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Reducing the Costs of Poor Quality: A Manufacturing Case Study

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Abstract

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MBA, Saint Leo University, 2015

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

Manufacturing firms can incur losses of up to 100% due to costs of poor quality (COPQ) in the form of internal and external product failures, rework, and scrap. The purpose of this single case study was to explore what quality improvement strategies senior manufacturing production managers used to reduce COPQ and increase profit. The participants selected were 3 production managers in 1 small-sized manufacturing company in the southeastern region of the United States with successful strategies to lower COPQ. The conceptual framework of this study was based on total quality management theory. Data collection was through face-to-face interviews and from a review of company documents. Yin's 5-step process was used to analyze the data. Three key themes emerged during data analysis: continuous improvement, quality assurance, and institutionalizing training. Manufacturing managers can use these strategies to lower COPQ and increase profits. The findings can contribute to social change by increasing individuals' sense of dignity and self-worth through the manufacturing firm leaders' ability to increase employment rates.

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Dedication

I dedicate this study to several people. First my wife, Victoria Faciane, I could never achieve such a task without you. What they say is behind every man is a great woman; in my case, there is a great woman behind, in front, to the left, to the right, above and below; thank you for your 720-degree support; I love you. To my two sons, you two gave me all the motivation I needed to make it through this process. Matthew, the days I had to walk away to research and write while you groped for me provided the impetus to get through this arduous process; it broke my heart each time you did it; I love you. We have much playtime to catch up on; I cannot wait for the great times we will share together. Lucien, watching you fight from the moment of birth motivated me to log on to my laptop in your NICU room and keep moving forward with this endeavor so that I can pave the way for Matthew and you; I love you. You are a fighter, and I cannot wait to see you excel, you will make a massive impact on this world. I want you two to remember these words by Alexander the Great, it is men who endure toil and dare dangers who achieve glorious deeds, and it is a lovely thing to live with courage and to die leaving behind an everlasting renown. To Dr. Keith Quarles, you thank you for your guidance along the way; you are more than just my SiFu, but a friend and mentor. Most importantly, I thank God for giving me this beautiful life; I love you.

Acknowledgments

I want to acknowledge the chair of the committee for my doctoral study, Dr. Fan. You were my first instructor for DDBA-8006 in the fall of 2015. Thank you for answering my calls, which went beyond the forecasted 30 minutes to prepare me for success. I would like to acknowledge Dr. Vadell, my SCM. I enjoyed the sidebars with you at residencies and in-class wherein you used your charisma to motivate us the student body. I also want to thank Dr. Knight, the URR for this study. Your feedback, attention to detail, and critical thinking made this research study much better.

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Section 1: Foundation of the Study

Costs of poor quality (COPQ) are a major business problem negatively affecting many firms in the business community (Jaca, Viles, Paipa-Galeano, Santos, & Mateo, 2014; Juran, 1988; Stanciu & Pascu, 2014). COPQ can cause significant revenue losses to businesses (Ahmad, Pesch, & Gulati, 2015; Stanciu & Pascu, 2014; Pakdil & Leonard, 2014). There are potential solutions to the COPQ business problem (Ahmad et al., 2015; Deming, 1986; Kanwarpreet & Inderpreet, 2015). Business leaders can mitigate the potential for the complications associated with COPQ by implementing quality improvement strategies aligned with the total quality management (TQM) model (Drohomertetski, Gouvea da Costa, Pihheiro de Lima, & Garbuio, 2014; Hunold, 2014; Parihar, Bhar, & Kumar, 2015). In this single case study, I explore strategies manufacturing managers can use to lower COPQ and increase profits.

Background of the Problem

COPQ are a business problem prevalent in the business community. COPQ are financial losses incurred by an organization because organizational process assets are not meeting product specifications due to a lack of quality adherence (Stanciu & Pascu, 2014). The business problem is not locally specific, as it plagues many business communities throughout the world (Jaca et al., 2014; Pereira, 2015). COPQ, which impede firm performance, come in the form of reputational degradation, waste, rework, scraping, and safety. Some of the causes of COPQ are the inability of managers to control quality, the lack of processes such as continuous improvement initiatives, and the lack of quality oversight (Ahmad et al., 2015).

When a significant amount of COPQ occurs, there is a likelihood the problem will consume a vast amount of the organization's capital (Pakdil & Leonard, 2014). When this occurs, there is a probability for poor business performance via decreased earnings, which has the potential for an adverse effect beyond the business community. An adverse influence beyond the business sector is the consequence of a reduction in the labor force. A decrease in the workforce has the potential to render many stakeholders without the means to subsist (Deming, 1986; Kawai, 2014; Pakdil & Leonard, 2014).

Problem Statement

Manufacturing companies may incur 100% losses due to the COPQ, which come in the form of internal and external failures, rework, and scrap (Ahmad et al., 2015). Losses stemming from poor quality internal and external failures may reach 20-100% of the entire cost of products manufactured (Ahmad et al., 2015; Stanciu & Pascu, 2015). The general business problem is senior managers in the manufacturing industry experience adverse effects originating from poor quality control resulting in profit losses. The specific business problem is some senior computer and electronic manufacturing production managers lack quality improvement strategies to reduce COPQ and increase profits.

Purpose Statement

The purpose of this qualitative single case study was to explore what quality improvement strategies senior manufacturing production managers used to reduce COPQ and increase profit. The targeted population was three production managers in one small-sized manufacturing company in the southeastern region of the United States with

successful strategies to lower COPQ. Deming (1986) noted enhancing quality improves employment rates within the communities the businesses operate. The implications for positive social change include enhancing individuals' self-worth and dignity.

Nature of the Study

Method

The goal of the research was to identify and explore quality improvement strategies, processes, and tools senior manufacturing mangers use to reduce COPQ. The quantitative method was inappropriate because it aids researchers in testing theories by examining relationships or differences among variables (Leung, 2015). The purpose of this study was not to test a theory, but to gain an understanding of successful strategies, for lower COPQ. The mixed method was inappropriate because there was no need to explore and test a theory based on the nature of the research question (Abro, Kurshid, & Aamir, 2015). The qualitative method provides a broad understanding of a phenomenon based on the participants' experiences (Leung, 2015). The qualitative method enables the researcher to develop a rich understanding of a phenomenon; and therefore, the qualitative method was the most appropriate research method for this study.

Design

The goal of this doctoral study was to understand what strategies senior manufacturing production managers use to lower COPQ. Grounded theory was inappropriate, as I did not seek to create or build upon theories (Matavire & Brown, 2013). A phenomenological design was inappropriate because there was no need to understand the constructs of one's conceptualization of a given experience (Vanscoy &

Evenstad, 2015). An ethnographic design is inappropriate because there was no need to understand the organizational culture, only solutions to the business problem (Brooks & Alam, 2015). The case study design was appropriate for the study to enable me to develop of a rich understanding of the phenomena through using interviews, document reviews, and observations (Yin, 2014).

Research Question

What quality improvement strategies do senior manufacturing production managers use to reduce COPQ and increase profits?

Interview Questions

1. What was the total COPQ experienced in your organization last year?
2. What strategies do senior production managers take to reduce COPQ?
3. How do you assess the effectiveness of your organization's strategies for reducing the COPQ?
4. What are the most effective quality improvement strategies employees of your organization using to lower COPQ?
5. What were the key barriers to implementing your strategies for reducing COPQ in production?
6. How did you address the key barriers to implementing the strategies for reducing COPQ in production?
7. What additional information regarding the quality improvement strategies manufacturing production managers use to lower COPQ would you like to add?

Conceptual Framework

Deming (1986) developed the TQM theory. TQM was the evolution of Feigenbaum's total quality control, which he developed through his teachings and research in 1960 (Cwiklicki, 2016). Deming (1986) noted several key insights of Dr. Juran in the development of his TQM theory regarding quality management strategies. Juran contributed to the TQM theory via the popularization of Pareto analysis wherein the cause of 80% of production errors are due to a very few error types (Ab Talib, Abdul Hamid, & Ai Chin, 2015). Juran also developed the quality trilogy consisting of quality planning, quality improvement, and quality control, which are necessary for successful operational quality management endeavors (Ngambi & Nkemkiafu, 2015).

Using TQM theory, business leaders could improve quality through the quality of production and service systems, standardized training, institutionalized leadership, and the elimination of employee production quotas. The critical points of TQM are (a) creating consistency within processes to improve products; (b) removing the need for mass inspection by becoming quality centric; (c) ending the practice of rewarding performance based on low price and ascertaining one trusted supplier for products; (d) adopting continuous improvement indefinitely, improving quality, and reducing costs; (e) starting on the job training; (f) synergizing all departments within the firm; (g) eliminating conditions, which cause unproductive competition between departments and improving the systems controlling quality; and (h) eliminating quotas (Deming, 1986).

Manufacturing managers are seeking ways to improve the quality of their products (Patyal & Maddulety, 2015). Decreasing COPQ can catalyze production

processes efficiencies and effectiveness (Sangode, 2016). The ability of the organizational managers to reduce the COPQ is dependent on their capacity to improve quality via prevention, appraisals, and improvements (Ahmad et al., 2015). The expectation was that TQM theory could provide a lens for understanding the results of this study because the purpose of the study was to explore strategies production managers use to lower COPQ.

Operational Definitions

Continuous improvement: Continuous Improvement is a management philosophy whereby employees increase organization value via perpetual improvement endeavors (Singh & Singh, 2015).

Costs of poor quality: COPQ is the sum of the costs onset by quality problems (Juran, 1988).

Six Sigma: Six Sigma is a quality improvement strategy business leaders use to achieve optimum product quality by reducing variations, which cause product defects (Marzagao & Carvalho, 2016).

Total quality management: Total quality management is a management practice increasing product quality and organizational performance (Arshad & Su, 2015).

Assumptions, Limitations, and Delimitations

Assumptions

An assumption is a conclusion, which a researcher concludes is true without empirical evidence (Ellis & Levey, 2009). The first assumption in this study was one can garner thick and rich descriptions as to strategies manufacturing managers may use to

lower COPQ. The second assumption was the computer and electronic manufacturing managers would give truthful and unbiased answers during the interviews. The third assumption was themes developed from the data from the interviews would aid in the answering of the research question.

Limitations

A limitation of a study is an area with the propensity for weakness (Ellis & Levey, 2009). A possible limitation of this study was participant withdrawal from the research. Fear of reprisal from organizational leaders could be a limitation of the study if participants perceive their account could reveal aspects of the firm, which leaders want to remain within the company. The lack of generalizability was a limitation, as qualitative case study findings are not generalizable because there is no statistical testing when researchers use the research design. The inaccuracy of the participants' accounts relating to the phenomena was another potential limitation in the research.

