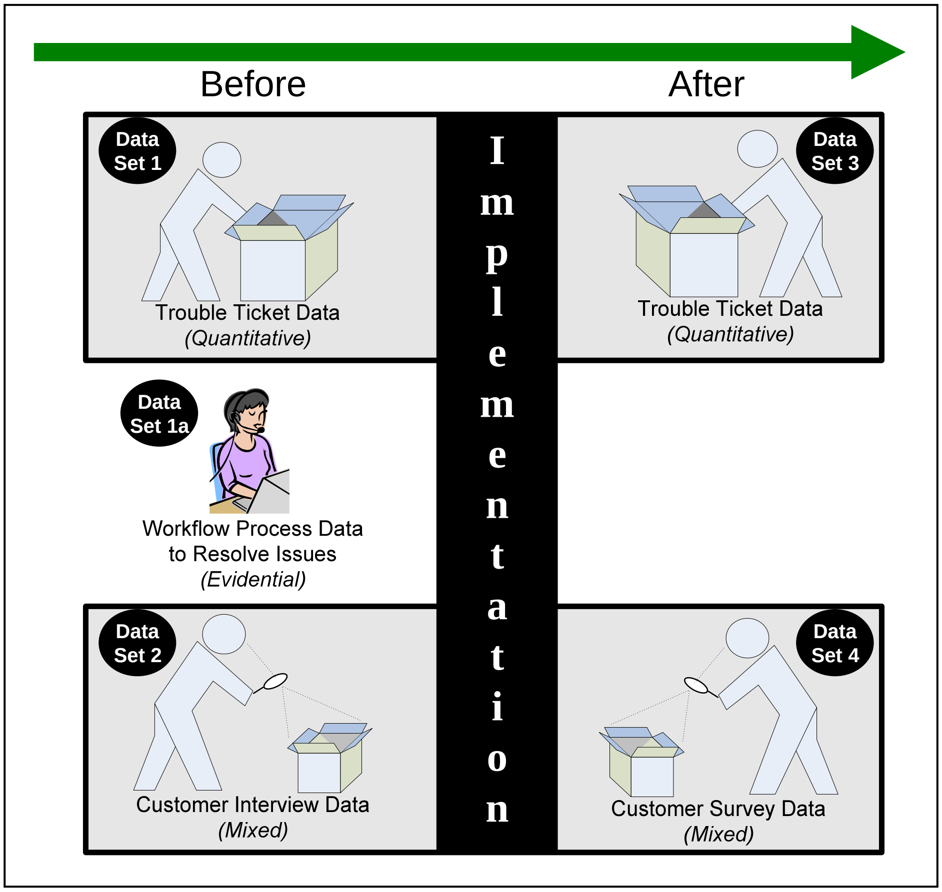

Figure 7. Data set comparisons before and after the implementation

Data Analysis Procedures

Pre- and post-implementation performance metric data

Standard statistical functions were applied to the quantitative performance metrics data during the analysis process. The collected data were exported into Microsoft Excel and sorted and filtered to produce only the specific data germane to this study. The researcher excluded invalid data that were missing fields, and used the quartiling technique to determine outlier thresholds for data that lay beyond the normal distribution; that data were subsequently removed from consideration. An Excel spreadsheet was used to produce results of running statistical functions of count, mean, minimum, maximum, median, and standard deviation. These functions were applied to the dependent variables of response time, resolution time, and turnaround time on the pre-implementation and post-implementation data sets. The resultant statistical values provided one-for-one data set comparisons for each variable. Finally, the *t* test was used to mathematically determine whether significant differences existed between the pre- and post-implementation metric data sets.

Pre-implementation interview data

The Atlas.ti software tool was used to add structure to the data collected from personal interviews. Critical thinking during analysis also played a crucial part, when PIT members analyzed the data and separated the key details from the insignificant. Common themes were discovered and assigned to codes, which were eventually added to data clusters or "data families." Numerical counts for each code were presented along with the results of the codes found during the interviews. One data element, a quantitative assessment that asked users to gauge their overall customer satisfaction level, was averaged using Microsoft Excel. See Appendix C for an interview form that was used in this study.

Post-implementation satisfaction survey – quantitative data

The same care taken while analyzing the workflow processes, interview, and performance metrics data was applied to the quantitative information gleaned from the customer surveys. To prepare the data for analysis, the researcher transposed the data manually from paper-generated worksheets into an Excel spreadsheet. The first step the researcher took was to run Cronbach's alpha coefficient calculation to determine the level of reliability of the data acquired from the survey questions. Next, the researcher used Excel to determine the completed survey return rate and its corresponding margin of error and confidence level. Duplicate data was discarded.

Statistical analyses were then applied to the quantitative data. Excel was again used to determine the arithmetic mean of the Likert-based responses. The chi square test for independence determined the likelihood that the responses occurred by chance. Aggregate totals of the numerical responses were then graphically presented, along with a discussion that interpreted the results.

Post-implementation satisfaction survey – qualitative data

The post-collection data analysis on the qualitative customer satisfaction data began with cleansing and analyzing the data. The Atlas.ti software tool was used to add structure to the qualitative data collected from the surveys. As with the interview data prior to the implementation, the researcher searched for common themes and then assigned the themes to codes, which were eventually added to data families. Numerical counts for each code were presented along with the results of the codes found during the surveys.

Data Assessment

The methodology of business process intervention, which focuses on producing functional improvement process reengineering, was used during this study, since workflows were identified as the source of the performance gaps (Harrington et al., 1997). During the assessment, the most important measurements to consider were organizational effectiveness and efficiency, which were measured with specific parameters (Combs & Falletta, 2000). Therefore, the main methods of evaluation were auditing the solutions on a continuous basis along with peer analysis (Barksdale & Lund, 2001). These techniques were used during all stages of the data assessment effort.

More specifically, during evaluation of the process intervention, the answers to three key questions were sought. These questions, identified by Burkett (2002) as "primary purposes and use of evaluations" when involved in HPI projects, and which were tied directly to the study's research questions were (a) did the intervention accomplish its objectives, (b) did the performance gap close or narrow, and (c) did the intervention meets its intended business goals? (p. 154.)

The ESD manager and the researcher shared the role of co-evaluators, and performed key functions of the project. They matched the gap analyses prior to the intervention and evaluated whether the post-implementation data indicated a narrowing of the gaps. The evaluators also assessed whether the intervention met the ESD's business goals. In addition, the evaluators decided whether the workflows continued to resolve incidents at the desired performance levels. Finally, the evaluators provided written and oral feedback to the organization, to the PIT, and to other stakeholders regarding the progress of the intervention (Rothwell et al., 2007).

The ESD manager and other stakeholders made the final decisions concerning the success of the reengineered workflows in meeting the objectives. The evaluator furnished all data, interpretations of the data, and suggestions and recommendations to the ESD manager, who in turn informed the stakeholders. The stakeholders used the deliverables to develop reports that were fed to upper management decision-makers.

Validity

Like ESD technicians, case studies must be well grounded, dependable, and objective, while able to produce the desired results if they are to meet their objectives. Consistent levels of effectiveness such as time to respond and time to resolve are expected to occur even when a variety of technicians with dissimilar technical backgrounds and skill sets are required to effectively troubleshoot end user incidents. When evaluating technicians, ESD managers consider how well technicians have performed in providing efficient and effective support to ESD end users. By the same token, a well-developed case study will produce accurate, consistent, and reliable results that can be measured and repeated by others (Simon & Francis, 2001). This section discusses those techniques that yielded valid and reliable study results.

There are certain tests of validity that Yin (2003) devised that help to maintain validity in case studies. The first test is construct validity and was applied during the data collection phase. Construct validity asserts that data collected accurately maps or "operationalizes" to the study's intentions (Gall et al., 2003, p. 460). The first of Yin's (2003) "tactics" to prove construct validity is to use multiple data forms, otherwise known as the "Six Sources of Evidence" (p. 85). These sources are documentation, archival records, interviews, direct observations, participant-observation, and physical artifacts, which were previously discussed in the Literature Review. Quantitative data were gathered from a trouble ticket database and customer surveys; qualitative data were generated through interviews, observations, and surveys. Technicians and other stakeholders helped to corroborate or refute the findings during round table discussions.

The second and third tests to strengthen a study's construct validity are to "establish [a] chain of evidence" and "have key informants review draft case study report" (Yin, 2003, p. 34). The chain of evidence required that the researcher make "clear, meaningful links between research questions, raw data, and findings" (Gall et al., 2003, p. 461). During the design of the data collection instruments, the research questions formed the framework from which the data collection instruments were created. For example, when considering which metrics to measure during the pre- and post-implementation periods, the research question that asked, "To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?" was the deciding factor. While developing the customer satisfaction survey, the survey questions were tied to the research question that asked, "To what extent is customer satisfaction affected by reengineered workflow processes?" Best practices were consulted during each of the above milestones. Finally, members of the PIT team and other stakeholders reviewed the "chain of evidence" to obtain their approval during the review.

Another form of validity used in this study was internal validity, in which causal relationships were set forth. To increase the strength of this study' validity, the effects of the reengineered workflows – quicker resolutions, increased return on investment, and increased levels of customer satisfaction – were shown to be results of specific conditions that were executed during the study. The intent was to show a direct correlation, while simultaneously reducing or eliminating the possibility that the measured effects of the intervention were due to "spurious relationships" (Yin, 2003, p. 34). Therefore, a technique that Yin (2003) calls pattern matching was used to mitigate the threat of internal validity.

In pattern matching, the risk of unexpected threats can be reduced by matching theoretical concepts to observed effects of the study. If the empirical effects support the predictions, a causal relation can be inferred. In this study, the expected outcomes of each phase of the reworked workflows were analyzed to determine whether the desired effect of each process and sub-process had been met. For example, when a technician utilized a particular technique that successfully resolved an issue, he or she documented the process and posted the steps in a knowledge management folder located on a shared server that was easily accessible by the other technicians. When a similar incident arose, and another technician accessed and used the repair technique successfully, which reduced the time-to-resolution metric, it was then concluded that the pattern of actual behavior matched the expected. At that point, an inference was made to a causal effect, and the case validity strengthened (Yin, 2003).

Triangulation was used to enhance this study's internal validity. Triangulation is a means to converge evidence from at least three types of different sources, such as observation, interviews, and service metrics, in order to indicate whether a measurement may be validated to "build a coherent justification for themes" (Bresler & Stake, 2006, p. 301). Rather than using just one source of data, triangulation enabled the researcher to probe deeper into the data to examine new ideas that eventually uncovered explanations for some of the study's outcomes. Triangulation was used when technicians and other ESD personnel were consulted to validate the pre-implementation process map. Multiple interviewees also triangulated the qualitative data when they remarked that ESD hours needed to be expanded to allow for immediate responses from users overseas. By the same token, the customer satisfaction data was validated through the multiple survey respondents who provided similar satisfaction ratings. Finally, on a holistic level, the process workflow data was one side of the primary research question data triangle with the other sides being performance metric data and the third being customer survey data. See Figure 8.

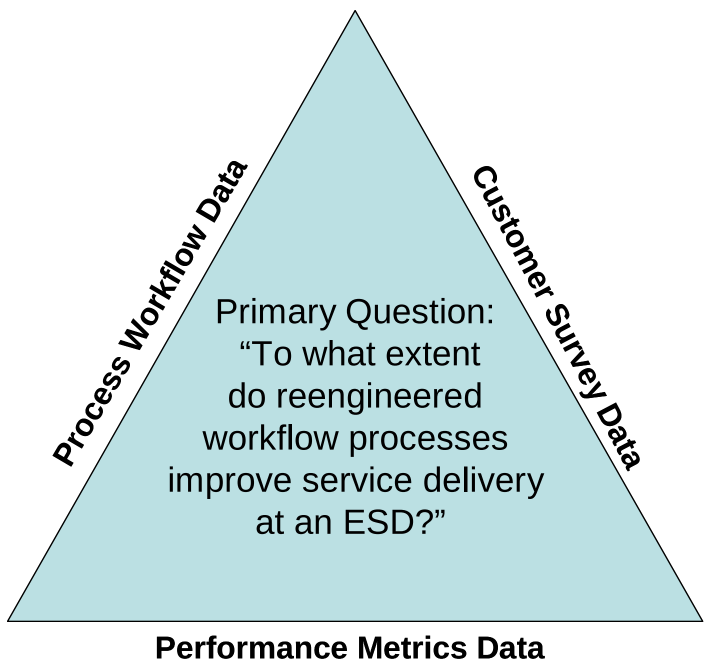

Figure 8. Primary research question data triangle

All data were properly handled. The PIT reviewed the data for accuracy, after which the PIT members drew preliminary conclusions regarding the effectiveness of the reengineering effort. Objectivity and freedom from bias were concerns during the data collection. Data was safeguarded by masking participants' identities, thus maintaining required levels of privacy. File backups including off-site storage ensured that the data was secure.

Reliability

Reliability is defined by how closely subsequent researchers can replicate a study (Merriam, 1998). To improve the reliability of this study, all activities were properly documented. The qualitative portion was more challenging than the quantitative, however, since numbers were transferred more readily. However, as Merriam (1998) points out, “achieving reliability in the traditional sense [of qualitative case studies] is not only fanciful but impossible” (p. 206). Be that as it may, great care was taken to not only transcribe the qualitative data but also to have highly accurate interpretations of the data’s meaning.

Reliability was strengthened by the inclusion of two tests performed on quantitative data. Cronbach’s Alpha test produced a numerical coefficient that assessed the reliability of the Likert-based satisfaction survey questions. The chi square statistical test was applied against the customer satisfaction survey results, which also enhanced reliability by indicating the quantitative possibility that chance was involved in the end users’ responses. In this way, reliability was reached to reduce biases in this study (Yin, 2003).

