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By Regena LaFaye Scott

Entitled Perceived Effectiveness of Supply Chain Management and Workforce Education and Training

For the degree of Doctor of Philosophy

Is approved by the final examining committee:

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For the degree of Doctor of Philosophy

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PERCEIVED EFFECTIVENESS OF SUPPLY CHAIN MANAGEMENT AND WORKFORCE EDUCATION AND TRAINING

A Dissertation

Submitted to the Faculty

of

Purdue University

by

Regena L. Scott

In Partial Fulfillment of the

Requirements for the Degree

of

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Special thanks to my family and friends
who have believed in me, encouraged me and wouldn't allow me give up
when I really wanted to. You have been my strength and I love you!!!

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ABSTRACT

Scott, Regena L. Ph.D., Purdue University, August, 2010. Perceived Effectiveness of Supply Chain Management and Workforce Education and Training. Major Professor: Edie K. Schmidt.

Using a qualitative comparative analysis as the interpretive approach, this research investigation examined the perceived relationship between the effectiveness of supply chain management and workforce educating and training. Participants in the study included decision-makers from various industry types, sizes and locations throughout the United States. These participants took part in one-on-one interviews that attempted to address the following research questions:

1. What is the perception within the organization of supply chain effectiveness?
2. Does a well-educated and trained workforce play a significant role in the organizations success?
3. Does the leadership communicate commitment to education and training?
4. Is there a perceived link between a well-educated and well-trained workforce and the organizations success?
5. Is the workforce more likely to be innovative, productive, and engaged in problem solving when company leadership openly communicates and rewards their accomplishments?
6. What is the significance and role of maintaining a high-performance workforce in a competitive global economy?

The analysis of data included the one-on-one interviews and flow-up surveys responses that resulted in meaningful clustering of research related

themes. These themes included supply chain effectiveness, workforce education and training, leadership communication and commitment, the perceived link of education and training and organizational success, problem solving and rewards and the competitive global economy. The outcomes of the study provided confirmation of the significance of both supply chain management effectiveness and education and training in industry sustainability and success. This contribution includes a listing of industry implications and recommendations, as well as suggestions for future research studies.

CHAPTER 1 INTRODUCTION

This chapter provides an overview of this research study and the overall document. This chapter will also discuss the significance of the research, define the scope and purpose of the research, and introduce the research questions, delimitations and limitations. This chapter will conclude with an overview of the organization of this project.

1.1. Overview

As the global marketplace continues to expand, the challenges associated with remaining a competitive business force have increased. Possibly one of the most significant challenges is that of finding, hiring and retaining a strong workforce that has the right combination of education, experience and skills necessary to stay ahead of the competition. Hiring a workforce that is prepared to meet the challenges inherent in being competitive is a pro-active step in the direction of achieving a sustainable competitive advantage. “Rapid change and increased international competition place the spotlight on the skills and preparation of the workforce, particularly the ability to adapt to changing technologies and shifting production demands” (Karoly & Panis, 2004).

Education and training are two key characteristics of a successful organization. For the purpose of this paper, education is defined as: “…that form of pedagogy that is provided at the pre-baccalaureate level by educational institutions, by private business and industry, or by government sponsored, and community based organizations, where the goal is to increase individual opportunity in the labor market or to solve human performance problems in

organizations" (Gary & Herr, 1997). Training is defined in the following way: "Training can be defined as a planned and systematic effort to modify or develop knowledge, skills, and attitudes through learning experiences, to achieve effective performance in an activity or range of activities" (Garavan, Costine, & Heraty, 1995).

Under-performing workers, those doing just enough work to meet the job requirement will not sustain a successful organization in a global economy. Rapid changes in technology, global competition, and dealing with a smarter more demanding customer base is altering the way business is conducted. Having the full commitment of a team of competent employees facilitates the likelihood of being successful in a global business environment when they are able to maintain and utilize an assortment of job skill expertise and knowledge necessary to identify and implement innovative improvements after effectively assess and measure outcomes, and who will use their knowledge to solve complex problems. Employees with this kind of vision are the catalyst necessary to take business organizations to new levels of success.

Competing in the global economy requires the commitment of a workforce that is educated, well-trained and thoroughly involved in every aspect of the work process. Unfortunately, companies are finding it difficult to find educated and motivated employees. A *2005 Skills Gap Report* conducted by Deloitte Consulting paints a bleak portrait of the state of the manufacturing workforce: "The picture that emerges is both more complex and more disturbing than in the past, because it exposes a broadening gap between the availability of skilled workers and the employee performance requirements of modern manufacturing" (Eisen, Jasinowski, & Kleinert, 2005).

In the same way modern manufacturing is affected by changing technology the need for educated and well-trained employees increase. The authors went on to express the following concerning the skills shortage:

- The skills shortage is expansive, it cuts across industry sectors and the shortage is impacting more than 80% of the interviewed companies
- Skill shortages impact productivity and the ability to keep up with the demand
- 75% of survey respondents report an increase in the need for a high-performance workforce because of the skill gap to compete in the global economy (Eisen, Jasinowski, & Kleinert, 2005).

Rapid transformations of business environments coupled with constant changes in demands and customer expectations necessitate maintenance of a workforce that is prepared to be responsive to these changes. Where once there was an abundance of willing and talented workers in the United States, we are now fighting to catch up with an expanding and well-prepared supply of international labors, many of whom received their education in the U.S. Without taking considerable actions to educate and train U.S. workforce, the skill shortage will continue and companies will struggle to meet the demand to find, hire and retain talented personnel.

Education and training are instrumental elements for success in the workplace. “In a study on the economic benefits of the workplace, 98% of employers reported that with Workplace Education Programs, employees gained at least one skill and there was at least one organizational benefit” (Bloom & Lafleur, 1999). Acquiring just one additional skill does not sound like much but one new skill or new bit of knowledge multiplied by the number of learners will result in an increase in productivity and will enhance success.

In a 2001 the National Association of Manufacturers (NAM) membership survey was conducted for the purpose of identifying a common set of education and skills that members believed were necessary for the workforce to have if they were to be successful in the manufacturing industry. The following is a breakdown of the results of the study:

A. 64.2% were skills specifically necessary for a particular job
B. 54% computer skills
C. 39.6% continuing education for technical and professional personnel
D. 37.1% certification training for various technical degrees and licenses
E. 33.5% teamwork and leadership education and training (NIFI, 2007).

Identifying the right education and skills it is not enough on its own. The NAM survey also talked about the importance of leadership commitment. In order to facilitate a strong successful workforce leadership needs openly and regularly demonstrate and voice their commitment providing opportunities for employees to access development. Of the companies responding to the NAM survey, 60.6% offered tuition reimbursement for undergraduate, graduate, and certification training. Employee benefits such as these that receive expressed support from leadership are among the enticements that help retain workforce talent.

When leadership says they believe in education and training then back their work with action, the workforce gains confidence to become problem solvers and make improvements that contribute to the overall success of the business. Noting the broader reaching significance of workforce contributions, Mansfield and Mitchell (1996) state; “Employers in modern enterprises are not so short-sighted as to deny the contribution of broader-based education to the quality of their workforce” (pg. 4) and “…management to the quality assurance models which place the competence of people and their contribution at the center of organizations success” (pg. 100). Education and training enhances the ability of the workforce to make daily and long term contributions to the overall goals and objectives and adds benefit through positioning the company to be business leaders.

1.2. Research Background

In 2006 Accenture, a global management consulting, technology services and outsourcing company, released a research report entitled *The High-Performance Workforce Study 2006.* Study researchers reported that "…without a superior ability to address key workforce concerns such as employee recruitment and retention, leadership development, and workforce performance and productivity, companies will struggle simply to remain competitive and likely find high performance and market leadership to be elusive goals" (Balaguer, Cheese, & Marchetti, 2006). High-performing employees recognize their role in the organization and how their efforts will be encouraged and rewarded. They want to be assured that they will have opportunities for advancement and reward by a strong leadership team that is committed to recruiting and hiring the best possible workforce. "As leaders we often underestimate the power of commitment, there is something powerful about being committed, I mean being truly committed to a cause, to a vision or to a meaningful purpose" (Ambler, 2008). Leadership has the daunting responsibility of providing leadership that sets the pace, defines the vision and determines meaning for the workforce. It is also important that leadership actualize their commitment to the workforce by consistently communicating their expectations, goals, and objectives for the company and each employee.

Demonstrating commitment from the top of the organization to the bottom and across the supply chain is a key to the workforce success. Leadership that is in sync, stable and that reflects a united portrayal of partnership will inspire a high-performance workforce to excel. The United States Military's leadership is a prime example how changing from the perception of being dysfunctional and unorganized bureaucracy to one that appears to have a single purpose and oneness that changes the organization. In 2008, the United States Department of Defense (DOD) began adoption of a single organizational framework (SOF) approach as part of their effort to communicate a united focused military leadership that was moving in a common direction (Solis, 2008). Adopting such

an approach changed the perception, both internally for those in various military branches and in the face of the public. Cohesive leadership is a good indicator that an organization is on the right track toward success. “Even the weak become strong when they are united” (Von Schiller, n.d.), a SOF creates, at the very least, the perception of strength and a sense of organizational purposefulness.

Blackwell & Blackwell’s (1999) traditional supply chain (Figure 1.1) is a prime example of a model for an SOF. The SOF model unites members from different organizations, companies, and departments, into a single focused, cross-functional decision making organization. “Joining together to accomplish a single purpose or goal…a single organizations framework is critical to successful transformation in both the public and private organizations” (Solis, 2008).

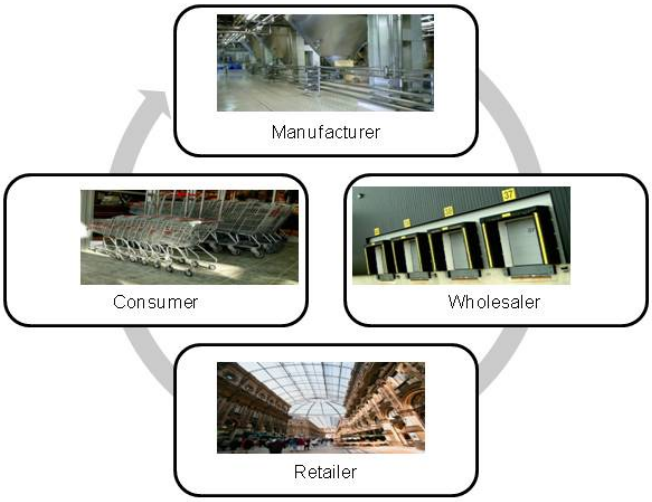

Figure 1.1 Traditional supply chain (Blackwell & Blackwell, 1999)

SOF, high-performance work teams and leadership commitment and communication are central elements for company success. Desired outcomes for this research included an investigation into the perceived effectiveness of the supply chain and the significance of a well-educated and trained workforce as

they pertain to increasing the ability of the supply chain to contribute to the success of the organization and to enhance the company's competitive business advantage. In addition, this research desired to gain insight into how leadership commitment and communication encourages workforce engagement and responsiveness to company goals and objectives.

1.3. Statement of the Problem

Education and training go a long way toward put the workforce on solid competitive footing. Global business competition has intensified discussions around the need to hire and maintain a high performing workforce. A high-performing workplace is defined as one that "…focuses on increasing people's influence on a business, as well as the impact of processes, methods, physical environment, and technology and tools that enhance their work" (Burton, et al., 2005). High performance employees can influence the success of their business environment.

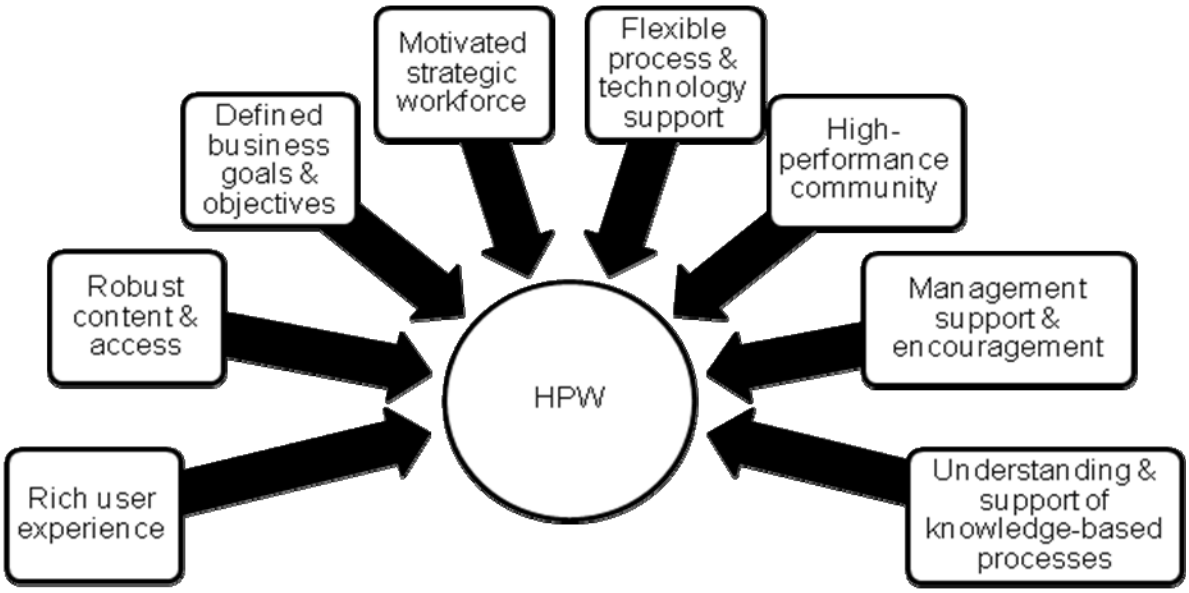

Figure 1.2 Key requirements for a high-performance workforce (Burton, 2005)

Each of the elements contributing to a high-performance workplace is equally important. In order to maintain a high-performance workplace each key requirement plays a significant role in workplace success (Figure 1.2). Management support and encouragement, understanding and support of knowledge-based processes, defined business goals and objectives, and a motivated workforce are all contributors to a high performance workplace. Education, skills and training development strengthens the workforce making that workforce stronger as they learn general skills, become better problem solvers, more innovative and creative.

The problem to be researched in this project is to; assess the perception of the effectiveness of supply chain management and workforce education and training as it applies to the sustainable competitive business environment. The purpose of the research was to gain insight into whether education and training related to supply chain management has an impact on how well the workforce-performs. In addition, how does education and training contribute to the company's long range business success? In order to address these issues, interviews were conducted with decision-makers from business management in a variety of industries. For the purpose of this research, decision-makers are those individuals who were in management or project leadership positions for the company at which they work.

1.4. Research Questions

This research focused on the decision-makers perception of supply chain effectiveness and the role of well-educated and trained workforce. Several questions were examined over the course of this study including:

1. What is the perception within the organization of supply chain effectiveness?
2. Does a well-educated and trained workforce play a significant role in the organizations success?
3. Does the leadership communicate commitment to education and training?

4. Is there a perceived link between a well-educated and well-trained workforce and the organizations success?
5. Is the workforce more likely to be innovative, productive, and engaged in problem solving when company leadership openly communicates and rewards their accomplishments?
6. What is the significance and role of maintaining a high-performance workforce in a competitive global economy?

1.5. Definition of Research Terms

For the sake of clarity it was important to define the terms used in this research within the specific context of this research. The following terms were defined as they apply to this research:

Basic education: At a minimum, math, English reading and writing, and problem-solving are the basic skill requirements that were most often identified as being the necessary tools for industry employment in the United States (Blundell, 1999).

Business education and training: the acquisition of knowledge, skills, and an increased understanding of the information necessary to enhance the proficiency of the workforce member and improve ability of the workforce members' ability to become engaged in and contribute to the success of the organization. "…is distinguished from formal school and post-school qualifications (which are viewed as education) and is generally defined in terms of courses designed to help individuals develop skills that might be of use in their jobs" (Blundell, 1999).

Education: "…that form of pedagogy that is provided at the pre-baccalaureate level by educational institutions, by private business and industry, or by government sponsored, community based organizations, where the goal is to increase individual opportunity in the labor market or to solve human performance problems in organizations" (Gary & Herr, 1997).

Global supply chain agility: “We define global supply chain agility as a measure of the supply chain’s ability to efficiently adapt to a rapidly changing global competitive environment to provide products and/or services” (Swafford, 2000).

High-performance workplace: “…focuses on increasing people’s influence on a business, as well as the impact of processes, methods, physical environment, and technology and tools that enhance their work. To be successful, balance investment, business goals, and values” (Burton, et al., 2005).

Human capital: “…investments involve an initial cost (tuition and training course fees, forgone earnings while at school and reduced wages and productivity during the training period) which the individual or firm hopes to gain a return on in the future” (Blundell, 1999).

Industry: “…any business that produces goods or provides services; the work and related activity in factories and offices; all organizations involved in manufacturing” (Simon & Schuster Inc., 2009).

Perception: “…mental grasp of objects, qualities, etc. by means of the senses; awareness; comprehension…insight or intuition” (Guralnik, 1984).

Traditional Supply Chain: “…a set of firms that passes materials forward. Normally, several independent firms are involved in manufacturing a product and placing it in the hands of the end user in a supply chain-raw material and component producers, product assemblers, wholesalers, retailer merchants and transportation companies are all members of a supply chain” (Guralnik, 1984).

Training: “Training can be defined as a planned and systematic effort to modify or develop knowledge, skills, and attitudes, through learning experiences, to achieve effective performance in an activity or range of activities” (Guralnik, 1984).

Supply chain management: "…the integrated planning, co-ordination and control of all business processes and activities in the supply chain to deliver superior consumer value at minimum cost to the end-consumer while satisfying requirements of other stakeholders" (van der Vorst, 2002).

Workforce development: "Workforce development is the coordination of public and private sector policies and programs that provides individual with the opportunity for a sustainable livelihood and helps organizations achieve exemplary goals, consistent with societal context" (Jacobs, n.d.).

Workforce education: "…that form of pedagogy that is provided at the pre-baccalaureate level by educational institutions, by private business and industry, or by government sponsored, community based organizations, where the goal is to increase individual opportunity in the labor market or to solve human performance problems in organizations" (Gary, 1997).

1.6. Delimitations

All research comes with degrees of unpredictability. Not every point of interest was explored in the course of conducting this research and there were unexpected results and findings. Planning for every eventuality is not possible, but it is possible to be prepared for them. The following are the detailed descriptions of the delimitations that were identified for this study.

Access to decision-makers: The interviews for this research were conducted with decision-makers from an assortment of industries including, aerospace, marine shipping, engine turbine manufacturers, and large equipment manufacturers. Dealing with this broad variety of industries and the business community made it difficult to accurately determine the number of potential participants in advance. The next issue became gaining access to these decision-makers had its challenges including making initial contact. It was often necessary to work through a third party

acquaintance of the decision-maker. This caused an additional delay in making interview arrangements. Once contact was made, the challenge was to coordinate the time and location. Time zone differences, work and travel schedules were often difficult to arrange, however each of the participants were eager and willing to work to find amenable solution to any problems that may have arisen.

Direct knowledge of supply chain management, education and training: Determining the knowledge base of the participant's in advance was also problematic. Though the decision-makers were at a level of management that would suggest they would understand the activities of the organization, there is no guarantee that their familiarity with supply chain management, education and training and their ability to respond to the interview questions would be sufficient. Decision-makers are not always as informed of the details and the effect they have down through the levels of the organization.

1.7. Limitations

Limitations are those restrictions or bounds that the research places on the project in order to narrow the scope of the study. Using a qualitative research methodology to attempt to identify the perception of the effectiveness of the supply chain and the effect of the educated workforce opens the collection of research to a plethora of additional areas of research. Therefore, it is important to limit the scope of the research to maintain control of the study. The following represent some of the limitations identified in this project:

The number of participants: Controlling the number of participants in this study was necessary to limit the scope of the data collection. Access to decision-makers had a direct relationship to the number of participants. Though potential resources were vast there was no way to predetermine the availability, willingness to participate and applicable knowledge of

supply chain management of the individual. These uncertainties made it difficult to accurately determine in advance the number of participants. The number of participants also depended heavily on the researcher's ability to coordinate interview sessions with key management level decision-makers in a timely manner. It is often the case that the schedules for senior level, decision-makers are tight making it difficult to find time for what would be considered extracurricular activities.

Information focus: It quickly became clear that the topics of supply chain management, education and training were broad and represented a wide assortment of possible directions for future research therefore it was essential to limit the scope of the research to focus on the perception of the effectiveness of the supply chain and a well-educated and trained workforce.

Budget and time concerns: Budget and time to conduct this research was limited. Determining the most expedient and efficient processes for completing the research was important. When time and location were not prohibitive interviews were arranged to be conducted at an agreed upon location, often the interviewees office. These locations were generally within driving distance however when distances was an issue the interviews were conducted via telephone and recorded using a digital recorder. Administering interviews via telephone saved time and money but the data was not as expansive as that collected in face-to-face interviews.

1.8. Potential Significance

Business expansion into the formally untapped international markets has dramatically changed the landscape of the marketplace. Supply chain partnerships and collaborative relationships are rapidly recreating the approach taken in the business community. In 2005, IBM hosted a supply chain management executive conference for a group of sixteen supply chain

management executives from retailing, high technology, automotive and manufacturing industries. Collectively, these companies represented revenues in excess of $400billion dollars, with more purchasing power than 205 of the world's 232 nations and a combined workforce in excess of 3 million people (IBM, 2006). In his opening remarks, Bob Moffat, IBM's Senior Vice President of Integrated Operations, made the following observation: "The force of globalization and commoditization in today's business world are unstoppable…Globalization and commoditization have created a challenge for a company that is as touch as it is clear. How to cut costs and grow simultaneously" (IBM, 2006)?

1.8.1. Global Competition

Companies worldwide face a growing need to be better at what they do while doing it faster, for less money, deliver a product of superior quality and satisfy to a consumer population that is more knowledgeable and therefore more demanding. In response to these changes in the business environment, the 1990's experienced growth in the number of cooperative business partnerships, alliances and international supply chains teams. Companies that functioned as rivals are now intermingling in order to be more efficient and globally competitive.

The automotive industry is one of the most striking examples of the effects of building an effective supply chain. Perhaps the most notable examples were the partnerships between Toyota and Nissan in 2002 (Nguyen Huy, 2004) and between Toyota and Ford in 2007 (Lee, 2008). Competition in the automobile industry has always been intense. American car manufacturers had dominated the industry until the late 1970's when Japanese auto manufactures began delivering cars and truck to America that exceeded the quality and cost expectations of American consumers. These partnerships united the best features of each of the partners then streamlined the processes in a way that improved quality, controlled costs and in many cases, saved product lines and jobs.

These seemingly unusual marriages of competitors focused their efforts toward achieving mutual success. Corporate cultures that were once at odds merge to structure new entities with a distinct culture. Effectively managing and preparing the supply chain plays an essential role in supply chain success. This research examines the perception of the effectiveness of supply chain management and provides useful information about the current state of supply chain management effectiveness as well as insight into the future of supply chain.

1.8.2. Human Capital

Human capital is another fundamental aspect of competing in a global market. Having a workforce made up of the right people at the right time is an essential element of success. Managing and preparing human capital to compete is the key to meeting the challenges inherent in competition. Educating and training the workforce is a considerable ingredient of preparing to meet domestic and global competition.

> "Shifts in the nature of business organizations and the growing importance of knowledge- based work also favor strong non-routine cognitive skills, such as abstract reasoning, problem-solving, communication, and collaboration. Within this context, education and training become a continuous process throughout the life course involving training and retraining that continues well past initial entry into the labor market" (Karoly & Panis, 2004).

The pace of industry competition in the global environment is most often fueled by technology changes. "Rapid change and increased international competition place the spotlight on the skills and preparation of the workforce, particularly the ability to adapt to changing technologies and shifting product demand" (Karoly & Panis, 2004). Advances in

technology fields such as information technology, nanotechnology, and biotechnology power the need to find a highly skilled and well-prepared workforce.

1.8.3. Impact of Technology

The new technology workforce paradigm underscores a new skill set. Production workers know how to program the technology-controlled milling machines in order to maximize production rates. Quality control-managers proficiently retrieve, evaluate, and apply system data, track and resolve quality products identified the traits for employees of the new workforce paradigm as follows:

1. Knowledge and the ability to use applied and technical skills
2. A commitment to the organizations' collective aims, goals and objectives
3. An understanding of the importance of embracing and practicing cooperation through collaborative relationships
4. Employees who look for creative and innovative solutions to problems as a means of serving overall supply chain needs (Karoly & Panis, 2004).

Hiring and retaining a high quality, innovative and knowledgeable workforce continues to be challenging but in the end, a worthwhile endeavor. "U.S. industry organizations spend $109.25 billion on employee learning development annually, with nearly three quarters ($79.75 billion) spent on the internal learning function, and the remainder ($29.50 billion) spent on external services" (Healthfield, 2007). Spending of this magnitude represents a clear commitment to developing the company's human capital. The return on investment (ROI) on the education and training investment is an enhanced, more committed, creative, and productive workforce.