Delimitations

Delimitations are scope statements, which are boundaries the researcher sets for what he or she is going to do in the study (Ellis & Levey, 2009). The focus of this study was to explore strategies of a manufacturing organization, which lowered COPQ in the southeastern region of the United States. The selection of participants was paramount to finding successful strategies to reduce COPQ. The participants in the study were senior managers, who have had experience reducing COPQ in computer and electronic manufacturing. The participants have expertise in the topic, as they must have experience

in the field of quality improvement for no less than 5 years. Interview questions and document reviews pertained only to strategies the participants used to lower COPQ.

Significance of the Study

Contribution to Business Practice

Participants within the study were senior production managers. The participants used a set of quality improvement strategies, resulting in lower COPQ. Manufacturing leaders in other manufacturing firms could use the successful strategies, which lowered COPQ in their companies. The use of successful strategies to reduce COPQ could enhance their organizations' financial performance. Quality improvement strategies, processes, and tools are necessary for effecting management success (Canato, Ravasi, & Phillips, 2013). Interviewing senior managers of a firm and reviewing company documents may reveal successful implementation strategies for reducing COPQ (Jung, 2016).

Implications for Social Change

When firm leaders reduce COPQ, they often increase employment rates within local communities (Deming, 1986). Employed individuals often enhance their development through the on the job application of their craft and improve their worth via wages and benefits (Rannenberg, 2015). Individuals have a higher sense of self-accomplishment, dignity, and autonomy when employed, as they have a sense of inclusion and social contribution (Wahab & Ayub, 2016). If manufacturing leaders reduce COPQ, they can employ more individuals, offering them the opportunity to develop their skills and increase their worth, sense of accomplishment, social

contribution, dignity, and autonomy. The implications for positive social change include enhancing individuals' self-worth and dignity through employment.

A Review of the Professional and Academic Literature

In the literature review section, I research reducing COPQ in the manufacturing sector. There were many studies about COPQ and the majority of researchers' findings were consistent with the premises of Deming's (1986) TQM theory. Drohomertetski et al., (2014), Hunold (2014) and Parihar et al. (2015) found practices consistent with those of TQM reduce COPQ and increase profits. Chorpa and Singh (2015), Chiarini (2015), and Kafetzopoulos, Psomas, and Gotzamani (2015) revealed the costs of quality when implementing all aspects of TQM principles may not increase profits to an optimal level. This literature review contains information on the benefits and critiques of TQM.

The keyword searches for the literature review consisted of *nonquality costs, costs of quality, costs of poor quality, quality improvement, total quality management, quality management, and quality management integration.* Articles worthy of inclusion in the literature review required individual data pertinent to the topic of COPQ. Data necessary for consideration of inclusion in the section contained information specific to qualitative case studies, quantitative studies, costs of quality, COPQ, quality management, or quality improvement. I used articles and books with information, which supported and criticized TQM techniques and practices. I assessed the worthiness of an article or report's inclusion by reading titles, abstracts of the articles, findings of the investigations, and purposes for the research. I have a total of 135 references in this study, 86% have a publication date between 2014 and 2017, which is within 5 years of my anticipated

completion date of 2018. The amalgamation of the references of the sources for this study includes 128 peer-reviewed articles, one report, and six books. The number of peer-reviewed sources amount to 95.9% of the literature I used for this study.

My goal for the literature was to find data on TQM, quality improvement, quality costs, and COPQ. The literature review contains diverse sources of literature. Within the section are seminal scholarly sources on the matters of COPQ. Scholarly journal articles wherein the authors focused on (a) COPQ, (b) costs of quality, (c) quality management, (d) quality improvement, (e) quality planning, and (f) quality improvement program integration are also in the literature review. The databases used for the journal reports were as follows EBSCO, ProQuest, Emerald, and Sage. Reports on quality management initiatives considered for this section were ones with data reported by manufacturing firms pertaining costs associated with COPQ and costs of quality.

The Evolution of Total Quality Management

Producing quality products is a goal maintained throughout the business community for over a century. The first stage of improving quality in recent history was from 1900 to 1940 when production managers aimed to produce mass quantities with low-quality failures. During the first stage, manufacturers developed inspection processes to decrease the likelihood of COPQ onset by quality failures (Weckenmann, Akkasoglu, & Werner, 2015). At approximately the same time, the first continuous process improvement program began within the National Cash Register Company in Dayton, Ohio. Continuous process improvement is a process whereby teams simultaneously improve quality and productivity with moderate investments. In the case of the National

Cash Register, the organization implemented continuous improvement by enhancing working conditions for employees, valuing employee feedback vis-à-vis innovation, and providing education to employees (Singh & Singh, 2015). During the first phase of quality management, quality managers aimed to improve quality failures and improve the processes controlling quality within their firms. Managers attempted to improve quality by focusing on employee feedback and educating their workforce.

The second phase of quality management occurred between 1940 and 1950. During the second phase, quality management experienced a shift to improve both the product and the quality of other processes. The impetus premised on improved delivery times, reducing manufacturing costs, and enhancing quality. The result was the quality triangle, which consisted of quality, cost, and time. Managers focused on each particular area via process orientation (Weckenmann et al., 2015). During the second phase of quality management, business leaders focused on a more inclusive management style wherein the leaders would concentrate on improving additional processes to improve performance within other departments, such as shipping and product composition. The goal of the managers was to decrease costs, enhance quality, and reduce throughput time.

The third phase of quality management was in the 1950s. Managers were no longer satisfied with inspecting and fixing quality shortfalls. The new aim was to identify problems with the process. During the third phase, Deming established the plan do check act (PDCA) solution to find, fix, and track the success of processes and quality related problems (Ivasciuc & Epuran, 2015; Weckenmann et al., 2015). Feigenbaum also developed the cost of the quality model. Feigenbaum named the cost of quality the

prevention appraisal failure (PAF) framework, which is a method a business leader can use to assess quality costs within the firm. The model is a formula whereby managers amalgamate quality prevention costs, quality appraisal costs and quality failure costs (Lim, Sherali, & Glickman, 2015; Malik, Khalid, Zulqarnain, & Iqbal, 2016). Deming designed the PDCA that helped managers thwart the new business problem by identifying process problems (Ivasciuc & Epuran, 2015; Weckenmann et al., 2015). Feigenbaum developed a model to assess quality costs (Lim et al., 2015; Malik et al, 2016). The two methods could help leaders enhance quality and determine the financial benefits of the quality improvement program.

The fourth phase in the 1960s, quality management, evolved and quality pioneers implemented risk management into the process. The risk analysis enabled managers to assess what could go wrong regarding quality failures, which reduced the likelihood of COPQ before incidents occurred (Weckenmann et al., 2015). During this same timeframe, Feigenbaum added another universal perspective to quality management. The comprehensive view was name total quality control (TQC). The purpose of TQC was to improve quality throughout an entire enterprise and not within one particular area, such as manufacturing. TQC was attractive and efficient in Japan from 1960 to 1965 with companies Nissan and Toyota (Cwiklicki, 2016). During the same period, it was necessary for Japan to use perpetual bottom-up continuous improvement and quality control initiatives. The necessity stemmed from the challenging environment the Japanese faced when they rebuilt their economy. The Japanese used quality control tools discovered through the teachings of Juran and Deming (Singh & Singh, 2015). During

the fourth phase, the Japanese business community members began using two new quality control programs, TQC and quality improvement tools, developed by Juran and Deming. The approaches were universal in nature and required feedback loops from all stakeholders.

In the 1970s, the Japanese manufacturers were the first to use TQM. Deming started to develop the TQM techniques in the 1950s. The Japanese first used the quality model in the 1970s (Cwiklicki, 2016). Early TQM was similar to TQC, but it incorporated several other factors to enable success. The factors were management buy-in, customer orientation, the education of employees, continuous improvement, stakeholder management, employee inclusion, and organizational transformation (Psoman & Jace, 2016). TQM was similar to TQC, and the Japanese were the first to use the TQM framework. TQM contained additional characteristics, which added depth to quality improvement practices to the manufacturing industry in Japan.

After the success of TQM in Japan, the method grew popular in the United States in the 1980s. During the same time, Deming refined TQM into a theory. Deming revealed a holistic arrangement of TQM via the TQM philosophy. In the TQM theory, Deming noted the importance of fulfilling process improvement while remaining agile enough to stay innovative, as the model involves using customer feedback loops (Weckenmann et al., 2015). Deming completed his TQM model in the 1980s. The theory was holistic and included a technique centered on quality but flexible enough for employees to innovate based on customer centricity.

A quality control tool, which emerged from TQM, is the International Organization for Standardization (ISO) 9000 quality certification. Shortly after the development of TQM, the ISO 9000 emerged. After the success of TQM in both the United States and Japan, business leaders began to focus on quality, and the need arose for an international quality certification in the international business community (Weckenmann et al., 2015). ISO 9000 is a set of principles, guidance, and certification standards necessary for accreditation. The purpose of the ISO initiative was to establish a standardization of quality for international trade. ISO founders used principles modeled on Deming's TQM philosophy, and the organization had an excellent reputation for reducing COPQ (Kafetzopoulos et al., 2015; To, Lee, & Yu, 2011). ISO certification also had a positive effect on operational performance and meeting quality goals (Kafetzopoulos et al., 2015). Teixeira Lopes, and Sousa (2015) found ISO certified manufacturing firms experience fewer quality failures than manufacturing companies without quality improvement programs consistent with TQM principles or ISO quality certifications. ISO has a record of reducing COPQ because manufacturing managers use the ISO standards as a guide and a benchmark for their quality improvement strategies and systems (Militaru & Zanfir, 2016). When manufacturing managers use ISO, they often improve the quality of their products and enhance their financial performance through the production of quality products (Militaru & Zanfir, 2016; To et al., 2011). The TQM model was the foundation for ISO 9000 international quality improvement certification. ISO 9000 is a quality certification system, which when implemented into an organization often reduces COPQ and enhances organizational performance via the

quality certification requirements leaders must implement into the company to ascertain the certification.

Total Quality Management

Deming's (1986) TQM is a quality improvement concept, which is holistic in nature and managers can apply it to all departments of an organization. The model has 14 principles organizational members use to improve quality continuously. The 14 principles are as follows (a) create consistency of purpose towards improvement; (b) adopt the new philosophy by management and workers alike; (c) do not depend on mass inspection but build quality into the product and process; (d) choose quality suppliers over low-cost suppliers to minimize variation in raw materials and supply; (e) improve consistency to reduce variation in all aspects such as planning, production, and service; (f) institute training on the job; (g) institute leadership; (h) break down barriers between departments in the organization; (i) eliminate slogans, exhortations and targets for zero defects and higher levels of productivity; (j) eliminate management objectives and quotas (k) remove barriers to worker satisfaction; (l) institute self-improvement and education; and (m) keep everyone responsible for continuous improvement for improving quality especially top managers (Deming, 1986; Nawelwa, Sichinsambwe, & Mwanza, 2015). Deming's TQM is a quality improvement concept containing 14 principles employees can use to enhance the quality of products and processes.

