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Automation and Its Effects on the Workforce

A thesis

presented to

the faculty of the Department of Business and Technology

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Master of Science in Technology with a concentration in Engineering Technology

by

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December 2010

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ABSTRACT

Automation and Its Effects on the Workforce

by

Daniel L. Lawson

Companies are constantly involved in automating processes to make them more efficient. Project details concentrate on corporate details. Little, if any, information is released about employees and how they are affected. This study is designed to determine if employees affected by the automation of a manufacturing or business process have a better life and consider themselves to be successful from their own perspective 5 years after the automation was completed. The study also established the things that helped and barriers that hindered their success. A survey was developed and sent to 63 individuals who have participated in a project to automate a manufacturing or business process. Their direct involvement could be through design, development, or general workforce operations. Plant operators and operations personnel were affected by automation in a much harsher manner than design and development personnel resulting in a greater need for future training.

DEDICATION

This work is dedicated to the Lord and Savior Jesus Christ, for without Him this work could not have been completed and to the dearest wife anyone could have, Becky Lawson, who has stood graciously through all the ups and downs of this work. Her words of encouragement have played a huge role in the success of the study, and the fact that she has always been there means more than words can express.

It is also dedicated to mom and dad Pauline O. and the late Carl Lawson, Sr., who were inspirational during the early years and instilled the desire to work hard in everything attempted. They began the molding process of turning this individual into someone willing to go the extra mile to achieve every dream and be the best. Their guidance has been an inspiration and no doubt will continue to do so in the future.

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The individuals who took the time to complete the survey were a tremendous help in this endeavor. Deepest thanks go to each one and accolades to them for their willingness to go above and beyond to help.

To sons, Dustin and Adam Lawson, go sincere appreciation for allowing the testing of new thoughts and ideas, which was invaluable during this process.

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CHAPTER 1

INTRODUCTION

Most companies face a daily fact that automation is a necessity if they are going to survive in today's economy. Automation can take many forms, but one of the largest segments involves the manufacturing environment. Even here it has varied aspects that must be dealt with including equipment upgrades, flooring and space management, utility requirements, building concerns, both structural and aesthetics and employees just to name a few. Of all things considered in an automation project, employees receive perhaps the least attention. Concerns centered on the total number of employees affected or how many are eligible for retirement form the basis for many corporate decisions when it comes to employees (Cooper, 2004). Corporate America has experienced a dramatic change in the number of employees actually employed due to jobs being shipped out of the country. Many times this lack of jobs is blamed on automation, but in reality it comes down to profits (Paper, 2004). How do employees fare when directly affected by such an automation project? Because of pressure to continually improve all aspects of customer service, firms have increasingly moved toward highly flexible production facilities (Hopp, Iravani, & Shou, 2005). Employees may be retrained for a completely new position, trained for job duties as a result of automation changes, cross-trained for other production jobs, or terminated. As a displaced worker, an employee experiences changes almost unimaginable to others. Management realizes that retaining valuable staff and providing rewarding and satisfying experiences for employees is increasingly challenging (Fox & Felkey, 2008). Faced with a challenge of this sort, companies continue to automate processes, and in some cases lose valuable employees. Most research deals only with the companies and how much their profits are

increased. Three years, 5 years, or even 10 years down the road most employees have moved on with their life in one way or another.

Purpose of the Study

At some point in their career the majority of individuals will be affected by various forms of automation. Whether directly or indirectly involved the circumstances surrounding the automation of a process may wreak havoc in their personal lives. It would take an endeavor much larger than this to determine how some might handle the adversity brought on by such an event. This project is a pilot study to investigate the viability of further research in this area. Its purpose is to determine how such individuals dealt with these adversities and moved on with their lives. This study also allows them to voice their opinion in their own words with no threat of retribution in any form coming their way.

Significance of the Study

The significance of the study is that the findings should enable company management to know the true feelings of affected employees and determine better ways to manage the type of change that automation brings about. Managers deal with the consequences after the fact, but perhaps they need to address them upfront (Hall, 1994). Some larger corporations have a better track record for doing this than small and medium sized companies. Good change management practices may be due to capital outlay and the fact they go through the changes more frequently. Employees dealing with the consequences must face retraining, moving to a new job location or at worst having to look for a new job that can lead to relocation, resulting in uprooting their family.

Research Questions

Many questions arise when dealing with a broad subject such as automating a manufacturing or business process. No study can endeavor to answer all questions or come to the realization of what they may encounter. The majority of research uncovered by this study refers to corporate circumstances dealing with profit margins and how corporate management handles the project. Questions can be asked concerning every aspect of the study, but the goal of this researcher was to determine answers to the following research questions from the employee's perspective:

- 1.) Do employees believe their personal well-being is successful 5 or more years since the automation experience?
- 2.) What factors do employees identify as being the biggest help in allowing them to move on with their life?
- 3.) What factors do employees identify as barriers to success after the implementation of the automation process?
- 4.) Do employees take advantage of benefits offered them as part of the automation process?

Study Limitations

1. The study was limited by the number of qualified participants taking part in the study.
2. The study was limited by the degree to which participants gave their full and honest perspective to each question.
3. Since this was a qualitative study of a limited number of participants, no generalizations were made to other populations.

4. The review of research literature is limited because of the lack of published data concentrated on employees.

CHAPTER 2

RESEARCH LITERATURE REVIEW

Introduction

The vast majority of research on this topic concerns corporate endeavors and results of various projects of automation. These projects involve the redesign of equipment to reduce labor and improve productivity in manufacturing, business, and logistics processes. Regardless of the project, employees are a major area of concern that may get shoved aside because of other critical aspects of the project. Since the early 1970s, the developed world entered into the Information Technology age, resulting in a total change to our way of life, leisure, and our means of communication and information exchange (Humbert, 2007). This age gave industry the means to improve production, create new ideas, and capitalize on them in ways never before imagined. In many cases employees got to move up the ladder or at least align themselves for better positions. However, if they were not willing to change and learn new technology, they were left behind (Fox & Felkey, 2008). Workforce changes have required changes in how things are done, from cleaning the floors to how executive decisions are determined. Concentrating on how workers have adapted after surviving the automation of a process is the major focus of this study. The main thrust of the study is to obtain their perspective on how they achieved success or what particular factor(s) led to their lack of success.

The following databases were used to locate information: Academic Onefile, OmniFile Mega, SIRS, LEXIS-NEXIS, and Google Scholar. The main keywords were: automation, automated workforce, displaced workers, workforce, effects on workforce, and automation technology. These were used both individually and in combination with each other. All resources

including articles, journals, books, and thesis documents were obtained through the Northeast State Community College Library by direct download or reservation through the college library.

Automation in the Workplace

Automation in the workplace is taking place at an alarming rate regardless of the industry or business type. Companies are under pressure to produce more products at reduced costs to increase profits (Humbert, 2007). This pressure sometimes results in the workforce facing the challenge of learning new technology or being terminated. Automation can range anywhere from sweeping the floor to the complete automation of an entire manufacturing process. One such means of accomplishing this is through the use of robots. Robots are attractive cost-cutting alternatives to human labor, not just in the automotive industry, but in all industrial applications. They have opened the door for exploration into new areas providing greater profits, even with a huge initial capital outlay. Companies must look at the long-term in addition to short-term costs vs. benefits to determine the best path forward for their company and the industry as a whole.

Fox and Felkey (2008) noted that 31 million manufacturing jobs were eliminated between 1995 and 2002 in the world's 20 largest economies. All of these cannot be attributed as a direct result of automation; however, many were the result of automated technology innovations occurring during the timeframe. As workers are displaced, retraining to learn skills for a new career is common. Changing careers requires a large time commitment on the employee's part, but the benefits outweigh the challenges. Regardless of whether it is for a new career, the workforce of the future is dependent on the development of new and better technologies (Fox & Felkey, 2008). Some new careers entered into by displaced workers include servicing automated

machines, becoming computer technicians, and installing automated assembly lines among others as many return to school to learn new skills (Lamonde, 1995).