Ethical Issues

Rules of ethical conduct were followed in this study. Participants’ consent prior to launching the intervention ensured that participants allowed the PIT to gather all necessary data in the manner specified. Participants’ identities, as well as the data collected, were protected during this study. The researcher was consistent in ensuring that proper precautions were taken to maintain strict confidentiality throughout the study (Bowen, 2005). No participant names were used; they were instead blacked out.

All participants were well informed about the study. Participant consent forms were given to all project stakeholders regarding general information, such as the study's purpose, its benefits, why they were chosen, and the expected length of the study. See Appendix B. How the data were to be acquired and the data's use was also noted. The privacy issue was also included, to let participants know that their confidentiality was guaranteed both during and after the study. Finally, they were informed that their inclusion in the study was strictly voluntary, and that participants had the option of withdrawing from the study at any point, no questions asked.

Furthermore, there was no deception with the data collected in this study. Interviewers told participants that their data was be used in aggregate form only, with no "individual-level data" (Combs & Falletta, 2000, p. 120). The data were only used to determine the extent of the intervention's results in meeting its objectives, not for other uses such as planning or employee evaluations. While the raw data were interpreted, special care was taken via thorough review and strong group consensus, to ensure that correct meanings were gleaned from data. These measures went a long way toward ensuring that integrity remained the cornerstone of this study.

Summary of Chapter 3

This chapter explained the study's research approach. Linkages to the research questions were shown to justify the study's purpose. This chapter discussed the methodology, benefits of HPI and mixed methodology, the study's setting and its participants, along with the methodology steps. Instrumentation was the next discussion point, after which data collection and analysis techniques were presented. Validity, reliability, and ethical considerations concluded this chapter.

CHAPTER 4. DATA ANALYSIS AND RESULTS

Introduction

The purpose of this study was to determine to what extent business process reengineering affects the delivery of IT services at an Enterprise Service Desk (ESD), in terms of performance metrics and customer satisfaction. This chapter will describe the findings of the study and explain how each of the five sets of data was produced, per the Data Collection Matrix in Table 3. Data results will also be displayed.

To review, there were three research questions that drove this study. The primary question was "To what extent do reengineered workflow processes improve service delivery at an ESD?" The secondary questions were, "To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?" and "To what extent is customer satisfaction affected by reengineered workflow processes?" To see how the research questions related to the data collected, see Table 4.

Organization and Presentation of the Data Findings

This chapter will use tables, figures, and charts to display quantitative and qualitative data that surrounded the reengineering implementation. To simplify these various parts of data, the findings will begin with the reengineering process: the steps taken, how the process improvement team (PIT) chose the particular set of information technology (IT) incidents for this study, the data associated for the chosen incident, and how the implementation project was initiated.

Table 4. Associating Research Questions to Data

Data Collected	Analysis Method	Final form of answers	How Data Links to Research Question
Primary Question: "To what extent do reengineered workflow processes improve service delivery at an ESD?"			
Process Workflow Data	Diagrammed current workflow processes; determined gaps; diagrammed "to be" processes to streamline efficiency	New workflow map of the reengineered incident shows improved processes, with unnecessary steps deleted	Triangulated with metrics and survey data to show streamlined processes
Secondary Question: "To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?"			
All incident data from ESD	Used Excel to sort the data to expose those incidents with greatest likelihood of success using BPR Determined incident to reengineer	List was pared down to two choices. Selection of "timesheet issues" was used as the focus of the performance metrics part of the study.	Provided categories of incidents from which response time, resolution time, and turnaround time may be affected by reengineered workflow processes
Timesheet data	Sorted data to determine greatest likelihood of success using BPR	Sub-categories of issues announced for incidents to be reengineered	Provided the specific sets of incidents from which response time, resolution time, and turnaround time may be affected by reengineered workflow processes
Secondary Question: "To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?"			
Performance Metrics	Identified and excluded invalid data and outlier thresholds by quartiling; ran statistical analyses	Quantitative results between pre- and post-implementation statistical values of dependent variables of respons, resolution, and turnaround time	Showed extent that response, resolution, and turnaround time values changed between the pre- and post-implementation periods
	Used Excel to run *t* test to calculate T statistical value	Table reflecting results of mean, degrees of freedom, T statistic value, and probability of performance metrics	Showed degree of significance of performance metrics of intervention; correlation between reengineered workflows processes and performance in service metrics

Table 4. (*continued*) Associating Research Questions to Data

Secondary Question: "To what extent is customer satisfaction affected by reengineered workflow processes?"			
Data Collected	Analysis Method	Final form of answers	How Data Links to Research Question
Interview Data	Created codes to cluster qualitative similar data into "families"; identified common themes	Discussed qualitative results by identifying frequency of occurrence and points revealed; quotations used as examples	Reflected end user perceptions as baseline indicators of satisfaction levels prior to reengineering workflows; showed degrees of change when results compared to post-implementation survey ratings
	Averaged quantitative responses from Likert-based question that asked users' their overall customer satisfaction level	Results added to pre-implementation interview discussion	Reflected user perceptions as baseline indicators of user satisfaction levels prior to reengineered processes; showed degree of change when results compared to post-implementation survey data
Customer satisfaction survey data - quantitative	Calculated return rate and confidence level, means from Likert responses	Results presented in table with discussion; individual questions presented graphically with discussion	Reflected user perceptions of satisfaction levels after workflows reengineered; showed to what extent customers were satisfied after workflows reengineered
	Used Excel to run Chi square test for independence	Results presented in table with discussion	Reflected degree of chance for responses; added strength to study's findings by indicating survey responses' legitimacy
	Ran Cronbach's alpha coefficient to test for reliability of the survey questions	Discussed numerical result	Reflected threshold of reliability; added strength to study's findings by placing high reliability for survey questions
Customer satisfaction survey data - qualitative	Created codes to cluster qualitative similar data into "families"; identified common themes	Discussed qualitative results by identifying frequency of occurrence revealed; quotations used as examples	Reflected user perceptions of satisfaction levels after workflow processes reengineered; helped to show extent of customer satisfaction

The remainder of this chapter will follow the same data sequence as the previous chapter: process workflow data, pre- and post-implementation performance metrics data, pre-implementation interview data, and finally post-implementation quantitative and qualitative customer satisfaction survey data. At the beginning of each data set's discussions, each section of this chapter will show the importance of that data and how they link to the research questions.

BPR and HPT

There are certain criteria that business process reengineering (BPR) requires in order to become a success. Among other factors, BPR needs upper level management's buy-in to sustain the effort through its cradle-to-grave lifecycle. If a component, technology should remain a tool to facilitate the BPR process rather than being the focal point. Training is often necessary to modify participant behavior. Following proven models is also crucial, since they act as guides for project owners throughout the various stages of development (Hammer & Champy, 1993; O'Neill & Sohal, 1999; Grover & Kettinger, 1995). All of these factors were used for this study.

Several key elements of the Human Performance Intervention (HPI) model served as the roadmap for this study (Sanders & Thiagarajan, 2001). Cause analysis, in which the intervention's structure was formed, came from the process mapping that presented each step that technicians took to resolve user issues. During intervention selection, a specific set of incidents was selected, since this set showed the greatest potential of organizational impact, based on an industry standard model. During intervention implementation, the ESD worked with site leads to help end users resolve their issues in accordance with the revised and approved process map; end users were then able to perform their duties in a timely fashion per company policy. Finally, the researcher and ESD manager entered the evaluation of results stage by conducting a summative evaluation on the quantitative and qualitative data. They analyzed the data to statistically determine whether a change occurred in performance metrics and perceptions of customers regarding their levels of satisfaction.

Selection of the Incident to Reengineer

The selection of the incident required two sets of data. The first set provided the PIT with all the issues the ESD resolved within the six-week period of data collection. After this list was sorted, the second data set revealed the specific sub-categories that would best provide the ESD with an answer to the research question, “To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?”

This second data set underwent a specific process to arrive at the incident to be reengineered. Harrington’s (1991) Weighted Selection Approach is an industry best practice improvement component that helps teams such as the PIT prioritize business processes to best serve organizational needs. The researcher sorted the metrics in various ways to give the PIT several different data views. Two incidents appeared to be likely candidates: timesheet incidents and password resets. Each of these incidents occurred frequently enough to provide measurable results. In addition, both issues were vital to user productivity. Password problems prevented users from accessing important files needed to fulfill mission requirements, while timesheet incidents, on the other hand, prevented users from logging their hours worked on any given day. To increase the likelihood of a successful reengineering project, the following five criteria were adapted

(Harrington, 1991). The subject of each question is shown in parentheses.

1. How much does the customer care about this issue? (customer impact);
2. Can a better way be found to resolve these issues? (changeability index);
3. How broken is this process? (performance status);
4. How important is the process to the overall mission requirements? (business impact);
5. Are resources available to streamline these processes? (Work impact).

Using a scale of 1 (*Low degree of…*) to 5 (*High degree of…*), the PIT members were asked to rate each incident using the five criteria. In the end, timesheet incidents rated higher than password resets; therefore, timesheets became the chosen incident.

Process Workflow Data

Pre-implementation workflow process map

Another meeting with PIT members centered on reworking timesheet incident processes. Team members agreed that diagramming the current procedures based on observations and experience would be highly beneficial in visually depicting the baseline environment. By examining each step in the process, a new, streamlined workflow process was created. The PIT produced an archived workflow diagram that reflected the current procedures that technicians use when resolving timesheet issues. See Figure 9. From this diagram, four items of concern were noted:

1. Lag in customer notification. From the time the user notified the ESD (point 1), five steps needed to be done before the user was notified that the ESD was working the issue (point 2).
2. Inefficient balance of technology and human resources. By underutilizing

human resources and relying heavily on automation, the ESD realized excessive staffing costs and high error rates.

3. Customer notification via e-mail. If users stepped away from their workstations, notification was delayed.
4. Lag in resolution. There were at least eight steps from the time the ESD was notified of an incident (point 1) until an agent focused on the incident and began working the incident toward resolution (point 3).

These four concerns were earmarked as process improvement targets by the PIT.

Post-implementation workflow process map

A new process map was produced at the next PIT meeting. See Figure 10. One technician and the researcher spent several sessions producing a set of new workflow processes that streamlined timesheet incidents. The most noticeable feature of the new workflows was that instead of end users calling the ESD when they experienced timesheet difficulties, they contacted their site manager, known as site leads, who attempted to resolve the issues locally without contacting the ESD (point 1 of figure 10). This new process in effect decentralized the service desk support, so that users were directed to seek technical assistance locally rather than via the centralized ESD. This was expected to be a major benefit especially for distance users, who during the pre-implementation interviews complained about delays in service due to time zones differences.

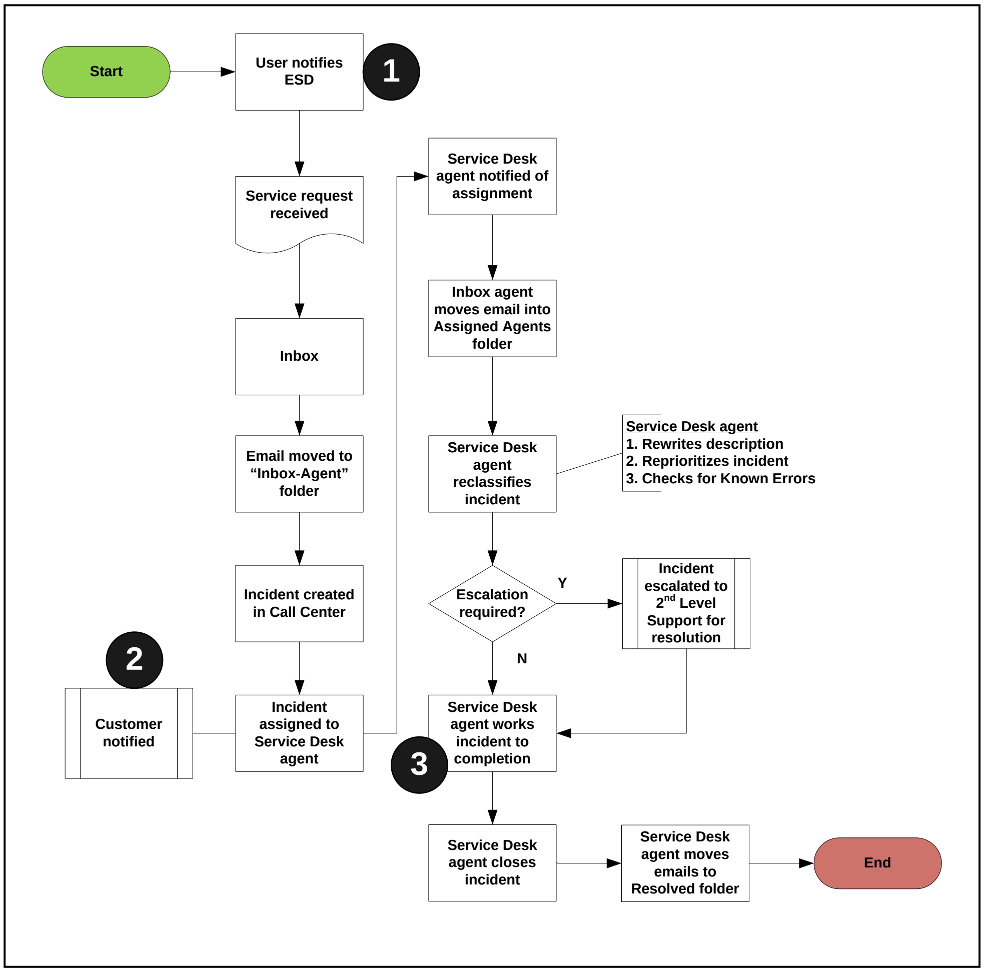

Figure 9. Pre-implementation workflow processes

Other changes became evident when comparing the pre- and post-implementation workflow processes. The technical representative, in this case the site lead, immediately began resolving issues, rather than having layers of automation as in the pre-implementation workflow processes (point 2). Additional workflow changes included new process steps that checked if the repair was successful and if the user was satisfied (points 3 and 4). In both cases, if the answer was "yes," the resolution process went forward. If "no," the user contacted the ESD, for the sake of end user expediency.