1.8.4. Measuring the Education and Training Investment ROI

Measuring the ROI for education and training is not easily quantifiable due to the inability to accurately assess what the learner actually retains. Attempting to ascribe accurate measurements to the ROI of education and training is more likely to create questions about the value-expectation of a company's education and training efforts than it is to provide useful information about the effect of education and training. As applied to the industry value-expectations, the ROI of education and training fall into two general categories:

1. Tangible returns are entities that can be touched. They are real objects, with material value and practical worth.
2. Intangible returns are elusive. They cannot be touched or seen and they are difficult to define, yet they contribute value and significance to the organizations' bottom-line.

1.8.5. Human Tangible Value

The perception of the effectiveness of education and training is primarily valued when the results are tangible. For example, if a recently hired biotechnology major from MIT finds a breakthrough cure for cancer that has market value, or if a mechanic returns from a three day training session with new product-skills and makes an improvement to a precision tooling device that increases the efficiency of the tool, saving time and money. Tangible results are easier to promote because they can be touched and seen.

Intangible values are no-less important, nor less consistent with the value-expectations of the organization. Intangible contributions are behaviors that are arguably as significant to the company-bottom line. Intangible behaviors are more closely aligned with the personal contributions made by the individual. For example, an intangible value of

education and training might materialize in the form of process-improvement training or management skills.

Education tools such as these are valuable learning experiences, from which the engaged employee is able to make valuable contributions to the organizations success. Yang (2007) created a two-branch conceptual model of intangible value contributions, consisting of human and structural intangible values (Figure 1.3). Human intangible values include competencies, attitude, and intellectual agility. These values would be considered intangible until they were converted into actions that yield results.

Structural intangible values are values that may never have an obvious value connection, but are equally important. Structural intangible are relationships, organization that may include process improvement, management reorganization, and/or reporting restructuring; renewal, identifying new product direction, or changing the look of the building; and development, education and training. Human and structural values are personal and therefore they are important in that they are things that engage employees and keep them coming back to their jobs.

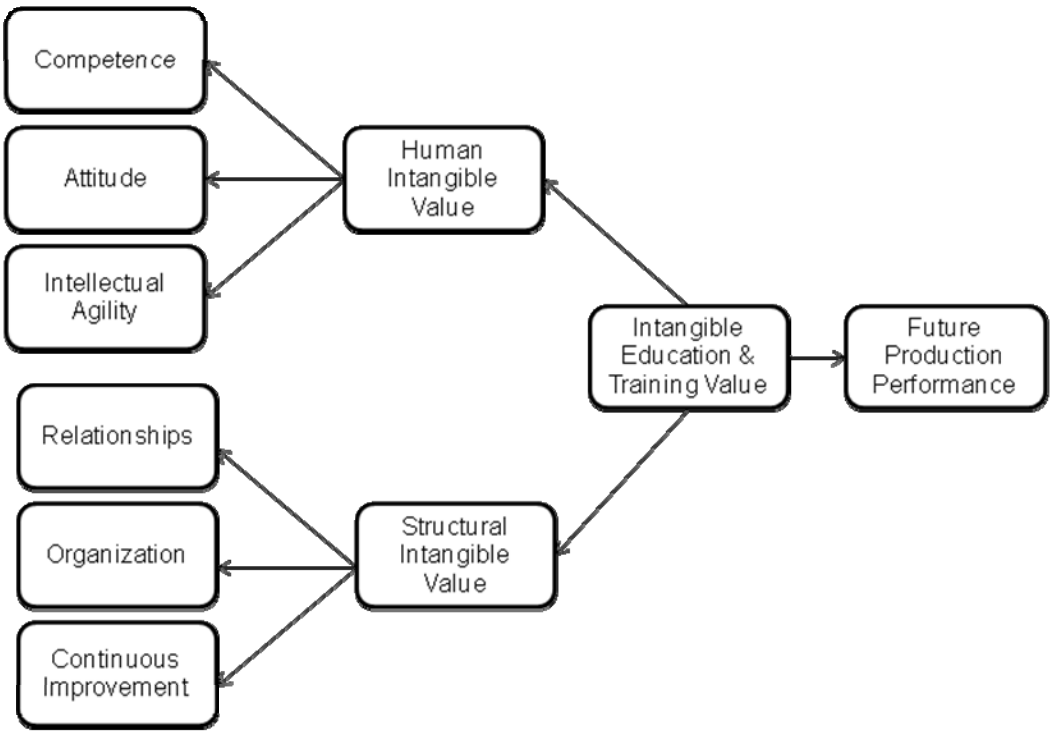

Figure 1.3 Model of intangible relationship value provision (Yang, 2007)

1.8.6. Human Intangible Values

Human intangible values such as attitude and intellectual agility, the ability to think quickly and creatively on your feet. Structural intangible values like organizational and relationship skills are difficult, if not impossible, to assign a quantitative value, yet they are priceless assets in a successful business environment. Employees, who can organize themselves and others because they possess people skills, encourage and motivate the work-team to accomplish great things.

A study commissioned by the Australian Government's Information Management Organizations (AGIMO) introduced a framework and checklist designed to help managers in Information and Communication Technology (ICT) fields recognize and assess the value of their employee's intangible capital assets (Binney, Guthrie, Boedker, & Nagm, 2007). Researchers involved in this study applied a tripartite model of intangible capital resources to an ICT

investment context (see Figure 1.4). This model was broken into three categories:

1. Rational capital – which refers to the organization's relationship to its stakeholders
2. Structural capital – addresses the 'structures and processes employees develop and deploy in order to be productive, effective and innovations
3. Human resources capital – which are reflective of workforce skills, attitude, abilities, etc. (Yang, 2007).

This framework and the checklist, which includes an evaluation process, furnished managers with a process for measuring the ICT investment lifecycle and the intangible value of ICT employees.

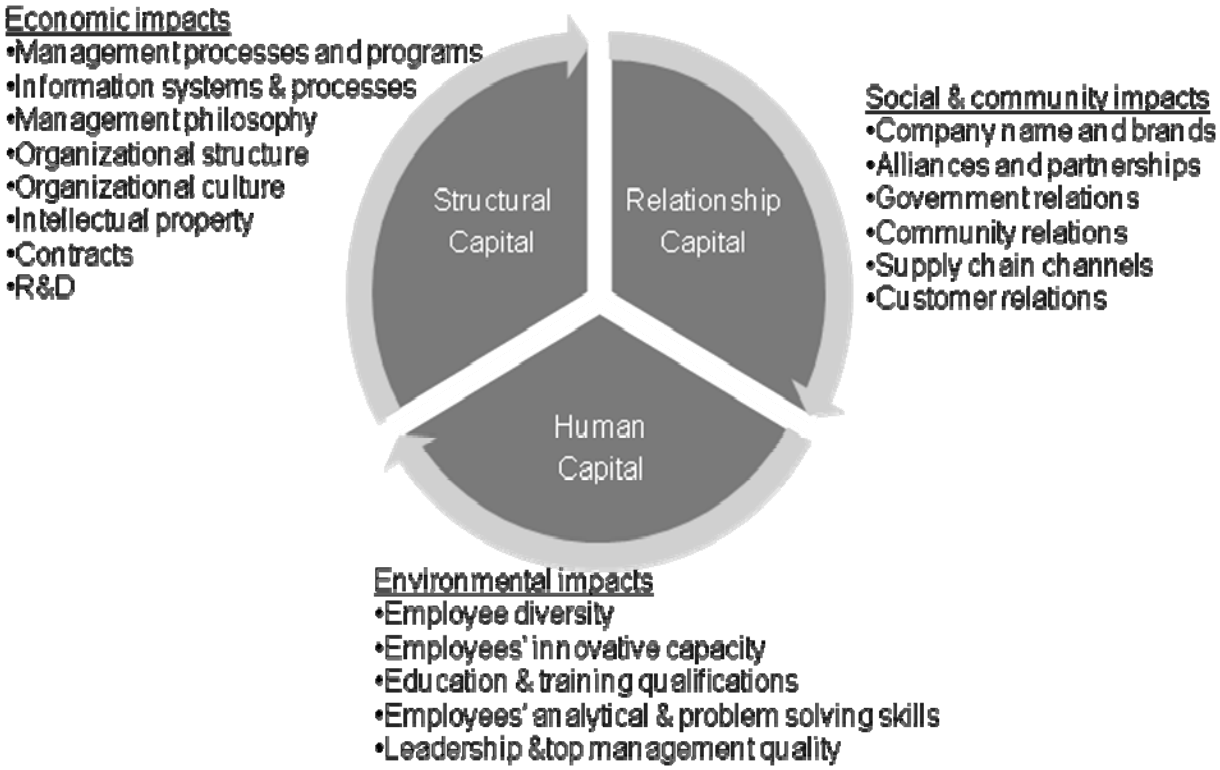

Figure 1.4 Tripartite model of organizational intangible resources (Yang, 2007)

In spite of the difficulties involved, the effort to measuring intangible value is important because intangible contributions are often unidentified advantages with long-range quantifiable outcomes. For example, innovations are frequently the result of a cluster of ideas derived from collections intangible events that develop into intangible performance enrichment: “More than 6,785 ideas submitted over 12 months with estimated savings of $1.2 million” (Huthwaite, 2007). Though intangible value often goes unseen, the results are still beneficial.

1.8.7. Education and Training

Education and training are pivotal components of the human capital equation. Employee innovations can be as simple as a suggestion from a nurse identifying a more effective, efficient, and safe method for distributing a patient’s medication. Alternatively, an innovation could be as complex as a work-team’s modification of the shop-floor flow process that significantly reduces production time, decreases man-hour requirements, improves quality, and saves millions of dollars. Either way, innovative ideas have the potential to contribute to company growth and success. Prerequisites for successful workforce contributions include hiring employees who are knowledgeable, skillful, and confident enough to take action and sometimes to take calculated risks. Working environments that nurture and develop values such as these and that reward the workforce for their contributions are destined to meet with success.

In 2008, *Fortune Magazine* publishes its annual list of the “100 best companies to work for.” Google topped the list (Levering & Moskowitz, 2008). Offerings included in the Google employees benefit package include: flexible work schedules, employee education and training opportunities, and an employee program that encourages employees to think of and suggest improvement ideas such as a 20% time-release program designed to work on special projects like the company’s Green Manufacturing project. In return, Google has a fiercely loyal workforce. Companies with responsive leadership that

give employees room and freedom to get things done are more likely to have happy employees.

Furthermore, the *Fortune Magazine* article emphasis is on the correlation between happy employees and the likelihood that they will be more innovative, productive, and loyal. In order to be satisfied, employees want to work for companies offering tangibles benefits such as good salaries, health, and childcare. At the same time, happy employees want to know that the company will value intangible benefits like the option to telecommute, an environment that encourages a balanced work and personal life, free grocery delivery, and 100% tuition reimbursement for education and training, even when classes are non-work related.

Education and training are reoccurring themes circulating throughout literature associated with successful organizations. Heathfield (2007) notes, "The right employee training, development and education, at the right time, provides big payoffs for the employer in increased productivity, knowledge, loyalty, and contribution." The relationship between workforce knowledge and successful preparation of the supply chain is extremely important in a competitive global environment. Employers often use education and training as a bargaining chip in their effort to enhance employee retention; offering and encouraging education and training opportunities sends the message that the company is interested in helping employees grow and demonstrates a commitment to keeping employees engaged and on staff for the long term. Another desired outcome for this research is to increase the awareness of the impact on the workforce that education and training has can have on the success of the supply chain management.

1.8.8. Organization of the Dissertation

This research document consists of five chapters along with appendices and supporting materials. This first chapter has presented introductory material and provided the groundwork for the research study. In the second chapter, there

is a review of literature in the areas of industry education and training needs, supply chain education and training, and collaborative education and training options. The third chapter presents the methods used in the study. It includes a description of the interview instrument, the process used for data collection, and details of the data analysis methods and procedure. The fourth chapter reports the results of the study, and provides a review of data gathering observations. Finally, chapter five provides a discussion of the results in light of research questions conclusions about the study and discussion of recommendations for future research.

1.9. Summary

The purpose of chapter one was to provide an introduction and overview of the research project. Basic elements of the body of knowledge in the field were discussed, as well as the groundwork for the study itself. Chapter two of this document provides an in-depth review of pertinent literature focusing on two main topics, industry education and training and industry implementation of supply chain. In addition, this chapter includes a review of research related to the common methods used for delivering workforce education and training in industry setting and the potential for increasing expanding the use of industry-university collaborations.

CHAPTER 2 REVIEW OF THE LITERATURE

This chapter contains a review of relevant literature and research associated with the topics of industry education and training and industry implementation of supply chain. There was a review of research related to the common methods used for delivering workforce education and training in industry setting and the potential for increasing expanding the use of industry-university collaborations. This review began with a discussion of the significance of workforce education and training to industry's desire to be competitive in a global economic environment. Next, there was a review of the history of supply chain and the potential implications of effective implementation of a well designed supply chain. The importance of constructing a strong workforce is next topic in the literature review. Finally, this chapter included a review of literature related to using a qualitative research methodology in conducting business research.

2.1. Research Approach

Since the early 1980's, industry leadership has searched for management tools that would improve give them the sustainable competitive advantage. Arguable human capital is the most important tool at the company's disposal. This section of the chapter defines supply chain and begins to make a connection between education and training and supply chain. Literature support industry leader's acknowledgment of the advantages of having a prepared workforce educated and secure in their ability to support the goals and objectives of the company. Companies are willing to commit time and financial resources to making sure their workforce is in the best position to be a real force in the global

environment. Universities are strongholds of knowledge and human capital. When a university has the knowledge, experience, and skill training to match the needs of potential industry partners, it is a win-win for everyone. Chapter 2 explores examples from the body of literature for each of these study ideas bringing them together and making them collectively meaningful.

2.2. Significance of Industry Education and Training

Increasing global competition has fueled the need for companies to be more prepared to respond to rapid changes in the business environment. In order to be competitive in the global economy companies must be flexible, globally perceptive, and prepared for anything. A successful supply chain workforce is well educated and trained to confront the challenges they will have if they hope to compete in the global marketplace. Since 2005 the corporate commitment to education has been a priortiy item in the business success equation. American corporations spent approximately $20 billion on their employee tuition assistance programs (Meister, 2006). The American Society of Training and Development (ASTD) “estimates that U.S. organizations spend $109.25 billion on employee learning development annually, with nearly three quarters ($79.75 billion) spent on the internal learning function, and the remainder ($29.50 billion) spent on external services” (Huthwaite, 2007).

Corporations around the world compete to hire and retain employees with process knowledge (education) and technical skills (training). Corporations attend job fairs and search community colleges and universities across the country to interview and identify potential employees. There is fierce competition to find employees with appropriate skill sets, who will take action, and self-starters are invaluable to a supply chain management environment. Corporations want to build a workforce that exhibits traits that match the job-skill of the particular industry, who have process knowledge, and leadership abilities that align with and compliment the goals and objectives of the company. In this search to hire an effective workforce, corporations look for potential employees

who have the ability to implement creative solutions to problems. “Education is the most strategic way for the aerospace industry to compete for and attract today’s and tomorrow’s best and brightest, retain these employees and continue to be an innovative giant on a global scale” (Seat, 2006).

2.3. Education and Training and Deliver Methods

Methods for delivering education may include; inhouse programs for basic skills training, training in the use of new equipment or upgraded technology, computer, sales, and process improvement education. Inhouse training is often conducted by an individual who has completed some form of training or specific edcation the topic area. Facility educational training-often larger corporations and companies with the financial capital to maintiane a facility will build on-site educational facilities. For example, companies like SIA (Subaru of Indiana), Boeing, RCA and Holiday Inn, establish their own sponsored university programs through which they will offer degree and non-degree seeking courses, usually after-hours. Some companies still have internal training personnel however many have found that it is more cost effective to contract out education and training responsbilitites. These programs are most commonly run in association with a college or university or by a consulting firm.

Education and training can be delivered in different delivery formats; lecture, hands-on skills training, video simulation, and in different location; at the business facility, a remote site, via the internet or at a local college or university campus. No matter the type of delivery or location, workforce education efforts continue to expand, providing greater weight behind the significance of providing education and training opportunities and constructing industry-university collaborations. Dr. Louis Matis, President and CEO of Immune Tolerance Institute (ITI) made the following observation about such collaborations; “This collaboration (ITI/University of San Francisco) goes to the very heart of ITI’s mission by bringing together the best of industry and academia in order to solve complex medical problems” (Unknown, 2005). Academic institutions contribute to

industry success by offering the opportunity for the workforce to profit from the intellectual expertise, knowledge of the latest trends and a variety of the newest available technologies. “It’s (education) a fast track to employment…and it is our response to what each industry is demanding to meet its workforce needs” (Kroll, 2009).

2.4. Recruiting the Right Workforce

Industry leaders are actively looking to recruit people who, with their knowledge, skill, and creativity, will be integral in the push to be successful. Good benefits are an essential instrument for accomplishing the recruitment goals. Continuing education opportunities are among the most coveted benefits offered to potential employees. Benefit packages that offer tuition packages that can include as much as 100 percent tuition reimbursement, remuneration for textbooks, on-site course offerings, and transportation reimbursement. From a practical-business standpoint, offering an education reimbursement programs is a win-win for both the corporation and their employees. Corporations consider “…education and training as a regular cost of doing business” (Eurich, 1995). Corporate education programs are considered business expenses for which the corporation is permitted tax credits (financial write-offs) that amount to as much as 50 percent. Offering continuing education programs benefits the corporation and the employee by increasing the knowledgebase of the employees, enhancing their skill levels, and the intangible advantages of nurturing happy engaged employees. Continuing education is an extremely valuable bargaining chip for hiring and retaining good employees.

2.5. Supply Chain History

Since early 1980s, supply chain and supply chain management have come to have significance for manufacturing, distribution, and service organizations as process models for utilization by industry leaders attempting to gain the competitive edge. Supply chains are collaborative relationships or

partnerships between companies to improve the efficiency and effectiveness of the organization and supply chain management is the management of this collaboration. Preparing an organization to meet the challenges and issues that are inherent in creating and maintaining a competitive industry edge might be the single most important element in implementing a successful business formula. The focus of this research is to investigate supply chain management and workforce education and training needs of industry. Before addressing the assigned preliminary question topics that deal with the history, purpose, and role of supply chain management in industrial applications and industry education and industry training trends, it is important to establish a working definition for supply chain and supply chain management as they apply to the education and training research topics.

2.6. Defining Supply Chain Management

Definitions for supply chain and supply chain management vary somewhat from one author to another as well as within industry circles however; common themes appear throughout the literature. For example, the retail value supply chain (Unknown, 2007) is an integrated collective of business concerns working together to achieve a common set of goals (Figure 2.1) Supply chain management is the management component of supply chain. The Supply Chain Management Council (SCMC) is a non-profit organization with a professional membership comprised of individuals and companies from around the world and across industries. SCMC defines supply chain management in the following way:

> "The supply chain – a term increasingly used by logistics professionals – encompasses every effort involved in producing and delivering a final product, from the supplier's supplier to the customer's customer. Four basic processes – plan, source, make, deliver – broadly define these efforts, which include managing

supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer" (Quinn, 1997).

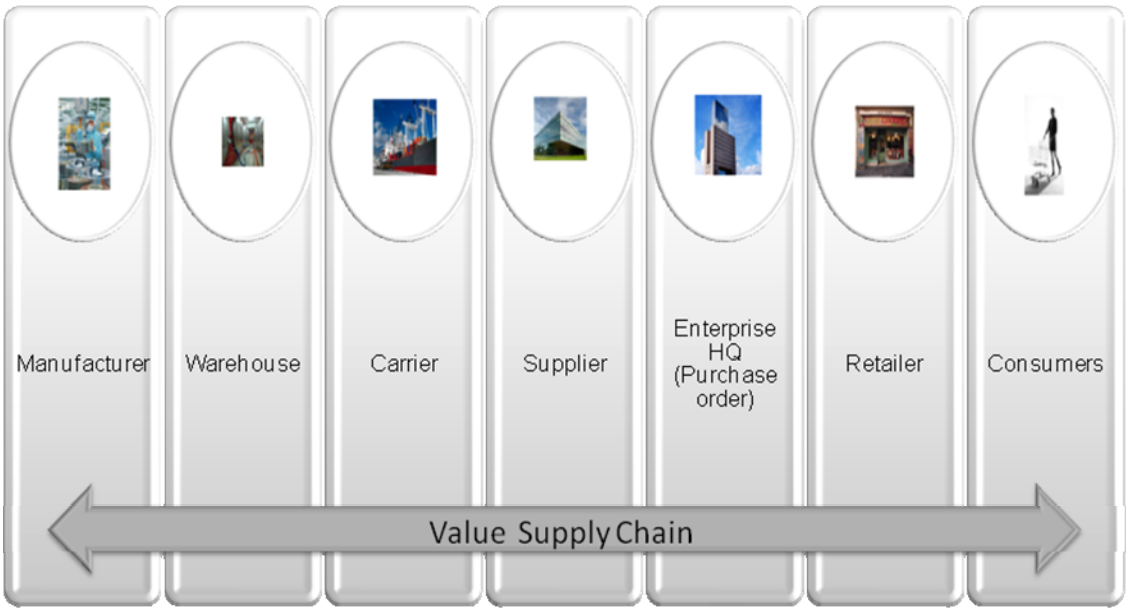

Figure 2.1 Retail value supply chain (Unknown, 2007)

The preceding definition includes representation from all of the elements and processes involved in manufacturing, production, and services that come from members of the supply chain. Effective management of the supply chain is central to the success of any collaborative venture. The following further helps emphasis the common elements embedded in definitions of supply chain and supply chain management. The *APICS Dictionary* describes supply chain in the following ways:

1. The process from the initial raw materials to the ultimate consumption of the finished product linking across supplier-user companies; and
2. The functions within and outside a company that enable the value chain to make products and provide services to the customer (Cox, 1995).

Rosenbloom (2002) defines supply chain management as “a term to describe logistical systems that emphasize close cooperation and comprehensive inter-organizational management to integrate the logistical operations of the different firms in the channel” (p. 244). Beamon introduces supply chain management in terms of two basic, integrated processes: (1) the Production, Planning and Inventory Control Processes, and (2) the Distribution and Logistics Process (Beamon, 1998). LaLonde and Masters (1994) state the following, “…a supply chain is a set of firms that pass materials forward. Normally, several independent firms are involved in manufacturing a product and placing it in the hands of the end user in a supply chain – raw material and component producers, product assemblers, wholesalers, retailer merchants and transportation companies are all members of a supply chain.” Each of these definitions reinforces a series of themes that are relevant to a clear understanding of supply chain and supply chain management. Themes such as:

A. inter-organizational cooperation
B. planning
C. coordination and
D. colla boration

Integrating concepts such as these help promote the importance of building a strong workgroup with a solid foundation existing at every stage of the product process extending from raw material through delivery into the hands of the customer. All members of the supply chain have a significant role to play as members of the collective organization. There is a fundamental need to construct relationships based on trust and communications built-in at each phase of the process is central if a supply chain is to achieve success. The job of the supply chain manager is to be aware of and accountable for each step in the supply chain process. Supply chain managers are responsible for coordinating supply chain management activities. Though each supply chain partner organization will

likely assign a supply chain manager to oversee the supply chain management processes within their organization, the supply chain from the dominate organization, often from the largest member-partner in the chain, will be in charge of overseeing the collective supply chain.

The consistent and common themes across definitions of supply chain are strong logistics coordination, inter-organizational cooperation, and planning. Supply chain and supply chain management is a process framework of planning, implementing, and controlling operations for a collaboration of organizations working towards a commonly agreed upon set of goals and objectives in order to deliver a product into the end user in a efficient and cost effective manner.

2.6.1. Supply Chain History

Historically there are documentations that suggest the introduction and use of supply chain management concepts in industry settings as far back as 1827. A weekly magazine called *The Journal of Commerce* published articles with information about supply chain and supply chain management trends in international transportation, global trade, logistics strategy, technology, supply chain management, finance, regulations and legislation and more. Documented reports of industry adoption of supply chain and supply chain management processes usage was first noted in the textile industry (Nordas, 2004). Creating an inter-organizational, synergetic process for the way they conducted business was at the heart of the textile industry's supply chain management initiative. Identifying and establishing process improvements that resulted in better methods of responding to customer demands for product along with the desire to become a more cost efficient organization was the driving force behind the industries desire to achieve faster response time.

The next and perhaps most well documented example of implementing supply chain management processes was by the Japanese in the 1950s. The Toyota auto manufacturing industry replaced the traditional Western auto-manufacturing model with more integrated processes to improve their

competitiveness and profitability. Keys to Toyota's success included developing and using new technologies, minimizing production costs, becoming synonymous quality and continuously looking for and rewarding process innovation and improvement. An interesting twist to the successful implementation of supply chain management by the Japanese was their aggressive development of international collaborative relationships as a tool in their drive to accomplish their success. Dr. Edward Deming work with the Japanese is an example of just such a collaborative relationship (Krar, n.d.). Dr. Deming was an American statistician, college professor and consultant who was invited by the Japanese to train Japanese employees to embrace the use of process improvement tool like statistical process control (SPC), total quality management (TQM) and just-in-time (JIT) manufacturing systems to drive down costs and provide better quality products for the end user (Aguayo, 1991).