Creating constancy towards improving quality helps to provide the foundation of a good quality management system and can sustain an organization over the long term. When manufacturing leaders create constancy to improve quality, they find using the

principle often fosters stakeholder collaboration towards a mutual interest of long-term sustainability wherein the group focuses on continuous improvement and innovative ideas to enhance performance (Deming, 1986). Creating constancy also helps organizational members set quality improvement goals to strive for when conducting quality improvement initiatives (Lagrosen & Travis, 2015). Creating constancy in quality management aids managers in the composition of a quality improvement system by enabling collaboration activities and setting benchmarks. Manufacturing managers should consider standardizing practices necessary to meet quality goals.

Adopting the TQM philosophy is critical to success in meeting quality improvement goals. Manufacturing leaders implementing all aspects of a TQM strategy experience better production levels and financial performance than manufacturing leaders who have a lower orientation to TQM principles (Chaudary, Zafar, & Salman, 2015). Organizations with staffs, who adopt and maintain buy-in to quality improvement practices consistent with TQM, may achieve a high level of quality in their products (Sunder, 2016). A significant barrier to the implementation of a quality management system is the lack of adoption of the philosophy by top managers (Jaeger & Adair, 2016). Organizations with employees and top-level managers who fully adopt a culture of quality and incorporate all TQM principles can achieve superior product and process quality and potentially circumvent barriers to the successful implementation of the quality improvement program. Organizational leaders should consider activities to foster a quality centric corporate environment and adopt all TQM principles so firm members can experience their quality improvement system operating at an optimal level.

Building and designing quality into a product is the responsibility of the individuals composing the products and the quality improvement strategy; firm leaders should not count on mass inspections unless firm members produce complex products. Building quality into the product reduces the likelihood of COPQ because manufacturing managers and manufacturing workers who wait for mass inspections to occur to find quality failures do not improve the system and the practice often causes internal quality failures requiring rework or scrapping (Deming, 1986). Building quality into products is the act wherein employees construct the product to meet the original design specifications through the standardization of work (Gupta & Jain, 2015). Standardization aids in ensuring the customer will receive the quality item they need (Juran, 1989). Relying on mass inspection implies quality failures will occur, which is counterproductive making all workers responsible for quality and building quality into every product (Deming, 1986). Mass inspections also require significant investments and can negatively affect profits (Deming, 1986; Diamandescu, 2016; Kafetzopoulos et al., 2015). Some inspections are necessary such as statistical analyses of quality variance and products with high levels of complexity such as technological and communication hardware require thorough inspections (Deming, 1986). Building quality into products is an act, which employees carry out to ensure a quality failure does not occur and customers receive a product meeting their specifications. Firm leaders relying only on mass inspections will likely have a higher rate of quality failures than companies with employees building quality into their products.

When manufacturing leaders decide to use quality suppliers they lower the chance of differing materials and supplies, which increase the likelihood of incurring COPQ. The suppliers' product quality is the most important factor to consider when choosing a supplier (Tang & Hsu, 2015). The material purchased from a supplier has an effect on the COPQ (Deming, 1986; Juran, 1989). Purchasing materials from suppliers with high grades in quality will lower the likelihood of internal and external failure, as the materials are of higher dexterity. In many business arrangements, materials from the supplier fit other supplies the manufacturer ordered to make up the end product and meet specifications. Ordering from differing suppliers increases the risk of a quality failure as the materials are not intended to work in tandem, which could cause a deviation affecting the quality of the product (Deming, 1986). Quality suppliers also efficiently manage their supply chain and will likely not have gaps wherein they cannot fulfill orders for material promptly, which can reduce delays in cycle times (Yadav & Sharma, 2016). Manufacturing leaders should consider using quality suppliers of raw materials, so there is no lack of supplies, which meet product specifications. The practice of ordering from quality suppliers lowers the probability of internal and external quality failures.

Improving a firm's affinity to reduce process variation during manufacturing operations decreases the likelihood members make mistakes causing quality failures. Production managers should design products to meet the demands of the customer and activities necessary to enable the successful composition of such products (Juran, 1988). Firm leaders should enlist the feedback of the customers to understand consumer needs and seek feedback necessary to meet their needs (Juran, 1988; Juran, 1989; Mitreva et al.,

2016). Juran (1988) notes customers' needs should be weighted on their importance to the firm, as there are two categories of customers, the vital few consisting of the majority of the sales and the useful many, which positively affect firm performance but to a lower level than the vital few. Firm leaders should focus on satisfying the needs of all customers but with a higher concentration on meeting the needs of the vital few (Juran, 1988). After the management team develops processes necessary to configure the products, organizational members should strive to eschew deviation from such procedures, to lower the likelihood of COPQ occurring (Patyal & Maddulety, 2015). Firm leaders can track employees' deviations from the standardized work necessary to achieve product quality through statistical analyses (Deming, 1986). When the deviations are beyond the control limits, process improvement teams can conduct causal analyses to find causes and develop countermeasures to circumvent the problems, using such practices improves processes and managers can check the effectiveness of the countermeasures using TQM's PDCA after the countermeasure's implementation (Kanwarpreet & Inderpreet, 2015). A practice firm members can use to enhance quality is to develop products and processes to satisfy the needs of the customer for the demanded product. Once the company leaders develop benchmarks necessary for success, they should also decrease the number of variations from established processes to reduce the amount of COPQ and quality failures a firm incurs.

Manufacturing leaders should institutionalize training in a way employees can understand and enhance their skill craft. Often in western manufacturing firms, managers expect employees to integrate into their position without training. The supervisor often

initiates training activities without considering learning styles, creating a problematic learning environment (Deming, 1986). Offering individualized training to employees may enhance all organizational members' performance (Mishra & Smyth, 2015). Many manufacturing managers in the West often fail to provide adequate training. When managers give individualized training based on the individuals learning style, the training endeavors could benefit all members and the leadership of the organization.

Instituting leadership into the organization enhances quality improvement. Good leaders are critical to the success of TQM (Dubey & Gunasekaran, 2015). Establishing leadership enables a higher affinity towards quality because leaders are subject matter experts on the work their subordinates perform. Ninety-five percent of manufacturing managers employ supervisors who have no knowledge of the production process, which could impair business leaders in attaining their quality goals (Deming, 1986). Institutionalizing leadership into an organization increases the motivation levels among employees necessary to fulfill organizational goals (Hyvari, 2014). The institutionalization of leadership enhances quality via the supervisor's experience and in overcoming barriers to quality. Leadership motivates employees to meet quality expectations. Incorporating managers without specialized experience and leadership skills may negatively affect the quality improvement program.

Leadership is necessary to enhance employees' knowledge, skills, abilities, and to improve quality. Organizational leadership is required to improve training and education within a firm (Bloice & Burnett, 2016). Increasing the level of knowledge through training employees could increase the employees' ability to improve quality (Deming,

1986). Leaders have specialized knowledge about the work their subordinates perform (Deming, 1986). Leaders have knowledge about subordinates' cultural pattern (Juran, 1989). Leaders motivate employees to perform at an optimal level (Deming, 1986; Juran, 1986). Good leaders are necessary to motivate employees and expand their breadth and depth of knowledge. Institutionalized leadership enhances organizational members' capacity to improve quality by motivating employees to fulfill the managers' quality improvement goals. Managers with leadership skills help to expand subordinates' knowledge bases, which has a positive effect on performance.

The elimination of interdepartmental barriers enhances the effectiveness of TQM. Barriers in manufacturing organizations hinder team members' ability to work as a cohesive team (Bloice & Burnett, 2016). Teamwork among organizational members enhances the quality of the organizational members' products and services, and collaboration is necessary to meet requirements to meet customer demands (Jung, 2016). When corporate leaders are inclusive and incorporate all departments, they garner a deeper understanding of quality problems (Kanwarpreet & Inderpreet, 2015). Department members can communicate and collaborate more efficiently and develop better solutions for the firm when there is a lack of barriers between the departments (Marodin & Saurin, 2015). When employees work interdepartmentally, they can improve quality through diverse perspectives necessary for enhancing the quality of products and services. Manufacturing leaders should remove departmental barriers to capitalizing on the views and knowledge of the diverse stakeholders.

Teamwork improves when employees focus on meeting quality goals and when leaders remove slogans, exhortations, and targets for productivity. Slogans of productivity and quality are a barrier for a quality improvement program (Bhat & Rajashekhar, 2009). Individuals from differing departments, which have exhortations and slogans, could have adversarial relationships due in part to the contentious rhetoric (Cannon, 2002). Business leaders who exhort about achieving zero defects are unreasonable and managers should strive to lower quality related problems without using means with the potential to cause frustration and animosity among staff members (Deming, 1986). Proclamations with the propensity to fracture the unity of effort of an organization could hinder production and quality. Business leaders should consider the removal of declarations of department leaders, which buttress compartmentalization and functional myopia, and support a more synergistic approach to operations allowing a firm to meet quality goals.

The elimination of management objectives and quotas for manufacturing employees helps to develop a culture of quality (Deming, 1986). When managers direct employees to produce some products within a given amount of time, product quality may decrease as the workers aim to meet numerical goals and focus on speed rather than quality (Lawton & Ivanov, 2014). If the individual substitutes the desire to complete the composition of a certain number of products with building a product of high quality, employees could focus solely on their rewards and not the voice of the customer (Melton & Anthony, 2015). Focusing on the voice of the customer is fundamental in meeting quality specifications (Juran, 1988). Organizational leaders are more likely to meet a

higher level of product quality by focusing on motivating their employees to become quality centric instead of meeting production quotas (Deming, 1986). Firm leaders, who want to improve quality, should remove quotas motivating employees to work on speed rather than building quality goods (Deming, 1986; Lawton & Ivanov, 2014).

Organizational leaders with an affinity for a culture of quality often eliminate barriers to their workers' job satisfaction leading to increased product quality (Deming, 1986). Leaders should not manage by objective and numerical quotas and allow employees to work in a manner, which allows them to take pride in their craft and focus on the quality of products instead of the number of goods produced (Deming, 1986). Enhancing the employees' satisfaction level causes increased productivity and the quality of their performance (Jung, 2016). When managers motivate employees to focus on quality, the practice enhances job satisfaction, quality, and has a byproduct of increased productivity, whereas, leaders focusing on quantity instead of quality could impede the quality goals of the organizational leaders. Managers should focus on removing barriers to job satisfaction, as it positively affects quality, output, and moral.

Manufacturing leaders can decrease COPQ by institutionalizing self-improvement and education within the firm. Quality improvement training endeavors enhance the quality of products (Patyal & Maddulety, 2015; Wu, 2015). Quality centric education programs and certifications reduce quality failures via teaching employees how to identify waste, training workers how to use casual analysis to identify quality failures, informing employees about effective quality failure countermeasures, and teaching employees how to monitor the efficiency of the quality improvement program through

statistical analyses (Nagi & Altarazi, 2017). The implementation of education and training programs help employees monitor and improve quality. Leaders should consider instituting education and training to limit COPQ.