Another modification in the post-implementation period was that trouble ticket data was entered after customer satisfaction was reached rather than at the beginning of the process, which enabled site leads to begin resolving issues sooner than previously; this allowed the overall effort to become more customer-centered (point 5). Lastly, a new process was added that encouraged end users to complete customer satisfaction surveys, an instrument that was previously unavailable (point 5).

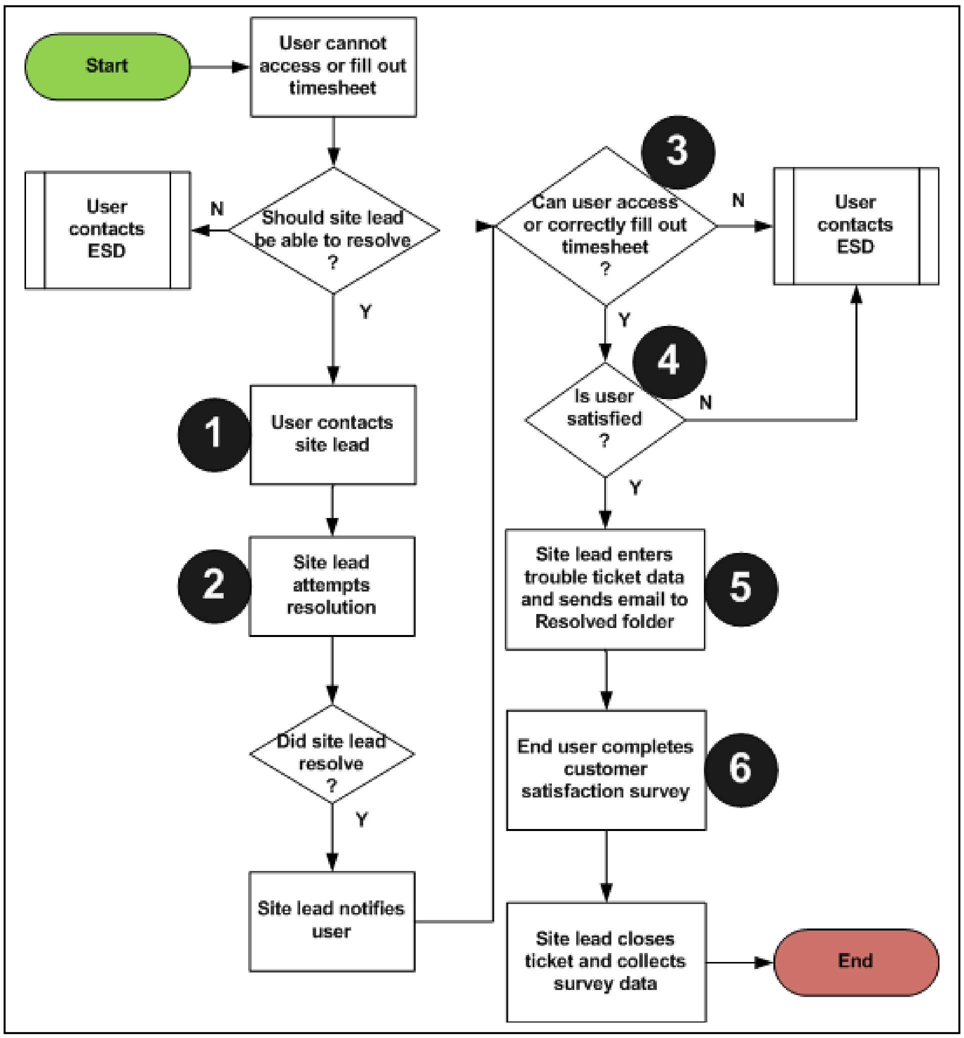

Figure 10. Post-implementation workflow processes

Pre- and post-Implementation Performance Metrics

Performance metrics for timesheet issues were collected because the data provided a direct link to answer the research question, “To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?” This data, along with the workflow process data and customer satisfaction survey data, helped to answer the research question, “To what extent do reengineered workflow processes improve service delivery at an ESD?” These answers are provided in chapter 5.

Quantitative data from the pre-implementation and post-implementation periods were culled from an automated trouble ticketing data source and exported into an Excel spreadsheet to facilitate the analysis process. Data columns that identified end users were not used in this analysis. The periods of data collection were six weeks for both the pre-implementation and post-implementation data. During a nine-day period, coinciding with the rollout of the intervention, none of the collected data were used for analysis. The intent of this action was to minimize possible data errors during the transition period, when end users adapted to the new resolution processes. Metrics applicable to this study were customer satisfaction, response time, resolution time, and turn around time (TAT). See Table 5.

Exclusions

Exclusions to the data were made based on a number of factors. Illogical entries, such as those with Resolved Times preceding Opened Times and blank Opened Time fields, were considered invalid and discarded. The definitions of these metrics were also directly tied to the exclusions. For example, since response time in this context was defined as the total time between when a trouble ticket was opened until an ESD agent committed his or her resources to resolve the issue, if values were missing in either the Opened or Committed fields, these records were excluded. Resolution time was defined as the total time between when an agent took action to resolve the issue and when the ticket was resolved; therefore, if values were missing in either the Committed or Resolved fields, those records were excluded. Finally, turn around time or TAT was defined as the total time between when a trouble ticket was opened and when it was resolved; if values were missing in either the Opened or Resolved fields, these records were excluded as well.

Other data were excluded because they were classified as outliers, or those "extremely small or extremely large data value[s] when compared with the rest of the data values" (Jaisingh, 2005, p. 81). The researcher used the mathematical approach of quartiling, in which the data were divided into four equal distribution segments, after which a formula was applied to determine if values lay outside the edges of normal data (Jaisingh, 2005; Campbell, 2002). In this study, all data outside the range of Q3 + 1.5 * IQR, or the third quartile plus 1.5 times the interquartile range (IQR), were considered outliers and thus excluded. Quartiling was thus instrumental in reducing the outlying sensitivity to the means in all three performance metrics categories of response time, resolution time, and turnaround time (Campbell, 2002). See Table 5.

Table 5. Excluded Records within Performance Metric Data

	Original record count (n=)	Excluded for missing values	Excluded as Outliers	Outlier thresholds	Total exclusions	Percentage Excluded	New Count (n=)
Response Time							
Pre-Implementation	151	22	29	> 10 hrs, 17 min	51	34%	100
Post-Implementation	150	39	23	> 39 min.	62	41%	88
Resolution Time							
Pre-Implementation	151	24	23	> 5 hrs, 19 min	47	31%	104
Post-Implementation	150	45	20	> 4 hrs, 51 min	65	43%	85
Turnaround Time							
Pre-Implementation	151	24	30	> 69 hrs	52	36%	97
Post-Implementation	150	44	20	> 7 hrs, 52 min	64	43%	86

Outlier thresholds showed a dramatic difference between the pre-implementation and the post-implementation data. The response time data gathered prior to the implementation beyond the range of 10 hours, 17 minutes were deemed invalid and were therefore excluded. In the corresponding category for post-implementation data, the range for the response time records was reduced almost 90%, down to 39 minutes. The resolution time records showed an approximate 15% reduction, or less than 30 minutes between the pre-implementation and post-implementation data. Turnaround time, as in response time, reflected a 90% reduction, from the 69 hours found in the pre-implementation data to less than 8 hours for the post-implementation data.

Statistical comparisons

After excluding the outliers, commonly used statistical functions were applied to the remaining data. These metrics were derived from numerical trouble ticket data and sorted into the standard statistical categories using an Excel spreadsheet. Count or "n" designated the number of trouble ticket records collected. The mean reflected the arithmetical average of the records in the various categories. The minimum and maximum time values are presented to show the range of the data points "furthest removed from the generality" (Campbell, 2002, p. 13). The median value displays the number in the middle of the trouble ticket records; half of the records have values above the median and half have values below the median. The final statistical calculation used was standard deviation, which indicates how far the values of the trouble ticket records are spread out from the mean value. See Table 6.

Table 6. Statistical Analysis of Performance Metrics Data

	Count	Mean (h:mm)	Min (h:mm)	Max (d:h:mm)	Median (h:mm)	Standard Deviation
Response Time						
Pre-Implementation	100	0:32	0:01	0:5:04	0:05	0.045444
Post-Implementation	88	0:06	0:01	0:0:29	0:04	0.004490
Resolution Time						
Pre-Implementation	104	0:32	0:01	0:4:14	0:08	0.036308
Post-Implementation	86	0:39	0:01	0:4:03	0:15	0.037260
Turnaround Time						
Pre-Implementation	97	2:24	0:01	1:8:17	0:08	0.232489
Post-Implementation	87	0:19	0:01	0:4:03	0:05	0.028616

This section will compare the pre-implementation and post-implementation data in three parts: response time, resolution time, and turnaround time values. Placed side by side, these values will be compared, with similarities and differences described. Items of interest will be discussed in quantitative terms. Response time had several significant differences between the centralized support agency (pre-implementation) and localized support functions (post-implementation) when notified of the need to resolve end user incidents. The data reflected an overall difference of twenty-six minutes within the mean measurements, an improvement of over 200%. While the minimum time of response (one second) stayed the same, the maximum response time of the pre-implementation data was over four and a half hours greater than the maximum after the intervention. The median during the post-implementation period was 20% faster (four minutes versus five). Regarding standard deviation, the data points were clustered much closer to the mean in the post-implementation phase than prior to the intervention, indicating a narrow data dispersion.

In the metric of turnaround time, the mean values were widely disparate. The ESD technicians within the centralized environment required on average two and half hours to resolve all incidents, while the site leads locally needed only nineteen minutes. The maximum turnaround time was much greater for the ESD technicians (one day, eight hours) as compared to on-the-ground site leads (four hours). The median turnaround time was different by only three minutes, while the standard deviation during the pre-implementation was ten times more distributed around the mean (0.232489) when matched to the post-implementation (0.028616).

Not only did resolution time values show a narrower margin of difference than response times, but there was a reversal of trends. With response time and turnaround times, the site leads' times were faster than the ESD; with resolution time, however, the site leads resolved the incidents slower than the ESD following the implementation. Site leads on average took seven minutes longer to resolve incidents than ESD technicians. The maximum time to resolve issues in both the pre- and post-implementation periods was over four hours, a consistency that indicated a delta of only nine minutes. The only exception was the median, in which the midway point between all the issues was at the fifteen minute mark when site leads resolved issues, compared to almost half the time of eight minutes for ESD technician resolutions. The standard deviation was nearly identical between the pre- and post-implementation resolutions.

T *test Results*

To determine the probability that a difference existed between the pre- and post-implementation metrics data, the *t* test was used, which "evaluate[s] the differences between two normally distributed groups" (Davis, 2007, p. 56). For this study, the *t* test analyzed the means of the dependent variables (response time, resolution time, and turnaround time) to determine if an effect was created by the independent variable (resolving timesheet issues locally rather than centrally). The researcher used the Two-Sample Assuming Unequal Variances type of *t* test by using Excel to produce the data. In Table 7, "df" stands for degrees of freedom, "T" designates the test statistic value, and "P" designates the probability.

Table 7. *T* test Results

Dependent Variable	Mean	df	T	P
Response Time	0.101	98	3.6	0.00046
Resolution Time	0.096	104	2.2	0.02644
Turnaround Time	0.198	101	3.9	0.00015

In all three of the dependent variables, the mean was significantly different between the pre- and post-implementation data. The researcher used the widely accepted standard of confidence of 95%. If P was less than 0.05 or 5%, the difference was considered significant. If P was greater than 0.05, the difference was considered not significant. The following findings represent the *t* test results.

All three of the performance metrics had either significant or highly significant results. The *t* test statistic for response time resulted in 3.6, with 98 degrees of freedom and an associated value for P of 0.00046, which was considered extremely significant. For resolution time, the *t* test statistic was 2.2, with 104 degrees of freedom and an associated value for P of 0.02644, which was considered significant. For turnaround time, the *t* test statistic was 3.9, with 101 degrees of freedom and an associated value for P of 0.00015, which was also considered extremely significant. Because of these findings, it was concluded that there was a significant difference between the dependent variables of response time, resolution time, and turnaround time when pre-implementation and post-implementation data were compared. Interview data were also used to determine service levels quantitatively, which follows in the next section.

Pre-Implementation Interview Results

Since customer satisfaction surveys were not used at the ESD prior to the implementation, interview data were collected because the data provided end user perceptions as baseline indicators of customer satisfaction levels prior to the implementation. When this data were compared to the customer satisfaction data after the workflows were reengineered, a direct link was established to answer the research question, “To what extent is customer satisfaction affected by reengineered workflow processes?” These answers are provided in chapter 5.

A coding scheme loosely based on Yin (1994) was used to compile and analyze the interview data that were collected. The researcher used the Atlas.ti software program to review each interview and find common themes. These themes were then assigned to codes that had similarities with other data elements. A total of nineteen codes were created. These codes were then grouped together and reduced into clustered affinities of data (Nwankwo, 2007). Each coding group is discussed below.

The most repeated theme mentioned or inferred during the interviews, with 18 occurrences, was in the area of satisfaction. Users reported being satisfied in six areas: competency and courtesy of technicians, issues being resolved quickly, length of calls, overall satisfaction, and why users were satisfied. Regarding competency, some comments were, “The technician was helpful, and before I hung up the phone we made sure that my problem was fixed.” Other terms used were, “helpful” (mentioned twice) and “thankful.” Another theme was the time it took to resolve issues. The common attitude among the three interviews was summed up by one interviewee who said, "Once you get a technician on the phone, it only takes a few minutes to have the problems fixed." For these reasons, the overall customer satisfaction rating for the users interviewed was 2.5 on a scale of 1 to 5 (*Extremely Dissatisfied* to *Extremely Satisfied*).