Customer satisfaction has driven the changing direction of industry. The grocery industry is an extremely competitive, customer driven industries that will not fade away with time. Consumers have stores and brand-name options standing on virtually every street-corner increasing the need for grocery chains to find and maintain some form of advantage over the competition. It is this abundance of options that give customers and the ability to impose an ever-increasingly demand for a better service, higher quality, product specialization, and lower prices. With the integration of new technology and innovative processes, the modern supply chain has been developed to provide a more effective and efficient flow (Figure 2.2). The modern supply chain is central to ensuring customer satisfaction and central to responding to rapid changes in meeting the demands of the customer. The Efficient Consumer Response Group (ERC) was contracted to "…examining the grocery supply chain to identify opportunities to make the supply chain more competitive (Lummus & Vokurka, 1999). ECR group was looking for answers to questions that would give the industry a more complete understanding of customer requirements and expectations. The research identified the importance of product freshness and

time to market, customer service, conveyance and responsiveness, and price. Perhaps the most significant piece of data was related to need for information "By expediting the quick and accurate flow of information up the supply chain, ECR enables distributors and suppliers to anticipate future demand far more accurately than the current system allows" (Lummus & Vokurka, 1999). Based largely on the results of this research, the grocery industry aggressively implemented supply chain management processes.

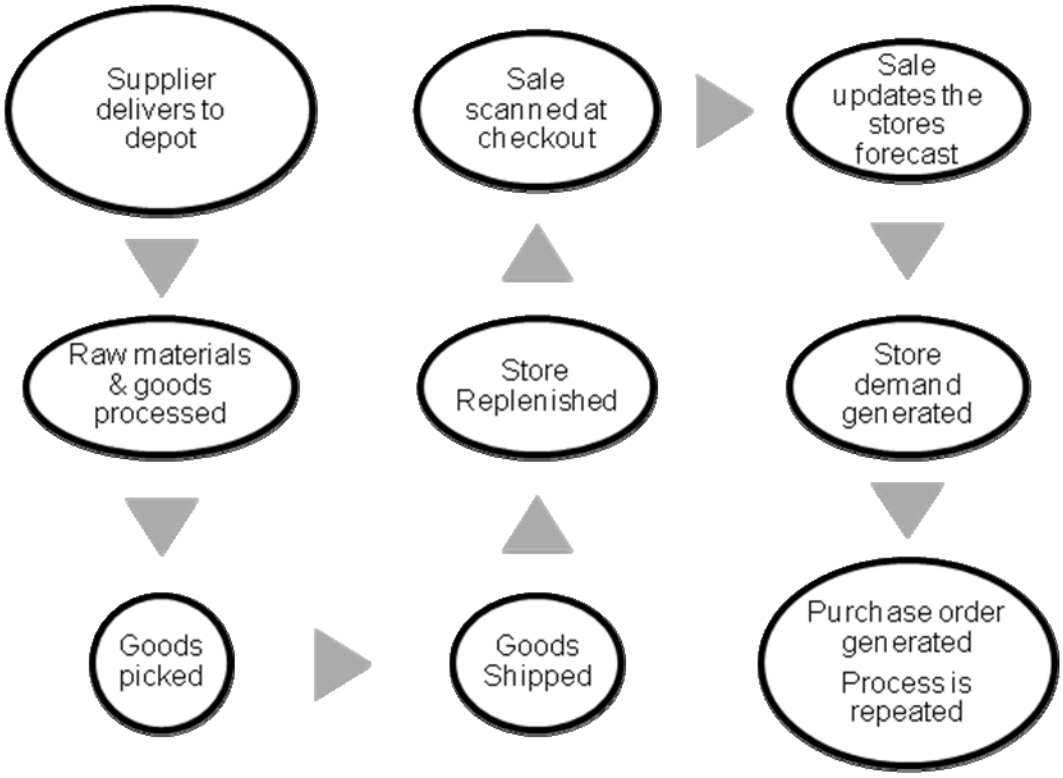

Figure 2.2 Modern supply chain process (IGD, 2009)

2.6.2. The Role and Purpose of Supply Chain Management

The purpose of supply chain is to facilitate process improvement and satisfy the demands of end-user. The role of supply chain management is to manage processes across supply chain channel members. Rapid changes in industry and demands for product specialization increase the benefits inherent in supply chain management. Successful implementation of supply chain

management processes used by the textile, auto, and grocery industries did not escape notice by other industries. Industries such as aerospace were quick to adopt many of the supply chain management processes and reap benefits of revolutionary changes. The sustainable competitive advantage realized by those using supply chain management processes become pivotal to computer companies like Dell and Apply, appliance manufacturers such as GE, Baxter producers of medical product, and large warehouse stores such as Costco and Staples both embracing hundreds of contributors within their supply chains. Ultimately, the role and end-goal of supply chain management is to create a system of management that forms a collective and mutually beneficial bond focused on achieving a set of goals and objectives that result in financial benefit for all members of the supply chain and enhances the company's long-term sustainability and competitive advantage.

Supply chain managers are responsible for creating a supportive environment of trust, cooperation, and partnership between the channel members. Research conducted by a Boston-based consulting firm cites the following eight requirements as elements that should be present in a supply chain management environment:

1. "Greater sharing of information between vendors and customers.
2. Horizontal business processes replacing vertical departmental functions.
3. Shift from mass production to customized products.
4. Increased reliance on purchasing materials and outside processing with a simultaneous reduction in the number of suppliers.
5. Greater emphasis on organizational and process flexibility.
6. Necessity to coordinate processes across many sites.
7. Employee empowerment and the need for rules-based real time decision support systems.
8. Competitive pressure to introduce new products more quickly" (Lummus & Vokurka, 1999).

Industry partnerships are difficult at best and are virtually impossible when there is not an agreement between parties does not exist. Working together towards a common set of goals, engage in trusting and reliable relationships, share information and fully commit to open communication are all necessary elements for supply chain management success.

2.6.3. History of Industry-University Collaborations

The rapid growth of the global economy has business and industry engaged in a race to keep pace with or surpass their competition. No longer does a company's size and business history the equivalent of an automatic success-punch-card. Increasing development of and access to technology has wrought major changes to the face of business success for now and the foreseeable future. Trade agreements with China and Mexico are indicative of how the face of the competitive business world has changed. Businesses and industries around the world are engaging in collaborative partnerships designed to improve business processes, share technologies, and impact the business bottom-line. Once known primarily as tourist destinations in 'developing nations' countries like Costa Rica and Argentina, Taiwan and Viet Nam are collaborating with leading businesses or in some cases, becoming direct competition for the same business world leaders.

During a round-table discussion with leaders from the shipping and transportation industries in Houston, Texas, participants were asked what their businesses and industries needed if their supply chains were to remain competitive. To a company, the response was a workforce with and understanding for and educated in supply chain management. Their concern was that there are not enough people prepared with a functioning knowledge of what it means to be engaged in a business composed of a world-wide, highly competitive global supply chain. Conversations of this sort continue to underscore the importance of focusing on workforce development. Managing and preparing a company's human capital to meet the challenges an inherent excelling in their role in the supply chain. Educating and training the workforce is

a necessary and integral ingredient of preparing to meet domestic and global competition.

> "Shifts in the nature of business organizations and the growing importance of knowledge- based work also favor strong non-routine cognitive skills, such as abstract reasoning, problem-solving, communication, and collaboration. Within this context, education and training become a continuous process throughout the life course involving training and retraining that continues well past initial entry into the labor market" (Karoly & Panis, 2004).

Education is globally significant issue in the supply chain world economic environment. In November 2009, the Asian Development Bank (ADB) announced the approval of a $60 million student and project loan plan to support secondary education programs in Viet Nam. The plan was created to "reflect changing needs of the labor market and efforts to keep its economy competitive and robust" (Staff, 2009). Following the United States Senate's approval of the Recovery Act, Senator Harkin of Iowa commented; "…it (the Recovery Act) is helping to ensure we have a good education system that is preparing our student for quality jobs and helping us stay competitive in the global economy" (Cyrul & Kenny, 2009).

Identifying affordable methods for delivering quality and supply chain management appropriate education to the workforce is the challenge. A part of the answer to the challenge is found in establishing effective working relationship for industry-university collaborations and partnerships. The face of the marketplace is rapidly changing to include a broader spectrum of business relationship agreements that include business-to-business partnerships and collaborations. In the same way business-to-business partnerships have increased in recent years, industry-university collaborations are gaining in popularity.

A significant body of evidence suggesting that there are benefits embedded in industry-university collaborative relationships when it comes to supply chain development. Industry-university partners enter into the relationship with business expectations, significant resources and potential for a long-lasting relationship. Industry brings their infrastructure, applicable technology and equipment, machinery, materials, experience specific to their business, leadership, and their workforce. While partnering university contributes their collective intellectual capacity, research experience, supply chain management knowledge, technology education, product, and other fundamental supply chain process education information. Universities also provide a wealth of students eager to take advantage of real world work experience. In many cases, university students are the next generation of problem solvers, managers, and leaders and the catalyst for successful competitive businesses.

2.6.4. Industry-university education collaborations

Industry-university collaborations can take shape in different ways and may focus on supply chain management and workforce education and training or business process and innovation research. Industry-university collaborations (partnerships) have been an active part of the research and development (R&D) landscape in the United States since shortly after World War II when the U.S. government began formally contracting universities to assist with field research. Variations in collaborative agreements are specific to the academic institution, the industry, and/or country but the fundamental expectations are the relatively consistent. A survey of approximately 400 companies involved in collaborative research joint ventures identified and ranked the following as reasons to engage in alliances:

1. Access to new research
2. Development of new products
3. Maintaining a relationship with the university

4. Obtaining new patents
5. Solving technical problems (Lee Yong, 1996).

Other cited benefits for collaborative ventures between industry-university cited in this report included: learning institutions getting funds for lab equipment, research assistance, insight into research and the ability and where-with-all to gain research knowledge.

Created by Congress in 1950, the National Science Foundation (NSF) is a major supporter and funder of research collaborations. The NSF is an independent federal agency with a mission to "promote the progress of science; to advance the national health, prosperity, and welfare' to secure the national defense." Strategic outcome goals for the NSF are categorized in four groups: *Discovery, Learning, Research Infrastructure,* and *Stewardship*. The NSF used their funds to encourage industry-university collaborations through programs like the Engineering Research Center (ERC) Program. ERC's are interdisciplinary centers located on university campuses throughout the United States. ERC partners industries and universities in pursuit of identifying strategic engineering, science, and technology advantages (ERC, 2009). In 2009, a $410 billion Omnibus appropriations bill was passed for the FY09 budget. The NSF received $6.49 billion of these funds. $5,183.10 million was allocated to research and related activities and $845.26 million went to education and human resources (NSF, 2009).

A successful collaborative relationship is characterized by an exchange of ideas resources and personal (Figure 2.3). The competitive nature of the global market has brought universities around the world into the forefront of collaborative partnerships. Engagement in collaborative projects partnerships with universities gives industry the opportunities to take advantage of access to research facilities and developing technologies. Collaborative partnerships give industry entrée to the fresh innovative minds of students with support from faculty and staff, all for a relatively minor financial investment.

Finally, collaborating with industry is a great way to bring funds into the universities to support research and students. Faculty and students have new inroads to real-world industry projects, resources, and the potential for student-employment opportunities in the future. Collaborative relationships are a win-win for everyone involved.

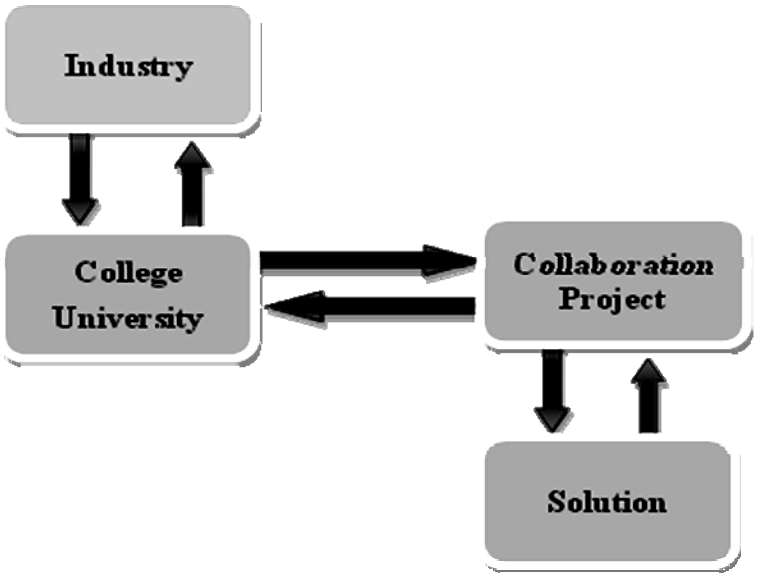

Figure 2.3 Flow of collaborative relationships

Flexibility, creativity, customization, these are hallmarks of a successful industry-university partnership. Undergraduate and graduate degrees, on-site/after hour degree programs, certificate classes, extension education programs and weekend masters' degree programs are just a few of the possibilities. On-going education is just one of the advantages of industry-university partnerships. Business leaders must be relentless in their search for new designs, new products, improvements to existing products, processes and procedures, and innovative solutions, anything that helps keep them ahead of the competition.

Universities are boundless resources for new innovations and research solutions. For example, at the *Intel Research Pittsburgh* lab on the campus of Carnegie Mellon University, industry lab group works along-side Carnegie Mellon students researching software prototypes. At Wichita State University (WSU) teams of students and faculty work with several aerospace companies in the *WSU Knowledge and learning in advance supply systems* (KLASS) program. KLASS offers customized supply chain related education and training for aerospace employees increasing the knowledge and advance their skills and enhancing their ability of be effective employees.

Many companies include full or partical financial reimbursement incentives as a means of encouraging employees to extend their knowledge and skill sets. Paying for; Bachlors, Masters, Masters of Business Administration (MBA), and Doctral (PhD) degrees are incentives for attracting the best and brightest employees. Non-degree and certificate programs are also inducements and motivators for the competitive business. Industry-university partnerships make good business sense as resources for delivering supply chain education in the workplace. Partnerships are a win-win proposition for industry and universities. The company access educational expertise, campus research resources, and innovative prospects and learning insitituation benefits in their access to real world case studies and experience for student. In addition, include having a positive impact on the enrollment numbers, increased visibility as a learning center and contributions to the financial state of the institution. “Likewise, by working with regional-engaged universities, businesses are able to innovate more effectively, learn more quickly, and help produce better and more competitive products improving their competitive strength” (Arbo, 1999) Engaging universities to development of new ideas and finding innovative solutions for ways to do things better, faster and in a more cost efficient ways is a plan that works to the advantage of all concerned parties.

Collaboration projects are often project specific such as the *Life Science Greenhouse* project in Western Pittsburgh, PA. The University Development Fund (UDF) project is part of three-way collaboration between the University, Goliath Company and the State government. In 1998, Dr. Tom Inch served as the Secretary General of the Royal Society of Chemist's (RSC). At a European Network for Chemistry (Unknown, 1998) workshop (held in Europe), Dr. Inch was the moderator for a panel discussion about why some industry-university projects success while others fail. Participating in this discussion were Professor Fischili of Hoffmann-La Roche, pharmaceutical company headquartered in Basle, Switzerland, Dr. Reitz of BASF and Dr. te Nijenhuis from Gist Brocades (Biotechnologies). Each of them shared a bit about the journey their companies took to collaborations and their paths to success or failure. When asked why Hoffmann-La Roche considered collaborations, Professor Fischili's was the first to offer comments making the following information and observations about his company:

A. In 1996/1997 Hoffmann-La Roche spent about 1.7 billion US$ in R&D monies of which approximately 70% was spend on development and the remaining 30% on research. 5-10% of the 'discovery' expenditure was spent outside the company (per company policy) however it was expected that this figure would grow in the future.
B. Having assessed future activity in the pharmaceutical industry, Hoffmann-La Roche determined that there was a need to have 35-50 new projects per year to remain competitive.
C. In order to respond to this growth activity they would need skilled individuals and/or they would have to outsource projects.

Dr. Reitz discussed the failure of BASF's industry focused collaborative program and concluded that the problem was that the program was grossly over-

subscribed (20:1) and that BASF had concluded that partners were not willing to put forth the effort for a project that had 19 “failed” proposals. Finally, Dr. te Nijenhuis (Gist Brocades) voiced concern about the lack of research available (at the time) in the area of biotechnology research in university programs and about the investment that would be most likely be necessary (Unknown, 1998).

Another trend among universities around the world is establishing research centers that cater to the needs of a particular industry. GOALI (Grant Opportunities for Academic Liaison with Industry) is a 1989 outgrowth initiative of the NSF’s Division of Design, Manufacture, and Industrial Innovation (DMII). DMII exists to facilitate manufacturing and supply chain management education needs within industrial settings. “This initiative, known as the Engineering Faculty Internship Program, required both an industrial stay for the academic principal investigator (PI) and a financial commitment from the industrial partner” (Martin-Vega, Seiford, & Senich, 2002). For this mutual commitment by the partners, GOALI provides matching funds (up to $25,000) for the project. GOALI awards have facilitated partnerships between University of Texas-Austin and Schlumberger, Iowa State University and Rockwell, Purdue University and Intel, Lehigh University and Air Products, and more. Funding from organization like NSF and GOALI sweeten the pot and provide added incentives for the participants to engage in research and development projects and collaborations that bring industry into the classroom and bringing the innovative ideas and innovations of the students and faculty into industry.

Both industry and academia have had to adjust their way of doing business and of approaching the relationship. There are benefits and issues associated with these collaborations, again, for both parties. Casey identifies the following as pressing issues:

A. Increasing competition for grant and contract dollars by colleges, universities, hospitals and medical centers, and other entities seeking extramural funding.

B. Regulatory compliance by colleges, universities, and hospitals and medical centers in a variety of areas (human subjects research, animal research and care, biosafety, conflict of interest, conflict of commitment, and misconduct in research.
C. Financial cost accounting, compliance, and auditing.
D. The relative decline of federal research and development (R&D) support coupled with the rise of corporate funding of R&D.
E. Industry-university relationships, particularly with concern toward areas that are viewed as contentious negotiation of research and intellectual property agreements (Casey, 2004).

There are definite advantages associated with collaborations however there are distinct challenges. Infrastructure resources are necessary for collaborative success and well as a thorough grasp of supply chain management.

There is an abundance of literature citing the accomplishments of those universities and industries who have engaged in successful collaborative relationship but the same cannot be said of those relationships that have ended in failure. Neither companies nor universities are particularly interested in admitting that their collaborations failed so literature with information discussing why the collaborations fail is limited and when published it is done so without identifying the parties involved. According to Casey (2004) the most contentious issues are:

A. Communication between universities and industry in the performing of particular projects, including their expectations and concerns.
B. Long delays in completing contract negotiations for projects, which may also be a function of A., above, which may certainly lead to frustration and a loss of trust between parties.

C. Negotiation of intellectual property and licensing issues, including issues of ownership, revenue streams, and licensing to third parties. In the experience of the author, negotiation of intellectual property and licensing provisions in research agreements or intellectual property agreements is the primary reason for the delays in completing contract negotiation, outlined in B., above.
D. Other legal provisions bearing on the research project or overall collaboration, including liability/indemnification, confidentiality, publication, and international students as a result of changes after September 11, 2001 (Casey, 2004).

In the article, *Living studies in Industry-university negotiations* by James Casey (2004) stated that poor communications is largely responsible for collaborative project failures.

> "This poor up-front communication of intent was compounded by missing or absent communication during the course of the project. When the university researcher structured the project as a time-unlimited exploratory piece of research for an inexperienced student, the project was doomed to failure with regard to the deliverables expectations of the corporate partner. At the same time, when the corporate partner set deadlines that were incompatible with the academic calendar, the project was doomed to failure with regard to educational expectations of the university partner. In this case, there was poor communication of intent, expectations, and progress" (Casey, 2004).

When communication on a project team fails, there is an increased probability that the project will also fail. Communicating across organization lines is difficult regardless of the relationship and becomes progressively more difficult as the chain of participants grows.

Even with all of the problems, there are benefits to collaborations that cannot be denied. The following is a list of benefits that emerged from the ENC workshop discussion (Unknown, 1998).

A. Real discovery had been made from such collaborations in the past
B. Should the focus now be on training of PhD students to do high quality research, or was the research itself very important; was there time in three years for substantial “real” research?
C. The management of intellectual property rights required careful management to avoid problems.
D. For many chemical companies, the out-sourcing of fundamental research in some areas was becoming the norm…could such research be done by PhD students under training, or was there a strong need for higher quality research organizations within universities.
E. Not all of the benefits from collaborations were immediate and tangible.
F. We should recognize that just as there was no unique form of a university, there could be no unique structure for university research. It was becoming clear however, that not all universities could achieve excellence in all of the forms of research collaboration required by tomorrow’s chemical and pharmaceutical companies (Unknown, 1998).

Though the audience addressed in this article is the chemical and pharmaceutical industries, the issues that they raised are no less applicable to manufacturing and distribution supply chains. Finding the right collaborative fit is a key element to achieving any successful relationship. Looking to the partner to customize the supply chain education and building a strong and trusting

relationship bridge gap between education and success and propels an effective supply chain past the competition.

2.7. Research Analysis Approach

This section the research will review the literature discussing the analysis approach utilized to conduct this research.

2.7.1. Qualitative Research

The purpose of this research is to evaluate and measure the perception of the effectiveness of the supply chain and the relationship of education and training in an organizations success. Measuring perception is difficult however the subjective qualitative research data gleaned from identifying perception is an effective measurement tool for analyzing company performance. “There are good reasons why subjective measures of company performance have been and will continue to be employed…The more fundamental reason, however, is that for certain types of organization and levels of analysis there may be no viable alternative” (Wall, et al., 2004). Collecting research data in to patterns and themes that supply a strong foundation for establishing significant research conclusions provides a level of organization to a collection of varied ideas and thoughts from an assortment of respondents.

Qualitative research is a combination of semi-structured and open-ended thoughts, ideas, and opinions, it is often perceived as being a collection of ‘soft’ data with limited concrete or purposeful value. In reality the qualitative researcher institutes a careful process of transforming a broad range of responses to research questions, categorizing the data and analysis to establish solid links to specific research outcomes. The flexibility of qualitative research facilitates organizing data into practical categories for the purpose of evaluation and understanding provided a source of new research avenues, ideas, and focus

areas. Qualitative research was descriptive, interpretative, and a good tool for evaluating the perceptions of the research subjects.

> "Qualitative methods permit inquiry into selected issues in great depth with careful attention to detail, context, and nuance; that data collection need not be constrained by predetermined analytical categories contributes to the potential breadth of qualitative inquiry. In-depth information from a small number of people can be very valuable, especially if the cases are information, rich" (Patton, 2002).

Furthermore, the using a qualitative research methodology makes it possible to solicit subjective measurable data from a smaller number of research participants yet collect a significant and meaningful body of information. "I n-depth information from a small number of people can be very valuable, especially if the cases are information, rich" (Patton, 2002). A primary criterion for participants in this study was that they were decision-makers for their company therefore; access to these individuals was the driver for the number of participants. The number of individuals participating in this research was difficult to determine. Regardless of the actual number of participants, the data can still enhance and contribute valuable information.

Based on the desired data outcome, dealing with the perceptions of the interviewees, a qualitative research methodology was determined to be the best fit process for conducting this research study. Categories of analysis as described by Peshkin (1993) provided a constructive process and practical pattern for reviewing the research data for this study. Applying a qualitative research method enabled the researcher to utilize a mixed data gathering process composed of concurrent cognitive materials consisting of one-on-one interviews followed by a follow-up survey that was delivered to each participant via email.

2.7.2. Development of the One-on-One Interview and Follow-up Survey's

"Open-ended questions can also yield useful information, especially when researchers need to explore complex issues that do not have a finite or predetermined set of responses" (Carey, Morgan, & Oxtoby, 1996). The set of open-ended question designed for this research were designed to afford a degree of answer variation from the participants. The questions for this survey were designed after reviewing the significant body of related research literature questions were formulated based on the relationship to the issues that were identified in the OCM. In order to validate the direction of the questions the researcher enlisted support and guidance from a team of subject matter experts (SMEs) in the areas of supply chain, training and education, customer service and manufacturing.

The research questions were divided into three major into three major data categories, six sub-categories and sub-level topics (Appendix A). The OCM logic tree was used to concentrate research questions around the perceived effectiveness of the supply chain in a difficult global economy and the role of maintaining an educated and well-trained workforce has enhancing organizational success. Based on the constructs of the OCM data the following are the questions designed to help facilitate a systematic data link between to the questions.

The next step was to design survey questions for the interviews. These interview questions (Appendix B) were configured from the OCM information, then organized to correspond with the each of the categories and sub-categories, and to be reflective of the sub-level topics. Once the list of questions was completed they were reviewed by a group of SME's from business and academia to confirm that the questions were appropriate for answering the studies research questions. Edits were made based on the SME's input and the questions were finalized.