This study looks at automation projects from large, medium, and small companies. Participant projects for this study include automation for yarn packing, processing lines for specific fibers, book binding, printing, paper etching, inventory management, warehousing, etc. These projects involve costs ranging from \$48 thousand to multimillion dollar projects. Some areas could not reveal cost information. Automation in the workplace can take on various forms that include a handful of employees to thousands of employees (Hopp et al., 2005). Automation can also affect employees in different ways. Some projects require employees to be retrained for work in the new process, while others require only a few employees to remain in the process. Therefore, many employees are simply moved to other areas where retraining is required. However, in some instances, jobs for the displaced workers do not exist, leaving as the only recourse termination or early retirement. Regardless of the type of automation taking place, employees are affected in various ways.

Corporate Rationale

The literature focuses mainly on corporate procedures and reasoning behind automation projects by comparing one to another in such areas as project purpose, benefits to the company, and how the project fits into the information age. Companies are constantly bombarded with demands from stockholders and boards to improve every aspect of their business. If profits are not produced, companies cannot take the chance to invest in anything except a sure thing. This is not to say they will not gamble if the potential is there, but they have little room for error nor

time to chase unsuccessful ventures. Some companies thrive on the leading edge, while others are fine to work at a much slower pace.

Companies must look deeper when considering automation. Investments are expensive, but so are employees. Nearly one third of all Americans – 76 million – were born between 1946 and 1964, thus creating the baby-boomer generation (Dychtwald, Erickson, & Morison, 2006). This generation has repeatedly reshaped America and fueled productivity increases for several decades. Many boomers are reaching retirement age, causing corporate America to worry about how they will survive such a mass exodus (Dychtwald et al., 2006). Automation is one popular choice to relieve some of the pains being felt as this mass retirement begins to unfold across our country. Companies must look at several factors including:

When are workers no longer productive?

At what age do employees stop learning or seeking new challenges?

How long will workers wait before retiring (Dychtwald et al., 2006)?

Dychtwald et al. (2006) also states that declining birthrates across industrialized nations all but guarantee a shortage of native-born young workers with few large organizations really preparing for this transformation of the workforce. Most companies, including those in this study, fall into this category; however, with automation on the rise and college enrollment at an all time high, some areas could weather this storm almost unscathed. According to Dychtwald et al. (2006) with the boomer generation moving through middle age and retirement age, they are the fastest growing segment ready to leave the workforce. If corporate America does not address this soon, their troubles are going to escalate tremendously.

While automation will help, it is not the only answer companies must consider.

Retraining employees is a must, and it will not happen overnight. Many older employees who are

not retirement eligible may take longer to develop skills required to be successful in the new age of automation. Younger workers may take less time to train, but many do not have the loyalty that corporate America has become accustomed to; therefore, the learning curve will be extended for them as well. Companies must continue to invest in research to develop new means of automating processes, and equipment and developing people skills.

Treatment of Employees

Workers are protected by government regulations, but provisions do not afford workers continuous income and related benefits. Owners, stockholders, and boards of directors worry about the bottom line leading to increased profits. Rarely in the research literature were employees mentioned other than to state they are a main consideration. Details of employee plans were not touted like that of the total costs or results of increased productivity and profit margins. Corporations value employees as a major asset but few ever divulge details concerning how employees are taken care of. Hopp et al. (2005) show various components pertaining to cross-training of workers and its benefits in terms of increasing capacity and reducing bottlenecks on production lines. These components include the acquisition of skill sets required to operate new equipment, and on the job training for process operations. Employees react differently to corporate decisions affecting their livelihood. Employee input to the decision process must be taken in the context of the specific situation concerning the employee's perspective of how it will affect his or her job. An employee's age, knowledge of the subject area, and ability to obtain new skills has a major impact on the input, or lack thereof, to the automation process (Waldeck, 2000). It is difficult if not impossible to provide details of a process knowing the end result could eliminate one's job. Companies treat employees differently

based upon several factors including age, skill set, attitude, and willingness to learn; however, some may involve a company's financial abilities. If a company is struggling and the automation is a last ditch effort to keep the company afloat, the benefit package offered to employees may be substantially reduced (Cooper, 2004). Factors such as severance pay, retraining allowances, extended insurance coverage, etc. are just a few things affected in this situation. Dychtwald et al. (2006) noted that a shortage of skills will precede the shortage of workers. Smaller corporations may not have the funds to handle extensive training costs, therefore resulting in reduced skills required to keep ahead of the game in this information age. Declining economic conditions result in a sharp rise in college enrollments and, unfortunately, a reduced rate of job creation. Proper planning allows companies to automate during these down times to keep people employed. There are exceptions to every situation, but companies tend to treat employees well to avoid bad publicity, resulting in lost revenue and a reduced customer base.

Corporate Planning for Employees

Corporate planning involving employees encompass a vast array of topics outstretching the bounds of this study, thus limiting the discussion to aspects pertaining to automation. How do companies plan for employees when it is a given that many will be retrained, some will be moved to new jobs, and some may be terminated? These data appear to be a well kept secret for most companies. It is not that they do not plan for these situations, but much involves financially significant information concerning an employee that cannot be released. Proper handling of employees during these situations reflects on the company as a whole. If employees are treated fairly, it is normally considered to be a good reflection on the company. Likewise, a lackluster approach can give the company a bad reputation and hurt recruitment of future employees.

Companies do not take the termination of employees lightly for several reasons. Laws protecting the rights of employees must be followed; it is not just the employee who is affected, but families and even whole communities come into play. Employees are the main resource of any company because without them they could not exist. Employee development has been named one of the most critical factors, if not the most critical factor, in competitive advantage (Waldeck, 2000). Even a completely automated company requires a minimum number of employees just to carry out daily functions. The first thing a company must do when automating a process is to determine how many employees will be required to maintain the new process and how many employees will need to be retrained, moved to other positions, or terminated. Other factors to be considered include:

- determining if there are employees with special skills and knowledge the company cannot afford to lose,
- how many positions are available throughout the company,
- offering employees an option to transfer to another plant location,
- determining if there will be a severance package and if so, what should be included and who will be offered the package?

The package should include: early retirement incentive, pay for accrued vacation and sick leave, retraining expenses, relocation expenses, etc. to be considered a complete package.

CHAPTER 3

RESEARCH METHODOLOGY

The purpose of this study was to investigate the actual experiences of workers who have been directly affected by the automation of a manufacturing or business process. Qualitative in design, the study reviews the resulting data analysis as described in the true life experiences of several individuals about the concept of having been directly affected by the automation process. This chapter identifies the participants, describes the data-gathering process, outlines the approach used to obtain the data, and defines the procedures used for data collection and analysis.

Study Design

Qualitative research techniques were used during the study. This methodology is defined by various authors and researchers, but the findings could not be arrived at by any means of statistical procedures because they are based on the lives, stories, and in some cases personal behavior in organizational functions of corporate America (Creswell, 1998). This approach was fitting because the procedures allowed the researcher to investigate the perspective of each participant. Information was obtained through a survey sent via email to likely participants.

Participants

A variety of subjects were included in the initial list of likely participants. This was done to ensure that a variety of participant types were included in the population because they were believed to meet the same criterion of experiencing the same or a similar incident.

Accordingly, each participant in this study was at least 18 years of age and had experienced the automation of a process that directly impacted their job status. Participation in this study was requested regardless of whether the participant was retrained, moved to another position and then retrained, or terminated from the company altogether. Their role in the project either from a design and development or plant operations will be differentiated in the data analysis. Creswell (1998) noted that purposeful selection of participants is a key factor in any qualitative study and it is essential that all participants experience the topic of the study. Of the initial list of likely participants, all had experienced an automation process from either a design or operations perspective.

As part of the survey each participant was provided written verification describing the purpose of the study and noting that his or her participation was strictly voluntary. Their completion of the survey served as their consent to participate in the study. The confidentiality of their input as well as their true identity and company affiliation was also guaranteed.

Sample Size

Initially, there were 27 individuals as likely candidates in the study. At the recommendation of one of the thesis committee members, the initial list was expanded to include individuals who had experienced automation from the design and development standpoint. This more than doubled the sample size. There were no guarantees as to how many would actually participate.