Factoring into the customer satisfaction rating of 2.5 were eight occurrences of dissatisfaction. Dissatisfaction not only with the ESD but also with the timesheet system itself was discovered during the interviews. Users of the timesheet system were apparently very unhappy with the software application. One participant expressed his views by saying, "It's hard to navigate the system," and remarked that he had heard co-workers similarly complain. Other comments were more directed towards the ESD itself, mostly the ESD's limited hours of availability. One interviewee stated, "I still don't like that we have to wait until 2 p.m. [Germany time] to make a call to try and get a person on the Service Desk. I have no luck at all getting a person when I call…" That same interviewee said later in the interview, "We sure could use longer hours to support us over here."

Closely related to the availability of the ESD was the frustration and uneasiness that interviewees felt when contacting the ESD. One user stated, "As soon as I get their recording asking me to leave a message and they'll get back with me, I know I won't get prompt service." Relief was evident when users were able to reach a technician on the first call. "I was very glad when they answered the phone with a live tech instead of their answering machine." One interviewee did remark, however, that "my experience of late is that [the ESD technicians] have been better about getting back and replying in a more timely fashion. The last time I had to call them, I got an instant response, unlike the [previous] couple of times."

Initial reactions when interviewees realized they had to call the ESD for support were not positive. When asked the question, "What would be your initial reaction upon realizing that you needed Service Desk assistance?" one responder shook his head while another gave a similarly negative non-verbal cue. One remarked, "I don't have the time or desire to wait in the queue as in past dealings …usually in excess of ten to fifteen minutes for just basic access problems..."

The nature of the incidents was another issue that emerged from the interviews. All three interviewers experienced timesheet problems the last time they had to call the ESD, primarily because project identification numbers had changed, which prevented users from inputting the information. Project numbers were then marked as the predominant factor, at least among this set of interview data, in calling the ESD for timesheet support. One interviewer also said that he had previously called the ESD because the timesheet was more complicated than it appeared: "It's very frustrating when a button [on the screen] that you need to click is inactive…and shouldn't the [data entry] fields open up automatically without first having to hyperlink on the timesheet number?"

The final theme to come out from the interview data was suggestions for improvement. One responder who answered the question, "What should ESD do differently?" voiced an often-heard sentiment: "Hire more people. More often than not, I have to wait until a tech is freed up before I can have my problems looked into." Another interviewee, a former Service Desk manager, offered advice to help the ESD pinpoint strengths and weaknesses in its delivery of support. "If not already done, gather metrics on…average queue duration (customer time while waiting for a technician to pick up), ticket counts categorized by criticality, method of submission (web or telephone), peak hours, compliance with contractual levels of service, and first call resolution. Perform analysis of metrics to determine if Service Desk manning is aligned with needs of our customer and adjust as necessary."

Post-Implementation Customer Satisfaction Survey Data

Customer satisfaction survey data were collected because the data provided a direct link to answer the research question, "To what extent is customer satisfaction affected by reengineered workflow processes?" This data, when compared to the interview data captured prior to the implementation, helped to show the levels of customer satisfaction both prior to and after the implementation. These answers are provided in chapter 5.

Cronbach's alpha test

To test for reliability, Cronbach's alpha coefficient was calculated on the survey's questions. Internal consistency indicates "the correlation between questions on the same test to determine if they measure the same trait" (Simon & Francis, 2001, p. 58). The PASS 2008 software program was used for calculations. At the significance level of 0.05 or 95%, the Cronbach alpha resulted in .78, which was regarded as an acceptable threshold of reliability among Likert-type tests used in research studies (De Vaus, 1996; Nunnally, 1978).

Customer satisfaction survey results - aggregate

The surveys consisted of six questions. Customers were asked to choose their appropriate level of satisfaction with five closed-ended questions based on a five-point

Likert scale model of *Strongly Disagree* (1) to *Strongly Agree* (5). One question was set apart from the others, because it included the option of *n/a* if the question was not applicable; this question's value was zero. The final question was open-ended, and asked customers for suggestions on how the ESD could improve its level of service. If end users wished to be contacted in reference to the survey, there was a space on the form to enter their name, e-mail address, and phone number.

The returned surveys, gathered during a two-and-a-half-month period following the implementation, were sent to the researcher for analysis. All returned surveys received ESD responses when requested; however, only those surveys pertaining to timesheet issues were used for this study. A total of 228 surveys were sent, with 70 returned. This resulted in a return rate of 31%, higher than the 20% industry standard that service desks can expect to achieve (Coyle & Brittain, 2006). This rate indicated an acceptable margin of error of 9.77 at a confidence level of 95%. Three of the returned surveys were duplicates, so they were excluded from the study. Several surveys were missing answers to one of the five questions, but they were still considered useable and therefore the data was included. The results of the study were manually counted and entered into an Excel spreadsheet for further analysis.

Customer satisfaction survey results - quantitative

Table 8 lists the response counts, corresponding percentages, and arithmetic means (averages) for the quantitative data. The data reflected the strongest, weakest, and most impartial responses. Ninety-one percent of the respondents agreed or strongly agreed that they were overall satisfied with the service they received from the ESD, while 4% disagreed or strongly disagreed. Eighty-eight percent of the respondents agreed or strongly agreed that they were satisfied with the time it took the ESD to contact them regarding their service requests, while 6% disagreed or strongly disagreed. Ninety percent of the respondents agreed or strongly agreed that they were satisfied with the resolution to their issues, while 4% either disagreed or strongly disagreed. Eighty-five percent of the respondents agreed or strongly agreed that they were satisfied with the total time it took the ESD to resolve their issues, while 5% disagreed or strongly disagreed. In the final close-ended question, 54% of the respondents agreed or strongly agreed that the service level of their recent interaction with the ESD was superior to a similar issue in the past, while 2% disagreed or strongly disagreed. Twenty-nine percent neither agreed nor disagreed to this last question. An option of *N/A* was offered for this question only, so that users who did not have a similar interaction in the past and could therefore not make a comparison between recent and former service levels could answer this question appropriately; 13% of the respondents chose this option.

Chi square tests for independence were run on the five survey questions using Excel's statistical analysis tools. The CHITEST function was used to answer the question: "What is the likelihood that the deviations were due strictly to chance?" (Linoff, 2008). Actual responses were compared to the expected responses to produce a value that indicated the strength of the association (De Vaus, 1996). The results of the Chi square tests indicated an extremely low degree of chance.

Table 8. ESD Customer Satisfaction Survey Quantitative Results

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A	Mean
1. Overall I was satisfied with the service I received from the ESD. (n=68)	2 (3%)	1 (1%)	3 (4%)	23 (34%)	39 (57%)		4.4
2. I was satisfied with the time that it took the ESD to contact me in response to my request for service. (n=67)	2 (3%)	2 (3%)	4 (6%)	19 (28%)	40 (60%)		4.4
3. My ESD agent resolved the issue to my satisfaction. (n=68)	2 (3%)	1 (1%)	4 (6%)	14 (21%)	47 (69%)		4.5
4. I was satisfied with the total time it took to resolve my issue including response time and resolution time. (n=67)	3 (4%)	1 (1%)	6 (9%)	18 (27%)	39 (58%)		4.2
5. The service level I received from the ESD during my most recent interaction was superior to the level of service I received from the ESD for a similar issue in the past year. (n=59)	1 (1%)	1 (1%)	20 (29%)	15 (22%)	22 (32%)	9 (13%)	3.4
					Overall rating		4.2

Table 9. ESD Customer Satisfaction Survey Chi Square Test Results

Question	Results	
	(Scientific Notation)	(Decimal Notation)
1. Overall I was satisfied with the service I received from the ESD. (n=68)	$2.77334 \text{ X } 10^{-17}$	0.0000000000000000277334
2. I was satisfied with the time that it took the ESD to contact me in response to my request for service. (n=67)	$1.00151 \text{ X } 10^{-16}$	0.000000000000000100151
3. My ESD agent resolved the issue to my satisfaction. (n=68)	$6.03177 \text{ X } 10^{-23}$	0.0000000000000000000000603177
4. I was satisfied with the total time it took to resolve my issue including response time and resolution time. (n=67)	$3.05944 \text{ X } 10^{-15}$	0.00000000000000305944
5. The service level I received from the ESD during my most recent interaction was superior to the level of service I received from the ESD for a similar issue in the past year. (n=68)	$1.033344 \text{ X } 10^{-6}$	0.00000103334358165506

Were end users satisfied overall with the service they received from the ESD? The answers are displayed in Figure 11 below. Over half (57%) indicated they were extremely satisfied, while 23 or one-third said they were satisfied. Two of the respondents (3%) said they were extremely dissatisfied with the overall level of service they received, while 1 respondent (1%) was dissatisfied. Three respondents (4%) were neither satisfied nor dissatisfied.

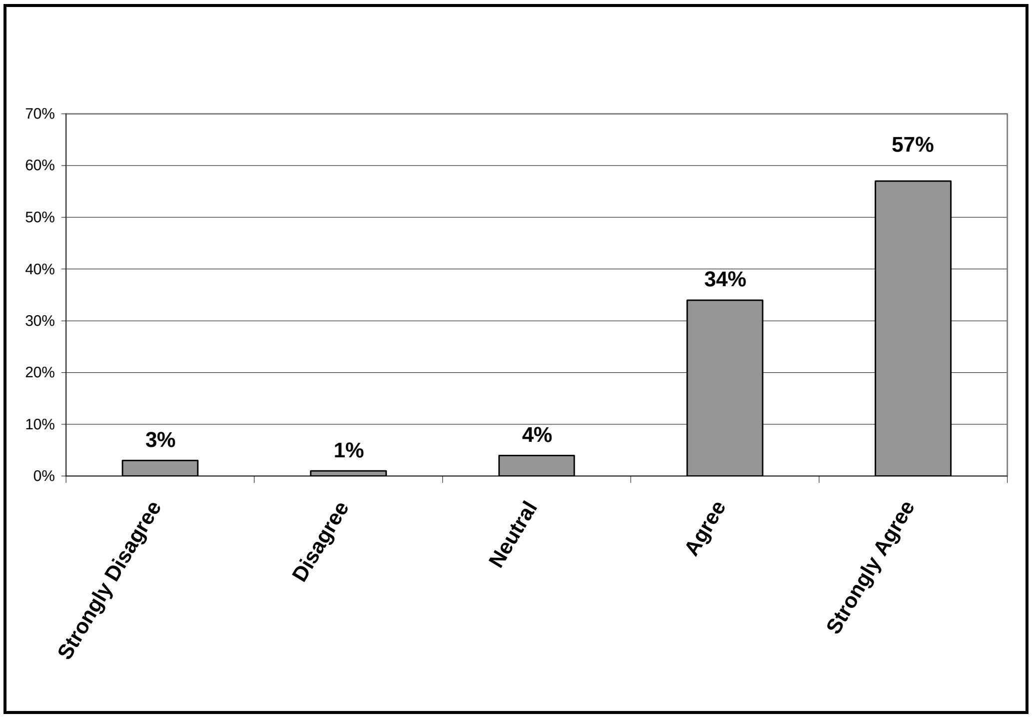

Figure 11. Satisfied overall? customer survey results

Were end users satisfied with the time that it took the ESD to contact them in response to their request for service? The answers are displayed in Figure 12 below. Forty survey participants (60%) indicated they were extremely satisfied, while 29 (28%) said they were satisfied. Two of the respondents (3%) said they were extremely dissatisfied with the time it took to be contacted, while 2 more respondents (3%) were dissatisfied. Four respondents (6%) were neither satisfied nor dissatisfied.

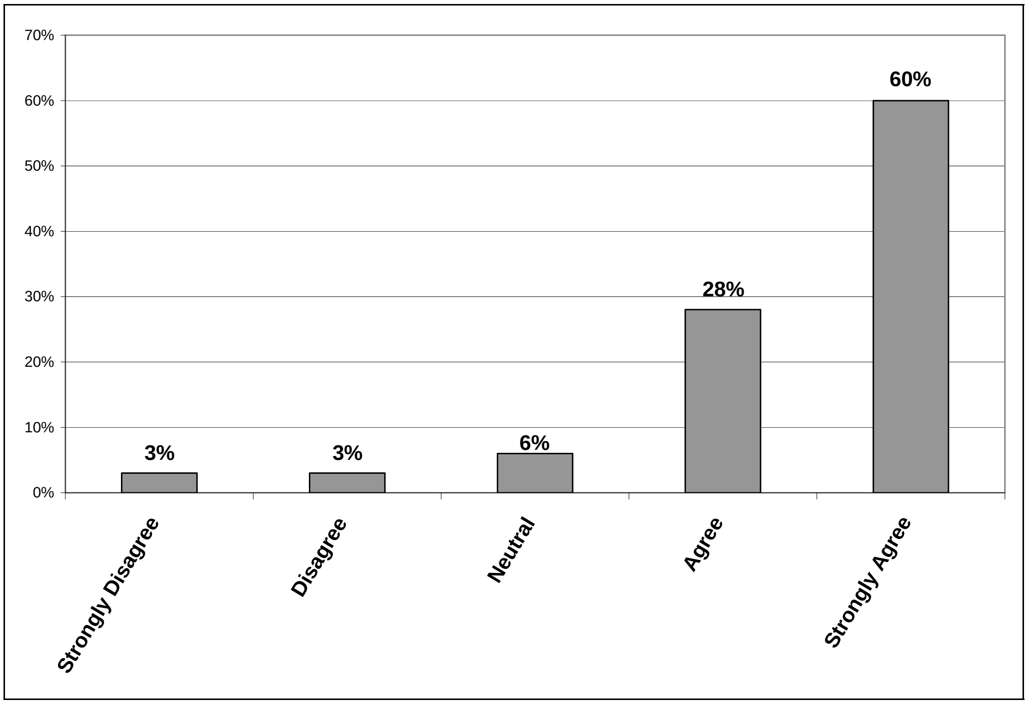

Figure 12. Satisfied with contact time? customer survey results

Were end users satisfied with the resolution of their timesheet issue? The answers are displayed in Figure 13 below. Forty-seven survey participants (69%) indicated they were extremely satisfied, while 14 (21%) said they were satisfied. Two of the respondents (3%) said they were extremely dissatisfied with the resolution of their issue, while 1 respondent (1%) was dissatisfied. Four respondents (6%) were neither satisfied nor dissatisfied.