When manufacturing managers task all members of the company with being responsible for quality, there is more buy-in for a quality improvement program by the staff. If all employees are responsible for quality management, they all have a vested interested in the program's success (Kanwarpreet & Inderpreet, 2015). Business leaders tasking employees with investing into the quality improvement program enhances buy-in (Diamandescu, 2016; Kanwarpreet & Inderpreet, 2015). When all of the employees of an organization buy into a quality improvement program, there is a lower correlation with quality failures causing COPQ (Wu, 2015). Making quality a responsibility of all employees increases buy-in, which enhances the organization's quality performance. The consideration of making all employees responsible for quality may lower quality failures and enhance performance.

Quality Failures

There are two types of quality failures causing COPQ, which are internal and external failures. Internal quality failures occur when an individual or mechanism identifies a product does not meet product specifications (Kondic, Miletic, & Bojanic, 2016; Zrymiak, 2016). An internal failure may cause for rework or scrapping (Kondic et al., 2016). The other quality failure is an external quality failure. An external quality failure is a quality problem wherein an external stakeholder such as the user identifies the quality breakdown (Kondic et al., 2016; Zrymiak, 2016). An external quality failure has

the affinity to cause rework, recalls, and replacing (Kondic et al., 2016). Internal and external quality failures can increase COPQ by causing rework, recalls, and scraping. The fundamental difference between the two is an internal failure recognized by employees or mechanism within the firm, whereas an external failure is a breakdown found after the composition and delivery of a product.

Costs of Poor Quality

COPQ are onset by mistakes made during the manufacturing of a product (Stanciu & Pascu, 2014). COPQ start by internal or external failures, which may result in product recalls, scrapping, and expenses incurred by rework (Stanciu & Pascu, 2014; Chiarini, 2015). COPQ also include litigation fees and attorney fees associated with the quality failure, and lower production rates due to the quality failure (Lu, Zhang, & Pan, 2015). COPQ also have intangible costs such as reputation and relationship costs (Ahmad et al., 2015). Intangible costs are soft losses (Zrymiak, 2016). COPQ consist of quality failures, which can affect a firm's profits due to costs associated with correcting the failure, reductions in new transactions, and reductions in repeat transactions. Business leaders should consider processes to lower COPQ occurring, so the firm's performance does not experience the negative effects of COPQ.

Scrapping. Scrapping products can have several adverse effects. Product scrapping due to poor quality occurs when there is no benefit to reworking the composition because it is practically infeasible (Sweeney & Curran, 2015). Scrapping products could be a waste of natural resources, which is socially negligent (Piercy & Rich, 2015). Scrapping products waste organizational capital firm leaders invested into

production initiatives (Sweeney & Curran, 2015). When companies scrap products and services projects, it can affect corporate morale, as the firm members contributing to the composition of the product have pride in their artisanship and when organizational members have to scrap their work they may lose a sense of pride in their performance (Ingvaldsen, Johansen, & Aarlott, 2014). Scrapping products could implicate adverse effects on the environment, financial performance, and employee morale. Business leaders who do not ensure production activities occur with an affinity to quality could experience losses within their investments.

Rework. Rework can cause animosity between employees and additional production expenses. Rework is COPQ wherein employees must perform other building activities to meet quality specifications, as the products did not meet specifications after the initial composition (Lim et al., 2015). When organizational members have to incorporate rework into their activities it causes additional costs in labor because employees have to perform corrective actions (Ahmad et al., 2015; Lim et al., 2015; Stanciu & Pascu, 2015). Organizational leaders also incur additional material costs, as managers could have to obtain other material to fulfill product requirements and quality specifications (Singh & Singh, 2015). Rework has the propensity to affect the morale negatively in an organization (Dale, Barber, Williams, & van der Wiele, 1997). The rework could cause animosity between employees when members have to carry out corrective work caused by the errors of their fellow employees (Lu et al., 2015). Reworking a product could cause additional stress among employees, additional labor,

and material costs. Organizational leaders with high levels of rework could experience a hostile work environment and adverse financial effects.

Recalls. Recalls are a COPQ, which decrease a firm's profits. Recalls often occur when products of poor quality fail after their delivery to the customer, rendering the consumers without the product or service they expected at the time of purchase. Recalls often consist of manufacturing leaders conducting activities to transport items back to the warehouse, employees performing root cause analysis to find the causality for the quality failure, workers reconstructing certain aspects of the product or scrapping the product, and, the removal of similar products from the market (Wowak & Boone, 2015). Recalls cost firms, as business leaders would have to allocate additional capital for rework or scrapping, distribution, transportation, and if there are damages, court fees, and restitution (Muralidharan, Bapuji, & Laplume, 2015). Recall activities could require additional unforeseen capital allocation, which can negatively affect a firm's financial performance. Injuries to the customer base may also occur, and employees may have to conduct rework activities to attain a higher level of quality.

Soft costs. COPQ can adversely affect future earnings via the loss of clients, transactions, and future referrals. Often COPQ has intangible costs such as reputation and relationship costs, which are soft costs (Zrymiak, 2016). When consumers purchase a product of poor quality, they are likely to tell more potential customers of their experience with the product than if they bought a product of high quality (Deming, 1986). The soft losses organizations can incur include the loss of referrals from previous customers and clients refraining from conducting repeat business due to the poor quality

of a product or service (Lu et al., 2015). Soft costs are financial losses due to COPQ leading to a firm's poor reputation. The poor reputation negatively affects customer bases and the reputation of the companies with poor product quality spreads faster than companies with excellent reputations do. Organizational members striving to eschew COPQ could circumvent losses to their customer bases due to having a reputation for poor product quality.

Product misuse. Product misuse is COPQ, which may result in litigation costs and soft costs to a manufacturing firm. Product misuse occurs when customers use a product for something besides its intended application (Juran, 1988). Customers could misuse the products on purpose (Randolph, 2014). Clients could misuse the products by accident (Yang, Rudy, Cheng, & Durmowicz, 2014). Product misuse could cause injuries and increased litigation costs stemming from the incident where the injury occurred (Berman, 2017). Product misuse could also cause damage to the organization's reputation resulting in lower sales (You & Sikora, 2014). Manufacturing managers can use countermeasures such as customer education and training (Voinea, Popescu, & Negrea, 2015). Manufacturing managers can use labeled warnings about the products to circumvent the likelihood of product misuse (Pitts, 2015; Song et al., 2017). Product misuse is a COPQ, which can cause damage to the organization's reputation and cause injuries to the users. Providing warnings and training to customers lowers the likelihood of injury or damage (Song et al., 2017).

Cost of Quality

Costs of quality consist of prevention and appraisal costs. Prevention costs are expenses organizational leaders incur by implementing systems and processes to lower the likelihood of quality failures (Grbac, Car, & Huljenic, 2015; Plewa, Kaiser, & Hartmann, 2016). Appraisal costs are expenditures associated with performing inspections, appraisals, audits, and controlling and improving quality (Lim et al., 2015). Processes and systems firm leaders use to improve quality require an investment in additional labor, training, and technology. When employing a quality improvement program, manufacturing leaders should consider the investments necessary to sustain such activities.

Prevention costs. Prevention costs are expenses organizations incur to prevent a quality failure. Prevention costs come in the form of expenses associated with the development of product specifications, quality planning, quality assurance, and training individuals on the quality improvement system (Lim et al., 2015). Manufacturing managers incur prevention costs to eschew quality failures by having employees perform activities such as developing, implementing, and sustaining the quality improvement system, which require additional labor costs (Lim et al., 2015). Manufacturing organizations' prevention costs come in the form of the expenses of all activities required to improve quality (Plewa et al., 2016). Manufacturing employees perform quality improvement activities to prevent the occurrence of a quality failure, but the actions require investments by the firm leaders to train personnel, develop products, and implement and sustain the quality improvement program. Prevention activities lower the

probability of quality failures; however, the activities require additional capital and human resource allocations.

Appraisal costs. Organizations incur appraisal costs by taking actions to monitor activities to ensure quality. Appraisal activities consist of validation checks and audits of quality. Manufacturing employees conduct validation checks by assessing if the processes and materials are consistent with established parameters necessary to meet quality goals (Plewa et al., 2016). Validation checks require additional costs in labor (Holota, Hrubec, Kotus, Holiencinova, & Caposova, 2016). Audits on quality are inspections on the functionality of the process (Grbac et al., 2015). Audit activities increase appraisal costs via the need for new technology and additional labor (Holota et al., 2016). Appraisal costs are expenditures associated with inspecting and validating quality activities and product quality within a firm. Appraisal costs come from additional labor and technology investments necessary to accomplish the validation of quality.

Assessing Costs of Quality

Organizational leaders can appraise the effectiveness of their quality management program by using the PAF quality-costing model. Feigenbaum developed the PAF, which is a quality economic analytical approach to aid business leaders to generate lower total quality costs. The model helps managers via the amalgamation and comparison of the expenses of prevention, appraisal, and failure costs (Holota et al., 2016). Organizational leaders may use the information to find an optimal level of the lowest total quality costs and COPQ (Lim et al., 2015). Feigenbaum developed the PAF quality costing model to assist business leaders in assessing the effectiveness of their quality improvement

program. Managers can use the model to evaluate if their quality improvement program is beneficial financially.

Quality Improvement Programs

Manufacturing leaders may reduce the COPQ by implementing quality improvement programs into their operations departments. Quality improvement programs lessen the likelihood of quality failures, which cause COPQ (Malouche, 2015; Patyal & Maddulety, 2015). Quality improvement programs enhance product quality via customer feedback loops informing business leaders of the customers' concerns regarding quality related problems (Marodin & Saurin, 2015). Some quality improvement professionals who use Six Sigma reduce the likelihood of quality failures occurring by using statistical data to help monitor variation with the potential to cause quality failures (Canato et al., 2013; Patyal & Maddulety, 2015; Pereira Baia, 2015). Six Sigma also aids employees in reducing the likelihood of future quality failures, as Six Sigma practitioners use root cause analyses to develop counteractions to the issues causing a quality failure (Nagi & Altarazi, 2017). Once quality managers determine causes of and develop solutions to the quality failures, they establish operating processes necessary to meet quality needs and procedures to lower the likelihood of variations causing quality failures (Patyal & Maddulety, 2015). TQM practitioners use the PDCA method whereby employees plan activities necessary to meet quality goals, do by implementing the plan, check by assessing the activities to find if they are successful in meeting the quality goals, and act by implementing standardized practices proving to be successful in meeting quality goals (Deming, 1986; Diamandescu, 2016). Manufacturing managers using quality

improvement initiatives such as TQM and Six Sigma could lower quality failures causing COPQ by using quality improvement programs to appraise the level of quality adherence in the organization, to understand the customers' perspective, and to standardize actions necessary to enhance the quality of their products. Manufacturing managers should consider using a quality improvement program to reduce the COPQ within their organization.