The afore mentioned series of a standardized open-ended, structured interview format will be used to gather research data and focus the interviews. “Open-ended questions can also yield useful information, expecially when researchers need to explore complex issues that do not have a finite or predetermined set of responses” (Carey, Morgan, & Oxtoby, 1996). Open-ended questions leave a degree of answering freedom for the respondent and gives the researcher the flexibility to engage in learning that may take the research in unexpected directions. Questions are standardized in that they are designed to provide an Operational Framework Model (Figure 9) or general direction from which the respondent can begin to answer the question. An example of a standarsized open-ended interview question might be: “How do you deal with conflict?” (Olmeda-Amaro, 2006). A question like this can be applied to a general or a specific situation while allowing the respondent room to elaberate and reveal the topics and issues that are foremost in their thoughts and giving the interviewee the richest measure of significant study data.

Glaser and Strauss have identified two “sub-problems” associated with conveying credibility. “The first sub-problem is that of getting readers to understand the theoretical framework” and “The related second sub-problem is how to describe the data of the social world studies so vividly that the reader, like the researchers, can almost literally see and hear its people-but always in relations to the theory” (Glaser & Strauss, 1967).

In order to accomplish this task the first step in the analysis process will be to enlist a code and classification bin process. Strauss and Corbin (2007) define coding as “the analytic processes through which data are fractured, conceptualized, and integrated to form theory”. Classification takes coding a step further. Classifying involves creating a system of indigenous typologies that are “made up of categories that divide some aspect of the world into parts along a continuum” (Patton, 2002). The combined processes of coding and classification are used as a tandem process to batch the data into common themes.

2.7.3. Pattern Matching

Finally, because this is a qualitative study it is important to have a method to confirm that the analysis of the interview data was on-target. To accomplish this, a follow-on survey consisting of 19 questions that restated the interview questions with a Likert scale scoring system. This follow-up survey (Appendix C) was then emailed to the interviewees. This data was integrated into the analysis using a pattern matching methodology.

Robert Yin is noted for his use of pattern matching as an analytical strategy for case study research. Yin's treatment of case study research suggest that patter matching, when performed with appropriate rigor, will result in the formulation of expected patterns found in dependent and independent variables from a series of mutually exclusive sometime opposing or rival theories and patterns that overlap with other observable pattern (Yin, 2009). Yin also discusses the following types of theory testing, (1) The pattern in a nonequivalent dependent variables design in which the initially predicted value must be found for each element of a pattern of dependent variables and (2) The pattern in a nonequivalent independent variables design (2009). Utilization of pattern matching permits an effective method by which quasi experimental design can be analyzed.

2.8. Summary

This chapter has provided a literature review of the significance of industry education and training, recruiting the right workforce, a history supply chain and pertinent supply chain management definitions. In addition, this chapter has discussed industry-university collaborative relationships and an exploration of the qualitative research approach, research survey approach and the process of pattern matching.

CHAPTER 3 DESIGN AND METHODOLOGY

The purpose of this research is to investigate the perception of the effectiveness of supply chain management in a difficult global economy and examine the ways in which an educated and well-trained workforce enhances the probability of an organizations success. In addition, this research will investigate how maintaining an educated, trained, and engaged workforce increases the ability of a company to extend their presence and competitive strength within their industry.

3.1. Research Overview

The following is an overview of the research process utilized to complete this research. The research was conducted in three major stages;

1. Background research and Research question development
2. Data collection
3. Data analysis and Data evaluation.

Each stage is representitive of a subset of activities and action necessary to complete the research (Figure 3.1). This figure is a pictoral outline of the overall methodology for this research. The outline include major headers, for example background, data, and data analysis and evaluation and detail categories.

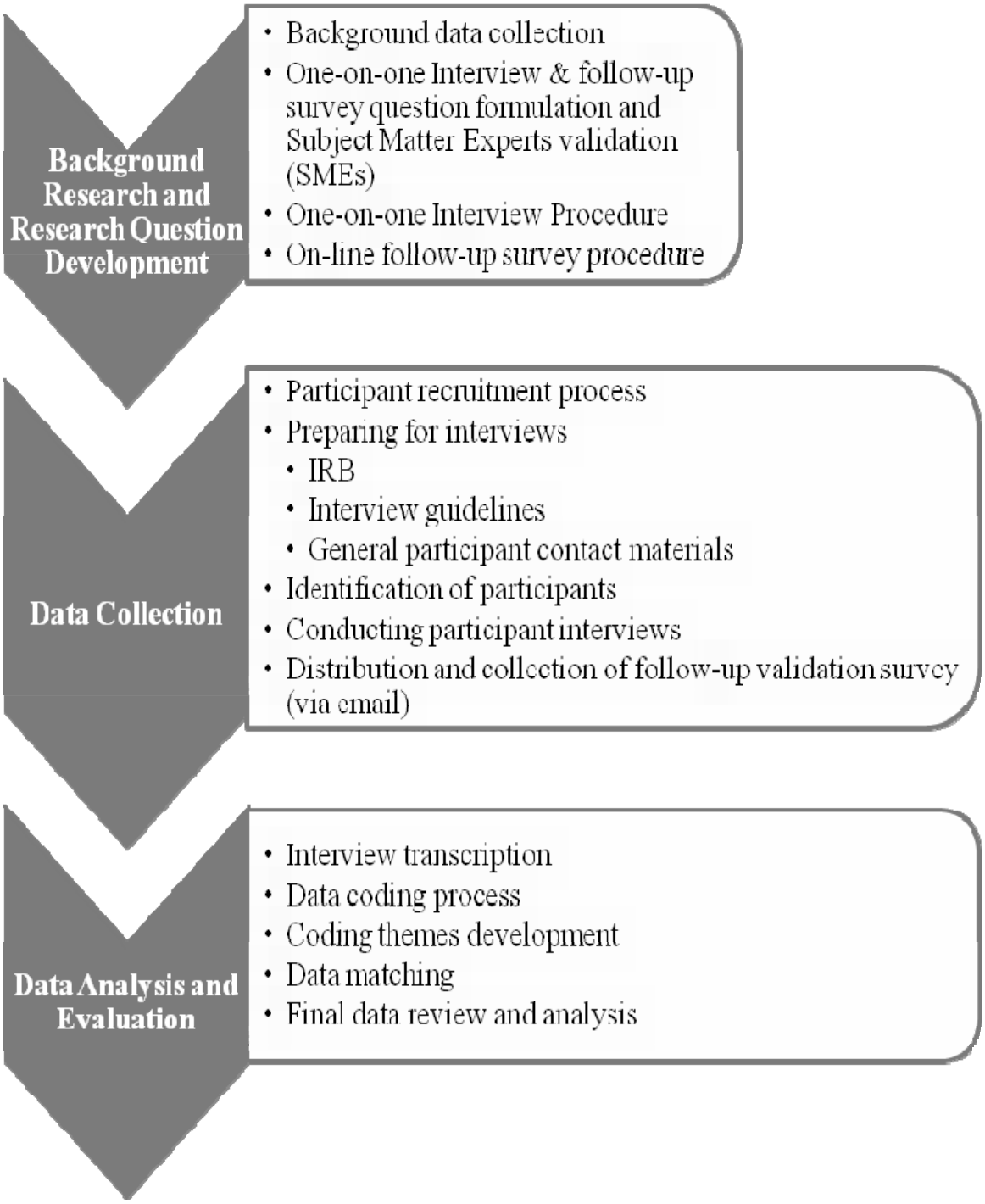

Figure 3.1 Research Methodology Outline

3.2. Research Methodology Outline

This section will review the details of the research methodology outline.

3.2.1. Background Data Collection

A collection and review of background and historical materials and data related to supply chain management and workforce education literature was compiled. These materials and data were utilized to establish a baseline for the research and a foundation for the development of the research processes, survey questions and research procedures.

3.2.2. One-on-One Interview.

Subject Matter Experts validation - Upon completion of the literature, the research met with six SMEs, four from industry and two from academia. SMEs were individuals from education and businesses with backgrounds in manufacturing, customer service, supply chain management and education and training. These SMEs were asked to review the operational framework model (Figure 9) and an early draft of the standardized open-ended interview and follow-up survey questions. Following the reviews with each of the SMEs a series of standardized open-ended interview question and follow-up questions were formulated. Standardized open-ended questions were used for this research because they can yield meaningful information when exploring complex issues (Carey, Morgan, & Oxtoby, 1996).

3.2.3. Follow-up Survey Question Formulation.

The follow-up survey questions were designed and used as a validation tool following the analysis of the participant interviews. The complete list of standardized open-ended interview questions and follow-up survey questions are available in Appendix B and C. These questions were designed based on their significance and relationship to the issues identified in the operational concept framework model (Figure 9) for this study. Once questions were formulated, they

were reviewed by a team of SME's in an attempt to confirm that the questions were representative of the prescribed research goals and objectives.

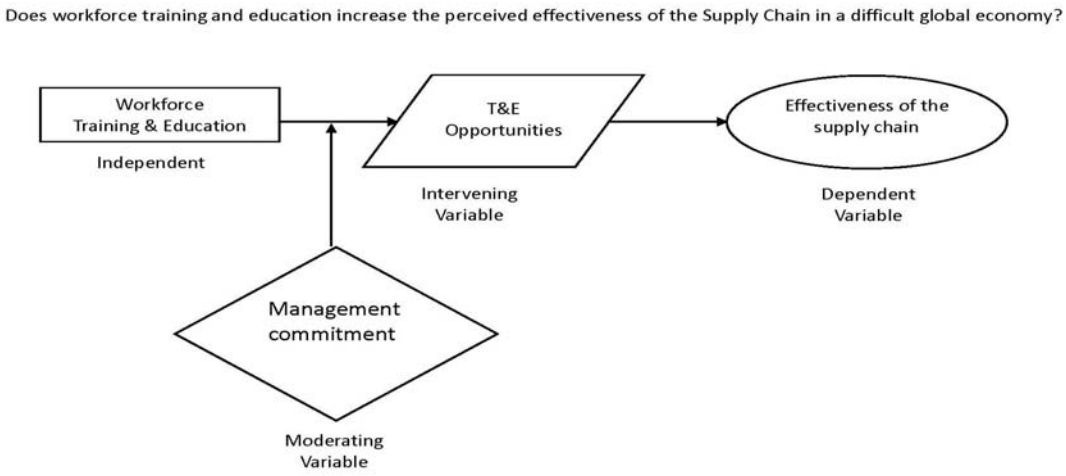

Figure 3.2 Operational Framework Model

3.3. Operational Framework Model

The operational framework model was the catalyst for development of the operational concept model (Appendix A). This model established the outline for the creation of the research questions which are as follows;

1. What is the perception within the organization of supply chain effectiveness?
2. Does a knowledgeable, well-educated, and well-trained workforce play a significant role in the success of an organization?
3. Does the leadership communicate and demonstrate their commitment to education and training?
4. Is there a perceived link between a well-educated and well-trained workforce and the organizations success?

5. Is the workforce more likely to be innovative, productive, and engaged problem-solvers when company leadership openly communicates their support of the workforce and rewards their efforts?
6. What is the significance and role of a high-performance workforce in a global economy?

The next step was to create actual research interview questions. These interview questions were designed to be reflective of the Operational Concept Model (Appendix A) and as a means of enhancing the clarity of the research direction and imparting a more succinct interviewing path. Research areas were divided into three major data categories and six sub-categories all stemming from concepts identified throughout this research literature review. The Operational Concept Model was designed to guide the formulation of research questions pertaining to the perceived effectiveness of the supply chain management. The next step was to sort supply chain management into process categories supporting the identified areas for this study. Three process categories were identified and labeled as;

D1 - SC process understanding,
D2 – SC process application
D3 – SC success elements.

The research questions also provided a catalyst for subject matter question areas for each process category reflective of the Operational Concept Model (Appendix A). Each category was further divided by the issues associated within the subcategory, also derived from the Operational Concept Model. The Tables are identified first by the model category headers then by category, activity and subcategory are labled and grouped in the following Tables.

Table 3.1

D1/D1A Supply Chain Process Understanding

Category	Activity	Subcategory
D1:A	Supply chain	Corporate stragegic plan
		Goals & objectives
		Signifiance of SCM to the strategic plan
		Effectiveness of cross-funcational teams
		Plant/company performance measurments

Table 3.2

D1/D1B Supply Chain Process Understanding

Category	Activity	Subcategory
D1:B	Global competitive	Global competition
		Economy
		Major global issues
		Marketshare

Table 3.3

D2/D2A Supply Chain Process Application

Category	Activity	Subcategory
D2:A	Job skills training	Engineering
		Mechanic
		Negotiations
		Problem Solving
		Quality
		Statistical

Table 3.4

D2/D2B Supply Chain Process Application

Category Activity	Subcategory
D2:B Process management	Strategic planning
	Strategic management
	Performance management
	Product lifecycle management
	Supply chain management
	Configuration management
	Customer relations
	Resource management
	Human resource management

Table 3.5

D3/D3A Supply Chain Success Elements

Category Activity		Subcategory
D3:A advantage	Competitive	Management of supplier relations
		Purchasing
		Supplier selection
		Warehouse management

Table 3.6

D3/D3B Supply Chain Success Elements

Category Activity		Subcategory
D3:B Customer	satisfaction	Customer service
		Transportation & logistics management
		Comparisons to the competition

Utilizing the layout of the Operational Concept Model (Appendix A) as a tool for organizing these categories and analyzing the response data gathered during the interview process.

3.4. Interview Questions

The following are examples of the questions used during the question validation phase of the research. Note that the data letter codes from the Operational Concept Model is in parantheses behind each question. This facilitated the on-going link between the data and the question:

1. How does your company communicate the goals and objectives in the corporate strategic plan to the supply chain? (D1:A)
2. Tell me how your company shares work process data with supply chain members. For example, if engineering makes a drawing change that effect cross-functional work teams. (D1:A)
3. Which measurements does your company use as key indicators of company performance? For example; production rate, cycle time etc. (D1:A)
4. What are ways that your supply chain members work together to accomplish your goals? (D2:B)
5. How do you deal with sharing sensitive business information with supply chain members without worrying about the security of the data? (D2:B)

The complete list of questions is available in Appendix B.

3.4.1. One-on-One Interview Procedure

One-on-one Interview Procedure - One-on-one interviews were conducted utilizing a guided standardized open-ended interview approach. This approach aided in the ability of the researcher to focus the interviews and it provided the interviewee the opportunity to contribute independent and undirected responses to the interview questions (Patton, 2002). The researcher met, either in person or

via telephone, with each of the participants at the agreed upon location and time. The conversation began with an overview of the research and the procedure for the interview. This overview included information about the university and the department program, the objectives of the interview, defining concepts and terms as they apply to this research and a review of the direction for the research.

Following the process overview and project explanation demographic data was gathered (Table 3.7) and verbal permission to digitally record the interview was requested of each participant. Interview questions were delivered verbalized by the researcher and responded to by the interviewee one at a time. These questions were designed to facilitate a free flow of decision thoughts, ideas and sharing of information. The length of each one-on-one interview's varied between 20 minutes and one hour. This process facilitated the collection of relevant information, enhance the ability to clearly comprehend data and accurately store the data for transcription at a later time.

3.4.2. On-line Follow-up Survey Procedure

The on-line follow-up survey (Appendix C) was designed to provide an additional level of validation for the study. After the completion of the one-on-one verbal interview, each interviewee was asked to complete and return the survey also via email. Once the survey was completed that data was reviewed along-side the one-on-one interview response data inorder to identify common issues and patterns and validate the accuracy and intrupretation of the recorded data transcription.

3.5. Research Data Collection

As previously stated, data collection was conducted using a standardized open-ended inteviews process. The standardized open-ened method allowed the interviewer to collect specific information related to the interview questions and the flexibility to gather additional information that might be used to enrich the

value of the research (Patton, 2002). Interviews with industry representatives provided the foundation for a broader sample population of industries participating in supply chain management and workforce education and training efforts. The purpose of these one-on-one interviews were to establish a baseline for understanding the role of supply chain management in the industry organization and to determine if workforce education enhanced the competitive ability of an organization. Furthermore, the survey questions (Appendix C) mentioned earlier in this chapter were formulated into a Likert evaluation scale then emailed to the original respondents as a follow-on survey to the original interview. These questions supported the researcher's analysis of the interview data.

3.5.1. Institutional Review Board (IRB)

The criteria for participants was submitted to and approved by the Purdue Human Subject Institutional Review Board. Generally, these decision-makers were in management or project leadership positions. It was also important for the interviewees to have significant knowledge of the supply chain activities, processes, and procedures utilized throughout their companies and their supply chain partners. For the purpose of maintaining a degree of anonymity, participants were assigned an identification code number that would follow their data throughout the research review process (Appendix D).

3.5.2. Participant Recruitment

After completing a search focused on identification of companies utilizing supply chain management processes, an initial list of approximately 20 companies was identified. In addition to utilizing supply chain management processes it was important that the participant have decision-making responsibilities for the company in which they worked. For the purpose of this research decision-makers were defined as those individuals in management or

project leadership positions who were in position to change processes and procedures used by the workforce. With the help of the SME's, from industry advisory committee members, and through personal career affiliations with business professionals contact was made with these companies and the list was reduced to those companies who indicated a willingness to participate in the research study.

3.5.3. Interview Guidelines

Participants involved in this research represented industries actively integrating a supply chain management methodology into the respective work-environments. Industry representatives interviewed for this study were decision-makers from aerospace, large equipment manufacturing, construction materials manufacturing, shipping, petroleum manufacturing, agriculture, education and bulk shipping. Access to these companies was gained with the help of a variety of contact sources such as local industry leaders, academic advisory committee members, members of professional associations, member of the academic community, SME's in the fields of supply chain management and education and training and personal industry contact established while in industry.

3.5.4. General Participant Contact Materials

Initial efforts to make contact with interviewees were via telephone or through an exchange of email. An interview script (Appendix E) was used to guide the recruitment conversation. Along with an overview of the goals and objectives of the research, the interview process and follow-up survey's processes were explained and meeting days, times and locations were arranged for each of the interviews. Following these conversation or email exchange, a confirmation letter (Appendix F) was sent via email or through the U. S. Postal service to each of the participants.

3.5.5. Identification of Participants

The field of participants for this study was limited by the studies focus on businesses engaged in utilizing supply chain management and the perception business decision-makers have of the effectiveness of supply chain and the impact that the well-educated, well-prepared workforce has on organizational success. These limitations made it necessary to narrow the field of participants to those who meet the above stated criteria therefore a non-probability judgment sampling design method was utilized for this study. The non-probability judgment sampling method was the most efficient and effective method for managing the list of potential participants who represented a variety of industries, located in various regions of the United States.

The number of participants necessary for this research was governed by the objective of the research, which was to gain insight into the perceptions of the participants in the interviews. According to Yin (2009) the nature of qualitative research can provide depth and significant insight into the perceptions of the effectiveness of supply chain management and workforce education effectiveness by the primary decision-makers supply chain effectiveness. It was important to decide whether it would be better to limit interview participants to decision making representatives from a single business or industry for example only aerospace manufacturing firm or to include a diverse participant business population. Limiting the interviews to a single industry might have been easier because of the similarities in production methods and processes however there was concern that the similarities would likely result in responses by the decision makers that were too much alike resulting in providing a narrow information focus and limited research value. It was determined that there was greater potential for gathering richer, more substantial and meaningful data from a wide range of business and industry resources with various product and service offerings. The variety of source allowed the researcher to connect with a diversity of supply chain networks and relationship and to collect information based on product offerings, services and company sizes.

Employing the use of the open-ended interview helped to maintain the research question perimeters of the interviews without influencing the direction of the response at the same time, the list of research questions enhanced the data collection process in that each of the research questions helped to categorized and compartmentalized the data. Determining the best number of participants when conducting qualitative research depends on the quality is subjective depending more on the quality of the data collected. According to Patton (2002) it is possible to collect detailed significant data from a smaller number of participants. Enlisting the participation of decision-makers complicates the data collection process because decision-makers, often managers and members of senior leadership, may not be easily accessible and/or may not be willing to participate in research studies. The access to company decision-makers, time restrictions, physical location and budget concerns were several of the pragmatic reasons for limited the number of research participants.

3.5.6. Conducting Participant Interviews

Once contact with the participant had been established the date, time and location for the interview was established. Interviews were conducted both in person and via telephone and with the exception of one interview, permission to use a digital recorder during the interview session was granted.

After a brief process introduction interview the standardized open-ended research questions were posed by the researcher one-by-one. The interviewee was then asked to furnish a free-flow verbal response to each of the questions. The one-on-one interviews were conducted utilizing a standardized, open-ended interview guided approach. This approach aided in the ability of the researcher to focus the interviews and it provided the interviewee the opportunity to contribute independent and undirected responses to the interview questions (Patton, 2002). Three of the interviews were conducted at in the offices of the interviewee, two via telephone, and researcher met, either in person or via telephone, with each of the participants at the agreed upon location and time. Following a verbal

overview of the interview process demographic data was collected (Table 3.8) and codes were assigned for each participant (Table 3.7).

Before beginning the interview, the researcher requested and in all cases received verbal permission to digitally record the interview. Interview questions were delivered verbalized by the researcher and responded to by the interviewee one at a time. Each one-on-one interview varied in length from between 30 minutes and 1½ hours. This process facilitated the collection of relevant information, enhance the ability to clearly comprehend data and accurately store the data for transcription and analysis at a later time.

Table 3.7

Participant Coding

CID	Title	Industry
SCED001	President	Agriculture
SCED002	Manufacturing Engineer	Aerospace
SCED003	Manufacturing Engineer	Turbine Engineering
SCED004	Supply Chain Manager	Equipment Manufacture
SCED05	Director	Aerospace
SCED06	President/CEO	International Shipping
SCED07	President/CEO	Construction
SCED08	Supply Chain Manager	Independent School District
SCED09	Vice President Supply Chain	Off-Shore Engineering

Again, each individual participant was identified based on their position in their respective companies as a decision-maker and their ability to influence the direction of the supply chain.

3.5.7. Distribution and Collection of Follow-up Surveys

Finally, during the research overview introduction the interviewees were notified that they would receive a follow-up validation survey via email. Once they had completed the survey they were asked to return the survey (Appendix C) to the reseracher via email. This data was then utilized as a validation matching tool to help confirm the analysis of the interview transcription data.

The survey consisted of 19 questions that were designed to be reflective of the one-on-one verbal interview questions. The survey was delivered to each participant via email with a request to complete and return the survey once it was completed. Data collected with this confirmation survey was designed to corroborate the transcribed data collected during the one-on-one interviews.

3.5.8. Data Analysis and Evaluation

Quantitative data is characterized by the collection of scientific and number driven or “hard” data. “Hard” data is defined in the *Grantsmanship Center* magazine as “what can be described with some specificity, which usually means that it is quantified” (Kiritz, 1997). Analyzing qualitative data depends on the researcher’s ability to collect data from a variety of sources and ‘real world’ settings and simultaneously organize the data in a manner that delivers a meaningful message providing understanding, and authenticates the research goals and objectives. The analysis flow was consisted of transcribing the recorded interview data, placing that data into bins based on common themes and ideas, collecting the follow-up survey data, utilizing the pattern matching process to support and validate the analysis of the recorded data and finally, process and document the results of the research.

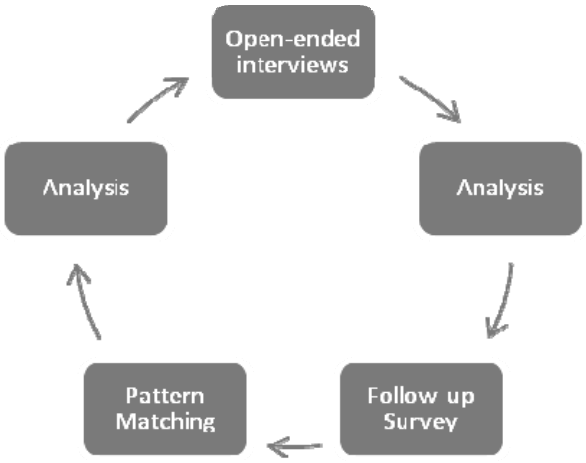

Figure 3.3 Analysis Flow

3.6. Coding and Classification of the Data

In order to accomplish the task of analyzing the data a coding and classification bin process was utilized (Strauss & Corbin, 2007). The process involved creating a system of analogous typologies in tandem with batching data into common themes (Appendix F). The coding and classification process was conducted using the following four steps identified by Foss and Waters (2003):

3.6.1. Coding and Classification of the Data Process

This step involved going through the data and looking for statements that address the research questions. This process involved uncovering key, reoccurring words, phrases, and ideas that can be used to gather the interview responses into bins or groups (Appendix F). Once common themes have been identified and grouped into bins research meaningful themes were discovered. The nature of qualitative research focuses on the collection of seemingly random information to the exclusion of concrete facts. Standardization and rigor are essential notions for qualitative researchers. Utilizing a coding and classification

process lends a means for applying standardization and rigor to the process of analyzing the research data. Coding and classification go a long way toward building a solid collection of standardized and rigorous qualitative data evaluation. Foss and Waters (2003) identify a four step coding process that consists of the following:

1. Coding the data – reviewing the data for items that were pertinent to the research question. The researcher looked for specific and concrete phrases, passages, quotes, and ideas to use as labels for bins or groupings of like data. Utilizing the information in these bins/groupings the researcher was able to examine the data and look for reoccurring examples and ideas. At that stage of the analysis it was important for the researcher to avoid the temptation of explaining or assigning meaning to the information in the bins.