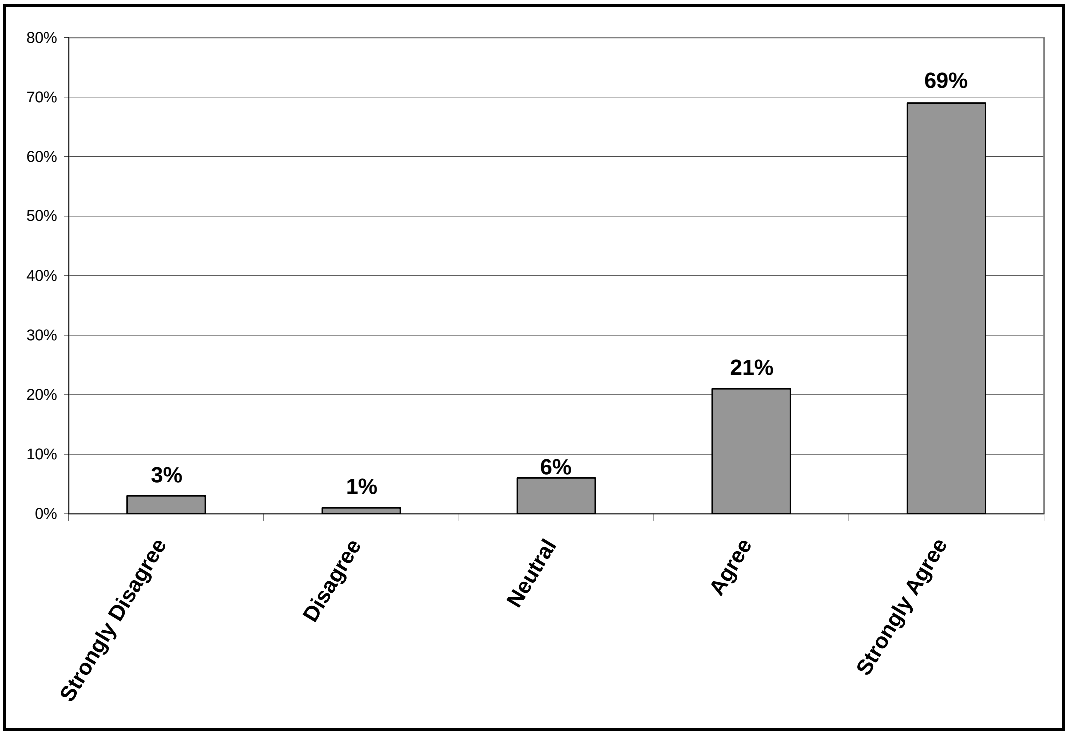

Figure 13. Satisfied with resolution? customer survey results

Were end users satisfied with the start-to-finish time it took to resolve their issue? The answers are displayed in Figure 14 below. Thirty-nine survey participants (58%) indicated they were extremely satisfied, while 18 (27%) said they were satisfied. Three of the respondents (4%) said they were extremely dissatisfied with the overall level of service they received, while 1 respondent (1%) was dissatisfied with the resolution. Four respondents (6%) were neither satisfied nor dissatisfied.

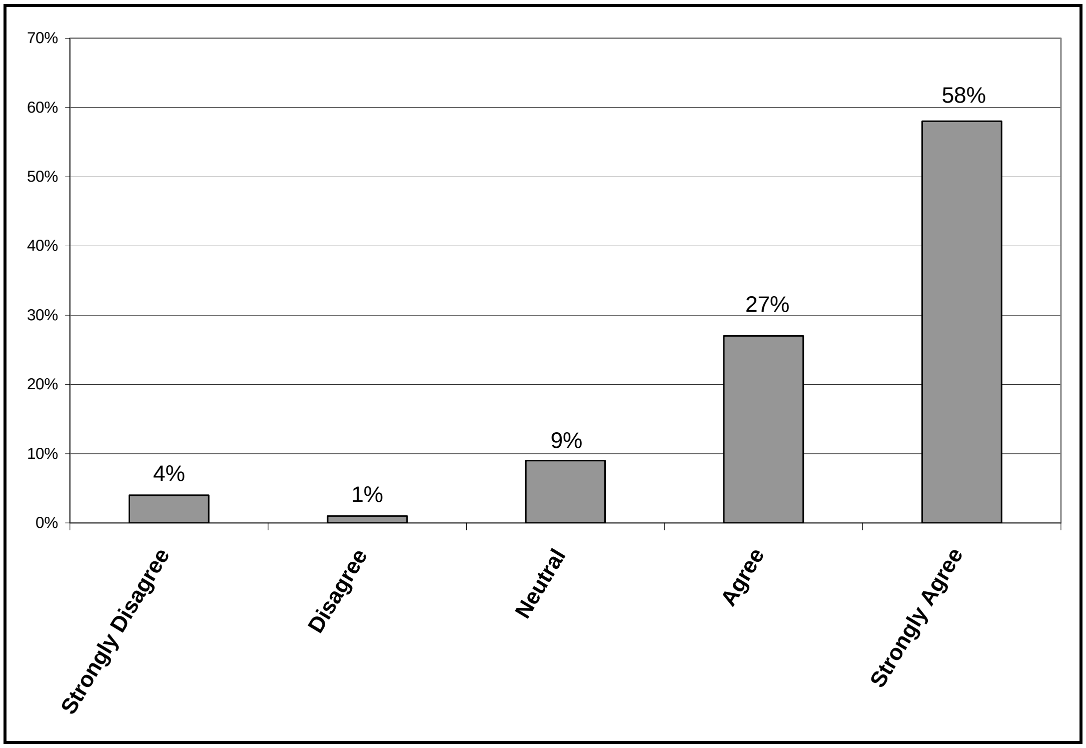

Figure 14. Satisfied with total time to resolve? customer survey results

Finally, did end users perceive an increased level of service quality for their current timesheet issue when compared to a similar issue within the past year? The answers are displayed in Figure 15 below. Twenty-two survey participants (32%) strongly agreed that the level of service had increased, while 15 (22%) agreed that service levels had increased. One of the respondents (1%) strongly disagreed that the level of service had increased, while another respondent (1%) disagreed that service levels had increased. Twenty respondents (29%) neither agreed nor disagreed that service levels had increased. Nine respondents (13%) indicated that this question was not applicable, that they had no previous interactions with the service desk to use as a comparison.

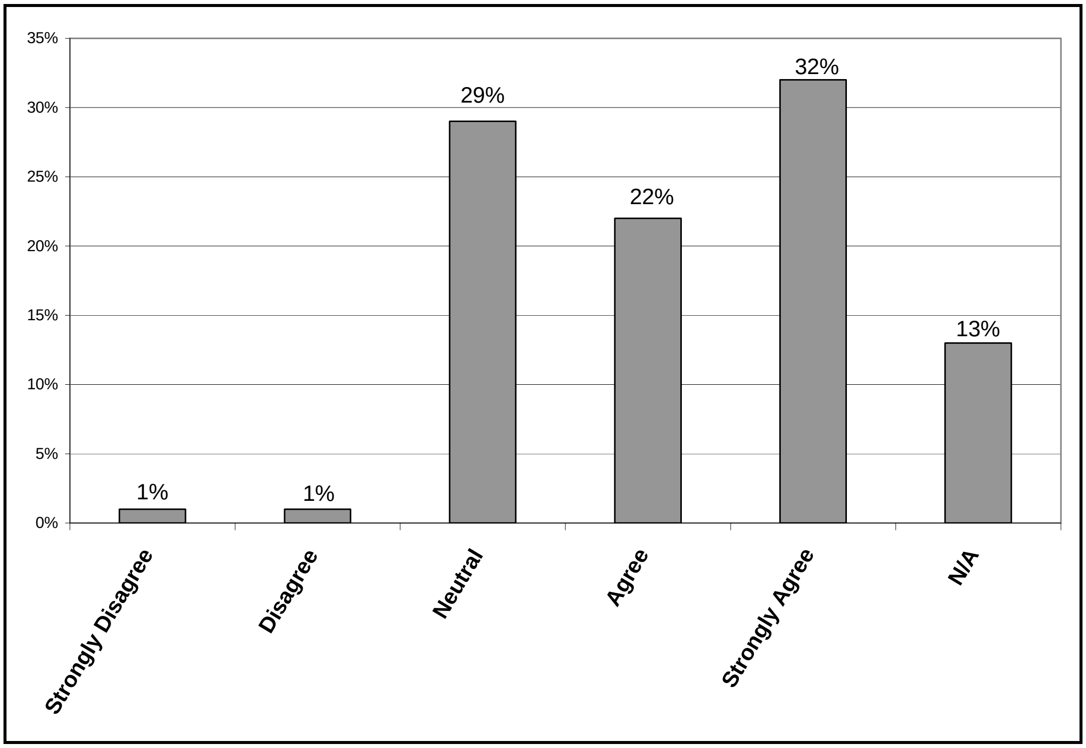

Figure 15. Quality increase since last year? customer survey results

The arithmetic means (averages) of the five Likert-based questions are displayed in Figure 16 below. The overall, combined score of all the quantitative survey questions was 4.2. The first four questions resulted in strong degrees of satisfaction. Question one, which asked users their overall satisfaction, produced a mean of 4.4, almost halfway between *Agree* and *Strongly Agree*. This result indicated that users were very satisfied with the overall service provided by the site leads following the implementation. Question two, which asked users if they were satisfied with the ESD's response time, also produced a mean of 4.4, almost halfway between *Agree* and *Strongly Agree*. This result indicated that users were very satisfied with the site lead's response times following the implementation. Question three, which asked users if they were satisfied with the resolution of their issues, produced a mean of 4.5, the highest mean of the survey results. This result indicated that users were very satisfied with the resolutions for their timesheet issues provided by the site leads following the implementation.

Questions four and five produced lower results. Question four, which asked users if they were satisfied with the total time of the resolution processes, produced a mean of 4.2, slightly lower than the previous three questions. This result indicated that users were very satisfied with the total time of their resolutions for timesheet issues provided by the ESD/site leads following the implementation. Question five, which asked users if they felt that their current interactions with the site leads to resolve their timesheet issues were superior to previous ESD encounters, produced weaker agreement levels than the other questions. With a mean of 3.4, this result indicated that users overall did not quite agree with the statement that their current resolutions were superior to previous ESD encounters of timesheet issues.

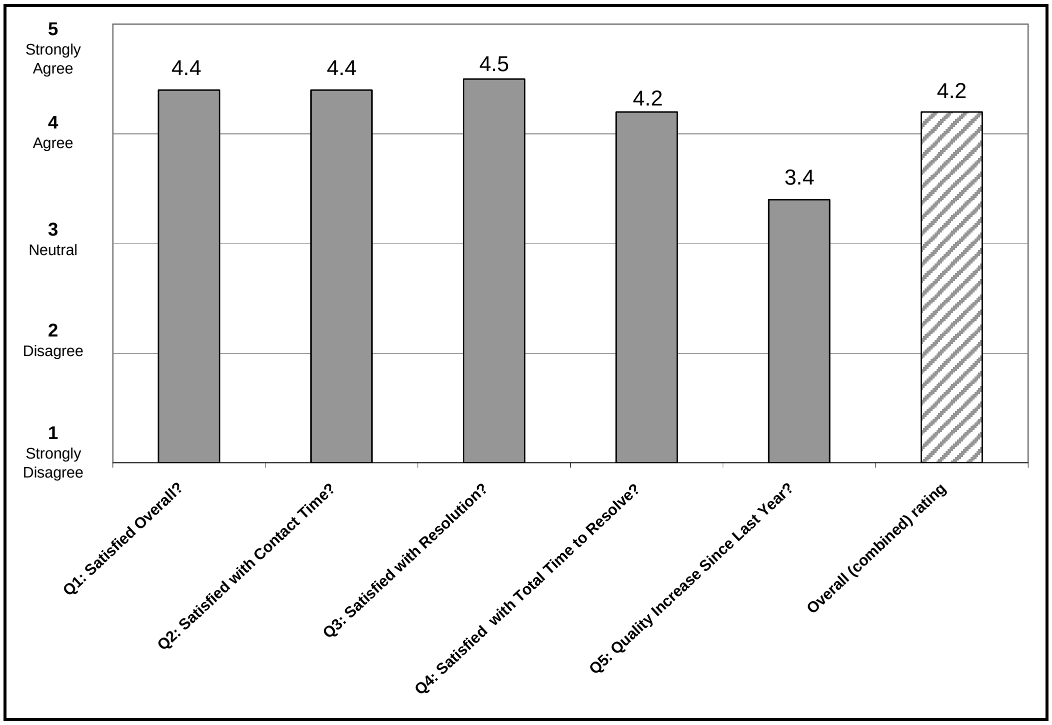

Figure 16. Means of responses

Customer satisfaction survey results - qualitative

The sixth and final question on the survey was open-ended, and asked, “How can we improve our services?” The purpose of this question was to elicit suggestions from end users via a free text comments field regarding how to increase the effectiveness of the ESD by improving its services. Thirty-eight customers or 56% of the 68 overall responders elected to provide comments. Forty-four pieces of data were collected from 38 users (one user gave 7 comments). The data entered in this field were compiled and analyzed using the Atlas.ti software program. Common themes that relate to this study, listed by order of frequency, were level of satisfaction, Site Lead effectiveness, and level of dissatisfaction.