Quality improvement programs have a propensity to increase more than product quality. Quality control programs increase teamwork, job satisfaction, sense of superior satisfaction, sense of work support, and sense of promotional opportunity in the organization (Jung, 2016). Improving quality also decreases waste through resource stewardship (Deming, 1986). Employees of firms reduce waste by using minimal resources to meet product specifications (Jaca et al., 2014; Pereira Baia, 2015). The decrease in waste also has a corollary effect whereby customers and external stakeholders benefit from lower costs (Deming, 1986). Quality control programs improve more than product quality. Managers who use quality improvement programs can experience positive effects such as positively contributing to environmental sustainability through responsible resource stewardship, artistry, career progression, and decreased costs to the external stakeholders.

Firms with members focused on being agents of quality management can experience fewer quality failures and large customer bases. Companies with employees embracing the notion of being responsible for quality are in an organization with a good quality culture (Wu, 2015). TQM reduces the likelihood of the quality failure occurring

by establishing an organizational culture with quality as its foundation (Deming, 1986; Patyal & Maddulety, 2015; Wu, 2015). The culture reduces the amount of COPQ, as workers take a sense of artistry in their labor (Deming, 1986). Organizations with quality cultures have a propensity to have lower COPQ. Firm leaders should consider incorporating practices, which increase buy-in by employees regarding quality improvement related activities.

Product Design Quality

Designing quality products is a method business managers can use to lower COPQ. Crosby (1984) notes individuals can prevent COPQ by designing quality into the product design. Product design is the process of establishing the characteristics of the product necessary to meet the needs of the customer (Juran, 1989). Having a quality design decreases the likelihood of COPQ, as the product does not require an inspection but meets quality specifications after its composition (Paraschivescu, 2014). Product designers can decrease the amount of COPQ a firm incurs by building quality into the product specifications and using the customers' needs as the framework to develop the design. Manufacturing leaders can reduce the likelihood of quality failures by designing quality into the product designs and product specifications.

Planning for Quality

Planning for quality is essential for implementing a quality improvement program. Firm leaders conducting quality planning can experience a significant improvement in organizational performance (Allen, McLees, Richardson, & Waterford, 2015). The customer is critical to the success of quality planning because firm leaders

must know how to meet the needs of the customer (Juran, 1989). Planning for quality is holistic and customer-centric requiring the inputs of the client to provide product specifications and quality goals, and firms in the past failed to elicit information from the client during the developmental process resulting in higher COPQ (Juran, 1988). Firm leaders should include customer inputs when planning for quality, as their insights could provide quality expectations, customer needs, and product specifications. Some organizational managers, which fail to plan for quality, do not use customer inclusion when setting quality goals and fail to develop product specifications, experience increased COPQ.

Planning for quality aligns operations with the needs of the consumer. Planning for quality is necessary when implementing quality improvement strategies in an organization, as it satisfies the needs of the customer by (a) identifying customers, (b) discovering the customers' needs, (c) translating the customers' needs, (e) establishing metrics to assess firm members' performance with quality goals, (f) establishing metrics specific to the customers' needs, (g) developing products, (h) enhancing product design, (i) designing processes, (j) operationalizing and improving processes, and (k) the transferring products and processes to the operational manufacturing departments (Juran, 1988). The steps in planning for quality enables the business team to focus on the needs of the customer and the development processes, products, and procedures necessary to meet the customers' specifications and requirements. Manufacturing managers should plan for quality because it aligns the needs of the clients with activities the firm members should take to meet their needs.

Quality Improvement Program Implementation

Organizational leaders should develop a strategy for a quality improvement strategy's implementation. The successful institutionalization of a quality improvement program is of high importance, as corporate leaders, which do not develop strategies to circumvent barriers to quality improvement program's implementation could fail to meet quality related goals (Canato et al., 2013; Marodin & Saurin, 2015). Some of the obstacles to successful implementation of a quality improvement strategy is an organizational culture not conducive to quality improvement, lack of buy-in for quality related practices by senior level managers, and lack of quality improvement sustainment plans (Marodin & Saurin, 2015). Managers with plans to implement the strategies experience better results in organizational performance, quality improvement integration, and product quality (Mosadeghrad, 2015). Managers implementing a quality improvement strategy could experience several barriers impeding the strategy's successful implementation, and managers with implementation plans can experience a successful implementation. Corporate leaders should develop strategies to integrate a quality improvement strategy to help ensure a successful implementation.

Quality Improvement Buy-in. To garner the totality of benefits of a quality improvement strategy it requires successful implementation, which could require buy-in from senior management. Chaudary et al. (2015) found the implementation of a quality improvement strategy could have a bearing as to whether or not the plan enhances organizational performance. A significant barrier to successful implementation is the lack of support from top-level management (Marodin & Saurin, 2015). Quality improvement

requires buy-in from senior level management because quality improvement requires a paradigm shift from all organizational members, which alters the entire organizational culture to an organizational culture centered on quality (Deming, 1986; Marodin & Saurin, 2015). A way for executives to garner buy-in from senior managers is to educate and train them on the new processes and provide incentives for taking actions to support the new endeavor (Canato et al., 2013). When members and senior managers buy-in to the quality improvement system there is a higher affinity for the successful implementation of the program. Corporate leaders should focus on garnering buy-in for the quality improvement strategy from both senior managers and operational level employees when executives in the firm decide to implement a quality improvement plan.

Organizational culture. Organizational cultures can be a barrier or an enabler of a quality improvement strategy's implementation. Firms with organizational cultures with members not opened to adopting and implementing quality improvement strategies or quality improvement programs do not experience the same benefits as companies with members espousing the practices (Wu, 2015). Non-quality centric organizational cultures can impede organizational performance on quality related issues because members do not use quality improvement methods, as they view the endeavors do not fit their culture (Canato et al., 2013). Business leaders can buttress a quality centric organizational culture by providing training on the benefits of the program (Canato et al., 2013). Managers can help to build a culture of quality by holding feedback sessions through quality circles wherein leaders find solutions to quality problems through employee feedback from individuals working at the operational level of the company (Deming,

1986; Juran, 1989; Schroder, Schmitt, & Schmitt, 2015). The feedback empowers the employees, builds a good quality culture, and helps to find practical solutions to quality related problems (Singh & Singh, 2015). Organizational cultures are critical to the success of a quality improvement program, as they have a causal effect on whether or not individuals will use quality improvement tools and techniques. Managers should use training, quality circles, and the quality improvement strategies of the subordinates to circumvent quality problems and enable an organizational culture conducive to quality.

Sustaining quality improvement programs. Business leaders implementing a quality improvement strategy without a plan for continuing the program often do not experience all the benefits of the quality improvement strategy. Organizational leaders, who do not sustain quality improvement, experience high rates of quality failures in their firms (Singh & Singh, 2015). Business leaders who enable cultures and activities to continue the quality improvement programs, experience better long-term results than business leaders with a laissez-faire approach to quality improvement (Davis et al., 2014). Firm leaders who do not have a plan to sustain a quality improvement strategy experience higher rates of COPQ than business leaders using quality improvement sustainment plans. Maintaining a quality improvement strategy should have positive long-term quality-related benefits for a firm.

Critiques of Quality Improvement

There are several critiques of TQM. Some researchers found TQM does not substantially reduce COPQ (Chiarini, 2015; Chorpa & Singh, 2015; Sanders, 2007). Kafetzopoulos et al. (2015) claimed quality improvement practices might also not

enhance financial performance via increased profits. Researchers in the past found TQM might not improve the financial results or lower COPQ. TQM may not improve the quality, or the benefits associated with a high degree of quality.

A manner in which TQM may hinder organizational performance is via a decrease in innovative activities necessary for long-term sustainability. Sanders (2007) found quality improvement practices inhibit innovation because the strategies enable an organizational culture beholden to standardization without deviation. The standardized processes and structural rigidity of quality improvement programs such as TQM and Six Sigma stifle innovation, as employees must perform standardized work without deviating into new and innovative ways of accomplishing their standardized work (Sony & Naik, 2012). The lack of creative progression may negatively affect the organization due to the obsolescence of goods, and the organization's market position can falter, as they cannot meet the changing demands of their customer bases (Spieth & Lerch, 2014). TQM may negatively affect innovativeness within an organization, which may adversely affect long-term sustainability due to structural rigidity and the lack of a culture supportive of experimentation. Firm leaders beholden to standardized work consistent with TQM principles could experience negative organizational performance via product obsolescence and a lack of innovative processes.

TQM practices may not increase profits by lowering COPQ. Quality management practices may not increase profits due to the growth of quality costs due to practices firm members must take to improve or improve and control quality (Kafetzopoulos et al., 2015). Quality costs associated with inspections, validation checks, and auditing

activities may offset the gains of the lowered COPQ and can represent many operational expenses a firm incurs (Kondic et al., 2016). Activities necessary to control and improve quality slow production and increase labor and technological costs (Diamandescu, 2016). A way managers can appraise the cost effectiveness of their quality improvement programs is to use the PAF quality-costing model (Holota et al., 2016; Kondic et al., 2016; Lim et al., 2015). Researchers found TQM does not increase profits and reduce COPQ. TQM does not increase profits due to higher costs associated with controlling quality; managers can assess the cost effectiveness by using quality-costing models.

Adopting all aspects of a TQM program may not enhance a firm's financial performance. Organizational leaders utilizing all aspects of a quality improvement program may increase operational costs and decrease profits (Chorpa & Singh, 2015; Kafetzopoulos et al., 2015). Prevention and appraisal costs may lower the profitability of the firm due to the investments business leaders make into prevention and appraisal activities necessary sustain some quality improvement strategies (Grbac et al., 2015). Organizational members can increase profitability whereby they adopt only the best practices of a quality improvement strategy proving to be effective within the firm, and exclude ascertaining additional human resources and technological resources, as such actions by organizational members cause increased costs with low or negative returns on investments (Chorpa & Singh, 2015). Incorporating only best quality improvement strategies is a good practice for small- and medium-sized organizations because they often lack the capital for large-scale quality improvement strategies (Chorpa & Singh, 2015). Utilizing all aspects of a TQM program may not enhance a firm's performance

due to appraisal and prevention costs. Manufacturing managers can assess quality improvement strategies effectiveness and efficiency, and use practices fitting their needs and budget.

Adopting all aspects of TQM may not increase profits to an optimal level. Using the PAF quality costing method managers can appraise what quality improvement practices enhance performance and find a point of pricing equilibrium (Grbac et al., 2015; Zrymiak, 2016). Equilibrium points many business leaders want to eschew is the points where if they spend more money on improving quality it will diminish their profits (Zrymiak, 2016). Applying all of the aspects of a TQM may increase profits to a point, but if leaders spend additional capital on quality improvement beyond the equilibrium point, they may experience diminished rates of return. TQM practices are beneficial to implement but only to the point wherein managers can maximize financial performance, as over investing in quality improvement is counterproductive to their return on investment.