3.6.2. Developing Data Themes

Using the previously identified bins, the next steps were to further sort and define the data and arrange the information into piles that narrowed the scope of the data. At this stage of the evaluation and analysis process in is important to confirm that the data was either directly linked to addressing the research questions or that the data was insignificant and therefore should be discarded. Foss and Waters second step involved continuing the sorting process, establishing more well-defined data groups in order to further capture the essence of the data.

2. The groups of data were evaluated by asking; Is everything in the group relate to the assigned bin label? Are there enough similarities between bin labels to combined groups? Should some bin groups have been deleted because they lack significance, are not related to the research question, or have very few data items and therefore will not contribute to the research in any meaningful way?

3.6.3. Development of a Conceptual Schema

From the data identified in the themes in step two, brought together into coherent concepts that answer the research questions in an articulate and lucid manner. The emergent patterns and themes began to crossover between categories, making it possible to organize into themes from which meaning could be made of the data. Once narrowed the data into these conceptual schemas, the results of the validation survey was used to help substantiate the analysis of the data and solidify the direction of the research results identified through analysis of the interviews. Foss and Waters third step is:

3. To development of a conceptual schema was completed based on the data gathered from the responses to the research questions. It was important that the responses were coherent and that the meaning behind the responses extended beyond the obvious. The step allowed the researcher to move and organize the themes in a way that made meaning and resulted in identification of findings and research results.

3.6.4. Documentation of the Analysis

Once the data had been compiled and a theme and theory was identified, the next step was to tell the best possible story with the data. The final step identified by Foss and Waters was the documentation or write-up of the analyzed results.

4. In this final step the researcher arranged the themes in a way that told the research results as they unfolded from the conceptual schema. Foss and Waters (2003) suggested that the work in the three steps of the coding process provided a grounded base for writing the final research study document in a way that effectively told the research story and contributed fresh and new ideas to the field of research.

3.7. Data Analysis Concept

In a supply chain management study conducted by Andersen and Rask (2003) explored an alternate use of pattern matching when looking at organizational practices for changing procurement realities. Andersen and Rask applied pattern matching to the study of supply chain management and practices and noted, "…a case study considered in terms of hits and misses in pattern patterns and is used as a means for further theoretical development, involving several iterative loops between phases of the research process" (2003). Research utilizing an open-ended interview process including responses from of multiple subjects in different industries will result in an array of responses that do not necessarily have an obvious relationship. Pattern matching permits the researcher an interpretative degree-of-freedom when analyzing the interview data.

Yin (2009) most often uses pattern matching in evaluation of case study materials, however the small sample size along with the use of the open-ended interview questions, and follow-up survey questions made the fundamental processes associated with this research made the use of patter matching a good fit for assessing the supplemental data collected in the research conducted for this project. Both Patton (2002) and Yin (2009) agree that qualitative researcher is responsible for telling the story of the data with honesty and credibility. The task for the researcher is to create a living research-picture of the 'real world' in a focused setting.

3.7.1. Data Transcription and Formatting

The data for this project has been collected during interviews that were recorded whenever possible. All data were then transcribed and formatted into side-by-side columns compiling the responses of the interviewee in the order of their answer to the question by the researcher. This data were then coded and labeled into groups based on emerging themes gleaned from the interviews.

Sorting the data by themes allowed the data to be further segmented into converging classifications and reviewed for the substantive significance of the data.

This process of identification made it possible to establish logical emerging patterns found in the data were recognized in the creation of crossover referencing categories themes for the sake of evaluation and analysis. This aided in the endeavor to provide a means by which the researcher could begin the process of assessing the current state of supply chain management and workforce education and training and the significance of these on the success of industry and to develop a interview instrument for the next phase of the research.

The data analytical process consisted of a system of open coding into labeled groups based on emerging themes gleaned from the interviews. Open coding fractures the data and involves line-by-line analysis of phrases and words that consistently emerged during interviews with each of the participants. Reoccurring descriptors (phrases and words) are headers for each BIN's (Appendix F) to generate an easy method to establish meaning. For example, the number of employees taking continuing education courses may emerge as a theme. BIN #1 might be labeled: employees enrolled in continuing education programs. A second theme, BIN #2 might be; well-educated employees are self-starters and so on. Such themes allow the data to be segmented into converging classifications and reviewed for the substantive significance of the data. The classification-coding system is completed in a five step review process:

5. Conduct at least 2 readings of all of the data.
6. Read again looking for significant themes and research patterns
7. Choose small parts (words and phrases) to identify chunks of ideas and thoughts
8. Begin placing data into BINS (coding)
9. Group concepts according to similarities and differences (Enersen, 2007).

The process outcome matrix facilitated the process of identifying what is truly important to the stakeholders. The matrix also helped focus the data and creates links between the processes and outcome impacts. Interpreting the data is the meaning-making step in the process. Using a qualitative comparative analysis as the interpretive approach to the research helped generate a strong explanation of the data (Patton, 2002).

The final analysis portion of the research was the integration of the emailed follow-up survey that provides the ability to implement a pattern matching process the research and facilitate the qualitative data. The concept of pattern matching is defined as follows: “A pattern is any arrangement of objects or entities…Theories ‘predict’ some pattern of values of variables” (Hak & Dul, 2009). The follow-up survey questions were rooted from the questions posed during the research interviews (Appendix B). These questions were formatted into a Likert scale for measurement purpose and as a means by which to reflect the results of the data acquired during the interviews. Analysis of the survey data was completed for each survey question utilizing the fundamental concepts found in the pattern matching process. Following this analysis of the follow-up survey questions, the data was compared to the interview data in order to validate the interview findings.

3.8. Summary

Chapter three unveiled to the design and methodology utilized to conduct this research. The one-on-one interview and on-line survey processes were discussed along with the method employed to organize the data during the interviews and the process used to analyze the data.

CHAPTER 4 RESULTS

This research study was designed to investigate the perception of the relationship between supply chain effectiveness and workforce education and training and answer the following questions: (1) What is the perception within the organization of supply chain effectiveness? (2) Does a well-educated and trained workforce play a significant role in the organizations success? (3) Does the leadership communicate commitment to education and training? (4) Is there a perceived link between a well-educated and well-trained workforce and the organizations success? (5) Is the workforce more likely to be innovative, productive, and engaged in problem solving when company leadership openly communicates and rewards their accomplishments? (6) What is the significance and role of maintaining a high-performance workforce in a competitive global economy?

In order to achieve the objectives of this research, company decision-makers were asked to respond to a series of research related questions designed to identify noteworthy correlations, if they exist, between supply chain management success and workforce education and training. Interviews were conducted with decision-makers from an array of company sizes and industry focuses. The qualitative framework methodology employed to collect this data provided a functional means for capturing and analyzing descriptive information for this study. Additionally, a Likert scale follow-up survey was administered to facilitate authentication of the data analysis. The results of this data are presented in a descriptive narrative and accompanied by summary tables that enhance the descriptive findings.

Data for this research was structured to gather, analyze and present the results of this study. These results are presented in three sections: demographic and related parenthetical data, interview analysis, and a follow-up survey. Because the primary correlation of the relationship between supply chain effectiveness and workforce education is constructed on the perception of the interviewees, it was important to construct interview questions that included that embraced the overall vision of the company. To this end the interview questions included inquiry into the methods utilized to communication company goals and objectives, measure workforce skills and education, and measure customer satisfaction. The composition of these research questions provided a collection of data formulated to analyze and confirm or negate the research assumptions. The follow-up survey was incorporated into the analysis process with the intention of furnishing a corresponding support for the overall research findings.

Data correlations were generated utilizing the Foss and Waters (2003) data coding methodology. The interview data collected during this research were organized into bins (Appendix F) of corresponding or commons themes creating patterns that represented the dominant trends established in this research. An inductive analysis approach was utilized to assign meaning to the interview data. The purpose of the follow-up survey was to provide a means confirming that the interpretation of the data collected and analyzed during the subjective interviews was accurately focused into themes and trends. A descriptive analysis of the ordinal data was utilized to support the inductive analysis data.

This chapter presents the data from the interviews with the decision-makers as well as the results of the follow-up survey information. The chapter begins with the general findings of the study followed by descriptive demographic information about the participants. The chapter goes on from there to the analysis of the interview data, the pattern matching analysis and finally, a results overview.

4.1. General Findings of the Study

Study results were mixed however the results clearly suggest that decision-makers perceive both supply chain management and a well-educated and trained workforce are essential and necessary component for company success. The compilation of research data revealed no significant evidence establishing a firm link and/or direct association between supply chain effectiveness and an educated and trained workforce. At the same time the research strongly reinforces the association between successful supply chain management and education. Reporting of these results will began with an overview of participant demographics.

4.1.1. Participant Demographic Data

As part of the study, participants were asked to provide personal demographic data. Demographic data included the interviewee's job title, industry affiliation, and number of years in the industry (Table 4.1). A research identification code number was assigned to each participant for the purpose of maintaining interviewee and company anonymity. The coding process replaced the name of the participant with an assigned letter and number for example; SCED001 identified the first study participant. These codes were utilized as the official designator for the participant throughout the research study.

Each interviewee was identified as one has management level decision-making power within their business organizations. These decision-makers are in a position to provide unique perspectives of the effectiveness of supply chain management, education and training integration in their respective companies. The following is introductory descriptive demographic information gathered from each interview participant.

Table 4.1
Participant Demographics

POSITION	INDUSTRY	YEARS IN THE INDUSTRY
President	Seed and grain	31
Manufacturing Engineer	Aerospace	3
Director of Supply Chain	Education	16
SSG Supplier Procurement Director	Aerospace	27
President/CEO	Shipping & Transportation	37
President/CEO	Commercial & Private Construction	20
Export Representative	Agricultural & Construction Equipment Manufacturers	12
Manufacturing Engineer	Turbines Engine Manufacturing	3
Vice President of Supply Chain Management	Offshore Service Provider	15

4.1.1.1. Participant SCED001

SCED001 is the President of the an alliance of crop seed and growth products based in Illinois. With the company for 31 years, he has worked in sales and management. He currently oversees the sales and global supply of genetic seed distribution for the company. He has a Bachelors Degree in Business Administration and an MBA.

4.1.1.2. Participant SCED002

SCED002 has been employed as a Lead Manufacturing Engineer at an Aerospace company in Southern California for three years. Prior to this he was enlisted in the U. S. Navy as an Information Technician. He has Masters Degrees in Manufacturing Technology and Business Administration. This division of the company at which he is employed has approximately 24,000 employees. In his

position as a Manufacturing Engineer, he is one of the managers responsible for making manufacturing process decisions that determine the direction taken by the manufacturing supply chain.

4.1.1.3. Participant SCED003

SCED003 is the Director of Supply Chain Services for the 34 plus pre-kindergarten through twelfth-grade schools in this Independent School District located just north of downtown Houston, Texas. He has been with the school district for approximately one year however he has worked in the supply chain related fields for 16 years. The newly completed state of the art distribution facility employs 29 full-time employees. He has a Bachelors Degree in Supply Chain Management and an MBA.

4.1.1.4. Participant SCED004

SCED004 is the Supplier Procurement Director for an Aerospace Manufacturing company in Southern California. With the company for 27 years, she is responsible for directing the internal and external procurement supply chain. There are approximately 8,000 employees at this division. She has a Masters Degree in Business Administration.

4.1.1.5. Participant SCED005

SCED005 President/CEO since 2004 of one of the leading specialist in the global transportation of break-bulk, heavy-lift and project cargoes. Located in Houston, Texas he has been active in the industry since college. Over the span of his career he has the reputation of having done just about every job imaginable in a steamship industry. He has a BS in Transportation Economics and Management.

4.1.1.6. Participant SCED006

SCED006 is the President of a small commercial and private construction supply company located in Marquette, Michigan. This family owned business employees 20 individuals in peak season and 10 during the layoff period when construction in the region of the country is halted by weather conditions. He has worked full-time as the President of the company since 1990. The supply chain for this company operates primarily within the U. S. boarders however, does order products and supplies from Canada on occasion. He has a Masters Degree in Mechanical Engineering.

4.1.1.7. Participant SCED007

SCED007 is an Export Representative for the world's largest manufacturing of agricultural and construction equipment manufacturers. In her job capacity, she is the primary liaison between her company in the U.S. and their international partners as well as managing the export supply chain worldwide. She holds a bachelors degree in Industrial Distribution and an MBA.

4.1.1.8. Participant SCED008

SCED008 is the Manufacturing Engineer over plants in California and Mexico. He coordinates and manages engineering and manufacturing upgrades and changes in both locations. He is also actively engaged in managing supply chain activities between the locations, external suppliers and their customers. He has a bachelor degree in Industrial Engineering and a Master's degree in Manufacturing Technology.

4.1.1.9. Participant SCED009

SCED009 is the Vice President of Supply Chain Management at an international provider of offshore services and products, primarily to the oil and gas industry, with a focus on deepwater applications. In addition, the company uses their applied technology expertise in service to the defense and aerospace industries. The participant has a degree in Industrial Engineering and an MBA.

4.2. Analysis of Interview Data

The interviews with decision-makers were rich with information about the supply chain, education and training and organization success. The diverse nature of businesses, the assortment of company sizes and locations, and the range and levels of responsibilities of the decision-makers who were interviewed increased the challenge of managing the information in a cogent manner. To aid in the process of assigning meaning to the interview data, it was important to organize the subjective data into categories that were directly associated with the levels identified in the Operational Concept Model (Appendix A) of the perceived effectiveness of the supply chain. The initial level of the Operational Concept Model encompassed three primary categories; D1: Supply chain understanding, D2: Supply chain process application and D3: Supply chain elements and six original research questions. This organization process proved to be the most efficient and effective method for sorting the results, confirmation of data connections, identifying the significance of the data and conveying the research findings. The following is a descriptive presentation of the interview data organized in categories based on the six original research questions. In addition to the overview of the interview responses to each question, segments from transcribed data will be displayed in a texturally descriptive format.

Company leadership, decision-makers, is inclined to assess the state of the organization from a somewhat skewed vantage point of their position. There

is a general reluctance on the parts of the workforce to reveal the truth about the working conditions and/or to discuss process and efficiency issues, especially with those in decision-making power. The working relationships between the “us” workers and the “them” management or decision-makers is a prevalent theme throughout industry history and it is a theme that continues to dominant decision-makers/workforce relationship patterns today. The result of this traditionally adversarial and secretive decision-maker/worker tradition leaves decision-makers to make decisions in a vacuum based primarily on their perceptions of the organizations effectiveness.

The following are clusters of meaningful responses were grouped in accordance with the format reflective of those in the Operational Concept Model (Appendix A) significant remarks from the decision-makers are shared. These comments reflect those themes that decision-makers deem important to making the organization and the supply chain function effectively. Each cluster of comments is a compilation of the perceptions of the decision-makers as they relate to the activities, systems, and processes that they believe guide supply chain effectiveness, education and training and organization success. The comments were assigned to research questions, coded by key themes then clustered into categories that address the research questions posed in this study.

4.2.1 D1: Supply Chain Process Understanding

Research Questions 1 & 6 – What is the perception within the organization of supply chain effectiveness? What is the significance and role of maintaining a high-performance workforce in a competitive global economy?

Having a strategy, a plan and a common sense of direction are important to the perception of supply chain effectiveness. Incorporating the ideas, skills and collective efforts of the entire supply chain is an instrumental part of the effective supply chain. The first cluster addresses the perception of the importance of engaging the entire supply chain the utilization of a strategic process:

4.2.1.1. Participant SCED001

"…we have a business agreement…we'll electronically share any type of data and information…agreements have confidentialities…create long-term relationships…our guiding principles…you know supply chain and as we deal with contracts, cause we do a lot of contract work…our genetics from people in technologies and we're out transferring that intellectual property."

4.2.1.2. Participant SCED002

"That's a little more pro-active once a new part is needed or required…Backlog (industry or peer indicator). Long-term strategic goals, what we want to do as a company…cornerstones to that strategy…Levering business opportunities."

4.2.1.3. Participant SCED003

"...goals and objectives of the district um tickle down throughout the organization…So, finance who is the division that I report to has goals that support the district and then goals within my department support the goals of the division, which support the district…goals of the different department and support departments within that what can we do as a department to become Nationally recognized?"

4.2.1.4. Participant SCED004

"Engaging suppliers in strategy."

4.2.1.5. Participant SCED007

"Supplier component warranty, quality plans with suppliers, how well they communicated using the parts change process…all of the corporate supply and plant each has their list of certified suppliers…We knew that China, with the

Olympics would delay getting parts…plan ahead. Collaboration web-site…Direct communication between factory and suppliers."

4.2.2. D2: Supply Chain Process Application

Research Questions 3 & 4 – Does leadership communicate commitment to education and training? Is there a perceived link between a well-educated and well-trained workforce and the organizations success?

The following are comments that emphasize the importance of integrating the right set of common systems, processes and procedures are also a significant portion of the perception of supply chain effectiveness.

4.2.2.1 Participant SCED002

"Everyone is involved…OASIS is an internet; web-based portal that any supplier can come and submit applications to become a supplier on…a centralized document spells out for them what we expect…ITAR (Inter-nation Traffic of Arms and Regulations) regulations will determine what type of supplier can see this type of information…The change technically goes through a centralized server…TeamCenter…a challenge with that using our US-Infinity to be the end all, save all of our SPC data…it's very hard to implement the data coming out of our CNC machines, especially our precision milling machining."

4.2.2.2 Participant SCED007

" SAP system to communicate changes and other critical changes…Process owners (champions; supervisor assigned persons) are responsible for tracking and they have full visibility for the enterprise…Production Product Management (PPM), T&A, SPC (per machine) they are all tracked measures. Supplier component warrantee metrics are also tracked."

4.2.2.3 Participant SCED008

"…enterprise planning software…some of our Black-belts actually go out to the casting facilities and work on improving their processes…part of it is lean six-sigma.

4.2.3 D2: Supply Chain Process Application

Research Questions 2 & 5 – Does a well-educated and trained workforce play a significant role in the organizations success? Is the workforce more likely to be innovative, productive, and engaged in problem solving when company leadership openly communicate and rewards their accomplishments?

This cluster of responses is compiled of significant comments related to involvement and trust between members of the supply chain as well as addressing the role a workforce that is encouraged by their leadership to be innovative and engaged plays in an organizations success.

4.2.3.1 Participant SCED004

" …we do a lot because a lot of the work that we do, ohm, we'll place work internationally in order to help with industrial participation requirements…we've found is a lot of the international suppliers have gone to great lengths around the control of data…they've done a lot to mitigate the concerns…our focus in the last couple of years, at least in the non-production area has been…process from end to end value…Making sure that we're optimizing the whole value stream and not any one piece."

4.2.3.2 Participant SCED007

"…there are non-disclosure agreements in place. Once signed, information flows freely between manufacturer and suppliers."

4.2.3.3 Participant SCED008

" …critical they are involved not only on, ah finding outside vendors to do this work, but also going to visit these vendors to make sure the quality's up to par as far as our standards."

4.2.3.4 Participant SCED008

"…these are partners of ours in, on good terms so that when the economy does change back…outside vendors to work again…we outsource to probably 70% or a mach…maybe more than that like 90% of the machine shops…Usually our supply chain is involved in all of our material review…"

4.2.4 D3: Supply Chain Success Elements

Research Questions 1 & 3 – What is the perception within the organization of supply chain effectiveness? Does leadership communicate commitment to education and training?

The final cluster of responses addresses supply chain success elements and the importance of communication throughout the supply chain. The workforce relies on leadership to plan and provide direction for the organization. Communication can come in many different forms from leaderships annual goals and objectives flow-down to the daily production schedule, every communication should reinforce movement towards supply chain success. The clusters in this section consider the different perceptions of the communication approach and effectiveness of the communication at the organizations of the participants in this study.

4.2.4.1 Participant SCED002

"LCD screens of the assembly line itself at each cost center…through the particular groups, department management…They will have flowed down to them weekly, indicators of benchmarks, trends from year to date…on physical sheets of paper…it's a lot more effective way to communicate back to the folks doin' the work, what their work is really doin'…Feedback after every contract award or loss…what it is that we did right…what we may have done wrong…particular milestones that are quarterly, annually,…Yearly owner conference…Objective form…we do have feedback criteria that are graded, subjective, it's 1-10."

4.2.4.2 Participant SCED004

"Benchmark data…how we are doing in the market and our ROI…Both end-user surveys…regular executive engagement…Customer focals sit on the leadership team in the business unit…Anecdotal feedback…New product surveys and Legacy Programs."

4.2.4.3 Participant SCED007

"Market research, customer focus groups, dealer network, process data figures...Customer satisfaction index…Customer completed (dealer and product CSI)."

4.2.5 D3: Supply Chain Success Elements

Research Questions 3 & 6 – Does the leadership communicate commitment to education and training? What is the significance and role of maintaining a high-performance workforce in a competitive global economy? Consistent and clear communication of the leadership's commitment to the goals and objectives of the organization and to the workforce is imperative to supply chain success. Leadership needs to voice their expectations and lead by example. Sharing the organizations vision, goals and objectives with in-house

supply chain members is the first step. Then it is critical to include the remaining members of the supply chain. If they are not included they cannot make valuable contributes to the success of the supply chain. If so, how are external supply chain members integrated into the success?

4.2.5.1 Participant SCED001

"I have three simple business rules that we push through our whole organization. Rule #1 is win/win business…we believe our suppliers also our customers, everybody otta make money…if you have win/win relationships…create long-term relationships in supply chain or any business. #2 is be profitable…we shouldn't be doing anything that we don't make money…expect the same as we deal with people…the 3rd one is have fun!"

4.2.5.2 Participant SCED002

"One is each year in our annual prospective…our strategic mission statement for the year…secondly, in supply chain… newsletter, e-letter, for lack of a better term."

4.2.5.3 Participant SCED003

"… goals of the different departments and support departments within that, what can we do as a department to become nationally recognized."

4.2.5.4 Participant SCED004

"Supplier conferences…Stratification of the supply base…so we probably do a relatively good job with those suppliers that we've identified as strategic or key…a better job of trying to engage them (suppliers) in strategy and where we're going. …even within shared services I would say that varies…we have

some RAA challenges……the delivery side is communicating on a daily basis because they are physically residing there with them, building the building…"

4.2.5.5 Participant SCED007

"Policy communicated through worldwide…supply network document."

4.2.5.6 Participant SCED008

"…about once every two weeks they have some senior level person. This is another really good thing. Through our internal network you can watch these videos of them (senior leadership) back in Peoria…see what they're talkin' about. About the business future about what we need to be doing."

4.2.6 D3: Supply Chain Success Elements

Research Questions 4 & 6 - Is there a perceived link between a well-educated and well-trained workforce and the organizations success? What is the significance and role of maintaining a high-performance workforce in a competitive global economy?

One of the fundamental purposes of this research was to establish the perception of the role that a well-educated and well-trained has in an organizations success and sustainability in the global economy. The responses that follow add to understanding the perceived roles of the education and training plays in the developing a workforce that contributes to the overall success of the organization.

4.2.6.1 Participant SCED002

" But, you will see that opportunity made available to, I think it's actually made available to all employees…More and more, they are trying to get folks

who have a couple of different skill sets. So, instead of just being a trend drill guy, or a machinist, you have to understand metrology, or you have some understanding of quality inspection such that you build your quality into your process no matter what layer you are on the production line…There's a big push to educate folks, especially with the economic downturn that we've had, there's a big push for management to educate folks on what it means for us to save and reduce costs. To become more efficient and effective and when people understand that means job security and it means ah profit, and means it security for them as an employee, then the next question…what does it mean…then most individual employees will go find how does that means become a method for them….it's really a big push on the education system…in fact has been a very good platform for us to educate down to the shop-level why improvements are necessary…all this stuff is good for the company and ultimately for them."

4.2.6.2 Participant SCED004

"We (procurement) hire degreed individuals…are a few universities that have programs…we recruit…Typically we'll do summer interns…we'll end up hiring those folks…Four major business units….And all along the way there's a suite of very well defined classes that they need to take before they progress to the next level…there's a very rigorous advancement process…they learn the process……training and development in the purchasing arena is really well defined and well executed."

4.2.6.3 Participant SCED006

"Upward mobility is connecte d to increasing k nowledge… Trainin g suppliers…we have a good training program and good partners to work with."

4.2.6.4 Participant SCED007

"Collaboration web-site that all suppliers go through yearly…Everything (education and training) is open to everyone…Compliance and safety are mandatory for employees and suppliers."