Originally, it was anticipated that 15 of the 27 would participate. By increasing the original size from 27 to 63, expectations were revised to 30 participants. The survey was sent to these 63 individuals from the surrounding geographic area and in the states of Florida, North

Carolina, Virginia, Oregon, and Texas. Responses were asked to be returned within 2 weeks of the original date they were received. In the email note accompanying the survey (see Appendix B), it was requested that if a candidate could not participate that he or she respond accordingly so as to not delay the study waiting for responses. Of the original 63, 14 responded they could not participate but stated no reason. Additional communications with 11 other candidates resulted in their lack of participation due to time constraints (7), fear of reprisals at current place of employment (3) and one stated his supervisor would not let him. There were 7 candidates who did not respond in any manner. A total of 31 candidates responded to the survey, creating the participant field. The majority of these were received within a 3-day period, with some stragglers taking just over 2 weeks. The desire was to receive a response from every possible candidate, but this was very unlikely.

Of the original list of 63 candidates, 33 (or 52.4%) were male and 30 (or 47.6%) were female. Fifty-one participants were from the tri-cities area of Northeast Tennessee, with the remaining 12 residing in the other states.

Companies involved in the study were designated only in size as small, medium, and large. The company size designation, as determined by the writer, was as follows:

Large sized company employs 1000 or more employees

Medium sized company employs between 75 and 999 employees and

Small sized company employs fewer than 75 employees.

Of the participants returning their surveys, 18 (58%) worked for large companies, 9 (29%) for medium, and 4 (11%) for small companies.

Survey

The survey was designed to allow the participant to relate his or her experience in much the same way as a one-on-one conversation would proceed. It was not designed to lead or sway the participant into any particular direction. It is the desire to get the participants' perspective on the events pertaining to the automation process in which they were involved.

The survey consisted of 12 questions as shown in Appendix A. The design does not allow for only a yes or no answer but asks for the individual to expound on his or her thoughts as they pertain to the subject. Each participant has a special knowledge gained through firsthand experience. Extracting this knowledge in common terminology from their perspective based on their personal outlook was the goal.

The survey was set up as a form so that no changes could be made to any question. Each field expanded to allow the participant to write as much or as little as he or she deemed necessary. They were also provided with a means to contact the author individually to ask questions or make comments of any nature concerning the survey. This approach ensured a consistent way of collecting data related to a set of topics common to everyone. The questions were based on typical circumstances involved with an automation process. The format was not formalized but was aligned to extract an appropriate response from each participant to the topic at hand. The pattern of questions was not intended to trick or use gimmicks to invoke any particular response but to grasp an overall understanding of their perspective given in the responses.

Data Collection

The author was the primary data collector for the study. Data were collected using a survey sent via email to an initial list of likely candidates. The survey provided a consistent set of questions to be answered by each candidate deciding to participate in the study. Each participant was asked to return his or her completed survey via email. As the returned survey was received, the participant was assigned a pseudonym to guarantee confidentiality, and the survey was stored as a file. The associated document identified by pseudonym only was stored on a secure device. If additional communication was required for clarification purposes, this was completed as soon as practical. Once this was completed, the original file was destroyed, leaving only the pseudonym as an identifier.

Data Analysis

As the response data were received, the process of analyzing the data began. The expectation to see recurring events was evident as the analysis was started early as each response was received. This approach also allowed the recognition of some key issues based on these recurrences. Having multiple data inputs, it was a necessity to start early and finish early. Further analysis was done to categorize the data based on the survey questions. It provided a means to determine the major categories for discussion in this study. Responses that were answered with “NA”, not applicable, to the participant were not included in the data analysis.

CHAPTER 4

DATA ANALYSIS

Introduction

The purpose of this study was to investigate the actual experiences of workers who have been directly affected by the automation of a manufacturing or business process. Thirty-one of 63 candidates responded to the survey. The survey was conducted from the residence of the writer via email and the responses were received in the same manner. Data analysis was completed by the principle investigator. A participant's residence or location of employment was not a factor in the analysis of the data. However, the size of the company, listed as small, medium, or large, was used to evaluate differences in employee treatment among the various companies.

The Companies

There were nine companies represented by the survey responses. According to size categories of this study, four were considered large companies, three were medium, and two were small companies. While company size does not dictate how employees are treated, it does help evaluate whether larger companies treat their employees better than others. However, in the case of this study the only input involves the participant's perspective in regard to how he or she was personally treated during the automation process. From their viewpoint, companies perceive their employees are treated in the best possible way, but employees view things in an entirely different manner. In reality every employee would like to be treated the best concerning all aspects of his or her job, life, and livelihood outside the workplace. Companies have procedures

and policies in place that determine how employees are selected for a new position or for possible termination, which in turn determines how they are treated concerning specific occurrences on the job. Automation projects result in employee changes, either through new positions, new job demands on existing positions, or total career changes. Profits are the key ingredient to reaching company success regardless of the product being produced. Reducing costs allows companies to try new approaches to old ideas.

The companies represented in this study are no different. Each automation project attempted was done to improve the bottom line of the company. From small to large and everything in between, companies strive to achieve the next rung on the ladder. Small companies want to be medium and medium want to be large, even large companies desire to grow larger. Product mix is a huge factor in helping companies to grow.

This study included companies from a variety of product and service types. While company products and services are much more diverse than shown here, these topics were mentioned specifically by the participants in their survey response. Several topics make a huge impact on the company as noted in all three size categories. Table 1 shows the project mix by company size.

Table 1

Survey Response Project Mix by Company Size

Large	Medium	Small
Chemicals	Mining Equipment	Printing
Paper	Finished Yarn	Clothing
Electronic Equipment	Logistics	Inventory Control
Plastics	Inventory Control	
Warehousing	Warehousing	
Logistics		
Fibers		
Inventory Control		

The projects shown in Table 1 represent millions of dollars spent by the companies listed in the survey. All participants did not list dollar amounts of the project and there was no way to determine the exact dollar amount spent or to check the accuracy of dollar amounts mentioned. The costs associated with projects are total project costs and do not include costs of employee benefit packages as a result of the automation project.

Concerns

The topic of how automation affects the people had been contemplated for over a year and thought to be a good research topic. Enthusiasm for this topic grew as classes were completed and the time to begin the study drew nearer. Talking with Dr. Clark about the topic, it was a relief to learn that the topic area was a valid research concern. Initial concerns related to

the collection of data and how to contact all the people to get their thoughts and ideas on the subject. Having known many individuals who have been through the ordeal of being displaced, there was concern as to whether they would take the time to discuss their experiences about the subject. The information age came to the rescue as it was decided to use the internet as a means to contact possible candidates. Obtaining information directly through personal interviews, or in this case through a survey, requires approval from the Institutional Review Board. All required forms were completed and approval was granted to proceed with the study. The next step was to determine how many individuals would be willing to take part in the study. The initial email was sent to 63 individuals. Expectations were that approximately one third of the initial list may participate, but for the study to be successful approximately one half would be needed. To increase participation, the email contained an introduction explaining the purpose of the study and the importance of completing the survey from their perspective and in a timely manner. Participants were also encouraged to include as much detail as necessary to clarify their position on each survey question. The final task was to assemble all the data together into a cohesive document.

Participant Selection

The criteria for selecting participants were straightforward. They must be at least 18 years of age, which was not a problem because most currently work for, or have worked for a company in excess of 5 years. One additional requirement was that their job must have been directly affected in some way with the automation of a manufacturing or business process that had been completed at least 5 years ago. This may seem like a difficult task, but having personal knowledge of individuals having gone through this experience made it much simpler. Of the

original 63 emails sent to likely candidates, 30 were females and 33 were male. Sixteen females and 15 males participated in the study.

Survey Categories

The survey questions were divided into eight main categories including:

1. Types of Automation;
2. Employee Treatment;
3. Selection Criteria for New Positions within the Company;
4. Benefit Packages Offered;
5. On-the-Job Training;
6. Employee Consideration as Part of Original Plans;
7. Life on Down the Road and
8. Participant use of Retraining Benefits.

These categories were then subdivided into two segments based on the participant's type of activity performed during the automation process, which were Design and Operations.

Those in the design segment played an active role in the actual development of the automation process, either through systems analysis, engineering, or project leadership of the project. Many project design models are available to correctly guide companies through various projects, but many of these guides lack the details required to properly steer a novice manager through an automation project correctly to help the company succeed (Schneider, 2002). Many team members served in various capacities during the design and implementation of the project.