Managers can use the PAF model to find a point of equilibrium wherein they have the lowest prevention, appraisal, and failure costs (Lim et al., 2015). When appraisal and prevention costs increase, failure costs should decrease, and when appraisal and prevention costs decrease, failure costs typically increase (Holota et al., 2016; Zrymiak, 2016). The reason for the phenomenon is organizational leaders will spend more capital and resources on activities and programs, which aid the finding and remedying of potential quality failures (Holota et al., 2016). Business managers may use the costing model to amalgamate the total costs and juxtapose them to find a price point wherein

there are lowest probable total prevention, appraisal, and failure costs (Lim et al., 2015). When leaders decide to use the costing model to find a point of equilibrium, they will often abstain from utilizing some quality improvement practices, which have diminished returns on investment (Zrymiak, 2016). The diminished returns on investment often derive from increased operational costs (Holota et al., 2016; Zrymiak, 2016). Investing in quality may enhance financial performance, but in many cases, there is a point where investing in quality improvement will decrease profits due to the investment firm leaders make in the quality improvement activities. Managers can use the PAF pricing model to gauge the appropriate amount of resources they should apportion to a quality improvement strategy to maximize the benefits the firm members receive from the quality improvement strategy.

Transition

The purpose of this study was to explore quality improvement strategies leading to reductions in COPQ. The majority of researchers found using TQM practices help organizational leaders lower the amount of COPQ their organization incurs (Drohomertetski et al., 2014; Hunold, 2014; Parihar et al., 2015). For this study, I focused on strategies manufacturing managers may use to lower COPQ and increase profitability in the southeastern region of the United States. Section 2 contains the purpose of the study, a description of my role as a researcher, the identification of the participants in the study, an elaboration as to the selected research method and design, a description of the sampled population and sampling method, and an explanation on my data collection and data analysis techniques. The following section also contains information about ethical

research and how I ensured the reliability and validity for the research. Section 3 contains a presentation of the findings, the application to the professional practice, recommendations for action, and social change implications. The conclusion in section 3 contains recommendations for future research and reflections on the doctoral study experience.

Section 2: The Project

For this study, I explored strategies to lower the COPQ and increase profits in the southeastern region of the United States. The participants of the single case study are senior manufacturing managers who have experience using successful strategies to reduce the COPQ and increase profits. In this section, I note the significance of my role as a researcher and provide information on my population, sampling procedures, and participants. Information on my research method and design, which includes discussion of my data collection instrument, and data analysis techniques, is also within the section. I also discuss issues related to ethical research and reliability and validity. I conclude the section with a summary of how the study will aid manufacturers in better understanding strategies they can use to lower COPQ.

Purpose Statement

The purpose of this qualitative single case study was to explore what quality improvement strategies senior manufacturing production managers used to reduce COPQ and increase profit. The targeted population was three production managers in one small-sized manufacturing company in the southeastern region of the United States with successful strategies to lower COPQ. Deming (1986) noted enhancing quality improves employment rates within the communities the businesses operate. The implications for positive social change include enhancing individuals' self-worth and dignity

Role of the Researcher

This study was a qualitative case study. In qualitative investigations, the researcher serves as the data collection instrument (Yin, 2014). In my role as the

researcher, I obtained access to relevant individuals who possess critical insight about the phenomenon of interest, whom I interviewed in order to answer the research question. I also reviewed organizational documents. Researchers must conduct their investigations in an ethical manner prescribed by academia and the U. S. Department of Health and Human Services (National Commission for the Protection of Human Subject of Biomedical and Behavioral Research, 1979).

I have 8 year's of experience relating to quality control in the public sector. My experience includes conducting audits of products and reports, spot checks, and customer feedback interviews. The inspections and checks led to several changes in policy and procedures and subsequently, significant changes in quality and policy adherence at my organization based on the increases in policy adherence. I also have experience with root cause analytics, which I used to conduct supplemental evaluations of organizational processes. The additional evaluations enhanced enterprise capabilities through changes to organizational process assets in the form of certification validation.

Researchers have a responsibility to conduct investigations in an ethical manner (Oye, Sorenson, & Glasdam, 2016; Yin, 2014). The conduct of research should not cause any harm to participants, and participants should be able to offer critical insight to the subject under review (Oye et al., 2016). To satisfy the need of ethical considerations, I selected participants who had a high level of knowledge regarding the reduction of COPQ. I adhered to the ethical principles outlined in The Belmont Report (1979). I took steps to ensure participants' identity was confidential, as well as involve participants on a strictly voluntary basis, to minimize their risk of harm. I strove to be inclusive in the

recruiting of potential participants. In the interviews, I also sought to accurately record participants' accounts.

Participants and researchers have worldview biases (Fusch & Ness, 2015). Worldview biases are biases all researchers have due to their culture and experiences, which can affect their research (Fusch & Ness, 2015). The use of precautionary techniques to minimize bias is a necessity (Yin, 2014). Researchers can lower the propensity for bias by using inclusive recruiting, the use of an interview protocol, transcript review, and methodological triangulation (Elo et al., 2014; Fusch & Ness, 2015; Houghton, Casey, Shaw, & Murphy, 2013; Oye et al., 2016). I used an interview protocol to lower the likelihood of my personal biases emerging in my study. Researchers should develop an interview protocol to ask questions pertaining only to the research question (Yin, 2014). The research question was the foundation for the composition of the interview questions, and I asked the participants the interview questions to answer the overarching research question. Academic committees help researchers ensure credibility (Houghton et al., 2013). An academic committee validated the interview questions of this study to enhance credibility.

Following the interviews, I transcribed the interviews verbatim. After the transcription of the interviews, a member checking meeting occurred with the participants to ensure accuracy in my interpretations of the participants' perceptions. NVivo 11 was the software system I used to code the transcription and develop themes. Coding ended when no new themes or data were present in participants' accounts about the phenomenon. Coding may also end if additional coding is not achievable because the

researcher is no longer able to attain new data about the phenomenon (Fusch & Ness, 2015). I stopped coding when I was no longer able to ascertain new information about lowering the COPQ in manufacturing. Participants review researcher interpretations to ensure that it is devoid of researcher bias (Houghton et al., 2013). The use methodological triangulation is a practical way to confirm the participants' accounts are free of any personal bias and to ensure that the study is truthful, reliable, and objective (Fusch & Ness, 2015). Recruiting included all organizational members with significant insight into the phenomenon under investigation. Inclusive recruiting of any members with substantial knowledge about a phenomenon may offer the perception of those who may not have a voice in the organization and fosters a truthful account of the phenomena (Oye et al., 2016). It also helps to foster a truthful account of the phenomena being researched (Oye et al., 2016). The study included participants with exclusive knowledge about lowering COPQ to understand the strategies to lower COPQ, member checking ensured I accurately represented the participants' accounts, and I used multiple sources of data to limit personal bias.

Participants

An essential aspect of a qualitative case study is the gathering of data from those with critical information and experience of the study phenomenon (Dasgupta, 2015; Oye et al., 2016; Yin, 2014). Researchers need to select participants based on the aims of their studies (Dasgupta, 2015; Oye et al., 2016; Robinson, 2014). My research aim of finding strategies to lower COPQ was the impetus for my selection of participants for this study. The participants I selected were appropriate for the nature of my study. The participants

were appropriate because managers have experience and expertise in applying strategies necessary to lower COPQ (Chiarini, 2015; Diamandescu & Ionita, 2015; Teixeira et al., 2015). The criteria for selection of participants is they must be senior manufacturing managers with 5 year's of experience in their discipline and have successful experiences of lowering COPQ in the manufacturing sector. The participants needed to be at least 18 years of age. The participants' experiences had to be within the southeastern region of the United States.

I recruited participants via email invitations and phone calls to human resource managers within my study organization (see Appendix A). If participants had questions about consent or the interview process, I made appropriate accommodations to meet face-to-face or by phone to answer any questions. This approach satisfied legal requirements and supported a trusting relationship necessary for the study and participant engagement (Check, Wolf, Dame, & Beskow, 2014; Oye et al., 2016; Robinson, 2014). After I received the consent form, I inquired as to the participants' interview preference. I conducted interviews via face-to-face meetings. My preference for the interview was face-to-face. If the participants could not accommodate a face-to-face interview, I made meeting accommodations based on the needs of each participant.

I carried out the study in a manner consistent with the essential elements of the Belmont Report (1979) as outlined in the Role of the Researcher section. In the spirit of building trust with the participants, I sought to make interviews and meetings a productive encounter. Querying the participants in an objective and unbiased manner and stimulating in-depth accounts about the topic under investigation is necessary in

qualitative case studies to develop an understanding of their experiences (Cairney & St Denny, 2015; Oye et al., 2016). I remained open and understanding and I encouraged participants to reveal their feelings and perspectives so that I was able gain holistic knowledge of the phenomenon of strategies to lower COPQ. I constructed a professional interview environment that was professional, organized, and free of outside distractions. All recording devices were operational, all materials organized, and the venue was free from outside interaction, enabling the participants to recall their successful strategies without distractions.

Research Method and Design

Research Method

There are three widely used methods to conduct research: quantitative, qualitative, and mixed methods. A quantitative method enables researchers to make hypotheses and test theories through numerical data or statistical correlations (Cairney & St Denny, 2015; Dasgupta, 2015; Park & Park, 2016). Qualitative research is discovery-oriented research whereby a researcher inquires about a topic through an exploratory examination to develop a deep and rich understanding of a phenomenon (Cairney & St Denny, 2015; Fusch & Ness, 2015; Park & Park, 2016). Researchers use mixed methods to develop an understanding of a phenomenon through qualitative research and to test the theories through quantitative analyses (Abro et al., 2015; Park & Park, 2016).

Researchers should select their research method based on their research question (Elo et al., 2014). The qualitative research method was appropriate for the nature of the research question, which is what strategies manufacturing managers are using to lower

COPQ. The research method was appropriate, as qualitative research is discovery-oriented wherein a researcher investigates via exploratory research to develop a deep and rich understanding of a phenomenon (Cairney & St Denny, 2015; Fusch & Ness, 2015; Park & Park, 2016). Qualitative research is an appropriate research method researchers use to discover solutions to business problems in operations management disciplines such as quality improvement (Dresch, Lacerda, & Miguel, 2015). A qualitative method is also a procedure researchers use to answer research questions by investigating individuals' lived experiences (Cairney & St Denny, 2015; Leung, 2015; Park & Park, 2016). A qualitative method was appropriate for my study because I could discover answers to the research question through the participants' lived experiences.

Research Design

There are five commonly used qualitative research designs researchers use to investigate; all designs require the experiences of the participants. Qualitative research designs typically used in research are ethnography, phenomenology, grounded theory, narrative, and the case study. An ethnographic design assists researchers in understanding participants' worldviews who share a common culture, ethnographic researchers spend long durations in the participants' environment, so they can better understand the contexts shaping their perceptions about a phenomenon (Brooks & Alam, 2015). Phenomenological researchers develop an understanding of a phenomenon through foundations of the participants' conceptualization of the phenomenon (VanScoy & Evenstad, 2015). Grounded theory is a design researchers use to develop new emergent theories through the views of the participants (Matavire & Brown, 2013). A narrative

design is a method participants provide the experience about a phenomenon through stories (Kourti, 2016). The case study is a design used by researchers to develop a deep understanding of a phenomenon through multiple sources such as participant interviews, document reviews, and field observations (Dresch et al., 2015; Sousa & Voss, 2002; Yin, 2014). Researchers using a qualitative method can develop an understanding of phenomena through the participants' conceptualization, views, and experiences. Researchers using the qualitative case study design also use additional sources such as document reviews and field observations.