4.2.6.5 Participant SCED008

"…by far this is the best place I've worked for that…to make sure people are trained…Everyone's supposed to be trained every year on, ah, yellow-belt awareness."

4.2.6.6 Participant SCED009

"…someone that's going to work you know, on their personal time to obtain an additional degree, you know that communicates just motivation of an individual that, that is going to...I would feel very confident was going to lead to a more productive, higher producing employee."

4.2.7 D2: Supply Chain Process Application

Research Question 5 – Is the workforce more likely to be innovative, productive, and engaged in problem solving when company leadership openly communicates and rewards their accomplishments?

The ability to successfully compete in any industry is enhanced by a workforce that takes it upon themselves to contribute, solve problems and be innovative. Reward and recognition incentivizes the workforce to be contributors to success.

4.2.7.1 Participant SCED009

"Company performance based on opportunity system. No enterprise wide reward system but each unit can reward for good work…Each month we have an employee of the month…based upon above and beyond…mostly include improvement to processes…better quality, use of time…"soft savings" …"Insta-taps"…instant, ah, dollar amount that comes out to your department. $50, $100, $150, $300…Process Improvement Award…employees are aware that, ah, should things be picked up from idea to implementation that there is recognition…More and more, they are trying to get folks who have a couple of different skill sets. So, instead of just being a trend drill guy, or a machinist, you have to understand metrology, or you have some understanding of quality inspection such that you build your quality into your process no matter what layer you are on the production line."

4.2.7.2 Participant SCED004

"Recognize and reward, you know, get the job done, you do improve the process…We have a thing called "Pride at B" and anybody can recognize. There can be peer recognition, manager recognition...I think about $150 bucks…Then there area cash awards above that. It's a pretty - it's a probably overly generous program."

4.2.7.3 Participant SCED007

"Problem solving is conducted on a unit-by-unit bases…participate in performance based councils. Not a formal based process. They tend to do a fairly decent job. Training is both internal and external."

4.2.7.4 Participant SCED008

"…using Six-Sigma…they have a lot of quality boards…you can't compare these two (San Diego & Tijuana) because the skill level is just so much different…a lot of disparity…simple stuff we've done for 40 years…Ah, that's a little more proactive. Once a new part is needed or required because you'll see a new set of criteria that comes…supply chain engineer…supplier technical engineer…supplier quality engineer…part of the supply chain. And they'll go back, they'll talk to them…There always looking at what is the one area that slows us down, and how do we get it to the point where we can have the minimal amount of parts in our warehouse…you build your quality into your process no matter what layer you are on the production line."

4.2.8 D3: Supply Chain Success Elements

Question 6 – What is the significance and role of maintaining a high-performance workforce in a competitive global economy? Though not each of the participating companies compete on the global front each of them desires to be competitive and each of them seeks national recognition in their industries.

4.2.8.1 Participant SCED001

"…goals of the different departments and support departments within that, what can we do as a department to become nationally recognized."

4.2.8.2 Participant SCED002

"Effective with our R&D dollars…we definitely are to the top of realizing our T&D dollar to a awarded contract…Contractual research and development is captured…we have a very strong record in that…altogether is a competitive advantage of being good at foresight for the government…realizing an effective internal dollar to capture external funding for R&D…So as a user of the global

supply chain itself, I find things through those two mediums…certain cost-centers are being met, and they get measured daily…TAKT time is benchmarked for each individual cost-center."

4.2.8.3 Participant SCED003

"By 2015 SISD will be recognized nationally as a leader among learning organizations and for exemplary student achievement."

4.2.8.4 Participant SCED004

" …it's an opportunity for us. We have an opportunity to both drive down our price, drive down our cost, unit price, ah, because so many of the commodities are less expensive right now…confidence in the suppliers financial viability over the timeframe is a concern right now… Our current market-share is doing substantially well. Ohm, a lot of the programs that were, are A, a cash-cow or B future programs, or ah, captures, where not impacted by the, in the way less were made….none of "Security Gate" recommendations where any of our primary, primary, secondary subcontract type programs at all…what we have seen though is a lack in our supplier base…niche mom and pops that use to be there for quick turnaround…expertise are no longer in business or have had to reduce their manpower. We have a formal benchmarking process. A 2-level…we participate in groups like the Mayflower group and some purchasing specific groups…we benchmark both around quality and cost…Supplier rating system…cost quality, schedule, management, and technology…new systems that are coming online, new improvement that are to help the global supply chain in general."

4.2.8.5 Participant SCED007

"EPEP is the process used to develop programs. Measured by percent (95%) must be completed by each phase…Regular updates allow planning and they notify suppliers and prepare for change. "That's one thing that we've done well!"…Brand recognition. Companies want to be a part of the family and it allows us to be picky…Training suppliers."

4.2.8.6 Participant SCED008

"This isn't the whole thing…no safety infractions, OSHA infractions. And get down to zero defects… It's effecti ng in the fact that we don't have as many…new orders this year…say about 75% or our customer base is oil and gas…they really understand making money, but they don't under stand maintenance very much. …when we get co ntracts that come out we understand contracts a re very political...look for cons istencies of where the subcontracts of those primes go…if there's certain areas of a certain airframe or vehicle,…you can glean a whole lot of data…How many are we selling…the c ompany market share…."Values in Ac tion" about ethics and how we don't… I think we hav e an opportunity to be in the non-production area, to be more strategic in how we, how early we engage with our business partner…take adv antage of the globa l market."

4.3 Analysis of Survey Data – Questionnaire Feedback

The aim of the subjective data was to transform the interview data into meaningful information. The Likert scale follow-up survey provided a level of confirmation of the process utilized to analyze the interview data. The tables below provide a pattern matching model depiction of the responses. Once again, though Yin's use of pattern matching is most often applied when evaluating case study materials, the small sample size along with the use of the open-ended interview questions and follow-up survey questions made the fundamental

processes associated with this research made the use of patter matching an appropriate supplemental data analysis method the research conducted for this project. Utilizing pattern matching complements the use of open-ended question in that it permits a relationship association and degree-of-freedom for the analysis of the data.

The following is the patter matchi ng data analyz ed from the follow-up survey. The same Operational Fram ework model (Append ix A), was the foundation from which the questions we re formulated and based on whic h clustered and themes were organized.

Table 4.2
Interview/survey Pattern Matching 1

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Understanding & Success Elements D1:A, D3:A Q1 The company effectively communicates supply chain related goals and objectives in the corporate strategic plan	1 2 4 0 0	Strategic planning does not assure organization success but there is evidence that there are benefits to creating and integrating a strategic plan. "…to be more strategic in how we, how early we engage with our business partner. (SCED004) These benefits include providing organizational clarity of direction, illustrating that there is a strategic thought process in place and helping to build teamwork and expertise (Bryson, 1998). The majority of those responding to the follow-up survey perceive only a limited benefit to communicating supply chain related goals and objective.

Table 4.3
Interview/survey Pattern Matching 2

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Application & Success Elements D2:B, D1:A Q2-There is a plan in place for sharing work process data with cross-functional supply chain members	2 3 0 0 2	Survey results suggest that sharing work process data cross-functional organizations is important. Generally the respondents agree effective utilization of cross-functional teams can pivotal to supply chain success. When leadership establishes and communicates strong, clear work procedures for work activities that extend across work teams and cross-functionally the supply chain are contributors to developing an efficient workforce.

Table 4.4
Interview/survey Pattern Matching 3

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Application D2:B Q3 Specific measurements have been established to help understand key indicators of company performance.	1 6 0 0 0	Identifying key performance indicators is perceived as central to performance measures. Establishing key measures then ensuring that the workforce is working to those measures will contribute to the company's success matrix. "…metrics that we use…quantity sold." (SCED006) Not every industry or business will track the same metrics in fact the key is to use the right measure for the right job or industry. "…hours-in vs. hours-out…scrap rate…" (SCED008) Each individual needs to understand the most effective and efficient measurement for accomplishing the company goals and objectives.

Table 4.5
Interview/survey Pattern Matching 4

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Understanding D1:A, D1:B Q4 Our supply chain member's work together to accomplish our collective goals.	4 2 0 0 1	It is importance of working together in a united effort with a collective set of agreed upon goals will promote supply chain accomplishments. "…so the goals of the different department and support departments within that…'what can we do as a department to become Nationally recognized?" (SCED003) A synergy is developed when all supply chain members know they are working toward a common goal.

Table 4.6
Interview/survey Pattern Matching 5

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Understanding D1:A, D1:B Q5 We share sensitive business information with our supply chain members without concern for the security of the data.	0 2 2 3 0	Increasing global competitiveness has resulted in the formulation of business relationships that were unheard of in the past. New age of partnerships and collaborations pose a conundrum in the area of sharing sensitive data for those involved. "…we'll electronically share any type of data and information…" (SCED001) Security is the chief concern for supply chain members. In order to be effective they have to share data, but sharing data requires a high degree of trust that appears to be lacking based on the responses of those interviewed.

Table 4.7
Interview/survey Pattern Matching 6

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Understanding & Process Application D1:A, D1:B Q6 The current state of the economy is having a negative effect on our market share.	3 1 1 2 0	The effect of the current state of the economy appears vary by industry and preparedness. For example, one of the interviewees stated that this is exactly the kind of environment in which his industry thrives. They are providers of products that are essential to human's basic needs, which in this case is food. (SCED0001) Another respondent said that they were prepared for the current economic scenery and that it is viewed as an opportunity. (SCED0004) In either case foresight and vision were important to remaining economically resilient.

Table 4.8
Interview/survey Pattern Matching 7

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Application D2:A		The consequences associated with education and training requirements and the significance as they relate to the supply chain success equation. Based on survey
Q7 Education and training differs for hourly and management or supervisory employees.	2 3 2 0 0	responses to it is clear that a series of cornerstone education and training elements such as math and English and correlated job skill training cannot be overlooked. "…just the minimum skill set test basically hits all three, ah math, English and technical writing." (SCED002) Each hourly or non-management employee is expected have rudimentary knowledge and skill to
Q8. Basic skills such as; math, English, problem solving, and product measurement, are desired for all employees.	6 1 0 0 0	completed his or her assigned work task. Advanced levels education opportunities appear to be reserved for those desiring the opportunity to move into management position. "…there is a rigorous advancement process." (SCED004) Management training programs are often part of a company established path for future members of their leadership team. While education and training requirements differ for individual employees, it is clear that educating and training is an indispensable ingredient for achieving the goal and objectives necessary to realizing supply chain success.

Table 4.9
Interview/survey Pattern Matching 8

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Application & Process Understanding D2:B, D1:A Q9 Each employee has the knowledge necessary to use process and performance tracking skills.	0 4 1 1 1	Tracking performance holds a vital place in keeping the goals and objectives of the organization on track. "Skills training is available in-house, via computer and in practical areas/common spaces. (SCED007) When each of the employees has process and performance tracking skills and knowledge such as six sigma and SPC, continuous improvement opportunities, process improvements and documentation maintenance will enhances the performance bottom-line.

Table 4.10
Interview/survey Pattern Matching 9

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Application D2:B Q10 Employees are recognized for implementing job related improvements.	3 4 0 0 0	Improvement implementation is integral to business success. Problem solving and improvement implementation. "We actually have a very good plan…program…" (SCED002) Though recognition programs vary they contribute to building a successful organization. Sometimes recognition is as simple gathering around for a-years-of-service anniversary celebration or birthday cake and sometimes there is cash compensation, whatever the reward recognizing the employees efforts to make things better appear to encourage improvements.

Table 4.11
Interview/survey Pattern Matching 10

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Application D2:A Q11 Statistical process control (SPC) or other statistical tracking tools are utilized to track quality improvements.	3 1 2 1 0	"…we have an SPC side program called Infinity QS, it really takes care of that side of stuff…" (SCED002) Statistical process tracking tools are widely used to keep business moving forward. "…Six Sigma black-belts come up with projects that are often brought to them by some of these departments or technical managers…" (SCED008) Processes like Six Sigma are major contributors to quality improvements.

Table 4.12
Interview/survey Pattern Matching 11

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Application D2:B Q12 Performance data-charts are displayed throughout the facility as tools for employee review.	2 3 2 0 0	"LCD screens on the assembly line itself, at each cost center…LCD screens that cycle through our IE's charts…" (SCED002) Visual communications are tools that facilitate the ability of the workforce to improve performance. "…we have charts that we put up in the time clock area…show how we're doin' against last year…" (SCED006) Having the ability to see and review the current state of the project and what they've accomplished either points the employee in the right work improvement direction or provides a sense of accomplishment and pride.

Table 4.13
Interview/survey Pattern Matching 12

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Application D2:A Q13 The company environment encourages employee problem solving.	3 3 1 0 0	For a business to be successful each employee has to embrace the role of problem solving. "…you know, get the job done you do improve the process." (SCED004) Problem solving is the responsibility of each employee.

Table 4.14
Interview/survey Pattern Matching 13

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Success Elements D3:A Q14 We regularly benchmark our competition	4 3 0 0 0	Benchmarking the competition is a good barometer for identifying where you stand and what it will take to become or remain competitive. "…we build our best practices based on the sharing of information." (SCED003) Benchmarking can be formal "We have a formal benchmarking process." (SCED004) or informal conducted with internal resources "We generally use market research against our major competitors." (SCED007) or external companies "And we participate in groups like, you know, the Mayflower group and some purchasing specific groups…" (SCED004) either way the information gathered during the benchmarking process can help with "…setting our long range business plans and our process performance targets…" (SCED004)
Q15 I believe we do a number of things better than our industry competitors.	5 2 0 0 0	

Table 4.15
Interview/survey Pattern Matching 14

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Process Application, Success Elements & Process Understanding D2: B, D3: A, D1: B Q16 We have a process in place for measuring and evaluating our performance as it compares to our competitors.	1 5 1 0 0	Tracking backlog, strategic purchasing, "…how we are doing in the market and what our return to our investors is." (SCED004) With a clear picture of where you stand in comparison to your competition.

Table 4.16
Interview/survey Pattern Matching 15

Operational Statement/ID & Questions	Response Scoring 5 4 3 2 1	Conclusion
SC Success Application & Success Elements D2:B D3:B Q17.There is an organized process in place for identifying what our customer values. Q18 A customer satisfaction process is in place at every level of our organization. Q19 We evaluate the overall satisfaction level of our customers.	2 2 2 1 0	How do you know what the customer values? "We ask 'em!" (SCED006) Understanding what the customer values is an important component for planning and service. Customer satisfaction must be embraced at every level of the organization. Utilizing customer satisfaction surveys and indexes, end-user surveys are all methods of providing insight into what customers want.

4.4. Summary

Each of these tables represents a collection of responses to the one-on-one interviews and the follow-up survey. The data was assembled based on the common themes that were identified through the coding process. Patter matching provided a meaningful tool for identifying information that was useful to supporting the outcomes of this research which if discussed in the next chapter.

CHAPTER 5 CONCLUSIONS

The purpose of this study was to elicit responses from company decision makers to the following questions: (1) What is the perception within the organization of supply chain effectiveness? (2) Does a well-educated and trained workforce play a significant role in the organizations success? (3) Does the leadership communicate commitment to education and training? (4) Is there a perceived link between a well-educated and well-trained workforce and the organizations success? (5) Is the workforce more likely to be innovative, productive, and engaged in problem solving when company leadership openly communicates and rewards their accomplishments? (6) What is the significance and role of maintaining a high-performance workforce in a competitive global economy?

Chapter Five summarizes data collected and analysis of the data that was collected during the interviews conducted over the course of this research project. These interviews supplied a wealth of information about the perceptions decision-makers (those interviewed) have of supply chain management and workforce education and training. In this chapter will discuss whether or not there is a significant relationship between the supply chain management success and education and training.

5.1. Theme and Meanings

A qualitative research strategy depends on the researcher's ability to interpret and make meaning of subjective data. The interview process utilized in this research project provided a wealth of descriptive and meaningful data from which the research was able to assess the perception of supply chain management and education and training. The challenge is identifying themes

and assigning meaning. A question imbedded in this research was whether or not decision-makers perceptive that there was an actually correlation between supply chain management and education and training. In the following is a compilation of the data and conclusions collected from the interviews and the responses to survey questions from this research.

5.1.1. Supply Chain Process Application - Education and Training

For example; at participant SCED004's location "…there's a very rigorous advancement process, so people come into the organization and then they work in a group that's call procurement services…And they learn the processes…and they learn how to use the automated tools, etc." At this location the workforce is trained to address the specific need to be well-versed in the tasks, tools, and functions associated with the job assignment in the procurement services organization. Often new employees are recruited from universities after having spent the summer interning however, "a significant amount of training is on the job…it's all internal, but a bunch of our training is sourced…it's our content, at our facilities, but not necessarily delivered by our employees." Workforce education at this company is "very well defined" and designed in a way that increases the effectiveness of the workforce. There is a clear line is drawn between the perception of workforce performance and supply chain success.

The education levels, learning focus, job skills, and job training requirements vary to accommodate the needs and issues of the supply chain yet the need for education and training was evident at each of the interviewed worksites and for several of the company's education and training requirements flow beyond the immediate workforce to external supply chain team members. At the sites of participants SCED007 "Everything (education and training) is open to everyone. On-line modules, instructor led, instructor on-line. Compliance and safety are mandatory for employees and suppliers…95% of classes are taught internally." By participating in the education and training goals and objectives

established by the primary company, the external supply chain partner clearly demonstrates their commitment and determination to have everyone share in the success of the supply chain.

Other interviews placed a similar importance on the value of workforce education and training in both professional and vocational education settings. Occasionally there were distinctions made between the kind of education and training for hourly and salaried employees, but education and training were offered to all employees using on-site locations as well as colleges and universities with most of the companies offering release time and tuition reimbursement. Education and training are deemed to play a significant role of the construction of a successful supply chain. Participant SCED004 stated, “I think our training and development in the purchasing arena is really, ohm, well defined and well executed. I think we have an opportunity to be, in the non-production area, to be more strategic in how we, how early we engage with our business partners.”

Though the number of courses and workforce classification levels of training requirements vary the consensus gathered from the decision-makers who were interviewed was that the goals and objectives of the company are more easily reached when the workforce is armed with right tools to accomplish the goals and objectives. Educated and trained workforce members understand processes and procedures and have the skills and knowledge to be active and creative contributors.

5.1.2. Supply Chain Understanding - Perception of Supply Chain Effectiveness

Data collected related to the perception of the effective supply chain and the success of the organization and the significance of the importance of integrating an effective supply chain management process were reinforces. It is important to note that the perceived effectiveness of the supply chain was affected by how each organization defined the supply chain. The definition appeared to be reflective of the organization’s size, product or service and

customer base. For example; SCED009 is a large manufacturing company with and international customer base. Their supply chain included internal engineering, purchasing, and manufacturing while SCED007, a small construction firm identified its supply chain in manufacturing and sales.

Regardless of the definition the company applies to supply chain there is a perception of the effectiveness that based on this research, can be identified in three primary areas. The first is in the areas of process understanding. Along with proprietary process systems, companies interviewed employed a variety of process tools including Enterprise Resource Planning (ERP), Product Lifecycle Management (PLM) and Manufacturing Requirements Planning packages from leading software providers such as SAP, Peoplesoft and Baan. These tool facilitate management and tracking of virtually every function within the company "basically a financial tool that kinda tracks ah, parts to vendors, how much it's costing, ah, how many hours are allotted to each job, each component you know." SCED008. Process tools support the efforts of the workforce and contribute to the company's effectiveness. "that's really what the success...or what's been, differentiates us in those lines, in those business areas is our up-time, our availability, I mean our ROVs, there available to work when they need them to be available to work..." SCED009

5.1.3. Supply Chain Elements - Success and Customer Satisfaction

One measure of success is customer satisfaction. The final three questions of the interview addressed how benchmarking against their competition, understanding what the customer values and using customer satisfaction as a measure of success. In order to gain an understanding of success measures company's use market research and formal benchmarking, internal and external customer surveys and sometimes they simply asked their customers what they wanted and if they believed the company was meeting the requirements set by the customer. When asked about the process used to evaluate overall customer satisfaction levels, participant SCED002 summarizes

his company's success with the following; "…taking all those things we spoke of previously (referring to the earlier research interview questions) as objective elements, I say that that builds a pretty good picture for us to say, we are meeting the expectations of our customer or we're not."

5.1.4. Supply Chain Elements – Leadership Communication

Clearly communicated goals and objectives and along with effective integration of processes are also important tool for making an organization successful. Process education and training is available using company managed online resources, along with other internal and external education and training centers. The key is to process learning is to arm the workforce with problem solving tools and the knowledge of how to implement these process improvements in a way that enhances the company's ability to compete in the global competitive environment. Process improvement teams are often used to address process improvement efforts. At the workplace of participant SCED008, six sigma black-belts identify projects and bring them to the appropriate workgroup where they bring together teams of manufacturing engineering, shop floor operators and assemblers and other appropriate team members are recruited to work on the project. This cross-functional team "…they all kind of brainstorm ah, to solve that problem. That's kinda like part of the best practices kinda idea." This kind of process management, process improvement is often responsible for an organizations success.

Upon establishing the need for effective processes and well communicated goals and objectives, a great deal of effort is put into understanding what the customer values and knowing when and how to satisfy them. The customer's perception of success is an important key to success. Participant SCED004 describes their customer satisfaction process at the company as being a 'stoplight' survey process. This process allows each customer to rate the service of the group providing the service. Green means

everyone is happy, the processes are under control and that they are making money. Yellow implies that there are cost saving measures in play but there is also room for improvement and red suggests that there are real problems. "…our CEO, he would say, you know, 'I'd be happier if that was yellow, because there would be greater cost savings.' So, tension in the system again, right. 'If we make everybody that happy', I'm thinkin' we're not pushing hard enough." Success is tied to happy customers, excellent delivery of their products and/or services and process improvements that increase cost savings.

Education and training, effective processes usage and customer satisfaction are clearly recognized as critical components in the quest to become successful and ultimately gain a sustainable competitive advantage over their competition. What was interesting was that in as much as all of the components were considered important elements in the success equation, the connection between maintaining a well-educated and well-trained workforce, effective process integration, and customer satisfaction remains unclear.

5.2. Research Question Focus

Analysis of the interview data suggested that there is an association between the perception of supply chain effectiveness and the significance of a well-educated and well-trained workforce and the company's success. The research interview (Appendix B) and follow-up survey questions are linked to the operational concept model (Appendix A) and then clustered by common process related groups that are designed to give meaning to the data.

5.2.1. Question Cluster 1-3

The first cluster encompasses questions 1-3 are linked to the addressed supply chain process methodology.

1. How does your company communicate the goals and objectives as stated in the corporate strategic plan to the supply chain? (D1:A)
2. Tell me how your company shares work process data with supply chain members. For example, if engineering makes a drawing change that effect cross-functional work teams. (D1:B)
3. Which measurements does your company use as key indicators of company performance? For example; production rate, cycle time etc. (D1:A)

These questions gathered information related to communication processes, supply chain work process data, and performance measurement tool. For example, communicating goals and objectives is to each of the companies. Responses to interview and survey questions 1-3 revealed the perceived importance associated with communicating and sharing the organizations goals and objectives. Each company had a clear plan for implementation of the goals and objectives were a priority if they are to be successful.

5.2.2. Question Cluster 4-6

Questions 4-6 focused on the ability of the company to compete in the current globally competitive environment and examining integration of supply chain members and effectiveness in a competitive global environment.

4. What are ways that your supply chain members work together to accomplish your goals? (D1:B)
5. How do you deal with sharing sensitive business information with supply chain members without worrying about the security of the data? (D1:B)
6. How do you think the current state of the economy will affect your market share? (D1:B)

Process management was a common theme for each of the companies. Process management was most often controlled utilizing a computer software system such as SAP, MRP or a proprietary management communication system. In the case of the larger companies the relationship with supply chain partners was developed to a level that elevated concerns for the potential of compromising sensitivity data. Though the current state of the economy has not had a severely negative effect on any of the companies, it has changed the way some of the companies conduct business.

> "...from a change in the landscape...economic issues right now for us because we're really at the basis of food and food is something, you know especially in, in corn, is really a long-term issues...we're going through a huge change with buyer technology and the change of product and the players...we're one of the multimillion dollar companies and seeing shifts goin' on because of the value change of biotechnology" SCED001.

It is understandable that SCED001, a provider of basic necessities are to a degree, recession proof however, the other companies also reported limited negative impact and in some cases business growth. "Our current market share is doing substantially well. Ohm, a lot of the programs that were, are 'A' cash cows or 'B' future pro…or ah, captures, were not impacted by the in a way that less were made" SCED002. Companies with a strategic plan, who have organized effective supply chain management processes and procedures and hired, educated and trained their workforce, are weathering the difficult economic times. Responses to these questions confirmed that there are processes in place and that they communicated the ability of the company to adapt to the changing competitive environment.

5.2.3. Question Cluster 7-10

Questions 7-10 attempted to address job skill and education requirements. The perception of each interviewed decision maker was that their company managed their supply chain effectively often regardless of the education and training of the workforce.