Operations were actively involved in the process being automated and thus were more likely to be affected by the success of the process. Various roles were required in the projects

represented in this study. These roles are too involved and extensive to list and describe in their entirety; therefore, they are discussed briefly for participants falling into this segment. Eighteen participants in the operations segment participated, with 13 from the design segment completing the survey. Participation statistics for each segment are shown in Table 2.

Table 2

Participation Totals for Males Females by Segment

	Initial Email Sent (63)		Responses Received (31)	
	Design	Operations	Design	Operations
Male	13	15	8	6
Female	8	27	5	12

Types of Automation

Numerous types of automation projects were undertaken by companies represented by the participants in this study. These involved manufacturing, human resources, business analysis of raw material procurement, inventory management, warehouse bar-coding, electrical equipment upgrades, Programmable Logic Controllers (PLC), accounts receivable, multiple production facility upgrades, logistic tracking, integrated circuit boards design, etc. The scope of this study does not include costs, but it is evident the total costs for all projects included in the responses of the survey will exceed the half-billion dollar mark. It is surprising to see the different type of automation projects taking place, mainly from this local area. The data reflect the bulk of the automation work to be concentrated in the manufacturing sector associated with productivity increases, which is understandable from the point of reducing costs to increase profits. Projects involving PLCs, integrated circuit board, and manufacturing process automation

had the largest costs associated with them, with the largest project exceeding \$284 million over a 3-year period. The smallest projects were associated with the printing industry and involved printing equipment upgrades. On a larger scale the replacement of a printing press exceeded several hundred thousand dollars.

Ralph, a study participant who has since retired, noted the new printing press equipment required extensive training and reduced the number of employees required for the setup on book runs. The new press increased productivity to the point where additional employees had to be brought in to handle the workload at the offloading station. The increased production had such a positive impact, the equipment paid for itself in two thirds of the time originally estimated. In all of the responses, this is the only project where the number of employees increased, from 6 to 11, and still resulted in positive results. The costs associated with the 18-month project were \$752,000.

Jamey, an inspector at the time, stated bringing the yarn production facility from the dark ages to the forefront of technology cut the number of employees by two thirds, from 60 to 19, and made the business profitable for the first time in over 10 years. This project involved replacing manual yarn identification methods with robotic barcode readers and manually moved yarn transfer trucks with electronically guided yarn trucks. Instead of holding each package of yarn individually to inspect it, the inspection was accomplished with the use of robotic arms, electronic light sensors, and weight scales to capture the package size and weight, along with other devices to automatically inspect the yarn package. The new automated system allowed the packing area to not only keep up with, but to be waiting on yarn arriving from the spinning area. This 2-year project exceeded \$3 million.

Jim, a retired operator, related experiences from equipment upgrades in one warehousing area to automatically track cartons from the time they were received from the vendor until shipment to the customer was complete with little to no human intervention. Trends in warehousing are moving to a hands-free environment (Brockman, 1999). Cartons were received from the main supplier with barcodes identifying the contents, customer, shipment destination, in addition to other information required for payment, raw material data, batch information, and everything needed by the customer for consumer information. The system involved numerous robots, material handlers, and barcode labels. Human intervention only occurred if a carton came open or a barcode was damaged or some similar incident. Brockman (1999) predicts warehousing will continue in this path for the foreseeable future for the cost savings alone. Employee numbers were reduced by three fourths, with the bulk of remaining employees used for loading trucks. This multi-year project exceeded \$24 million.

Certificate of Analysis (COA) data plays a major role in today's environment. Denver, a systems analyst, was involved in a system to incorporate COAs into the corporate enterprise system. The enterprise system made this a simple task by having the complete layout ready in the existing database. It eliminated manual data entry, thus reducing mistakes and helped reduce the number of waste batches due to a mismatch of product bases. This project was completed in 6 months but no cost information was included.

Lee, a systems analyst in the corporate Human Resources Department, led a project that allowed all employees to update their own personnel records. Before the project department employees sent their information through various means to get their records updated. Mistake prone, the old system screamed for help. The new system is used for all personnel changes and was expanded to handle employee enrollment in benefit plans and payroll tax form completion.

Including the expansion, the new system reduced the number of Human Resource Department employees by one half. Reducing the amount of data entry and handling all but eliminated errors because the system caught most of the mistakes as an employee entered his or her data. Project cost was not included, but the project was completed in just over 1 year.

Laura, an operator in the print shop of a small company, lost her job as the result of automation. The company's equipment was antiquated and could not meet the needs of current requirements in the industry. The project was gradually completed over a 3-year period. On the verge of complete failure, they had no choice if they were to survive. As the new equipment went online, automated processes handled the jobs of three fourths of the employees. As the work decreased, employees were sent home, resulting in all but 12 employees losing their jobs.

Programmable Logic Controllers (PLCs) control most devices in a robotic process line. Such is the case for David, as his job is much easier in one sense and more complicated in others. Process lines once required a minimum of 10 people per shift just to maintain the equipment and ensure things are working normally. Over a 5 year period, the entire line of the manufacturing process was renovated, reducing the number to 4. The remaining employees watch mainly from a control room where they can adjust valves, flip switches, and control the entire process from the comfort of their chair.

Delmer is involved from a different perspective from most designers and operators. His role as a control system maintenance technician puts him in the middle of automation. Whether it is a PLC or another part of the line, he has to maintain it to best of his abilities. His group contains approximately 55 employees, whose workload goes up when processes are automated. His job involves a production line being down at a cost of thousands of dollars per hour. The

criticality of this job cannot be overestimated. Knowing that as automation continues to increase, his job duties expand with it.

Allen views automation from a different perspective from most individuals. His job as a Human Relations Manager requires him to look at projects from a different angle. Automation of the plant role overtime into a centralized information system is one such project. Overtime is a huge concern for each manager. Controlling the frequency and location of overtime results in dollars saved for the department. The project took just a few months to complete and has already resulted in improved reporting and savings of several thousand dollars just by making informed decisions about assigning overtime. Employment was neither increased nor decreased with the system, but savings come from freeing up a team manager's time for other work. For this reason alone, the users accepted the system. At one time human resource system design referenced various ergonomic methods used in the workplace (The Eastman, 2004).

Automation can take on several forms. Brandon was involved with a project that automated the Electronic Data Interchange (EDI) and Business 2 Business (B2B) connectivity for his company. This automation looked at things from a different perspective in that it involved the help of a third party provider. This approach was unusual in that many providers were considered involving contract negotiations and other such things. The efforts of five full time analysts were required over a 2-year period. In turn, fewer support personnel were required, but no employee terminations were made. Team members, as well as the support team, were moved to existing positions within the company. Eliminating these support positions was actually a good move for most of these employees. Moving to bigger and better assignments is always a good thing when compared to losing a job. Medium costs resulted in huge overall savings for

this project. Loss of control was the biggest concern, but since the implementation even this has not been a problem.

Eric gets credit for having the shortest project in terms of the time required to implement. Plant users were required to use a series of forms that were created on the fly as the request was made, which happened a thousand or so times a day. For these forms the underlying data only changed about once per week. These complex forms were being generated many times per day, resulting in excessive computer usage, while at the same time slowing the computer system down and tying up the operator's time. This simple project generated these forms once per week, allowing users to use the previously generated forms. All users received the same data faster with more free time.

Raw material procurement is big business for any company. At the request of the Purchasing Department, Marcus developed a system that allowed department employees to review pertinent data concerning contract details such as price, terms, contract type, quantity and allocation information. Read only copies allowed everyone to be certain all information was up-to-date. It reduced the time required to process buyer information requests. The number of employee positions did not change, but job duties for some employees were revised to reallocate their time and job functions.

Mike was involved in a huge automation project for Customer Service Representatives (CSRs) concerning the online order entry system. Prior to this all orders were placed via phone, email, or fax. This information had to be manually entered into the system at this point. Very time consuming and prone to data entry errors, the system worked well albeit slowly. Over 100 CSRs were involved in the project. This does not include those behind the scenes, checking records, approving credit, orders, etc. With no push to require certain customers to order online,

the system took off at a meager pace. CSRs were the most affected by the system, but reductions were handled through attrition. Many were moved to other areas and many job duties were reassigned and aligned with the new system. No new jobs were created, but of the 100 CSRs, all had their jobs duties changed in some manner. This was a multi-year phased project.