The most prevalent theme found in the comments field regarded level of satisfaction with 20 occurrences, or 29% of total survey results (n=68). End users expressed high levels of satisfaction for the incidents in which site leads repaired their IT problems. Three users cited “prompt” and “superior” service. The term “professionalism” was mentioned by three users, while “excellent” was used twice. “Very cooperative,” “expeditious,” “ready to help,” “there’s nothing to improve,” and “overall excellent service…thank you” were listed in the survey’s comments field. One user offered, “Keep up the good work. I was helped quickly.” Perhaps the greatest compliment was made by one user: “You are doing a great job. You can’t improve on perfection.”

Users were specific when they expressed satisfaction tied directly to site lead effectiveness. Site leads were mentioned 13 times or 19% of the total surveys. “Friendly, helpful, and professional” were terms used to describe the Site Lead’s effectiveness. One user wrote, “I’ve been very happy about the turnaround time and professionalism from the support of the help desk, especially now that my site lead can fix my timesheet problems.” Response times associated with site leads was mentioned four times, such as the following: “The service desk’s response time has greatly improved since allowing site leads to resolve my site’s issues.” Another user noted the site lead as the way to offset what the user perceived as mediocre service levels: “For an IT company, the IT service was awfully slow. However, my site lead was able to come to my rescue much quicker.” One user first called the ESD to resolve his timesheet issue instead of notifying his site lead. After being on hold for ten minutes, the user, in his words, “finally gave up” and called his site lead, who fixed the timesheet problem “within minutes.” One customer went so far as to suggest that the ESD managers "allow the site leads to help us with other problems too."

There is, however, room for improvement. Five end users or 7% of the surveyed customers expressed a level of dissatisfaction with the support they received. According to one customer, the website for initiating a trouble ticket "should be more user friendly." Resetting passwords was mentioned by a customer who saw the ESD's password reset feature as being "a cumbersome process that should be streamlined 'like my bank's.'" The timesheet system itself was mentioned as well, although the ESD had no control over that system except to assist users when problems arise. Finally, one user remarked, "My Site Lead needs to learn the [resolution] techniques better."

Summary of Chapter 4

This chapter presented the quantitative and qualitative data and procedures that were associated with the business process reengineering implementation at the ESD. The purpose of each data set was stated, as well as how that data was associated with one or more of this study's research questions. The selection of timesheet issues began the discussion, followed by the development of pre- and post-process flow maps that were designed to improve the ESD's efficiency by reducing or eliminating pre-implementation business process shortcomings. Metric data comparisons of service levels were then made between prior to and following the implementation, with the various levels of differences in response times, resolution times, and turnaround times discussed. User satisfaction levels were then presented based on pre-implementation interview data, which culminated with an overall customer satisfaction rating of 2.5 on a 5-point scale, pointing to a somewhat mediocre level of end user satisfaction.

Following a high level description of the implementation process, chapter 4 concluded with a discussion of the quantitative ratings based on customer satisfaction surveys. The overall results of the survey indicated high levels of customer satisfaction following the implementation in the areas of total satisfaction, response time, quality of the resolutions, and total time to resolve issues. The overall combined satisfaction rating on the customer surveys was 4.2, compared to 2.5 from the interviews. Users were less satisfied when they compared their most recent timesheet problem resolution with previous ESD sessions. Lastly, the qualitative survey data indicated that users had high levels of satisfaction when site leads resolved their timesheet issues.

CHAPTER 5. CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The purpose of this study was to determine to what extent business process reengineering (BPR) affects the delivery of IT services at an Enterprise Service Desk (ESD) in terms of performance metrics and customer satisfaction. The research was conducted in a case study format using the mixed methodology of quantitative and qualitative approaches under the human performance improvement (HPI) theoretical framework. In previous chapters, the background and problem statement of the study were presented, along with the study's intended significance, assumptions, and limitations. A thorough literature review followed which explained the purposes, gave historical examples, and displayed critical success factors in the fields of case study research, human performance improvement (HPI), business process reengineering (BPR), help desks/service desks, and customer satisfaction. Chapter 3 detailed the methodology used in this study, which included HPI, case study characteristics, the study's participants, instrumentation and tools utilized, and data collection and analysis techniques. Reliability and validity were also discussed. Chapter 4 held in-depth discussions of the quantitative and qualitative data and procedures that resulted from the reengineered processes. Pre- and post-implementation performance metrics were compared, interview data were presented along with relevant themes that most concerned end users, and customer satisfaction data were described in quantitative and qualitative terms. Along the way, each data set was linked to its associated research question.

This chapter summarizes the data results and offers conclusions and recommendations for future studies that center on customer satisfaction in a service desk environment. The chapter is divided into the following sections: an introduction to restate this study's purpose, a summary and discussion of the data findings, a summary of the use of HPI and BPR, items that impacted the study, significance of the findings, and finally recommendations for further studies.

To review, there were three research questions associated with this study. The primary question was "To what extent do reengineered workflow processes improve service delivery at an ESD?" The secondary questions were, "To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?" and "To what extent is customer satisfaction affected by reengineered workflow processes?"

Summary and Discussion of the Findings

Performance metrics conclusions

Performance metrics data were collected and analyzed to determine the answer to the research question, "To what extent are response time, resolution time, and other performance indicators affected by reengineered workflow processes?" The analysis of that data indicated that reengineering workflow processes may have been a contributing factor in effecting the ESD's level of IT support. The quantitative results showed a possible correlation between introducing localized IT support for timesheet issues and realizing a significant effect on the response time, turnaround time metrics, and resolution time. After removing the outliers, the data indicated that response times, or the total time between when a trouble ticket was opened and a service desk technician committed his or her resources to resolve the issue, substantially decreased an average of twenty-six minutes per incident. Turnaround time, or the total time between when a trouble ticket was opened and when it was resolved, also saw a dramatic decrease when site leads responded to incidents. Turnaround times went from almost 2.5 hours in the pre-implementation period, down to less than 20 minutes per incident in the post-implementation period.

The reductions in response and turnaround times may be explained in several ways. Since end users contacted their site leads in many cases within the same office spaces, the chances of receiving immediate support may have been greater than trying to contact a far away ESD technician by phone. This was especially true for overseas or other-time-zone end users, who identified the time difference as a high priority issue during pre-implementation interviews. Since only timesheet issues were delegated to the site leads to resolve, with all other IT problems going to the ESD, this may have worked to an advantage: Site leads may have been better equipped to deal with that limited type of issue with greater efficiency than ESD technicians, who, because they were responsible for all IT issues including hardware, software, network, and server incidents, must be prepared for a much wider range of known and unknown issues whenever end users call.

On the other hand, resolution time, or the total time between when an agent took action to resolve an issue and when the issue was resolved, increased in the post-implementation period when compared to before the implementation occurred. After the implementation, site leads on average needed seven more minutes to resolve incidents than the ESD technicians prior to the implementation. This is probably linked to the experience levels of seasoned technicians whose full-time duty is to resolve incidents quickly, compared to the extra time that apprentice site leads required, whose primary duties did not include resolving user IT issues. Another reason might be related to access. Depending on where the database servers were located and the speed of the various networks, the ESD technicians might have been able to access the databases quicker than the site leads, which would have contributed to the site leads' longer resolution times.

Customer satisfaction conclusions

Interview and customer satisfaction data were collected and analyzed to determine the answer to the research question, "To what extent is customer satisfaction affected by reengineered workflow processes?" The analysis of that data indicated that reengineering workflow processes may have been a contributing factor in improving customer satisfaction levels. When comparing the pre-implementation interview data with the post-implementation customer satisfaction qualitative data, several items of interest are noted. The most repeated theme was in the area of satisfaction. Prior to the implementation, end users were pleased with the service they received, although that was conditional on whether the users were able to reach an ESD technician quickly without having to wait. After the site leads took over the responsibility for resolving timesheet issues, end users were also pleased with their levels of IT support.

However, there is one difference. The rating that interviewers gave for their service, on a scale of 1 to 5 (*Extremely Dissatisfied* to *Extremely Satisfied*) was 2.5. Using the same 5-point scale, end users on the customer satisfaction survey rated their service with a combined average of 4.2, a significant increase. The rating difference may be attributed to the number of users canvassed, the difficulty or ease of contacting support, and the immediacy of the interviews and surveys. Since this study had no customer satisfaction survey data prior to the implementation, interviews were conducted with three participants, far less than the sixty-eight satisfaction survey respondents; this unequal comparison prevented the standard methodology of evaluating matched pairs of participants. End users who were interviewed prior to the implementation mentioned remarked that contacting a person for support was often difficult; different time zones and the lack of after hours support were recognized as the main barriers to users receiving timely support from ESD personnel. On the other hand, end users who filled out customer satisfaction surveys after the implementation, whose issues were resolved by site leads, were apparently able to reach their site leads much quicker than ESD technicians. Lastly, the interviews were conducted well after the ESD resolved their incidents. Conversely, the satisfaction surveys followed best practices and were administered immediately after end user issues were resolved to their satisfaction (Davis, 2007). The different interval time periods plus the other factors just mentioned may have all contributed to the difference in satisfaction ratings.

Once end users during the pre-implementation phase were able to contact the ESD, the levels of satisfaction appeared similar to post-implementation levels. “Helpful,” “superior,” “thankful,” and “ready to help” were positive terms mentioned during the interviews and the surveys. This would suggest that both ESD technicians and the site leads responded in similar, efficient fashion to notifications for service. It may also be true that ESD technicians were able to instill the same levels of customer care in the site leads during the technical “how to” training. Either way, it appears that end users tended to use similar terminology regardless of who resolved the incidents, so long as the incidents were resolved.

When combining a summative evaluation with critical thinking, however, it becomes apparent that the high customer satisfaction levels may have had other contributing factors aside from the implementation. First, there was no way to tell if the study's results represent an actual increase in customer satisfaction levels, since no customer satisfaction survey data existed prior to the implementation that could be used as a baseline to compare with the post-implementation survey data. Therefore, one cannot assume that the satisfaction levels represent an actual increase in service quality: The results may have in fact been a reduction in satisfaction levels. The data is inconclusive. Second, high satisfaction levels were already evident from the pre-implementation interview data. Once users were able to reach the ESD, the technicians provided high quality service. If the ESD offered 24x7 availability, end users might rate their satisfaction levels as high as or even higher with the ESD support structure than with the site leads. Third, end users, who previously had to wait long periods to receive ESD support, may have been so relieved with the immediate service from site leads that their high ratings reflected being satisfied more with quicker service rather than with effective, high quality service.

Use of HPI and BPR Models

Benefit of HPI

The HPI model was a major benefit for this study because it provided the blueprint for the project and the researcher. During the performance analysis stage, the participants determined that the current service levels fell short of industry standards. The decision to use redesigned workflows followed the progression of Sanders & Thiagarajan's (2001) HPI model, from the gap analysis and the "structure and process" decision to use BPR during the intervention selection stage (p. viii). The model was then instrumental in gathering and analyzing the data to determine whether the research questions were addressed. Because the HPI model included the stage to evaluate the results, the performance intervention team (PIT) and the researcher were able to present the findings, which were done in chapter 4.

Benefit of BPR

The BPR design was successful in some areas and saw limited success in others. Scherr (1993) suggests that "concern for customers and their satisfaction has prompted many enterprises to begin looking at processes from a customer point of view" (p. 2). During the reengineered process flow's lifecycle, from the time end users identified a timesheet problem to the end point when trouble tickets were closed, customer focus was evident, as reflected by two factors. First, users were the focus of three steps contained within the revised process map: "Can user access or correctly fill out timesheet?" "Is user satisfied?" and "End user is requested to complete customer satisfaction survey." See Figure 10. The answers to those two questions and the activity of the third determined whether the timesheet resolution process went forward.

The ratings collected from the customer satisfaction surveys also validate the fact that the newly reengineered process was customer-focused. Customers rated their service very highly with scores of 91% overall satisfaction, 90% resolution satisfaction, and 88% satisfaction in response times. Top level management buy-in may have been a contributing factor and therefore a key BPR driver (Hammer & Champy, 1993; Weicher et al., 1995). Mid- and high-end managers were not only aware of the BPR project but were anxious to view its results. Their enthusiasm held firm, perhaps due to the small scale and/or brevity of this reengineering effort when compared to other similar studies (Paper, Mok, & Rodger, 2006; Kuilboer & Ashrafi, 2006).

Simplifying processes appears to have greatly enhanced the BPR project's results. By eliminating three process steps in the resolution lifecycle from the pre-implementation count of fourteen to the post-implementation number of eleven, and dropping the reliance on technology in favor of a more customer-focused approach, users were moved much more quickly through the resolution process. Instead of being placed on hold or having to wait until the ESD technicians came on duty, end users were quickly engaged in dialogue with their site leads to have their timesheet problems investigated. Fewer resources were needed for the resolutions, since long distance, extended length phone calls were replaced by local, short duration calls and face-to-face service.

Benefit of process mapping

Mapping the processes was also an integral part of the BPR's success. In so doing, stakeholders were able to see the values and deficiencies of the as-is resolution techniques. While reviewing each step, the PIT was able to streamline the lifecycle by reducing the reliance on automation. The PIT also redesigned the post-implementation process to empower the end user to decide whom to contact for support, based on the nature of the incident. Another advantage of mapping the processes was to provide visibility to optimally position the customer satisfaction survey in its proper place in the procedural chain, which did not exist in the pre-implementation period. When site leads asked end users to complete the survey, this action had a twofold purpose: they made end users aware that the survey existed, and they gave the message that the ESD support structure was interested in user feedback. The above average survey return rate of 31% may be validation of the advantages this important process step demonstrated.

Benefit of standardized workflows

Workflow standardization, one of the factors that Hammer & Champy (1993) identified as being a key BPR enabler, appears to have been a contributor to the increased level of quality at the ESD. Following Sanders and Thiagarajan's (2001) suggestion that performance interventions "help the organization adapt to the changes," resolution processes became uniform (p. viii). At the same time the site leads performed identical or nearly identical resolution procedures, metrics pointed to increased service levels. Another successful outcome of the standardization from the reengineering process came in the form of training aids that were developed for site leads to resolve end users' timesheet issues. These job aids were clear, understandable, and easy to follow; there were very few instances when site leads needed to contact the ESD for clarification or guidance. This action helped to alleviate common problems such as confusion and resistance to change that often arise during BPR projects when processes are standardized (Abitz, 2003).