7. How are education and training different for hourly and management/supervisor employees? (D2:A)
8. What key job related skills that you desire of your employees? For example: basic math, English language skills, problem solving, production-measurement. (D2:A)
9. What process and performance tracking skills do you expect employees to use? (D2:A)
10. How are employees recognized for implementing improvements? (D2:B)

These questions were often more difficult for the decision-makers to respond to, often because education and training perceived as lower-level issues that are handled by the human resource department and/or at the work-station. All of the companies looked for basic education; reading, writing and fundamental math skills. Other required mandatory education levels for various positions, such as shop-floor supervision, and management positions. Others focused attention on the importance of being trained at the task-level.

5.2.4. Question Cluster 11-13

Questions 11-13 addressed proc ess management issues and employee problem solving issues.

11. How is statistical process cont rol (SPC) utilized to track quality improvements? SPC is a production measurement tool? (D2:A)
12. How are data charts such as cycle time , production rate and incident reports, made visible throughout the organization? (D2:A)

13. How does your company's environment encourage employees to solve problems when they arrive? (D2:B)

Understanding the processes, if a process exists, and the expectation of the employee's ability to utilize the processes for problem solving is significant data necessary for supporting a continuous improvement process. When process management is clearly communicated and problem solving is encouraged employees do the things necessary to meet the company's goals and objectives.

5.2.5. Question Cluster 14-15

Questions 14-16 are looked how companies benchmark their competitors and what they perceive as being their current sustainable competitive advantage or position in industry.

14. How does your company benchmark your competition? (D3:A)
15. What things do you believe your company does well, in order to compete effectively? (D3:A)
16. How do you measure or evaluate your performance compared to your competitors?

Additionally, these questions were intended to understand the methods of measurements for evaluation their position as it compares to the competitors.

5.2.6. Question Cluster 1-3

Finally, questions 17- 19 focused on the customer, what they value, how companies measure the satisfaction level of their customers and the evaluation process utilized to understand the satisfaction level.

17. How do you identify what your customer's value? (D3:B)
18. Describe the process you use to measure customer satisfaction. (D3:B)

19. How do you evaluate your overall customer satisfaction levels? (D3:B)

Customer perception is an indicator of supply chain effectiveness in that if the customer is satisfied they keep coming back implying that the company is on the right track towards the achieving their goals and objectives.

All of the questions were designed to provide insight into the operating questions for the research, which were:

1. What is the perception within the organization of supply chain effectiveness?
2. Does a well-educated and trained workforce play a significant role in the organizations success?
3. Does the leadership communicate commitment to education and training?
4. Is there a perceived link between a well-educated and well-trained workforce and the organizations success?
5. Is the workforce more likely to be innovative, productive, and engaged in problem solving when company leadership openly communicates and rewards their accomplishments?
6. What is the significance and role of maintaining a high-performance workforce in a competitive global economy?

These questions were addressed in detail in Chapter Four with mixed results of the assumptions.

5.3. Implications of the Research

As the face of industry continues to add new players to the competitive mix, United States industry recognized the growing need change the way they conduct business, provide services and view potential world partners, if they remain competitive in the current global economy. All of the companies

interviewed in this study were clearly aware of their strengths and the areas in which they would need to demonstrate improvements if they are to compete over the long-haul. Developing the necessary operational and workforce tools within the company and establishing supply chain partnerships that support the goals and objectives of the company are a few of the steps that will influence the ability to remain competitive.

While this research suggests that there is much room for growth and improvement, it also revealed the companies participating in this study are not standing in one place waiting to be overtaken by the competition. Instead they are increasing the effectiveness of their current processes and procedures, implementing new ways of doing business, searching for and integrating solutions where problems have been identified, and perhaps the most important undertaking for these companies has been acquiring and maintaining well-educated and well-trained workforce teams who are equipped with the right tools and the knowledge necessary to meet the challenges of the global economy.

Among other things, this research reinforces the importance of having the right people in the right jobs, with the right knowledge and the right skill sets. While the participating companies acknowledge these needs, they are also aware that there is a rapidly growing shortage of right people available and ready to meet these needs. The companies involved in this research and others like them are looking for potential workforce members who are prepared to step into the company and make an immediate impact. In order to do this, the workforce needs to acquire the right knowledge and skills before they arrive for their first day on the job. Again, this research has highlighted the magnitude of the consequences of not addressing these workforce needs head-on.

5.4. Recommendations for Future Research

Based on the results of this research data collected from the decision-makers the connection between the perception of supply chain effectiveness and a well-educated and well-trained workforce was somewhat subtle and seemingly intangible, however the findings made it clear that an effectively managed supply chains and a well-educated and well-trained workforce are equally significant efforts necessary when companies are trying to maintain their position or become globally competitive. The inability to make this connection between effective supply chains and a well-educated and well-trained workforce is in itself an opportunity to conduct additional research that is specific to establishing just such a bridge. The mixed results of the study also offer the prospect of supplementary studies in the areas of customization of workforce education and training, identifying methods of increasing the effectiveness of the supply chain and how to verify that there is a relationship that, when effectively managed, strengthens the company's competitive position. The following overviews of potential future research investigation ideas.

5.5. Decision-Makers vs. User-Supervisor Decision-Makers

The participating population for this study was identified as and confined to decision-makers who were defined as those individuals in management responsible for providing direction for the workforce and the supply chain units. Generally speaking, these decision-makers were senior level management individuals. As the research proceeded, a secondary group of workforce leadership immerged. The researcher labeled this group, user-supervisors decision-makers.

User-supervisors are first level and middle management leaders who do not have the same decision making power of their senior management cohorts, however they are more often directly involved in the day-to-day work of the supply chain and are more acutely awareness of how workforce education and training and effective supply chain management work in tandem to contribute to

the success of the organization. In the course of the initial efforts to identify the right group of decision-makers, several interviews were conducted with member of this user-supervisor group. An interesting outcome of these interviews was the difference in the perception of the senior level (for lack of a better term) decision-makers and the user-supervisor decision-makers.

This difference in perception will provide another potentially fruitful area for conducting additional studies of the perception of the effectiveness of the supply chain and workforce training and education. Investigating the difference in the perception of decision-makers and the user-supervisor decision-makers would provide valuable information about the overall decision making process. Building on the existing data collected from this studies decision-makers interviewed in the course of this research, the next phase would be to pose the same basic research questions to the next level of decision-makers, those in the middle and supervisory level of management. Analyzing the comparison data from this study would be useful in understanding and building a bridge between the different levels of management, while expanding the body of knowledge surrounding the subject matter.

5.6. How Industries Differ in their Definitions of Supply Chain Management

"You know, a good question is how do people define supply chain. Talk to lots of people and it means lots of different things" SCED009. One of the difficulties associated with conducting a research study is assigning common definitions. The interviews conducted with the participants involved in this study reinforced this need. The evaluation of SCM begins in the 1970s more as a vertical integration management tool utilized more as an inventory management tool. In the 1980s SCM shifted to include horizontal relationships, opening the door to increase global relationship possibilities. Technology has been the catalyst much of the expansion of SCM integration throughout the global workplace. Interviews conducted over the course of this research made it clear

that it SCM is important and that everyone defines it to fit their industry needs. Though there has been a good deal of effort placed on defining SCM, there is room of a great deal more.

5.7. Customization of Workforce Education and Training

Each of the participating companies reinforced their need to maintain an employee base with the right education, basic job training skills and process knowledge if they were to recognize their goals and objectives and achieve supply chain success. Beyond developing competence in the areas of math, English, problem solving, and product measurements, each company expresses a need for better or enhanced job and industry specific training. In order to effectually develop an understanding of and solution for the industry customer's desired outcome, it is important to assemble a customized program. Studying and identifying a methodology for establishing a curriculum that is specific to the workforce education and training needs of the industry customer is a great opportunity to conduct future research aimed at identifying precisely what kind of education and training has the most potential to support the goals and objectives of the organization and enhance the success of the supply chain.

5.8. Industry-University Education and Training Collaborative Efforts

Closely related to research related to workforce education and training is the potential the need to examine exactly how collaborative relationships between industries seeking solutions for education and training problems and universities who are willing to become that solution for those problems. In what ways do universities already equipped to answer this need and/or in what ways can universities adjust to meet these needs? Though research has been conducted in this area, there is room for further research into identifying and improving the development, implementation and integration of industry-university collaborations. In an economy that demands wise use of resources, industry-

university partnerships are natural platforms for providing supplemental job skills, process knowledge and supply chain education and training.

Matching the expertise and knowledge of a potential university partner with the needs of the industry customer put the company and the workforce on "a fast track to employment…and it is our response to what each industry is demanding…" (Yin, 2009). As discussed in Chapter Two of this research, the benefits of the right collaboration is one filled with great possibilities for both the industry and the university. Industry partners may use university partners to expand research and development dollars, and increase their human resource dollars. Academic institutions realize new funding sources and opportunities for graduate students to engage in real-world research. This field of research remains open to new solutions.

5.9. Research Lessons Learned

The Chapter's in this research have provided a good platform and a springboard for increased understanding the value of a strong supply chain and the implications associated with sustaining workforce education and training. That said there is room for change and improvement. Attempting to tie the relationship between the two areas, effectiveness supply chain and workforce education and training, was more complicated than expected. There are several things that might have facilitated the research effort.

5.10. Making a Connection Between Supply Chain Management and Education and Training

Though there were efforts in the early stages of to narrow the scope of this research however, the lack of conclusive results suggests a need to future narrow the scope of the inquiry. Change the interview questions to create a possibly more natural connection between supply chain success, education and training. In the current format the interview questions included process, data,

economy, and customer service questions. While the questions posed in this research revealed valuable insight into both, they were unable to make bridge the gap and connect the two areas.

5.11. Redefining Participants

Supplying a working definition for SCM would help control the responses of the respondents. Without establishing this working definition responses to the same questions were very different and that made it difficult to establish common themes.

While the interviews with organization decision-makers selected for this study supplied the research with worthwhile information, many of these decision-makers were in leadership positions that did not put them close enough to the inner-workings of their supply chain or the specific education and training requirements to make a genuine connection between the two. Amending the group of interview participants to include those with job designations that are more directly aligned to the supply chain and those receiving and utilizing the education and training would be a next important change toward enhancing the value of this research.

Finally, expanding the research to include a survey that would be distributed to members of the workforce would bolster the richness and provide some confirmation of the data gathered during the interviews.

5.12. Conclusions

The perception of supply chain effectiveness, education and training and the collective connection between the two to organizational success were the focus of this research. This research was designed to validate or negate the connection. Certain assumptions were made about the relationship between supply chain effectiveness and workforce education and training. One of the assumptions fully engaged supply chain was important to the success of a

business organization. A second assumption was that a well-educated and well-trained workforce would contribute to the success of the supply chain. The third assumption was that the relationship between the first and second assumptions encourages organizational business successful.

While the significance of a fully engaged supply chain and a well-educated and well-trained workforce were both validated in this research, the relationship between the two was never made. Focusing future research to discover the importance of this relationship will help industry leaders to plan for and potential of achieving a truly sustainable competitive advantage and organizational success.

Notes

Contact the research author for complete transcription data and additional participant demographic data.

LIST OF REFERENCES

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Aguayo, R. (1991). *Dr. Deming: the American who taught the Japanese about quality.* New York: Fireside .

Ambler, G. (2008, June 15). *The Practice of Leadership*. Retrieved July 29, 2009, from The power of commitment: http://www.thepracticeofleadership.net/2008/06/15/the-power-of-commitment/

Andersen, P. &. (2003). Supply chain management: New organizational practices for changing producement realities. *Journal of Purchasing Management* , pp..83-95.

Arbo, P. (1999). *Understanding the regional contribution of higher education institutions: A literature review.* Tromso: Center for Urban & Regional Development Studies.

Balaguer, E. C. (2006). *The High-Performance Workforce Study 2006.* Accenture.

Beamon, B. (1998). Supply Chain Design and Analysis: Models and Methods. *International Journal of Production Economics* , Vol. 55, No. 3, pp. 281-294.

Binney, D., Guthrie, J., Boedker, C., & Nagm, F. (2007). *The intangible capital ICT investment framework - extracted from 'Recognising the intangible value of Federal Government ICT investments V3.0'.* Australian Government: Department of Finance and Administration.

Blackwell, R. &. (1999, September 1). *The century of the consumer: Converting supply chains into demand chains*. Retrieved July 12, 2009, from Supply Chain Management Review: http://www.scmr.com/article/329607-The_Century_of_the_Consumer _Converting_Supply_Chains_Into_Demand_Chains.php

Bloom, M., & Lafleur, B. (1999). *Turning skills into profit: Economic benefits of workplace education programs.* New York: The Conference Board, Inc.

Blundell, R. D. (1999). Human capital investment: The returns from education and training to the individual, the firm and the economy. *Fiscal Studies* , vol. 20, no. 1, pp. 1-23.

Bryson, J. (1998). A strategic planning process for public and non-profit organizations. *Long Range Planning; Pergamon Journals Ltd.* , 73-81.

Burton, B. C. (2005, July 22). *The High-Performance Workplace Defined.* Retrieved March 28, 2009, from Gartner Research: http://download.microsoft.com/ download/4/F/C/4FCD7931-1519- 4940-BA67-6BC3FB157A92/Gartner%20Bur ton%20-%20HWP%20Definied.pdf

Business Wire. (2009, January 13). *The Immune Tolerance Institute, Sequenom and the University of California, San Francisco to Develop Advanced Diagnostic Test for Severe Combined Immunodeficiency in Newborns* . Retrieved January 28, 2009, from Business Wire: http://www.businesswire.com/portal/site/home/permalink/?ndmViewId=news_view&news Id=20090113006336&newsLang=en

Carey, J., Morgan, M., & Oxtoby, M. (1996). Intercoder agreement in anslysis of responses to open- ended interview questions: examples from Tuberculos is reserach. *Cultural Anthropology Methods* , 1-5.

Casey, J. (2004). Developing Harmonious University-Industry Partnerships. *University of Dayton Law Review* , Vol. 30: 2, pp. 245-263.

Cox, J. (1995). *APICS Dictionary (8th ed.).* Fallss Church: Amerianc Production and Inventory Controls Society.

Cyrul, K. &. (2009, November 2). *U. S. Sen. Harkin: Recovery Act has created more than 5,300 jobs in Iowa to date*. Retrieved November 2, 2009, f rom Iowa Politics.com: http://www.Iowapolitics.com/index.Iml?

Eisen, P., Jasinowski, J., & Kleinert, R. (2005). *2005 Skills Gap Report - A Survey of the American Manufacturing Workforce.* Unknown: Deloitte & National Association of Manufacturers.

Enersen, D. (2007). Analyze data: Categories. *EDCI 615: Qualitative Research Methods in Education* . West Lafayette, IN.

ERC. (2009). *Engineering Research Centers*. Retrieved November 30, 2009, from About the ERCs: http://www.erc-assoc.org/indel.htm

Eurich, N. (1995). *Corporate Classrooms: The learning business.* Princeton: The Carnegie Foundation for the Advancement of Teaching.

Foss, S., & Water, W. (2003, February 06). *ABD Survival Guide.* Retrieved October 14, 2009, from Coding qualitative data: www.ab dsurvivalguide.com/news/020603.htm

Garavan, T. C. (1995). *Training and development in Ireland: context, policy, and practice.* Oak Tree Press.

Gary, K. a. (1997). *Workforce education: The basics.* Boston: Allyn-Bacon.

Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies of Qualitative Research.* New York: Aldine Publishing Company.

Guralnik, D. (1984). *Webster's New World Dictionary of the American Language.* New York: Simon & Schuster.

Hak, T. &. (2009, June). Pattern Matching. *Encyclopedia of Case Study Research* . Thousand Oaks, CA, USA: Sage.

Healthfield, S. (2007). *Training: Your investment in people development and retention.* Retrieved February 21, 2008, from About.com: Human Resources: http://humanresources.about.com/od/educationgeneral/a/training_invest.htm

Huthwaite, B. (2007, December 13). *United Theory of Lean Innovation.* Retrieved February 26, 2008, from Institute for Lean Innovation: www.innov ationcube.com

IBM. (2006). *The supply chain and business transformation: rethinking.* Somer: IBM Information Technology Services.

Jacobs, R. H. (Unknown). Emergence of workforce development: definition, conceptual boundaries, and implications. *International Handbook of Technical and Vocational Education and Training, Amsterdam, Kluwer* . Columbus, Ohio: In press.

Karoly, L. & Panis, C. (2004). *The 21st Century at work: Forces shaping the future workforce and workplace in the United States.* Santa Monica: RAND Corporation.

Karoly, L. &. (2004). *The future at work - trends and implications.* Retrieved March 24, 2008, from RAND Reserach Brief: http://www.jpgassoc.com/PDF/ client-future-at-work.pdf

Kiritz, N. (1997). *Hard Data/Soft Data: How they help you build strong proposals.* Retrieved October 13, 2009, from The Grantsmanship Center: http://www.tgci.com/magazine/Hard%20Data.pdf

Kroll, K. (2009, January 19). *Community colleges exist for reasons beyond meeting the needs of business*. Retrieved January 27, 2009, from mlive.com: http://blog.mlive.com/readreact/2009/01/community_colleges_exist_for_r.html

LaLonde, B. &. (1994). Emerging logistics strategies: Blueprints for the next century. *International Journal of Physical Distribution and Logistics Management, Vol. 25* , pp. 35-47.

Lee Yong, S. (1996). Technology transfer and the research university: a search for the boundaries of university-industry collaboration. *Research Policy, Vol. 25:* , 843-863.

Lee, Q. (2008). *Lean in hard times: The gift of desperation.* Kansas City: Strategos, Inc.

Levering, R. &. (2008). 100 Best companies to work for 2008: Top 50 employers. *Fortune Magazine* .

Lummus, R. &. (1999). Defining supply chain management: a historical perspective and practical guidelines. *Industrial Management & Data Systems* , 11-17.

Mansfield, B., & Mitchell, L. (1996). *Towards a competent workforce.* Hampshire: Gower Publishing, Ltd.

Martin-Vega, L. S. (2002). GOALI: A National Science Foundation University-Industry Liaison Program. *JSTOR: Interfaces* , pp/ 56-62.

Meister, J. (2006). Grading executive education: Universities put to the test; Firms are setting hard criteria for selecting programs and emphazing strategic results. *Workforce Management* , pp. 792-797.

Nguyen Huy, Q. (2004). *Building emotional capital for strategic renewal: Nissan (1999-2002).* Fontainebleau: INSEAD.

NIFI. (2007, September 19). *Workforce Education.* Retrieved March 15, 2008, from National Institute for Literacy: http://www.nifl.gov/nifl/facts/workforce.html

Nordas, H. (2004). *The Global Textile and Clothing Industry post the Agreement on Textiles and Clothing.* Geneva: World Trade Organization.

NSF. (2009, March 10). *National Science Foundation*. Retrieved November 28, 2009, from Congress Passes FY09 Omnibus Bill: http://www.nsf.gov/about/congress/111/highlights/cu09_0310.jsp

Olmeda-Amaro, M. (2006, September). *Career Innovations*. Retrieved January 23, 2010, from Bronx Community College Career Development Office: http://www.bcc.cuny.edu/CareerDevelopmentOffice/assets/downloadable/publications/Innovations09_06_september_06.pdf

Patton, M. Q. (2002). *Qualitative Research & Evaluation Methods.* Thousand Oaks: Saga Publications, Inc.

Peshkin, A. (1993). The goodness of quality research. *Educational researcher* , pp. 23-29.

Quinn, F. (1997). What's the buzz? *Logistics Management* , pp. 43-46.

Rosenbloom, B. (2002). *Marketing Channels: A Management View.* Ohio: South-Western College Publications.

Seat, E. (2006). Education on the line: The aerospace industry is learning to appraoch training as a 'cradle-to-grave' pursuit to lure and keep the best. *Aviation Week & Space Technology Vol. 164 No. 3,* , p. 68.

Simon & Schuster Inc. (2009). Retrieved July 31, 2009, from Pimsleur: http://pimsleur.english-test.net/definitions/definition-of-degree-mark-biology-verse-west-industry-com pany-skin-jewel-gate.html#industry

Solis, W. (2008, March 13). Defense management: Overarching organizational framework could improve DoD's management ofenergy reduction efforts for military operations. *Highlights* . Washington, DC, United States: United States Government Accountability Office.

Staff. (2009, November 26). *ADB gives loan for education reform*. Retrieved November 28, 2009, from Viet Nam News: The National English language daily: http://vietnamnews.vnagency.com.vn/showarticle.php?num01EDU261109

Strauss, A., & Corbin, J. (2007). *Basics of qualitative research: Techniques and procedures for developing grounded theory.*

Swafford, P. G. (2000). A model of global supply chain agility and its impact on competitive performance. *Proceedings of the 31st National DSI Meeting.* Atlanta.

Unknown. (1998). *RSC: Advancing the Chemical Sciences.* Retrieved November 14, 2009, from Royal Society of Chemistry: www.chemsoc.org/networks/enc/allcheme_pub4e.htm.

Unknown. (2007, 10 18). Supply chain collaboraiton in retail enterprise. *ARC Thoughts* . Brussels, Belgium: Association of Retail Technology Standards.

van der Vorst, J. &. (2002). Identifying sources of undertainity to generate supply chain redesign strategies. *International Journal of Physical Distribution & Logistics Management* , Vol. 32 No. 6, 2002, pp. 409-430.

Von Schiller, J. F. (n.d.). *Finest Quotes*. Retrieved January 20, 2010, from http://www.finestquotes.com/author_quotes-author-Johann%20Friedrich%20Von%20Schiller-page-0.htm.

Wall, T., Michiie, J., Patterson, M., Wood, S., Sheehan, M., Clegg, C., et al. (2004). On the validity of subjectie measures of company performance. *Personnel Psychology* , 95-118.

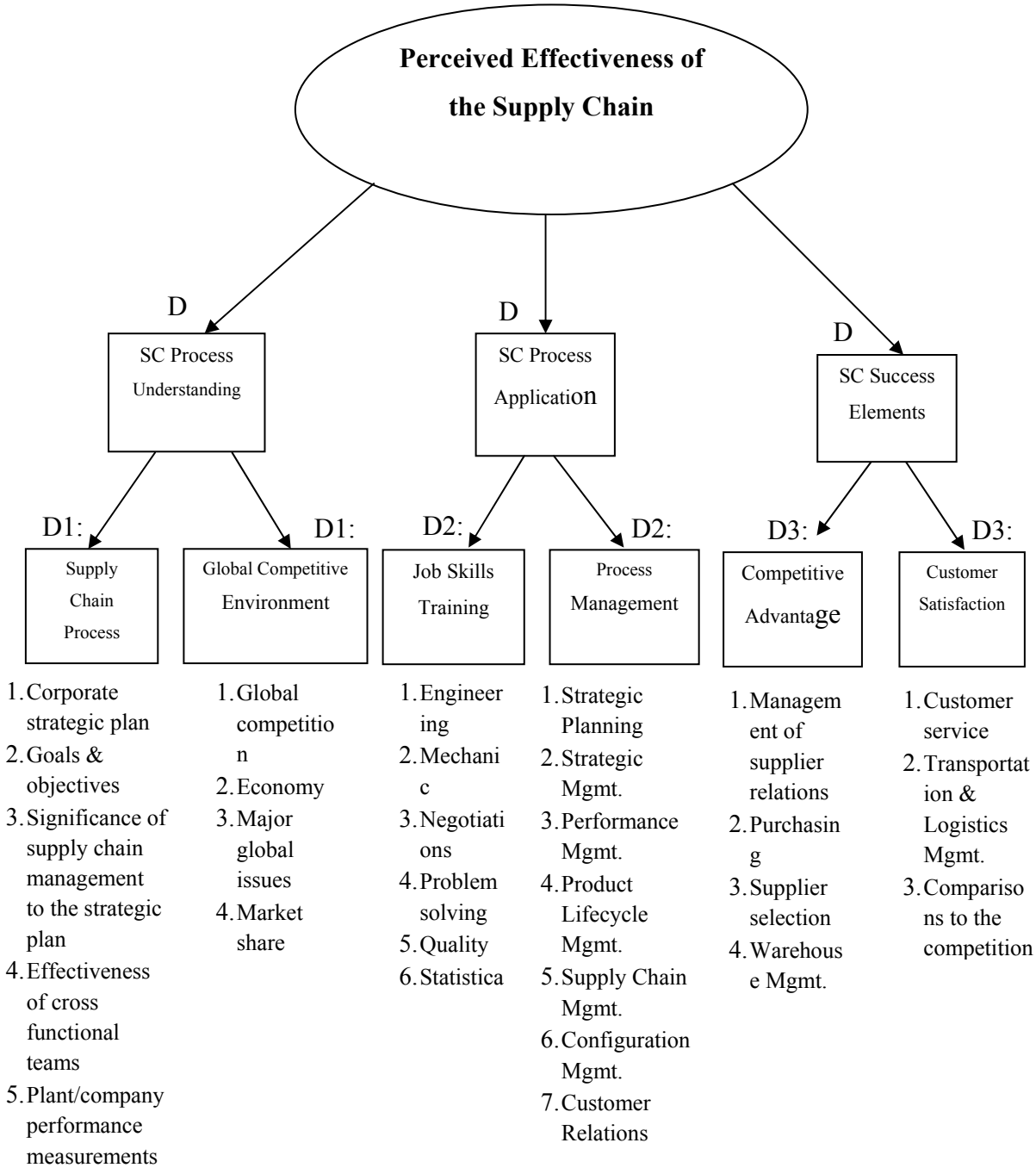
Yang, A. (2007). Intangible relationship value in service industries. *ANZMAC* (pp. pp. 2621-2628). Dunedin: University of Otago.