Ethnography, phenomenology, and grounded theory were inappropriate because the goal of such studies is to explore cultures, understand individuals' conceptualizations of the study phenomena, or to develop theories (Brooks & Alam, 2015; Matavire & Brown, 2013; VanScoy & Evenstad, 2015). A researcher using the case study design may yield data, which helps to answer research questions by analyzing participants' lived experiences with the phenomena (Dresch et al., 2015; Sousa & Voss, 2002; Yin, 2014). Case study design was most appropriate for this study because information gleaned through the interviewees' lived experiences led to the answering the research question.

Data saturation aids a researcher in ensuring the completeness of data and an understanding of the information discovered in a case study (Elo et al., 2014). Data saturation occurs when no new themes occur (Fusch & Ness, 2015; Houghton et al., 2013; Robinson, 2014). The data saturation strategy for this study will be to conduct follow-up interviews and document reviews until no new themes emerge. I will ensure

completeness in the study through data saturation and conduct interviews until no new themes emerge.

Population and Sampling

Population

The population comprised of all the individuals meeting participant criteria described in the Participants section above. The population used to answer the research question should have essential knowledge about the phenomena (Dasgupta, 2015; Robinson, 2014; Yin, 2014). The population is appropriate as senior manufacturing managers may have rich data regarding lowering COPQ (Digalwar, Jindal, & Sangwan, 2015; Jaca et al., 2016; Moonsamy & Singh, 2014). I interviewed in a manner free of bias, preconceived notions, and I did not attempt to influence the answers of the participants regarding the phenomenon under investigation. The environment of the interview setting was one founded on trust, respect, and professionalism, all of which are necessary for a relationship conducive to ethical research (Andraski, Chandler, Powell, Humes, & Wakefield, 2014; Cairney & St Denny, 2015; Oye et al., 2016).

Sampling

Purposeful sampling is the sampling method used for this study. The sampling method is appropriate when seeking information about a phenomenon because the participants have critical insight and expertise regarding the research question (Akkus, 2015; Argan et al., 2015; Loh, 2015; & Robinson, 2014). Data saturation ensures validity and transferability of a qualitative study (Fusch & Ness, 2015; Robinson, 2014). Member checking is a process wherein the participants review the researcher's interpretation of

the participant's statements made during the interview to enhance the validity of the study (Chandralal & Valenzuela, 2015; Nelson, 2016; West, 2015). To ensure data saturation, researchers conduct interviews until no new themes emerge (Fusch & Ness, 2015; Heisler, Firmin, Firmin, & Hundley, 2015; Robinson, 2014). I used member checking to ensure the interpretations of the participants' accounts were correct and if necessary conducted follow-up interviews until no new themes emerge to accomplish data saturation for this single case study.

Ethical Research

Ethical dilemmas may occur during all phases of qualitative research. Qualitative researchers must carry out investigations in a manner with the intent to do no harm to the participants (Oye et al., 2016). A way researchers may do no harm is to protect participants and inform them as to what the research entails via the informed consent form (Yin, 2014). The informed consent form used for this study informed the participants of the nature of the study, provided a record of the participants' volunteerism in the study, and informed the participants they may withdraw from the study at any time.

Denying participants, the right to withdraw from the study at any time is unethical (Alahmad, Al Jumah, & Dierickx, 2015). If the participants wished to withdraw from the study, they were free to do so, and they would not be subject to additional pressure or questions relating to the study. The participants could withdraw from the study by expressing they did not want to participate in the study by in person communication, by phone, or by written correspondence. The participants of the study did not receive any incentive for participation. In order to conduct research in ethical manner, researchers

must take steps to ensure the confidentiality of the participants (Yin, 2014). Researchers may protect the confidentiality of participants by using identification numbers rather than names (Yam & Reynolds, 2016). I protected the participants' information in an ethical manner. The participants' identity remained confidential, and throughout the study, the participants' name did not appear only the name participant and the sequential number of their initial interview. The identity of the organization also remained confidential. I referred to the organization as the manufacturing organization. My method to secure data will assure confidentiality, as I will store the data relating to the organization and participants in a locked safe and destroy the data after 5 years to protect the confidentiality of the participants. An additional oversight, which aided in protecting the confidentiality, is the Institutional Review Board (IRB). The IRB approval number for this study is 02-26-18-0635053. IRB approval is necessary for doctoral research with human participants and serves as an oversight to protect the confidentiality of the individuals investigated by the researcher (Whitney, 2015).

Data Collection Instruments

For this single case study, I was the primary data collection instrument. The data collection process for this case study was semistructured interviews and document reviews. Semistructured interviews and documents are two reliable sources for collecting evidence about a phenomenon (Bloice & Burnett, 2016; Ølholm, Kidholm, Birk-Olsen, & Christensen, 2015; Yin, 2014). Semistructured interviews are a mixture of both structured and unstructured interviews, wherein the interviewer allows the interviewee to go into depth via open-ended questions regarding a phenomenon while adhering to a script

(Bloice & Burnett, 2016; Haavisto & Goentzel, 2015; Nguyen, 2015). A document review is a review wherein an investigator examines past data via legal documents, company records, service records, and charts and graphs. Document reviews are an accurate way for researchers to collect data about the phenomena (Chatha, Butt, & Tariq, 2015; Dasgupta, 2015; Yin, 2014).

For this study, I asked questions to explore the senior managers' strategies relating to lowering COPQ in the computer and electronic manufacturing industry. The participants of the study validated the interpretations of the semistructured interviews via member checking. The documents reviewed during the data collection process enhanced the reliability of the research through multisource data triangulation (Fusch & Ness, 2015; Goldblatt, Karnieli-Miller, & Neumann, 2011; Leung, 2015). Research protocols help researchers ensure validity in their studies (Dresch et al., 2015). Case study protocols consist of (a) an overview of the case study, (b) data collection procedures, (c) data collection questions, and (d) a guide for the case study report (Yin, 2014). I used the data collection protocol (Appendix C) throughout the investigatory process.

Data Collection Technique

The primary data collection techniques for this study were semistructured interviews and reviewing documents about COPQ. Semistructured interviews are an effective way to collect data about a business problem (Cairney & St Denny, 2015; Leung, 2015; Park & Park, 2016). The interview allows participants to reveal their lived experience of a phenomenon leading the researcher to a richer understanding of the topic under investigation (Cairney & St Denny, 2015; Fusch & Ness, 2015; Park & Park,

2016). The collection technique gives a voice to individuals often overlooked and provides the chance to share their experience and key insights (Oye et al., 2016). Interviews have disadvantages, such as the participants' perception is inaccurate, or the individual does not have good insight into a phenomenon (Oye et al., 2016). Conducting document reviews aids researchers in validating the data (Fusch & Ness, 2015; Houghton et al., 2013, Yin, 2014).

A disadvantage to interviewing is the complexity of accurate data interpretation by the researcher (Elo et al., 2014). Conducting member checking enhances the reliability of the data (Elo et al., 2014; Goldblatt et al., 2011; Houghton et al., 2013). Member checking helps a researcher ensure his or her interpretations of the data are correct (Elo et al., 2014; Goldblatt et al., 2011; Houghton et al., 2013). To ensure the accuracy of the interpretations of the participants' experiences for this study, I used member checking. The participants and I engaged in member checking whereby I shared my interpretations with the participants to ensure I do not misrepresent or misunderstand their experiences.

Data Organization Technique

Data organization is necessary for qualitative case studies, as there is a vast amount of data collected during the investigatory process (Rytkönen, Nenonen, Österlund, & Kojo, 2015). I used several software tools to organize the data for this study. The use of NVivo helped me to evaluate data via coding and the development of the themes. Microsoft Word is the software application I used to transcribe interviews and research notes. Research logs are an efficient way to maintain and track information about a topic via notetaking by the researcher (Blanton, 2015; Cai et al., 2015).

Researchers who use reflective journals deepen their understanding through transformational learning and perspective changes, and it enhances critical thinking (Castelli, 2016; Rich, 2015; Woronchak & Gilles, 2016). When I conducted interviews, I used a research log to track data. I used both the research log and the reflective journal when I analyzed the data found during the investigation on lowering COPQ to enhance my understanding of the data. The storage of data will be secure and consistent with IRB protocol. I will retain all raw data in a locked safe for 5 years. After the 5 years, I will destroy all raw data.

Data Analysis

For this case study, I used Yin's (2011) 5-step process to analyze the data to ensure I analyzed the data thoroughly and accurately. Yin's 5-step process requires the researcher to (a) compile the data, (b) disassemble the data, (c) reassemble the data (d) interpret the meaning of the data, and (e) conclude the data. Using Yin's 5-step data analysis process enhances the researcher's ability to analyze the data with a high level of completeness and a deeper understanding of the phenomenon under investigation by the researcher (Stewart & Gapp, 2017).

I compiled the data by transcribing it into word documents containing the data from interviews, member checks, and journal notes. The disassembling of the data occurred when I categorized and organized the information for coding. I began the disassembling of data by entering the transcripts into the NVivo software application for coding. Researchers use NVivo to help develop codes from the interviews (Houghton et al., 2013; Lee et al., 2015; Nelson, 2016). Using the NVivo helped me to sort the data for

patterns, codes and wording. I reassembled the data by assessing the emergent themes and subthemes found within the data sets. With NVivo and my research journal, I interpreted the data and developed links and patterns, contrasts, and semblances between data sets and I accomplished data saturation when no new themes emerged during the data interpretation process. Comparing findings of new research with the conceptual framework is necessary for qualitative analysis because it aids in the interpretation and understanding of the results (Borrego, Foster, & Froyd, 2014; Dasgupta, 2015; Soltanifar & Ansari, 2016). Preceding the theme analysis, I compared the key themes of the research and compared the findings to Deming's (1986) TQM theory. I encapsulated the data by assessing the significance of my data in relation to my research question, conceptual framework, and social change implications.

Reliability and Validity

Reliability

I addressed the dependability of my data through member checking of data interpretation. The reliability of qualitative research is important because it limits biases and errors in the research (Yin, 2014). Qualitative researchers can enhance the level of reliability in their research by conducting member checking (Andraski et al., 2014; Houghton et al., 2013; Nelson, 2016). Member checking is a process whereby the participants review the researcher's interpretation of the data to ensure the analysis of the data is correct (Elo et al., 2014; Houghton et al., 2013). For this study, I used member checking to ensure the reliability of the data.