Alice, a retired factory worker, lost her job as an inventory clerk when the process was automated as part of a complete revamping of warehouse operations. Robots, PLCs, electronic equipment, and barcode readers all took their toll on hers and other's jobs. When all was said and done, the warehouse operation was among the most efficient in existence. Unfortunately, Alice and 27 other workers were in the process of looking for work. At an estimated cost in excess of \$16 million, the process was second to none. Eight employees remained to run the entire operation.

Ashley had just begun a new career at a small local yarn factory when before it could really get launched, it was grounded. Automation moved in as 95% of the entire workforce faced extensive retraining and possible termination. The yarn industry is old and hard to improve without a complete overhaul. After being bought out, the company would start anew. While not quite at the bottom of the totem pole, she fully expected to be let go. One man, ahead of her in seniority, decided he did not want to go through all the changes, so she got a new start, too. Retraining on equipment she never even imagined was in her future. Weeks and weeks of training, followed by a significant amount of on-the-job training, prepared her for a pretty bright future. Her move into a support maintenance role for some of the new equipment helped prepare her for tomorrow.

These represent a quick snapshot of some of the more interesting projects that were represented by the survey responses. To include all of the projects, updates, and changes would have been all but impossible to represent in one document.

Larger corporations do the most projects and spend the greatest amount of money. Medium and smaller companies do an appropriate number of projects as well, considering they are more limited by capital funds and manpower to complete projects. Planning is a major aspect for all projects, taking nearly half of the project life, especially if it is done correctly.

Employee Treatment

Each response related employee treatment in a little different manner, but in no case did there seem to be resentment or animosity toward the company. Feelings were hurt, and in a few cases words were exchanged, but time heals all wounds to a point. Treatment ranged from complete openness and upfront dealings with all involved employees to that of not even a hint as to what was coming. Granted, most people figure things out and one thing leads to another, thus the rumor mill goes wild. In this study there were two projects in this same situation that forced management to divulge information concerning what was about to happen to the workforce.

Some cases require information up front, while others make no difference in the outcome. When people's jobs are on the line, there are several ways a company can go. One may not be better than another and many want to know good and bad news up front, while others would rather not know bad news until the last minute. Of the four individuals in the study who lost their jobs, two were told upfront what would happen and the others did not know for sure until later. One of these individuals was not told her job would be cut until a couple of weeks before the date. The other one was told approximately 5 weeks in advance but had already figured it out.

The company is not the only recourse an employee has if he or she is terminated. State laws are in place to help employees through these situations.

Employers have legal responsibilities when planning a layoff or closure, regardless of the reason. The Worker Adjustment and Retraining Notification Act of 1988 (WARN) requires Tennessee employers to send a written notice to the Dislocated Worker Unit 60 days in advance of a plant closure or mass layoff. In addition the Tennessee Code annotated (TCA 50-1-601) requires such notice when 50 or more workers are affected, versus the 100 required by federal guidelines (Tennessee Department, 2010).

The Dislocated Worker Unit generates the required WARN Notification Letters which will be sent to the highest elected local official, the Local Workforce Investment Act (LWIA) Executive Director, the Governor's designated cabinet members, certain federally elected representatives, and others requiring this information. Area Dislocated Worker coordinators are notified of impending layoffs or closures. The coordinators then contact the company and other members of the Rapid Response team within 48 hours to set up an initial meeting (Tennessee Department, 2010).

Companies have responsibilities that must be handled according to laws and regulations in their areas, but their obligation to their employees is just as critical. In every case represented in this study, the companies acted in a reasonably responsible manner to treat their employees fairly. It appears some companies could have notified the employees earlier that their job was in jeopardy. The exact point when this fact was determined was not apparent from the data. The company's bottom line is its main focus, and while they must answer to owners and stockholders, they must be a good corporate citizen and treat their employees with dignity and

respect. Room for improvement is always on hand, for there is no possible way to treat each individual employee exactly as he or she might desire.

Honesty was among the most common item mentioned in the survey responses. Only one participant in the design segment who suffered any job repercussions mentioned unfair treatment by the company. The operations segment had the most mentions of unfair treatment by an employer. None in either segment made statements regarding any hostile treatment or feelings concerning their present or past employer.

Based on responses received from the survey, treatment of employees was handled in an honest and fair method. There are always unusual circumstances, but in all the cases of this study the companies did better than expected.

Selection Criteria for New Positions Within Company

Companies have many methods to fill job vacancies, some of which are better than others. Most companies fill open positions from within the corporation before going outside to hire additional employees. In the case of automation special plans are undertaken to handle displaced workers to keep from having to terminate any employees.

The exception to this situation was in part determined by employee status in terms of where they stood concerning their job performance, attendance, work history, etc. Companies have ratings from yearly job performance appraisals and other similar evaluations. If an employee was placed in one of several categories, such as warning or final warning, he or she may be let go during an automation process as a means of handling the problem. As in any personnel situation, a case would have to be made to justify the termination, but keep in mind, a fairly simple solution is just to state the employee's job was no longer available. Any type of

automation process is a way many companies reduce the number of problem employees they have to deal with. However, it is not a given that employees terminated under these circumstances were done so because they were not good employees. Just the reverse is true. The vast majority of employees terminated were let go for the legitimate reason that the work was not there after the automation process was completed. Of all the responses received for this study, only one participant noted he was in a warning status.

Of the two categories of this study, operations personnel are usually the hardest to secure a new position in the company. Table 3 shows the differences in selection criteria between design and operations.

Table 3

Selection Criteria for Design vs. Operations Personnel

Category	Design	Operations
Specialized Skill	Yes	Yes
Satisfactory Work Status	Yes	Yes
Skill Rating	Yes	Yes
Number Employees Affected	No	Yes
Number Departments Affected	No	Yes
Size of Department	No	Yes
Exempt or Nonexempt	No	Yes
Number Positions Open	Yes	Yes
Number of Projects Available	Yes	No

Design participants can normally move from one area to another with little delay. Waterson (2002) states that operations personnel normally have more specific skills for the particular job they have been performing. This can cause problems locating similar positions to use their skills. On the job training is a must for most new positions. Employees who stay are given new training in line with the new jobs created by the automation itself. Others are sent to similar positions within the plant a different plant location within the company or are terminated. Design personnel are accustomed to designing and implementing a system then moving on to the next. They are familiar with changing gears to meet the demands of one project versus another as a normal part of their job. Operations people, on the other hand, are not used to this at all. Many are on production lines for years before moving to another job. This is why their skills become so specific, thus, making it harder to place them in other jobs. The study sent requests to participants in an almost equal field in terms of operations versus design. The largest response was from operations. Perhaps this was because design participants are not normally affected by automation projects, they did not see the need. Another aspect of selection involves those ready for retirement.

Retirement plays a huge role in the selection process. It can be looked at from several different viewpoints. Employees of retirement age or close are normally those with all the experience. Some have been waiting on a good deal or package from the company before leaving. For these individuals, it is a special deal. On two separate occasions in this study, employees of retirement age volunteered to retire and save the jobs of others. Another tried to do this, but the company would not allow it because of the huge amount of experience she possessed. Being somewhat upset about this decision being made for her, she decided to leave anyway. Because her department was directly affected by the automation project, they did end up

giving her the same package that everyone else received. During the automation project many times the designers will go to the experienced operations personnel to gain additional information concerning the operation of the process. At one time it was referred to as artificial intelligence data gathering, but has since been called a number of things. In any case the desire is to glean every bit of information they can from the employee before he or she leaves. This information was entered into a computer database to help set up computer controlled robots and other electronic equipment. A fair amount of resentment arose from these situations, with some refusing or only revealing a portion of their expertise.

Companies take advantage of everything when they have the option to move people around. While most tend to consider the employees up front, others wait until later in a project to consider them. In response to the survey question on this point, 65% said they were considered up front. Does this matter to employees? Very much so, it seems. No one wants to be an afterthought, but many felt they were just that. Comments along this line reflected some bitterness.