BPR successes

The reengineering process had its successes with the site leads, end users, and ESD technicians. With little resistance, the site leads accepted their new resolution responsibilities with professionalism. Since the background of many site leads was information technology (IT)-related, the mechanics of performing the resolution steps were not difficult for most to perform. The fact that the dependent variables of response times and turnaround times improved after the implementation indicated a strong possibility that the site leads successfully used the steps when processing incidents. End users had little trouble notifying their site leads when timesheet problems surfaced. In fact, based on the pre-implementation interview data, end users may have felt relieved that they did not need to call the ESD for help. The workload of the ESD technicians may have been reduced by redirecting timesheet issues to the site leads.

BPR problems

On the other hand, the reengineering process was not without its problems. Communication among the stakeholders was a constant challenge, since primary duties threatened to preempt meetings and decisions. With standardization came the risk of limiting creativity, which was vocalized on several occasions. Varying degrees of resistance were encountered from the moment the stakeholders were notified of the upcoming BPR activities until weeks after the implementation was initiated. Attitudes less than positive occasionally surfaced, for instance when site leads begrudgingly fixed their employees' timesheet problems and complained that the additional workload infringed upon their primary tasks. Distribution of the resolution steps and the policy announcement of the site leads' new IT support role apparently did not reach all units downrange, even though, as precautionary measures, the information was e-mailed to all stakeholders and posted on the Company's website. End users also needed to be reminded of their site leads' responsibilities after the users, perhaps by habit, called the ESD for timesheet help after the implementation went into effect, when they should have notified their site leads.

BPR applicability

The impacts of the reengineering process, namely the supposedly increased service levels and the ability to obtain customer satisfaction input, may be applied to other service desks which choose to decentralize their IT support. An increase in service levels that may be attributable to this BPR process might be realized by other IT support agencies that support thousands of end users who are similarly widely disbursed. The decentralization involved local managers who helped their employees resolve IT issues, in this case timesheet problems; other service desks could successfully apply other incidents or groupings and expect similar results. Another impact was that of gaining customer feedback, an initiative not done with any consistency prior to this study's implementation. In so doing, the ESD learned that customers were satisfied with response times, turnaround times, and the overall quality of the support they received. In addition, users made suggestions regarding how the ESD might improve its service, such as employ more user-friendly websites, streamline password resets, and educate site leads to do more effective IT repairs. As a result, the ESD can make the most of this valuable user-perspective information by implementing these suggestions and further increase user satisfaction and boost its revenue. By the same token, other service desks would do well to follow the ESD's example "by engaging the customer in a post incident customer satisfaction survey and acting on the results" (Davis, 2007, p. 87).

Impacts to the Study

It is crucial for IT support organizations during an HPI study to look for influential factors, such as customer satisfaction data, that may help gauge the value of a performance intervention (Van Tiem, Moseley, & Dessinger, 2001). For example, Trimarco-Beta (2007) states that how customers were treated while recovering from a service failure such as a downed network directly affects satisfaction levels. The nature of the end users, reliability and bias, Likert scale issues, and the nonavailability of remote desktop access were found to impact this study's results. These issues are discussed below.

Nature of end users

A factor impacting this study was the specific nature of the end user base. ESD customers were a specific blend of company employees, government officials, and military members. Such a specialized corps of end users may not be found in other service desk environments, whose customers may be more homogenous than those who received IT support from the ESD in this study. Nevertheless, the process which the ESD used to determine the best courses of action to take to raise its customers' satisfaction levels can still be followed by other service desks. Difficulties encountered due to different configurations, different problems identified, and different demographics can be overcome by determined human performance interventionists who are dedicated to increase the productivity of the organizations they serve.

Reliability and bias

Reliability and bias may have played a role in this study's results. An important assumption was made while performing the data analysis. Since trouble ticket data was manually entered by site leads after the resolution took place, there may have been a higher degree of error than automatically entered date/time stamps from the trouble ticket system. Reliability may thus have been compromised. Along those same lines, the customer satisfaction surveys were assumed to be independent; that is, customers completed surveys individually, with no group interaction. If end users filled out the surveys together or asked other customers their opinions just before filling out surveys, a form of bias known as groupthink, or susceptibility to bowing to peer pressure, may have entered the study (Green, 2006).

Nature of Likert scales

Another factor in the study was the concern that Likert-based scales may be a less than ideal instrument than commonly thought. Contrary to their definition, Likert scales may be more ordinal than interval in nature (Grossnickle, (2001). Although the values may appear to be equidistant, in reality they are not. There exists "a reasonable possibility that the increase represented by a jump from 4 to 5 (*Agree* to *Strongly Agree*) is significantly more than the jump from 3 to 4 (*Neutral* to *Agree*)" (p. 184). In other words, it takes a user more determination or a stronger opinion, or even subjectively by chance or whim, to strongly agree with a question than to merely agree. For a variety of reasons, there seems to be no inherent standardization between the Likert choices. Therefore, the Likert-based questions may not be as accurate an indication of user perceptions as the literature indicates.

Another problem with Likert scales is the tendency for users to "sit on the fence" by choosing *Neutral* (Bowling, 2005). It is estimated that up to 30% of respondents are likely to choose this option "to avoid making a statement on either side" (p. 410). It is impossible to discern whether a respondent genuinely chose *Neutral* because he or she neither agreed nor disagreed with the statement, or if the respondent did not want to answer, was in a hurry, or chose to not agree or disagree. Therefore, the neutral responses incurred in this study have questionable validity, and may limit the reliability strength of this study's results.

A third difficulty with Likert scales is the occasional inability to interpret the results. Because not all Likert scales are standardized, some users may believe that 1 has the value of *Strongly Agree* rather than *Strongly Disagree*, even though the options are clearly marked. This confusion appears to have occurred in this study with at least two respondents. One respondent strongly disagreed (all 1s) with service levels in the areas of overall satisfaction, response time, resolution time, and total time to resolve. Yet this same user wrote the comment, "I have always received superior service from the service desk. Always personable and willing to help to resolve problems in the most expeditious way." Since the views indicated by the comments are exactly opposite to the user's Likert choices, it would appear that he or she may have actually intended to strongly agree with all statements, but mistakenly chose the wrong option on the survey. The data were inconclusive and negatively impacted this study's reliability.

Nonavailability of remote desktop support

The lack of remote desktop access, not available during this study, may have adversely affected this study's results. Remote management software allows centralized IT support agencies to access end user computers in all external locations via Web-based network sharing to troubleshoot software and hardware incidents. These systems are used in approximately 75% of enterprise organizations (Colville & Silver, 2005). The ESD, however, was prevented from implementing this solution based on firewall restrictions, which is not uncommon on military installations. With this tool, the ESD might have been able to oversee the implementation by watching the site leads perform the correct resolution steps and confirming that end users could access their timesheets.

Significance of the Findings

Centralization vs. decentralization

This study added significant value to the field of HPI in the areas of decentralization of IT services, shared access of a database system, and increasing technical workloads of human resource managers, which can all impact human performance. Many IT support organizations are currently deciding whether centralized or decentralized support structure is their best path to reach or maintain high levels of productivity. What worked in the past may not work in the present or foreseeable future. The same is true for one-stop shop agencies such as service desks and other service-oriented agencies "with highly centralized command-and-control models, [which] actually may depress overall productivity and suppress measures to expand the enterprise to reach new customers" (Austin, 2004, p. 3). Globally, there is a current reconsideration of whether single, centralized agencies are showing expected profits, both for end users and service providers, especially when replacing older, out of warranty personal computers is necessary (Da Rold & Tramacere, 2007; Coyle & Cosgrove, 2007).

This study validated recent findings conducted by the Gartner Group, the leading information technology (IT) research and advisory firm. During a comprehensive survey of mature IT service organizations, Gartner found that those organizations that had combined centralized and decentralized support were "slightly less problematic and …moving in the right direction" (Young, 2006, p. 5). Furthermore, "in the aggregate, IT organizations are overly centralized and are not developing their service delivery models fast enough to keep pace with changing business demands" (Young, 2006, p. 6). In this study, the ESD validated Gartner's survey because end users were able to reach their local IT support for timesheet issues quicker than frustrated global users needing to notify the consolidated support structure of the ESD; hence, this strategy was "slightly less problematic" for users than before the implementation. In addition, the survey respondent who suggested that site leads expand their scope to "help us with other problems too" was an indication that, due to decentralization, the ESD's IT support infrastructure was "moving in the right direction" to meet "keep pace" with end user requirements. The ESD would do well to continue adjusting its methods of service delivery to meet what Gartner calls its "changing business demands."

There is one advantage to this study that appears to be paradoxical to the collected data. When resolution processes were localized down to user locations, onsite repairs appeared to be more attractive and convenient to end users, who were apparently relieved to notify their resident site leads for help rather than the remote ESD. This may be due to the previously-discussed difficulty in reaching ESD technicians in time of need. However, according to the responses to question five of the survey, only 54% of users perceived an increase in service levels since last year, when ESD technicians were responsible to resolve all issues including timesheet incidents. With 91% of the users satisfied with the overall service, based on question one's results, this would seem a contradiction: how can users rate their overall service so high, yet have average responses when asked to compare this year's resolution to last year's? One possible answer may be explained when considering the non-responses to this survey question: between those users who answered neutrally (29%) and those users who chose *N/A* (13%), 42% or almost half of the end users neither agreed nor disagreed with the question. By isolating only the *Agree* or *Disagree* responses, the results show 54% agreed or strongly agreed versus 2% who either disagreed or strongly disagreed. Clearly, the former group is much larger than the latter.

Shared database permissions

This study suggests that, in spite of possible barriers, shared system access can be used effectively. When site leads were granted privileges to access the timesheet's databases, the vulnerability of that system was susceptible to security breaches due to site leads' inability to recognize potential situations as being risks; for example, a site lead who, after logging in to the system, then delegates the authority to resolve the timesheet issue to a subordinate (Haight & Heiser, 2006). The nature of shared access also added to the likelihood of a violation, since sharing access has its own inherent management challenges such as fidelity, detection, compliance, and other control issues, which may cause harm to information systems (Kane, 2006). However, the ESD did not detect any security alerts during the six-week period following the implementation; the assumption was that zero security issues existed. Therefore, the access granted to site leads for this study appears to have remained uncompromised.

Uncertain roles and responsibilities

Another item of significance regarding HPI is that there may have been disadvantages to this intervention that did not surface from the study, such as lack of control, role confusion, and the increased workload placed on site leads. The ESD may have felt a certain degree of loss of control when the site leads assumed responsibility for resolving issues. Some technicians might have looked on the implementation as a manipulative shifting of authority, which would have triggered attitudes of antagonism. Role confusion may have been experienced by end users who were unsure of whom to contact for their issues. More than one call reached the ESD from an end user who should have contacted his site lead; the ESD technician took appropriate action by first resolving the issue and then reminding the user of the new resolution policy. The increased workload of site leads may have caused them to be distracted from their primary duties. Some site leads may have worked overtime to allow for regularly assigned duties that were delayed due to the additional job of resolving their employees' timesheet problems.

Recommendations for Further Study

Scope of BPR

There were some lessons learned from this study that subsequent researchers in the field of HPI may wish to take into account. During the intervention selection phase, only two potential sets of incidents were considered: timesheet incidents and password resets. More incidents would offer managers more potential solutions for earmarked organizational afflictions. Furthermore, the scope of the BPR project can be broadened to encompass an entire organization's business practices, as compared to the small grouping of timesheet issues that this study targeted.

Better communication

During intervention implementation, the site leads received their direction from paper and electronic procedural documents. Instead, live or videotaped demonstrations by ESD technicians may have lessened the steepness of the site leads' sharp learning curve. Regional managers could also have ensured that Company personnel were aware of the resolution changes for timesheet issues by having the site leads conduct meetings with their employees to inform them of the change.

Satisfaction survey enhancements

Another lesson learned occurred during customer satisfaction survey data gathering process, or the stage termed "gather formative evaluation data" in HPI terms. To add to a topic previously discussed, users were asked whether their most recent dealing with the ESD was superior to last year's. In addition to the 1 thru 5 point scale, a comments field would have helped the ESD to pinpoint exactly why only 54% of respondents agreed or strongly agreed with that statement. This reinforces what Flor (2008) says, that giving respondents the opportunity to describe the "why" may have bridged the gap between the "limitations of numbers versus the richness of words" (Capella University, Atlanta Colloquium, 2008).

Similarly, site leads or those technicians' equivalents should be surveyed after the implementation to garner their levels of satisfaction. Items noted previously such as lack of control, role confusion, and the increased workload placed on site leads may come to light during the data gathering process. This would also add another dimension to the findings and help to confirm or deny triangulated concepts that end users or service desk technicians have offered.

Performance metrics enhancements

Future researchers may want to use more service level metrics to measure "before" and "after" ESD effectiveness. First call resolution, or the number of incidents resolved during the initial call to the service desk, is a key performance indicator that customers and industry use regularly to measure service desk effectiveness. One reason for first call resolution’s widespread use is that “not having to escalate the call, route [the incident] to another department, or engage a supervisor all reduce costs for the organization and increase customer satisfaction” (Davis, 2007, p. 92). Call abandon rate is also a common metric used to measure service desk efficiency (Maurer, 2005). Staffing workload metrics such as incidents per staff member and cost per incident may also be helpful.

In addition, more data than purely numerical is needed for high quality assessments. While quantitative data adequately shows the level of responsiveness of a service desk, this metric is single-dimensional. “Attentiveness and accuracy in the attention to detail of information received from customers in placing requests for service” are also key factors that affect customer satisfaction, yet they were not included in this study (Fehl, 2006, p. 24). Although two sets of qualitative data were collected, there are characteristics such as customer service skills that were not found in this study, which may have enhanced this study. Furthermore, other researchers may want to measure the accuracy of the data input by technicians both during and after implementations. In addition to providing managers with the ability to make sound business decisions, increasing the accuracy of data metrics through elimination of operator errors reduces the cost of ownership by eliminating correctional data management activities.