Yin, R. (2009). *Case study research. Design and methods.* Thousand Oaks, CA, USA: Sage.

APPENDICES

Appendix A

Operational Concept Model



Appendix B

Perceived Effectiveness Survey

SC Process Understanding (D1)
SC process questions
1) How does your company communicate the goals and objectives as stated in the corporate strategic plan to the supply chain? (A)
2) Tell me how your company shares work process data with supply chain members. For example, if engineering makes a drawing change that effect cross-functional work teams. (B)
3) Which measurements does your company use as key indicators of company performance? For example; production rate, cycle time etc. (A)
Global Competitive Environment
4) What are ways that your supply chain members work together to accomplish your goals? (B)
5) How do you deal with sharing sensitive business information with supply chain members without worrying about the security of the data? (B)
6) How do you think the current state of the economy will affect your market share? (B)
SC Process Application (D2)
Job Skills
7) How are education and training different for hourly and management/supervisor employees? (A)
8) What key job related skills that you desire of your employees? For example: basic math, English language skills, problem solving, production measurement. (A)
9) What process and performance tracking skills do you expect employees to use? (A)
10) How are employees recognized for implementing improvements? (B)

Process management

11) How is statistical process control (SPC) utilized to track quality improvements? SPC is a production measurement tool (A)
12) How are data-charts such as cycle time, production rate and incident reports, made visible throughout the organization? (A)
13) How does your company's environment encourage employees to solve problems when they arrive? (B)
SC Success Elements (D3)
Competition
14) How does your company benchmark your competition?(A)
15) What things do you believe your company does well, in order to compete effectively? (A)
16) How do you measure or evaluate your performance compared to your competitors? (B)
Customer Satisfaction
17) How do you identify what your customer's value? (B)
18) Describe the process you use to measure customer satisfaction. (B)
19) How do you evaluate your overall customer satisfaction levels? (B)

Appendix C

Perceived Effectiveness - Regena Scott

Follow-on Confirmation Survey Questions

First, let me again thank you for taking the time to participate in the Supply Chain interview segment of the work on my dissertation. I am currently evaluating the interview data to identify and verify my hypotheses. As a final step, it is important to validate my findings. To that end, I would appreciate your taking the time to answer the questions below. Please answer each question on the scale below; "5-Strongly agree" to "1-No Opinion." Please check (x) the answer that closest represents your response. Please email your response to: scottr@uhd.edu
Thank you for your participation!

	5 Strongly Agree	**4 Agree**	**3 Slightly Disagree**	**2 Strongly Disagree**	**1 No Opinion**
1. The company effectively communicates supply chain related goals and objectives in the corporate strategic plan.					
2. There is a plan in place for sharing work process data with cross-functional supply chain members.					
3. Specific measurements have been established to help understand key indicators of company performance.					
4. Our supply chain member's work together to accomplish our collective goals.					
5. We share sensitive business information with our supply chain members without concern for the security of the data.					
6. The current state of the economy is having a negative effect on our market share.					
7. Education and training differs for hourly and management or supervisory employees.					
8. Basic skills such as; math, English, problem solving, and product measurement, are desired for all employees.					

	5 Strongly Agree	4 Agree	3 Slightly Disagree	2 Strongly Disagree	1 No Opinion
9. Each employee has the knowledge necessary to uses process and performance tracking skills.					
10. Employees are recognized for implementing job related improvements.					
11. Statistical process control (SPC) or other statistical tracking tools are utilized to track quality improvements.					
12. Performance data-charts are displayed throughout the facility as tools for employee review.					
13. The company environment encourages employee problem solving.					
14. We regularly benchmark our competition.					
15. I believe we do a number of things better than our industry competition.					
16. We have a process in place for measuring and evaluating our performance as it compares to our competitors.					
17. There is an organized process in place for identifying what our customer values.					
18. A customer satisfaction process is in place at every level of our organization.					
19. We evaluate the overall satisfaction level of our customers.					

Appendix D

Research Introduction Letter

Date: April 17, 2009

Dear,

My name is Regena Scott and I am a Ph.D. candidate in the College of Technology at Purdue University in West Lafayette, Indiana. I am conducting a research study related to supply chain workforce education and training. The purpose of this research is to help the investigator acquire an understanding of the current impact of supply chain in industry and the current education and training effectiveness as related to the performance of the supply chain.

I would like to arrange a one-time interview to be conducted either face-to-face or via telephone at a time and location that will be as agreed upon by you, the participant. Participation in this study is voluntary and all participants must be at least 18 years of age. The interview should last approximately 30 to 45 minutes. Though it is not anticipated, follow-up contact will be conducted via telephone for interview clarification purpose. There will be no more than two follow-up contacts.

Maintaining the anonymity of the participant and their interview responses is a priority of the research therefore; the utmost care will be taken to ensure the privacy and confidentiality of your responses during the interview. To this end, each participant will be assigned a coded identification that will be used throughout the analysis and reporting phases of the research. This coded identification will serve to disassociate the participant from the interview data and aid in protecting the integrity of the participant and the data. Only members of the research team will have access to the interview information that you will provide.

I will contact you within the next week to arrange a time and location for the interview. I would like to thank you in advance for your time and assistance with this research. I believe that this research will be a significant contributor to understanding supply chain education and training and workforce effectiveness and how the supply chain can enhance industries effectiveness in a global marketplace.

Sincerely,

Regena L. Scott
Ph D Candidate
Purdue University

Appendix E

Interview Confirmation Letter

Dear Participant,

Thank you for agreeing to participate in this research study. The purpose of this research is to help the investigator acquire an understanding of the current impact of supply chain in industry and the current education and training effectiveness as related to the performance of the supply chain.

Once again, this interview should last approximately 30 to 45 minutes. Your participation in this study is voluntary and your response will be kept strictly confidential. Only members of the research team will have access to the information you give. In order to ensure the utmost privacy, we will assign an identification number for each participant. This number will be used by us only for follow-up procedures. The numbers and names will not be made available to anyone other than the research team.

Thank you very much for your time and cooperation. I greatly appreciate your help in furthering this research endeavor.

Cordially,

Regena L. Scott
Ph D Candidate
Purdue University

Appendix F

Interview Bins 1 & 2

1. Supply chain effectiveness	2. Workforce Education & Training
SCED001 - …those are our guiding principles…supply chain and as we deal with contracts…so we're increasing our genetics from people in technologies and we're out transferring that intellectual property… SCED002 - …a challenge with that using our US-Infinity to be the end all, save all of our SPC data…it's very hard to implement the data coming out of our CNC machines, especially our precision milling machining… SCED002 - Backlog (industry or peer indicator). Long-term strategic goals, what we want to do as a company…cornerstones to that strategy. Levering business opportunities SCED002 - Everyone is involved…OASIS is an internet; web-based portal that any supplier can come and submit applications to become a supplier on…a centralized document spells out for them what we expect. SCED002 - Feedback after every	SCED002 - …skill set test basically hits all three, ah; math, English, and I think it's a technical writing, ah, of some sort…some training specific to what you're gonna do and all this stuff…We have an SPC side program called Infinity-QS…Upward mobility is connected to increasing knowledge. SCED002 - There is definitely a difference. The hourly employees will receive training specific to their job skill-set…most of it tends to be in-house…salaried to management type people, the education tends to go more, ah, towards professional education outside, you know, meaning a university or college…you tend to see more reimbursements on that side for training…a lot more has been put out on…electronic sources…our evaluation criteria on our annual evals, which is to go and take so many of these courses…ranging from project management to science and accounting…But, you will see that opportunity made available to, I think

contract award or loss…what it is that we did right…what we may have done wrong…particular milestones that are quarterly, annually,… SCED002 - ITAR (Inter-nation Traffic of Arms and Regulations) regulations will determine what type of supplier can see this type of information. SCED002 - LCD screens of the assembly line itself at each cost center…through the particular groups, department management. SCED002 - Objective form…we do have feedback criteria that are graded, subjective, it's 1-10… SCED002 - That's a little more pro-active once a new part is needs or required… SCED002 - The change technically goes through a centralized server…Teamcenter. SCED002 - They will have flowed down to them weekly, indicators of benchmarks, trends from year to date…on physical sheets of paper…it's a lot more effective way to communicate back to the folks doin' the work, what their work is really doin'. SCED002 - Yearly owner conference SCED003 – goals and objectives of the	it's actually made available to all employees. SCED004 - I say it's all internal, but a bunch of our training is sourced… "My Learning" and it identifies all of your, all of your history, all of your future training. SCED004 - So, there is both classroom training…there's a very rigorous advancement process…they learn the process…they learn how to use the automated tools…And all along the way there's a suite of very well defined classes that they need to take before they progress to the next level…then we also have a whole series of annual kinda, online training, that, that people need to take, like conflict of interest…all those buckets, and very defined on the job development process, with required training…And then there annual refresher training around compliance issues. SCED007 - Online modules, instructor led, instructor online…Compliance and safety are mandatory for employees and suppliers…95% of classes are taught internally…there is some reimbursement for outside courses…might need supervisor's

district, um tickle down throughout the organization…So, finance who is the division that I report to has goals that support the district and then goals within my department support the goals of the division, which support the district. SCED004 - …our focus in the last couple of years, at least in the non-production area has been…process from end to end value. Making sure that we're optimizing the whole value stream and not any one piece. SCED004 - …we do a lot because a lot of the work that we do, ohm, we'll place work internationally in order to help with industrial participation requirements. SCED004 - …we've found is a lot of the international suppliers have gone to great lengths around the control of data…they've done a lot to mitigate the concerns. SCED004 - Benchmark data…how we are doing in the market and our ROI. SCED004 - Both an end-user survey…regular executive engagement. SCED004 - Customer focal sit on the leadership team in the business unit.	approval… And then there annual refresher training around compliance issues. SCED007 - Some basic skills, math, English. Any job related must meet company guidelines and necessary prerequisites. Computer tools track all learning for all employees. SCED008 - We have a lot of internal training…by far this is the best place I've worked for that…to make sure people are trained whether it's on ah, software…we even have some like internal people that train on the CAD system…I had a GD&T class (Geometric, Dimensions, and Tolerance)…40 hours…Everyone's supposed to be trained every year on, ah; yellow-belt awareness…basically like a two or three hour class…either on the internet or you can take an actual class.

Anecdotal feedback SCED004 - Engaging suppliers in strategy. SCED004 - New product surveys and Legacy Programs SCED004 - Yep, all still around…still got the same old PBM charts. SCED007 - …all of the corporate supply and plant each has their list of certified suppliers. SCED007 - …there are non-disclosure agreements in place. Once signed, information flows freely between manufacturer and suppliers. SCED007 - Customer satisfaction index. Customer completed (dealer and product CSI) SCED007 - Market research, customer focus groups, dealer network, process data figures. SCED007 - Process owners (champions; supervisor assigned persons) are responsible for tracking and they have full visibility for the enterprise. SCED007 - Production Product Management (PPM), T&A, SPC (per machine) they are all tracked measures. Supplier component warrantee metrics are also tracked.	

SCED007 - SAP system to communicate changes and other critical changes. SCED007 - Supplier component warranty, quality plans with suppliers, how well they communicated using the parts change process. SCED007 - We knew that China, with the Olympics would delay getting parts…plan ahead. Collaboration web-site…Direct communication between factory and suppliers. SCED008 - …critical they are involved not only on, ah finding outside vendors to do this work, but also going to visit these vendors to make sure the quality's up to par as far as our standards. SCED008 - …enterprise planning software. SCED008 - …some of our Black-belts actually go out to the casting facilities and work on improving their processes…part of it is lean six-sigma. SCED008 - …these are partners of ours in, on good terms so that when the economy does change back…outside vendors to work again. SCED008 - …we outsource to probably 70% or a mach…maybe more than that	

like 90% of the machine shops… SCED008 - Ah, we have different grading; it's called C. Confidential and its like 1, 2, 3, 4… SCED008 - Usually our supply chain is involved in all of our material review…	

Interview Bins 3 & 4

3. Leadership Communication/Commitment	4. Perceived link E&T and Org Success
SCED001 – I have three simple business rules that we push through our whole organization. Rule #1 is win/win business…we believe our suppliers also our customers, everybody otta make money…if you have win/win relationships…create long-term relationships in supply chain or any business. #2 is be profitable…we shouldn't be doing anything that we don't make money…expect the same as we deal with people…the third one is have fun! SCED002 - One is each year in our annual prospective…our strategic mission statement for the year…secondly, in supply chain… newsletter, e-letter, for lack of a better term. SCED003 – …our goals and objectives for the district, ohm trickle down throughout the organization…"By 2015 SISD will be recognized nationally as a leader among learning organizations	SCED002 - But, you will see that opportunity made available to, I think it's actually made available to all employees. SCED002 - More and more, they are trying to get folks who have a couple of different skill sets. So, instead of just being a trend drill guy, or a machinist, you have to understand metrology, or you have some understanding of quality inspection such that you build your quality into your process no matter what layer you are on the production line…There's a big push to educate folks, especially with the economic downturn that we've had, there's a big push for management to educate folks on what it means for us to save and reduce costs. To become more efficient and effective and when people understand that means job security and it means ah profit, and means it security for them as an employee, then the next question…what does it

and for exemplary students achievement.” SCED004 - How we communicate changes…Supplier conferences…Stratification of the supply base…so we probably do a relatively good job with those suppliers that we've identified as strategic or key. …a better job of trying to engage them (suppliers) in strategy and where we're going.…even within shared services I would say that varies…we have some RAA challenges…the delivery side is communicating on a daily basis because they are physically residing there with them, building the building… training and development in the purchasing arena is really well defined and well executed. SCED006 - …we have a safety training meeting that we hold annually…we outline a series of goals that we wanna research…we go over all of our safety procedures, all of the goals, all of the problems we had, and all of the things we wanna see fixed in the future. SCED007 - Policy communicated through worldwide…supply network document. SCED008 - …about once every two	mean…then most individual employees will go find how does that means become a method for them….it’s really a big push on the education system…in fact has been a very good platform for us to educate down to the shop-level why improvements are necessary…all this stuff is good for the company and ultimately for them. SCED004 - We (procurement) hire degreed individuals…are a few universities that have programs…we recruit…Typically we’ll do summer interns…we’ll end up hiring those folks…Four major business units….And all along the way there’s a suite of very well defined classes that they need to take before they progress to the next level…there’s a very rigorous advancement process…they learn the process……training and development in the purchasing arena is really well defined and well executed. SCED006 - Upward mobility is connected to increasing knowledge… Training suppliers…we have a good training program and good partners to work with. SCED007 - Collaboration web-site that all suppliers go through

weeks they have some senior level person. This is another really good thing. Through our internal network you can watch these videos of them (senior leadership) back in Peoria…see what they're talkin' about. About the business future about what we need to be doing. SCED009 - Uh, we have a system called MBOs, Management By Objectives where ohm, there's a set developed at the CEO level and then cascaded down to the different business and functional units. Ohm, so there's a tie or relationship as it goes from the top down.	yearly…Everything (education and training) is open to everyone…Compliance and safety are mandatory for employees and suppliers. SCED008 - …by far this is the best place I've worked for that…to make sure people are trained…Everyone's suppose to be trained every year on, ah, yellow-belt awareness.

Interview Bins 5 & 6	
5. Problem solving and rewards	6. Competitive global economy
SCED002 - Company performance based on opportunity system. No enterprise wide reward system but each unit can reward for good work…Each month we have an employee of the month…based upon above and beyond…mostly include improvement to processes…better quality, use of time…"soft savings" …"Insta-taps"…instant, ah, dollar amount that comes out to your department. $50, $100, $150, $300…Process Improvement Award…employees are aware that, ah, should things be picked up from idea to implementation that there is recognition…More and more, they are trying to get folks who have a couple of different skill sets. So, instead of just being a trend drill guy, or a machinist, you have to understand metrology, or you have some understanding of quality inspection such that you build your quality into your process no matter what layer you are on the production line. SCED004 - Recognize and reward, you know, get the job done, you do improve	SCED001 - …goals of the different departments and support departments within that, what can we do as a department to become nationally recognized. SCED002 - Effective with our R&D dollars…we definitely are to the top of realizing our T&D dollar to a awarded contract…Contractual research and development is captured…we have a very strong record in that…altogether is a competitive advantage of being good at foresight for the government…realizing an effective internal dollar to capture external funding for R&D SCED002 - So as a user of the global supply chain itself, I find things through those two mediums…certain cost-centers are being met, and they get measured daily…TAKT time is benchmarked for each individual cost-center. SCED003 – "By 2015 SISD will be recognized Nationally as a leader among learning organizations and for exemplary student achievement." SCED004 - …it's an opportunity for us.

the process…We have a thing called "Pride at B" and anybody can recognize. There can be peer recognition, manager recognition...I think about $150 bucks…Then there area cash awards above that. It's a pretty - it's a probably overly generous program. SCED007 - Problem solving is conducted on a unit-by-unit bases…Participate in performance based councils. Not a formal based process. They tend to do a fairly decent job. Training is both internal and external. SCED008…using Six-Sigma…they have a lot of quality boards…you can't compare these two (San Diego & Tijuana) because the skill level is just so much different…a lot of disparity…simple stuff we've done for 40 years…Ah, that's a little more proactive. Once a new part is needed or required because you'll see a new set of criteria that comes…supply chain engineer…supplier technical engineer…supplier quality engineer…part of the supply chain. And they'll go back, they'll talk to them…There always looking at what is	We have an opportunity to both drive down our price, drive down our cost, unit price, ah, because so many of the commodities are less expensive right now…confidence in the suppliers financial viability over the timeframe is a concern right now… Our current market-share is doing substantially well. Ohm, a lot of the programs that were, are A, a cash-cow or B future programs, or ah, captures, where not impacted by the, in the way less were made….none of "Security Gate" recommendations where any of our primary, primary, secondary subcontract type programs at all…what we have seen though is a lack in our supplier base…niche mom and pops that use to be there for quick turnaround…expertise are no longer in business or have had to reduce their manpower. We have a formal benchmarking process. A 2-level…we participate in groups like the Mayflower group and some purchasing specific groups…we benchmark both around quality and cost. SCED004 - Supplier rating system…cost quality, schedule, management, and technology…new

the one area that slows us down, and how do we get it to the point where we can have the minimal amount of parts in our warehouse…you build your quality into your process no matter what layer you are on the production line.	systems that are coming online, new improvement that are to help the global supply chain in general. SCED007 - EPEP is the process used to develop programs. Measured by percent (95%) must be completed by each phase. SCED007 - Regular updates allow planning and they notify suppliers and prepare for change. “That’s one thing that we’ve done well!”…Brand recognition. Companies want to be a part of the family and it allows us to be picky…Training suppliers. SCED008 - …no safety infractions, OSHA infractions. And get down to zero defects… It’s effecting in the fact that we don’t have as many…new orders this year…say about 75% or our customer base is oil and gas…they really understand making money, but they don’t understand maintenance very much. …when we get contracts that come out we understand contracts are very political...look for consistencies of where the subcontracts of those primes go…if there’s certain areas of a certain airframe or vehicle,…you can glean a whole lot of data…How many are we

	selling…the company market share…."Values in Action" about ethics and how we don't… I think we have an opportunity to be in the non-production area, to be more strategic in how we, how early we engage with our business partner…take advantage of the global market.

VITA

VITA

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August, 2010

Education

Doctorate of Philosophy, Purdue University, College of Technology, 2010

Major: Technology

Industrial Technology

Dissertation title: Assessing the perception of the effectiveness of supply chain management and workforce education and training as they relate to business success.

Masters of Science, Purdue University, College of Technology, 2006

Major: Industrial Technology

Industrial Technology, Industrial Distribution

Thesis title: Advancing Innovations in Education: Supply Chain Laboratory Workshop Instructional Design for Hands-on Learning (Directed Project)

Bachelors Degree, California State University-Long Beach, 2003

Major: Communications Studies

SCHOLARSHIP

Scholarship since September 2003

Accepted for Publication Peer Refereed Journal Articles

Scott, R. and Dyrenfurth, M. (2007), "*Integrating PLM software into supply chain education"*, 2008 Industrial Distributors Education Association (IDEA), Houston, TX. *Advances in Marketing*, pg. 256-257.

Conference Proceedings and Presentation

Scott, R. (2010) *"Supply chain management education: Industry-University collaborations"*, 2010 Association of Collegiate Marketing Educators (ACME) Conference

Davis, J., Schmidt, E., Khiewnavawongsa, and Scott, R. (2009) "Developing a manufacturing cost-of-ownership algorithm for comparing goods from traditional suppliers to vendor management", 2009 conference of Industrial Education Collaboration (CIEC), AC 2009-1780.

Scott, R. and Schmidt, E. (2007), "*Educating for a Global Environment: Meeting industry needs through updating education and training"*. 2008 conference of Industrial Education Collaboration (CIEC), Presentation.

Scott, R. Newton, K. and Schmidt, E. (2007), "*Implementing hands-on laboratory exercises in undergraduate education"*, Proceedings of the 2007 American Society for Engineering Education (ASEE), Honolulu, Hawaii. Ac 2007-1743

Scott, R. and Schmidt, E. (2007), "*Enhancing learning through a college based tutoring program"*. Proceedings of the 2007 American Society for Engineering Education (ASEE), Honolulu, Hawaii, AC 2007-1719.

Scott, R. Newton, K. and Schmidt, E. (2007), "*Instructors adjust to the challenges of electronic distance learning"*, Proceedings of the 2007 American Society for Engineering Education (ASEE), Honolulu, Hawaii, Ac 2007-2143

Scott, Regena L. (2004). *"International Technology Management: The Next Business Necessity"*. Proceedings of the National Association of Industrial Technology (NAIT), Louisville, KY. Presenter

Other Scholarship since September 2003

Scott, Regena L. (2006), "Applying PLM to Team Smith Kart: Product Lifecycle Management", Proceedings of the Future of Midwest Manufacturing Summit, Purdue University West Lafayette, IN. CGT 598

Scott, R. and Schmidt, E. (2005), "Manufacturing Process Improvement", flexcel Customized Manufacturing Solutions, Jasper, IN, furniture manufacturing process control evaluation, recommendation, and development.

Scott, R. and Schmidt, E. (2005), "Supply Chain Laboratory" EAN-Works (Spring 2005) Melbourne, Australia, design and development of corresponding campus laboratory.

Scott, R. and Schmidt, E. (2004), "Scheduling Process Review", Freudenberg-NOK Queretaro, Mexico, automotive parts manufacturing process control evaluation, recommendation, and development.

Service/Committees

Service to the College of Business and the University –

- Student Supply Chain Management Association advisor
- University Student Publication Committee, member
- COB Marketing Faculty Position Committee, member
- COB Supply Chain Management Faculty Position Committee, member

Service to region's economy –

- Participation in the development and preparation of a proposed "Program in Transportation Management". This proposal has been introduced to regional partners involved in a variety of transportation modes (air, land, port, and marine) for the purpose of designing and implementing a course of study specifically identified by industry leaders as they pertinent to their business success. UH-D students participating in the program to enter the transportation workforce with the appropriate knowledge, skills, and tools necessary to contribute to advancing a regional competitive business and industry advantage.

- Member of the Port of Houston Partners in Maritime Education (PHPME) Committee. This is a community, business, industry, and education collaboration tasked with assisting in the design, development, and support of Maritime curriculum for Houston area high school students.

Teaching

Course Information					
Prefix	Number	Course Title	Sem. Hrs.	Term	#Students
SMC	3303	Negotiating Skills & Technique	3	Fall, 2009	12
MGT	3303	Negotiating Skills & Technique	3	Fall, 2009	10
SCM	3308	Purchasing Management	3	Fall, 2009	24
SCM	3309	Materials Management	3	Fall, 2009	22
MGT	3303	Negotiating Skills & Technique (online)	3	Spring, 2010	30
SCM	3303	Negotiating Skills & Technique (online)	3	Spring, 2010	12
SCM	3308	Purchasing Management	3	Spring, 2010	10
SCM	3309	Materials Management	3	Spring, 2010	10
SCM	3308	Purchasing Management (online)	3	Sum, 2010	29
SCM	3309	Materials Management (online)	3	Sum,2010	17

Performance

Course Information					
Prefix Number		Course Title	#Students	Term	Mean Score
SMC 3303		Negotiating Skills & Technique	12	Fall, 2009	4.50
MGT 3303		Negotiating Skills & Technique	10	Fall, 2009	4.44
SCM 3308		Purchasing Management	24	Fall, 2009	4.34
SCM 3309		Materials Management	22	Fall, 2009	4.25
Dept MMBA		SCM	68	Fall, 2009	4.35