Benefit Packages

As companies automate processes they realize there may be a need to terminate some employees. This is not the first choice because they have a huge investment tied up in these individuals. Nevertheless, in some cases it cannot be avoided. To make the process a little more bearable, companies put together benefit packages to help displaced workers. This is not part of the retraining and on-the-job training given to employees who are moved to other jobs or those who move into newly created jobs in the automated process. These packages are offered to those leaving the company for whatever reason as a result of the automation.

Benefit packages contain various elements, but Table 4 shows items that are generally included.

Table 4

Benefit Package Elements

Name	Occurrence	Description
Severance Pay	One Time	Specified amount for each year of service
Vacation Earned	One Time	Normal pay for vacation earned, to date or saved from previous years (Carryover)
Life Insurance	Specific Time, 6 months to 1 year	Provided at current level for specified time
Health Insurance	Specific Time, 4 – 6 months	Provided at current level, normally short timeframe
Training Allowance	One Time	Highest amount \$5000
Retirement Center	Limited time, 4 months	Set up to help with transition, resume and interview skills, etc.

Benefit packages vary based on how many people are affected, company size, the actual area involved in the automation and other similar items. This may vary widely depending on the company itself and its location. Few details were expressed about the actual contents of benefit packages offered to participants of this study. Three of the four operations participants being terminated stated that they used most of the retraining dollars from their respective companies, with the largest being \$5,000 and the lowest being \$2,500. There were no participants from the design category because their jobs were not normally affected by the automation. They complete

the project, and then move on to the next one. Their only interaction with the operations side mainly concerned what the job entailed and what specifically would be affected in the automation of the process. Designers may have skills related to design and implementation, but when it comes to knowing the intricacies of the process and what really happens, they are dependent on operations. The operators may not always have the formal education, but they know what it takes for the process to run smoothly whether automated or not.

Specialized Training

Training can take on several forms as an automation project progresses through its life cycle. The designers require special training to familiarize themselves with new equipment, software packages, and the area affected by the project itself. Operations will need training in various formats depending on whether they will be integrated into the new process, moved to another job in the same or similar area, or moved to a completely new position within the company. If their job is terminated, their training requirements will be determined by other circumstances. These may include such things as: starting a new career, learning new skills to improve their chances of obtaining a new job in the same field, or learning new skills to qualify for a new or related field (Adkins, 2003).

Designers must be familiar with new equipment and how it is to be programmed and set up in the new process. This may require a formal training session with the vendor or some hands-on training. In some cases the designers placed on the project may have worked with the same type of equipment before. If this is the case, the learning curve will be much shorter. Once designers learn the basics, normally after a project or two, learning new software is easier as is learning the concepts of new equipment. Costs associated with this training are normally part of

the purchase price for equipment and software packages. It is also of a shorter duration because most of the learning takes place through actual use of the product. Designers are helped in this by the fact that this experience and knowledge is added to their portfolio. All design participants have over 15 years of experience, so this training was not a factor in the study.

Operations personnel are affected in different ways from designers. In most cases this is their first time going through a process of this nature. As mentioned above, their future depends on where they will end up when all is said and done.

If they stay with the new project, they will require some of the same training offered to the designers although not as detailed. Their experience with the old process will prove invaluable to the project team as the new process is designed and implemented. All but three of the operations participants said they had input concerning the existing process. One of the three was asked but declined to help knowing her job was being eliminated. The other two had input into the design, and one of them was kept after being told her job would be eliminated in the new process because of the interest shown in the project. This is unusual, but Ashley took a great interest in the project, stating it was interesting. Table 5 shows the training received by the participants of this study during the project or after the project to prepare them for new jobs.

Table 5

Participant Training Received As Result of Project

Type of Training	Participant Categories			
	Design		Operations	
	15 Participants		16 Participants	
	Training Received			
	During	After	During	After
Specialized Equipment	12		4	
Software	15		2	
Similar Job – Same Department			3	
Similar Job – New Department	13			5
Different Job – Same Department				1
Different Job – New Area				2
New Job – New Location	1			
Termination – Training Allowance		1		2
Termination – No Training Allowance				1

Most design personnel move on to the next project. The new project may require complete retraining on an entirely different type of equipment and software. Many are picked for their previous training and experience. When this happens they can move into the next project with a reduced learning curve. This creates the best situation for the new project and allows them to hit the ground running. If training is required, it may be less demanding, thus allowing the designer to move forward much quicker. Every now and then a new project comes along that requires many, if not all, members of the team to receive extensive training. This is not a surprise and is normally included in project plans upfront.

The next job for operations personnel is not so clear cut. Most require training in one form or another and it usually means their job duties are going to change. Many operations personnel are devastated when their job is changed by automation or anything else for that matter. Their skill set has evolved over time for the job they have been on for many years in most cases. To say they are resistant to change is very much an understatement. Those willing to

accept change fare much better when dealing with automation. Those unwilling to accept the change are more likely to be moved to jobs in other areas or out the door if nothing else is available. In the responses received in this study there was no clear indication of what led to staying in a similar job, moving to another area, or going home except the individual resisting the new system.

Employee Consideration as Part of Original Plans

All employees like to feel the company cannot go on without them, but this is not the case. Every participant in the study stated the employees were part of the original plans. Somewhat surprising, it does show that companies attempt to treat their employees with enough respect to keep them in the loop and give them as much information as possible.

After the Automation Process

The goal of the study is to determine how these employees are several years past dealing with the automation, after all has been said and done. Reports are heard where many people say they are worse and some acknowledge they are better, but in reality where do they really stand?

Many would argue over whether an individual is actually better off in life now, versus where he or she was before an automation project turned things upside down, but that is way beyond the scope of this study. It was anticipated that regardless of how disturbing the circumstances may have been at the time, that several years down the road most people are much better off. The first question coming from this statement is why would people feel this way after losing their job or being forced to move to another job, plant, or geographic location and start a new career or learn new job duties and skills? Once the initial shock is over and employees

realize the changes are imminent, they proceed to the new task at hand. Familiarizing themselves with their new surroundings, regardless of which avenue they went down, is a good start. Few people love change in their daily routines, but once they acclimate to their new environment they are well on their way to a new career (Young, 2009). In all but a couple of the participants of this study they realize that while it was tough at first their life has been improved in several ways that are discussed later.

It is not just the individual who is affected by automation. The families go through many ups and downs especially if the employee is moved to another location within the company or if the displaced worker has to seek employment elsewhere. Children changing schools, making new friends, leaving old friends and relatives are just a few of the changes. The parents are also affected because they must leave relatives and friends in the area. Spouses must abandon old routines, learn new areas, change licenses for new states, and update addresses just to settle into a new routine. In other words everything can change just because a company decided to automate a process to improve its bottom line. Most kids get through this with no problems, but others have a terrible time. Families may not be affected in the same manner as the employee, but they do have to undergo some life changing experiences.

Changing careers at any time is a nerve-racking experience, but when it happens later in life the emotional rollercoaster is harder to grasp. Its affects may be devastating to say the least. Of the participants who went through this ordeal, their comments indicated they felt better now, but they sure would not want to experience it again! The trauma thrown at the individual during this time is unlike anything most people will see in a lifetime. Learning new career skills is enough in itself, but some individuals in this study had to undergo moving to a new area and basically starting all over. According to Adkins (2006) learning new technology can be much

harder when pressure of a new career is already mounting. To achieve the new career much training would be required. This is discussed in the next section. In many cases the displaced employee may choose a completely new career field. Convincing a new company to hire a middle-aged person is no easy task. Displaced participants of this study fell into that category, requiring several years of retraining just to get companies to look at them. Two individuals completed requirements for a bachelor's degree and another did the same for his associate degree. All of these individuals consider themselves and their families to be much better off now than before. They also admit they would not want to go through the whole process again. That time in their life is something they would not wish on anyone, but they are glad they moved on to better things.