Future researchers may wish to study metrics over longer periods than the six weeks in this study, which has the possibility to reap higher informational returns. During the evaluation of results phase of the HPI model, researchers recommend a 6 to 12 month period of evaluation to gauge the continued effectiveness of an implementation over an extended period (Sanders & Thiagarajan, 2001; Tracy et al., 2007; Gliedman, 2005).

Longer evaluation periods to gather and analyze metrics may help indicate that a correlation exists between the implementation and the problem it was addressed to solve, or help identify areas of deficiency areas that need attentions.

Further studies may be enhanced by breaking down the data geographically, by technician, or time of day. These segments may indicate areas in which differences in service levels occur. For example, if service desk technicians in the Western region of the U.S. realize quicker response times and resolution times than in other regions, the increase in efficiency may be linked to faster network speeds for database accessibility, better training, more time to devote to user issues, or a host of other explanations. Sorting the data by technician may indicate areas where training or non-training interventions may be necessary, especially in environments such as this study that incorporated technicians with differing technical backgrounds. These data results could then be studied, adapted, and ultimately replicated in other regions to raise their efficiency levels and bring standardized levels of service across entire organizations. Additionally, by sorting the data to determine how many users had their issues resolved after normal duty hours, especially overseas customers, the data may indicate higher degrees of satisfaction from users who previously had to wait until their U.S.-based service desks arrived on duty.

HPI non-training enhancements

Finally, when it comes to implementations that follow the human performance intervention (HPI) theoretical framework, such as this readjusted workflow project, forty-five years of study have shown the ineffectiveness of training when used as the only solution to a human performance problem (Broad, 2005). The literature clearly shows that organizations need to use not only training but other tools as well to improve performance and reach desired outcomes. While this study successfully used on-the-job training and a job aid in the form of electronic checklists that outlined the resolution steps, future researchers may wish to incorporate even more sophisticated, on-demand tools such as Electronic Performance Support Systems (EPSS) and knowledge management systems as part of interventions to enhance their study's findings.

An EPSS is a job aid that helps service desk agents, especially newly assigned or inexperienced ones, to grasp and apply technical information by blending computerized systems with a hands-on, tactile learning style. For example, using a format similar to widely used frequently asked questions (FAQ) pages found on many websites today, service desk organizations wishing to replicate this study would do well to offer their technicians easy-to-access intranet pages that display hyperlinks of the most frequently occurring incidents. When clicked, the links launch animated or video-based instructions that guide technicians by "drilling down" or accessing detailed instructions through a series of linked electronic folders in so-named hierarchical trees. The technicians perform the steps in real time as they simultaneously view the pre-recorded steps. Another example of an EPSS is a question-and-answer format, in which technicians type in keyword search criteria, the database returns the results that match the entered criteria, and the system shows the technician how to do the repair (Van Tiem, Moseley, & Dessinger, 2001).

While an EPSS is established on a static database that may be periodically updated when new business processes are designed, knowledge management (KM) systems, on the other hand, are highly advanced, dynamic databases that organizations use for knowledge transfer and organizational learning (Van Buren, 2001). While this study used a static, simple form of a KM system to share resolution techniques, more sophisticated systems that include search and artificial intelligence capabilities may increase efficiency at a greater rate. A service desk is an ideal environment for such an advanced KM system, since service desks are interested in “sharing solutions and innovations, determining best practices, meeting customers’ needs, increasing responsiveness, and increasing collaboration” (p. 172). In fact, future researchers who conduct reengineering studies involving service desks may very well realize several advantages from using KM systems: reduced staffing costs, increased rate of first call resolutions, and reduced resolution times, the latter of which may surpass the results produced from this study.

Summary of Chapter 5

This chapter began by a summary and discussion of the findings. Performance metrics and customer satisfaction data results were discussed by using the research questions as yardsticks by which to measure the results. The benefits and challenges of HPI and BPR in this study were presented, after which impacts to the study such as the unique nature of ESD end users and Likert-based scales were stated. The significance of the findings, such as the ongoing argument of centralized versus decentralized and shared database permissions, were also part of this chapter. The final section of chapter 5 and this case study, which asked to what extent do reengineered workflow processes improve service delivery at an ESD, was to discuss recommendations for further study.

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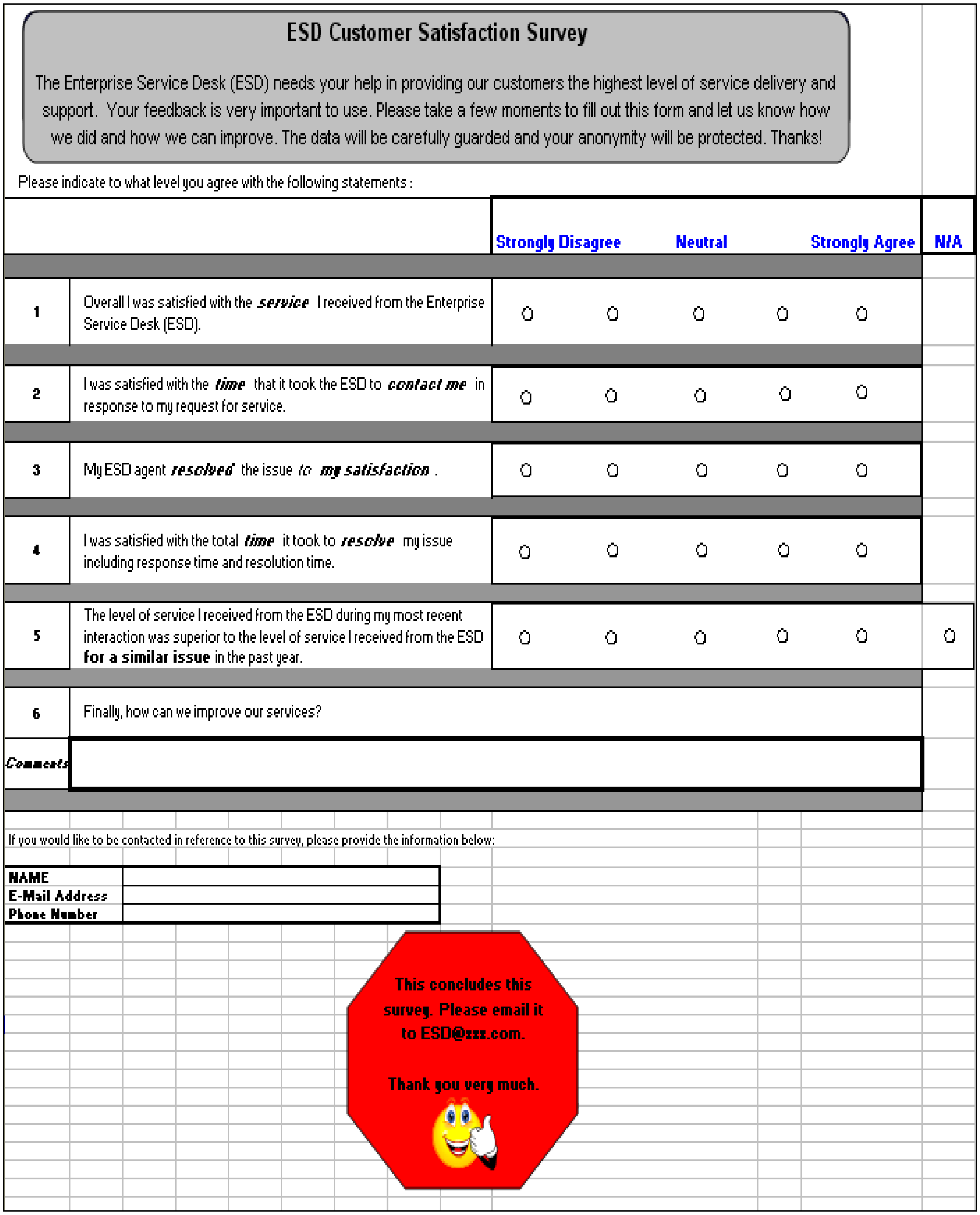
Appendix A. ESD Customer Satisfaction Survey



ESD Customer Satisfaction Survey

The Enterprise Service Desk (ESD) needs your help in providing our customers the highest level of service delivery and support. Your feedback is very important to use. Please take a few moments to fill out this form and let us know how we did and how we can improve. The data will be carefully guarded and your anonymity will be protected. Thanks!

Please indicate to what level you agree with the following statements :

		Strongly Disagree		Neutral		Strongly Agree	N/A
1	Overall I was satisfied with the ***service*** I received from the Enterprise Service Desk (ESD).	O	O	O	O	O	
2	I was satisfied with the ***time*** that it took the ESD to ***contact me*** in response to my request for service.	O	O	O	O	O	
3	My ESD agent ***resolved*** the issue *to* ***my satisfaction*** .	O	O	O	O	O	
4	I was satisfied with the total ***time*** it took to ***resolve*** my issue including response time and resolution time.	O	O	O	O	O	
5	The level of service I received from the ESD during my most recent interaction was superior to the level of service I received from the ESD **for a similar issue** in the past year.	O	O	O	O	O	O
6	Finally, how can we improve our services?						
Comments							

If you would like to be contacted in reference to this survey, please provide the information below:

NAME	
E-Mail Address	
Phone Number	

Figure 17. ESD customer satisfaction survey

Appendix B. Participant Consent Form

Participant Consent Form

TO: [redacted], Enterprise Service Desk (ESD)

FM: Keith Pressey, [redacted]

Re: Participation in Research study

I am seeking your written agreement to participate in a study that centers around process improvement at your service desk.

The purpose of this research is to investigate whether reengineering workflow processes can successfully be used to increase efficiency and levels of customer satisfaction.

The ESD is expected to benefit greatly from the research gained from this study. Streamlining and standardizing workflows will lower the total cost of ownership, increase revenue, free up resources for other tasks, provide consistent service to end users, improve employee morale, increase service reliability, increase customer satisfaction, and possibly bring in new customers.

You were chosen to participate in this study because of your expertise in ESD processes. In addition, your open-mindedness and willingness to contribute to this study will greatly enhance this study's results.

This study is projected to take place between 1 Jan and 1 June 2008.

The proposed data collection procedures are as follows:

A single incident will be chosen as the focus of the reengineering study. The incident should be one that occurs frequently at the ESD, lends itself to reworking its workflows, one that stands much to gain from being reengineered, and is an incident that that management and staff would like to see improved.

Three sets of data will be used for the baseline:

1. Trouble ticket metrics will be gathered to show current levels of resolution time and other such measurements when the incident occurs with ESD end users;
2. Customer survey data from users who had this incident resolved;
3. Current workflow data. Technicians will be observed while troubleshooting the incident, after which the processes will be diagrammed.

During the implementation, the incident's workflows will be reengineered to streamline the process flow. When the participants have successfully reworked the processes and they have been accepted by ESD management, technicians will be taught the new processes, thereby standardizing the business processes. Also during this step, the customer satisfaction survey may be modified, with management approval, to reflect industry practices per the *Gartner Research* group.

Two more sets of data will be gathered in similar fashion to the baseline data after the rollout:

1. Trouble ticket metrics will be gathered to show the new levels of resolution time and other such measurements when the incident occurs with ESD end users;
2. Customer survey data from users who had this incident resolved.

The participants will then be asked to assist in the data analysis effort, to determine the degrees of change, if any, between the two data collection periods. Finally, an assessment will be made, with the study's results becoming a product of a joint effort between the ESD and the researcher.

The data will be used strictly for this case study. The researcher and the ESD will jointly own the data during the study. After the study is completed, the researcher is required to keep the data in secure storage for seven years per Institutional Review Board instructions. After that time, the data will be destroyed.

Data masking techniques such as coding names and anonymous identifications will ensure the ESD's confidentiality. End users will also be protected by the same methods; e-mail addresses, location acronyms, and other identifiers will be automatically deleted when satisfaction ratings are entered. Finally, the data will be protected by strict measures such as password protection and viewing on a need-to-know basis. Confidentiality will be reiterated throughout the course of the study to all participants.

There are no actions or activities that are predicted to cause physical danger to participants during the length of this study.

Participation in this study is voluntary. Refusal to participate will be accepted with no explanation required. Furthermore, the participant may discontinue participation at any time.

Your participation is greatly appreciated.

For further explanations, comments, or questions regarding this study or its use, please contact Keith Pressey, phone [redacted] or e-mail [redacted]

I have read and understand the above information:

____

(Signature)

____

(Printed name)

Appendix C. Pre-Implementation Interview Form

Pre-Implementation Interview Form

1. How many times have you contacted the Service Desk in the past year?

2. Generally speaking, what is your overall customer satisfaction level regarding the Service Desk's resolution processes for timesheet incidents?
   1 - Completely Dissatisfied
   2 - Dissatisfied
   3 - Not really sure
   4 - Satisfied
   5 - Completely Satisfied

   Why do you feel this way?

3. Please describe a recent interaction you had with the Service Desk that concerned timesheet reporting.
   a. What was your overall takeaway?
   b. What was good about the experience?
   c. What could have been improved?

4. Suppose you couldn't log in to the timesheet website, and realized you had to contact the Service Desk for assistance. Based on your previous experiences, what would you expect to happen?
   a. What would be your initial reaction upon realizing that you needed Service Desk assistance?
   b. How would you notify the Service Desk?

5. If you were in charge of the Service Desk, what would you do differently than what's currently being done?

6. Do you have anything else to add, that would help us to determine how customers currently feel about how the Service Desk resolves timesheet incidents?

7. Finally, can you recommend someone else who has had timesheet incidents and who would be willing to share their feelings during an interview? If so, please provide me with their contact information. Thanks. ☺