Use of Retraining Benefits

Retraining is a must for displaced workers if they want to re-enter the workforce. Workers staying with the company to work in a similar, or even a new role, would receive necessary training associated with the new assignment. However, displaced workers may be offered a benefits package that included retraining allowances. These vary not only by the amount but in how they will be received and the length of time they will remain available. Some companies do not allow any retraining monies. The smallest company represented in the study allowed \$2500 for retraining, while one of the largest allowed none. It is based on company policy and the employees have no say. The highest amount was \$5000, which in today's education costs does not amount to very much training. One participant did not use any of the retraining funds offered because she was so upset. By the time she decided what to do her time

had expired. She later went back to college and received her associate's degree. There was no clear cut reason for the companies who offered this particular benefit versus the one who did not.

Employee Success after Automation

Overall, participants in this study have fared exceptionally well in the time since the automation projects they participated in were completed. One design employee who was terminated recently completed a master's degree program and stated he feels surer of himself and feels the future is brighter for him and his family even with the poor economy the country is facing. With this one exception, most design participants moved on to other projects and many received promotions in the technical ranks. Of the 63 original participants, five were known to have moved into management positions. Oddly enough, none of these five individuals agreed to participate in the study. Only one bothered to respond that he didn't have the time. Designers play a completely separate role in automation projects.

Designers are involved in various aspects of how the project will affect the jobs of operations employees. This is a normal part of their job and most handle it with respect, as if it were their job on the line. Their basic role is to design, implement, and move on to the next project. Some come to the project early for the initial design, some come after the project is underway, and others come to clean up or close up as the project winds down. Design participants of this study represented all three of these scenarios. Jim stated it was extremely hard to deal with people's lives and he considered it the hardest part of his job. He further explained that as you go through these projects, you get to know the individuals who have been doing these jobs for years. Most are helpful and go into great detail of what must happen to produce products and please the customers. The next thing you know, they have been moved to another job, or

worse, out the door. It can lead to designers becoming hard and callous in their dealings with individuals, just so they don't get involved. It is the goal of all designers to grow in knowledge and experience from their work on every project. To get the good projects designers have to produce quality results in a timely manner. The designers did not play a significant role in this study because it is somewhat of a given that completing the project and moving on are a major aspect of their job on any given project. Therefore, to say all but one design participant is better off is of little surprise. This would result in less than one tenth of 1% faring better as a result of their design participation in automation project work. Operations participants were not expected to fare that well.

Operations employees are more directly affected by automation of their job. This could be attributed to several factors such as the lack of education, technical skill development, performing the same routine job for many years, or the lack of desire to learn new technology. Having done the same manual job for many years either on an assembly line or similar production process, operations employees become dependent on the job remaining the same. When automation comes along, many suspect their job will be eliminated and refuse to help, at least to a point. Having witnessed a similar experience, one employee refused to give any information to help the project team concerning the process that was being automated. This individual was given another chance but still refused, so he was immediately terminated. On another occasion an employee refused to cooperate at first. After understanding the consequences of his actions, he later decided to help. His cooperation led to him moving to a new job related to the new process. Of the operations participants in this study all were cooperative from the beginning. Sixteen operations people consider themselves better off as a result of the automation 5 years down the road. Just over 62% of these people feel they are a

great deal better off. This is due mainly to additional training they received as a result of the automation. Of these, 43% took the training as part of their new job in the plant, 32% did on-the-job training as part of the new automated process, and 25% participated in formal education classes as part of the benefits retraining allowance. It was unanimous from all operations participants that the initial shock of knowing you could or are losing your job is the worst part of the whole ordeal. Number two was deciding the next step, or what to do next, and third was actually coming to the realization of what just happened and moving on with your life. It was first thought something like this would only apply to those actually losing their job, but over 50% of those changing job duties commented about the stress concerning a new job. Naturally, those losing their job experienced the most pain, but now they seem to be the greatest benefactors. This is because they picked themselves up, learned new skills, and started new careers (Dychtwald et al., 2006). While there is no way to prove this assumption, the statement was based on the overall enthusiasm in their comments and the amount of comments returned in their survey. It was refreshing to read especially after sensing what they experienced during and after the project.

Success after project implementation is apparent for the vast majority of the participants regardless of the category they were a part of. Design and operations both fared well, but operations experienced the most stress resulting from the automation. However, the design team experiences a different type of stress as a result of deadlines placed on project team members during any given project. There is stress associated with the workplace regardless of the type of work performed.

CHAPTER 5

FINDINGS AND CONCLUSIONS

Introduction

Participants sent their responses to a survey based on their personal knowledge from direct involvement in the automation of a manufacturing or business process. The survey consisting of 12 questions was initially sent to 63 potential participants. These individuals were all over the age of 18 years and had been actively involved in a project to automate a process. Of the original 63 asked to participate in the study, 31 agreed and returned their responses to the survey questions in a timely manner. Their involvement was in one of two categories: 1.) Design – included their work as an analyst, engineer, area and project manager, or consultant; 2.) Operations – working in a normal capacity of the business or plant area undergoing the automation.

The design segment consisted of 15 responses representing various companies and project types. Company size was the only variable related to the place of employment for participants. Participant employment was designated as working for a small, medium, or large company. Analysts, as part of the design category, are able to give more details of initial projects, but plant workers, as part of the operations category, were more knowledgeable of process workings and open to expressing their thoughts and feelings toward what happened to them.

Survey Research Findings

This chapter relates the findings from the survey responses to the research questions posed in Chapter 1 based on the data analysis presented in Chapter 4. Project effects vary for each category of participants in the study. While input from project designers is important, emphasis is placed on plant operators and operations personnel perspectives relative to their experiences during the automation project. This perspective is required to answer the research questions. Every effort was made to provide confidentiality of each participant in the study. It was also critical that each participant understand this before responding to the survey. Participants were encouraged to respond in the manner most comfortable to them regarding the wording of their responses. Participants were also encouraged to write as much or as little as desired to express their thoughts and ideas on the survey questions.

Research Question 1

Do employees believe their personal well being is successful 5 or more years since the automation experience?

The initial note shown in Appendix B was sent to each potential participant and stated the researcher was interested in how they were doing after experiencing the automation. It was expected that most would say they were doing somewhat better. It was intriguing to note that 22 of the 31 participants expressed the point that they were doing much better than they thought possible. Overwhelmingly, the response given most often was indicated by a job where they were making more money, with 23 of 31 participants listing it as their measure of success. There was no mention of how much money was required to be considered successful.

The second most often response received as a means to being successful was to have a job that was enjoyable and rewarding. Details were not given as to the exact meaning of rewarding, but several mentioned they enjoyed going to work and looked forward to the day's events. Eight of the participants also mentioned that their success would not have been possible if the automation of their original job had not forced them into preparing for a new role either in a similar or completely new career.

The third most notable response was that their success was aided by the fact that they feel like they are a more important part of the company. This was not a part of any survey question, but seven of the participants noted this aspect in their response. It was also noted that this came about as part of their training for a new position and the enhancement that was felt as being more important to the company's overall success. One participant went so far as to say that he realized no one was indispensable and he would not make the mistake of falling behind in his job interest. People want to think they are better off now than they were a few years ago, but the participants had a real wakeup call in their life a few years ago. Most do not want to ever think of having to experience something like it again but feel they would be better prepared the next time.

Two participants who were fortunate enough to have kept their jobs said this was their biggest motivation for picking up some college credit for related training. They did not comment on whether they would complete requirements to receive their college degree. Everyone measures success in different ways, but as revealed by the data analysis presented in Chapter 4, the overwhelming manner to achieve success is to be gainfully employed in a job that you enjoy going to each day.

Research Question 2

What factors do employees identify as being the biggest help in allowing them to be successful with their life?

Eighteen of the 31 participants responded that their success could be attributed to their retraining efforts. Whether it consisted of on-the-job training, formal training in a company classroom setting, or in a college setting, training was the biggest help. Surprising is that 6 of the 15 design participants stated it was a big factor in their moving to better projects and ultimately receiving a promotion. Four of the operations participants stated it was a do-or-die situation for them, but all are grateful for the opportunity offered them. Comments did mention some concerns over learning new technology at their age. Two also commented about their surprise to find they could learn, even if it came to them at a slower pace than in their earlier years.

The second most common response was the help and support of God and their family. Support from God in an individual's life is priceless in this situation. This support system proved invaluable to 12 of the 31 participants. Families are an important aspect to any endeavor of this type. One family that relocated to another state related their experience of moving similar to that of moving to a foreign land. In a short time, once the family got adjusted, it seemed like home. We are a family oriented country, and it was evident as comments backed up the fact that it was family who helped the employee get motivated to move on with their life. It is easy to say what each person should do, but until we have been in that situation, we cannot say what we would do.

Research Question 3

What factors do employees identify as barriers to success after the implementation of the automation process?

Barriers to a process that upends your entire life could be many, but the overwhelming response was lack of communications. This seemed to be involved in every aspect, especially before official statements were made concerning what would happen concerning jobs. As society goes, so goes the rumor mill, which has a way of making people comfortable in one way and very uncomfortable in others (Musser, 2007). Many times the realization that rumors are just rumors comes too late as emotions have already taken their toll. Eleven of the 31 participants said they could have handled the news better if they had known earlier exactly what was going to happen. Of course, this is just a guess because there is no way to know how one will handle news of this sort in a given situation. Ten of the 11 participants were from operations, which is understandable because they are directly involved in any reshuffling of jobs in the area.

The second most common response to barriers concerned age. Twenty eight of the 31 participants stated age was a factor in training. Frustrations stemming from mid-career workers increase as age increases as do expectations (Dychtwald et al., 2006). Most people enjoy learning about new technology when it is something they have an interest in. This is not always the case when it is job related. Age has a way of making things harder to absorb and recall. It was not the fact that they were going to have to go back to school, so to speak, but the realization it would take longer to grasp the material. Their comments appeared that this barrier was not nearly as bad as first expected. All participants have settled in to their new lives almost as if nothing ever happened.

Third on the list of most common barriers was the fear of the unknown. Six participants said not knowing what would happen with their job was the worst part of the entire process. Having to guess, wonder, and worry about what was coming was a horrendous thing to endure. One participant stated after going to her management, she knew no more than she did when she

went in. Actually, this was management doing a great job, because by telling one person, others would have gotten involved and this would have resulted in a nightmare for the company, or at least the area involved in the automation. These participants were from operations and were concerned for their livelihood, just as anyone would be.

Research Question 4

Do employees take advantage of benefits offered them as part of the automation process?

Benefits offered during the automation were limited to employees directly affected by the elimination of their positions. Those who were retained in the new automated jobs or moved to jobs in another part of the same area, or even moved to another department, were trained for their respective job as part of the overall project costs, at least in part. For those moving to another plant or geographic location, they were allocated certain moving expenses associated with the move and allowed retraining benefits as required. However, those who were displaced or terminated received a different benefit package. In some cases they were given a severance package consisting of a few weeks pay and pay for earned vacation only. Others were offered health, dental, and life insurance for a few months (4) with the option to continue in a different rate structure at the end of that period. Two of the four participants who were terminated were offered \$2500 to \$5000 for retraining. Both of these individuals took advantage of the offer and used this money to enhance their formal education. The other individuals also pursued further training with grants and loans through the federal government and community colleges.

Company Size

It was originally expected that larger companies would take better care of their employees when affected by automation. While all companies took care of those remaining with the company, it was not true of those being terminated. The company offering the best benefit package for its employee was a small company, while the company offering the worst was a large corporation. It is beyond the scope of this study to determine why such drastic differences occurred. Variances in company offerings were perhaps due to the economy or the financial condition of the company.

In reality it is the corporate culture that exists in the company itself that determines what kind, if any, benefits package will be offered. Most companies state their employees are their biggest and most valuable asset. Some are willing to back that up, while others just say the words and leave it at that. How the bottom line is viewed determines whether a company backs its employees or just settles to make the most money at their expense.

Final Thoughts

This study started out to determine how employees made it through the ordeal of losing their jobs as the result of the automation of a process. However, it ended up with the reality that companies strive to keep their employees if at all possible. This does not mean that those employees who stayed did not overcome some pretty insurmountable tasks during the ordeal. Studying the responses and communicating with some of the individuals about their responses was very enlightening. It was expected that most in the operations category would say they are doing alright, but it was a joy to discover that they have moved on to be successful in various ways. Somewhat surprising was their desire to discuss the various aspects of on-the-job and

formal training for new positions. The realization of what had happened was not the end but a new beginning. Overcoming adversities was something they had to deal with in whatever manner worked best for each individual. The survey was designed to elicit each individual's perspective regarding the subject of the study. Obtaining adequate information to complete this study was the goal. Timing appeared to be excellent for the participants as they wanted to express their concerns in detail for each of the twelve questions.

The biggest learning was that company size did not play a major role in how employees were treated. It is also good to note that employees did not hold a grudge toward the company because they have many friends still employed and they are happy for them.

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APPENDICES

APPENDIX A

Participant Survey Form

EAST TENNESSEE STATE UNIVERSITY THESIS SURVEY Daniel L. Lawson

Introduction

I am currently working on my Research Thesis at East Tennessee State University. The research project is entitled: Automation and its Effects on the Workforce. I am seeking input concerning your workplace experiences involving the automation of a process or job that you were directly involved in. By completing the following survey, you agree to participate in my thesis research. Your identity and company affiliation will be maintained with the strictest confidence at all times.

Description

Please type your thoughts and ideas for each question listed below. As you type your response below each question, the space will expand as needed.

Participation

Your participation is strictly voluntary. If you decide not to participate, please respond to the email address shown in the contact information.

Contact Information

Do not hesitate to call me if you have any questions or concerns.

Name: Danny Lawson
Phone: 423-323-1787
Email: dllawson@northeaststate.edu

Please accept my sincere thanks for helping me with this endeavor.

1. Briefly describe the automation taking place within your company, including the approximate number of employees affected, the time required to complete the automation process, and your assessment as to the automation's success.
2. What input did you provide during the planning phase of the project?
3. What upfront information were you given relative to the project's affecting your job?
4. From your perspective, how were employees treated concerning the effect it would have on their jobs?

5. Explain how the automation affected employees in terms of reduction in force or employee terminations.
6. How were employees who were moved to other areas within the company selected/relocated in terms of job types, pay grades, job openings, and higher paying jobs?
7. Describe any benefit package you were provided that enabled you to receive specialized training in order to apply for a better position.
8. Describe any “on-the-job” training provided for new jobs created by the automation process.
9. Explain your feelings concerning the manner in which the company treated you as a result of the automation process.
10. Express your opinion as to whether employees were considered part of the original automation plans or as an afterthought.
Original Plans:
Afterthought:
11. Now that some time has elapsed since the process, describe whether your situation is better or worse in terms of your career, life, family, etc., considering the financial aspects and job responsibilities you have now prior to the automation process.
12. What percentage of any retraining benefits did you use? (None – 0% - All – 100%).

APPENDIX B

Email Sent with Survey Form to Potential Participants

From: Lawson, Daniel L [mailto:dllawson@northeaststate.edu]
Sent: Monday, September 13, 2010 2:50 PM
To: Thesis-List
Subject: Danny Lawson - Thesis Help

I am working on my Master's Degree at ETSU, currently trying to complete my Thesis and very hopeful of graduating this December. I spent most of the summer trying to obtain approvals from my thesis committee and the Institutional Review Board (IRB). Finally this morning I received the last one.

The title of my Thesis is: "Automation and Its Effects on the Workforce". I need your perspective from having been on a design/development team, as well as, from the operations side of an automation project that was completed at least 5 years ago. It does not matter what project it was, I just need your input in the next couple of weeks or as soon as possible. Please give me your honest thoughts and ideas concerning your experiences with the automation. My thesis has to be completed and ready to route for approvals by the first week in November.

The thesis document will not use real names or any means of identifying you with your company. You will be listed with a first name (pseudonym) only and companies will be referred to as small, medium or large. Therefore, there is no way you can be identified or tied back to the company you work for. When I receive your response, I will assign the pseudonym and your original reply will be deleted. After a few weeks, I won't remember who said what, probably more like a few days.

I would greatly appreciate your help with this short survey. It consists of 12 questions. You can write as much or as little as you wish. Just give it your best shot and I'll take it from there. Send your response to dllawson@northeaststate.edu.

If you don't want to participate, please let me know so I won't hold things up waiting for your response.

Thanks Again!!!

Danny Lawson

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VITA

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