Validity

Member checking ensured the credibility of the study. The credibility of qualitative research is the value and the plausibility of the data (Houghton et al., 2013; Nelson, 2016). A method researchers may use to enhance the level of credibility in their research is member checking. Member checking for credibility is when the participants review the researcher's interpretation of the participants' accounts (Andraski et al., 2014; Elo eta al., 2014; Houghton et al., 2013). Having the participants check the interpretations of the interviews helped to ensure the validity of my interpretations of their accounts. The assurance of transferability for this study was via detailed descriptions. The replication of the findings in a similar circumstance and setting are the transferability of a study (Houghton et al., 2013). Researchers can enhance the level of transferability in their study by providing detailed descriptions whereby readers can make informed assessments as to the transferability of the research (Houghton et al., 2013; Pomeii, 2015; Robinson, 2014). I provided detailed descriptions of my research, so readers can appraise if my study is transferable.

The use of member checking and a committee review addressed the confirmability of the study, and I ensured data saturation by conducting interviews until no new themes emerge. The confirmability of the study refers to the correctness and neutrality of the information (Houghton et al., 2013; Pompeii, 2015). Having the participants confirm the perceptions are theirs and not the researcher's aids in the confirmability of the study (Nelson, 2016). Committee reviews also aid in the confirmability of a study (Murphy et al., 2016). A failure to reach data saturation

compromises the validity of a qualitative study, as there may not be enough data to duplicate the study (Fusch & Ness, 2015). Researchers should conduct follow-up interviews until no new themes emerge to ensure data saturation (Fusch & Ness, 2015; Heisler et al., 2015; Robinson, 2014). I used member checking, and I used a committee review for the research to support the confirmability of the study. Interviews continued until no new themes emerge to ensure data saturation.

Transition and Summary

In Section 2, I restated the purpose of my study. I decided to use a qualitative single case study, which will lead me to a richer understanding of potential answers to the research question via semistructured interviews and document reviews. Participants for this qualitative single case study included three senior manufacturing managers with successful strategies for lowering COPQ in the southeastern region of the United States. Section 2 contains information about the data collection instrument, the data collection techniques, the data analysis method, and how I ensured the reliability and validity for the study. Section 3 contains the presentation of my findings, the application to professional practice, recommendations for action, and implications for social change. I also note my recommendations for further research and reflect on my doctoral study experience.

Section 3: Application to Professional Practice and Implications for Change

Introduction

The purpose of this qualitative single case study was to explore what quality improvement strategies senior manufacturing managers used to reduce COPQ and increase profit. Three senior production managers with experience using successful strategies to lower COPQ participated in this qualitative single case study. The participants' answers to the interview questions and review of the firm's private documents aided in the answering of the research question.

I explored what successful strategies senior production managers use to lower the COPQ in manufacturing. I used semistructured interviews with three senior manufacturing managers from one computer and electronics manufacturer in the southeastern region of the United States, all of whom had experience of reducing COPQ in manufacturing. The production managers had a minimum of 5 years' experience as a manager in manufacturing. The assessment of the data the participants shared indicated six prevalent findings (a) continuously improving all aspects of quality within a firm by applying a lessons learned and training program; (b) implementing a quality assurance program wherein a quality assurance professional inspects and tests all products; (c) making all employees agents of quality and including them in quality decision making; (d) encouraging communication between all stakeholders, internal and external and seeking their feedback about the quality of products and quality problems; (e) holding firm members accountable for quality by incorporating documentation and serialization

practices; and (f) institutionalizing training are strategies manufacturing managers can use to reduce COPQ and increase profit.

Presentation of the Findings

The overarching research question for this research study is what quality improvement strategies do senior manufacturing production managers use to reduce COPQ and increase profits? The participants of this study were senior manufacturing managers with over 5 years' experience in the field. Every manager used quality improvements strategies to lower COPQ. Through the analysis of the data offered by the participants, member checks, and document reviews I identified six emergent themes, which are strategies manufacturing can use to lower the COPQ and increase profits. The six emergent themes I identified were (a) continuous improvement; (b) quality assurance; (c) all employees are agents of quality improvement; (d) communication between stakeholders; (e) holding all firm members accountable for quality; and (f) the institutionalization of training.

I applied the data from the participants and the conceptual framework to garner a deeper understanding of what quality improvement strategies manufacturing managers can use to lower COPQ and increase profits. I associated my findings with the conceptual framework. I found (a) administering continuous improvement initiatives; (b) making all employees agents of quality improvement; (c) enhancing communication between stakeholders; (d) holding all firm members accountable for quality; and (e) instituting training are quality improvement strategies, which align with the TQM conceptual

framework. The quality assurance theme disputed Deming's TQM findings, but I tied the findings to other researchers in the field of quality improvement.

Theme 1: Continuous Improvement

The most prominent theme I found after analyzing all the data was the senior managers' goal of continuously improving. The theme aligns with the TQM conceptual framework's fifth point. The fifth point of TQM is to improve constantly to enhance quality and lower costs (Deming, 1986). Firm leaders can enhance their performance by incorporating a continuous process improvement programs. Singh and Singh (2015) found organizational leaders can reduce costs and increase quality via continuous process improvement. Participant 2 (P2) told me the firm members use processes improvement to constantly improve and streamline the customers' needs into product development and product design and they use continuous improvement, so they can continually look for potential quality problems, so they can improve quality throughout the life of the firm. Participant 1 (P1) pointed out firm members strive to continually improve through their quality assurance practices by updating inspection checklists when individuals notice a new technique works better than the one, which is in place; he mentioned the changes are not abundant but do occur incrementally. Manufacturing managers can use continuous improvement to reduce COPQ. Leaders reduce COPQ by streamlining processes and having employees search for potential quality-related problems.

Lessons learned. Lessons learned is a subtheme shared by all participants. Every participant expounded on how vital applying their lessons learned is and how they improve their quality continually through their lessons learned documents and quality

feedback circles. Participant (P3) stated he discusses ways the firm can improve quality and processes with employees to foster continuous improvement endeavors and he and his employees review and document internal failures and effective solutions in the lessons learned book to help ensure the failure does not occur in the future. P2 advised me lessons learned are very important to the firm, as it helps to assure the employees will not repeat the same mistakes in the future. Manufacturing managers can reduce COPQ by instituting a lessons learned initiative. Leaders can reduce COPQ by discussing and documenting quality problems and by discussing and document countermeasures to thwart quality failures.

The finding aligns with Point 5 of TQM. Under the constantly improve to enhance quality and lower costs TQM point, Deming (1986) explained production managers should review past performance to learn about how to improve a process. The senior managers in this study reviewed their past performance and created a lessons learned document to improve processes and quality. The lessons learned subtheme aligns with the fifth point of the TQM, as senior managers within the firm reviewed their performance to garner a better understanding of how to improve their processes.

Theme 2: Quality Assurance

The second theme that emerged was a successful strategy to lower COPQ was quality assurance. The quality assurance themes had two subthemes; inspection and testing. All three participants explained the importance quality assuring all products the firm members produce. P1 stated the quality assurance process saved the company and reduced COPQ by approximately 90%. P2 told me the quality assurance process ensures

completion of fabrication and the customers do not receive products, which did not go through the entire quality assurance procedure. The participants of this study explained their quality assurance and mass inspections significantly reduced their COPQ, and the firm leaders will continue to retain the activity as a valued practice, as it significantly decreased COPQ. Quality assurance was a successful strategy to reduce COPQ because it significantly reduced the number of quality failures for the firm leaders; it held firm members accountable for the firm leader's quality goals and design specifications. This theme does not align with the conceptual framework. Deming (1986) explained firm leaders should cease to rely on mass inspection to find quality failures, as it implies the firms' processes are incapable of achieving quality specifications. The findings are consistent Plewa et al. (2016) who found investing in appraisal activities increases profits and decreases COPQ in manufacturing. The participants of this study believed the risks of internal failures are worth the investment in quality assurance. P1 explained the investment in quality assurance is sound because when they find an internal failure, it only takes a minute to rework. Quality assurance is strategy manufacturing managers can use to lower COPQ. Managers can use the strategy to reduce COPQ by having employees find quality failures before the products leave the firm.

Inspections. Inspections are one of the quality assurance activities the firm members take to lower the COPQ. P3 said all products employees produce, must go through quality assurance inspections and the process helps hold employees accountable for their work. P2 noted inspections are vital to the quality of a product, and employees will not skip the step; if necessary, they will inform customers they will have to extend

the deadline so they do not compromise the quality of the products. Deming (1986) claimed firm leaders should cease their dependence on mass inspection; however, some inspections such as statistical testing for variance are necessary with complex and technical products. The inspections the quality assurance professionals I investigated for this study did not perform statistical inspections; instead, they looked at the product and compared it with the standardized work documents and examples. Inspections as a strategy to lower COPQ are consistent with other findings. Grbac et al. (2015) found inspections could reduce the likelihood of a quality failure and could cause firm leaders to invest large amounts of capital into appraisal activities. Plewa et al. (2016) asserted inspections are beneficial because employees discovered the errors in the products and developed countermeasures to the internal failures and remedied them before they became external quality failures, decreasing costs associated with external failures, which enhanced firms' performance. I found inspections to be a strategy to lower COPQ via the participants of this study. Inspections decrease COPQ because if there is a quality problem, employees can find the problem before it leaves the factory.

Testing. Testing is a step firm members take to lower COPQ. P1 informed me every piece of equipment the firm members produce; quality assurance professionals test before shipping it to the customer. P2 explained testing the product via the quality assurance checklists ensures the product is of sound quality. Testing equipment is an appraisal activity and reduces the likelihood of an external quality failure (Holota et al., 2016). Testing the fabrication of products can be costly investments for business leaders (Grbac et al., 2015; Holota et al., 2016). Since the firm I investigated relies on testing all

equipment to meet specifications, it is another activity, which does not align with the third TQM point: cease to rely on mass inspection to find quality failures. Inspections require additional funding from executives, but the firm managers I investigated will continue to apply the practice to ensure quality problems do not occur. The mass testing of all products does not align with the conceptual framework, but it is a strategy I found to reduce COPQ and increase profits.

Theme 3: Making All Employees Agents of Quality Improvement

Making all employees agents of quality improvement is a theme shared by all participants. The theme aligns with point 12 of the TQM conceptual framework. Under the making all employees agents of quality improvement theme were two subthemes I found when assessing the data. The two subthemes were employee caring and employee inclusion. Deming (1986) gave several examples of how managers robbed their employees of the pride in artisanship by not instituting their suggestions to reduce COPQ and by including employees on the decision-making process only as a gesture and not implementing any countermeasures to poor quality suggested by the employees. Deming's (1986) examples revealed a lack of caring led to higher rates of absenteeism, lower quality and a reduction in productivity. The participants of this study announced, when they instituted employee inclusion, the employees had good solutions to quality related problems. Another byproduct of the removal of the barrier was an increase in employee caring, resulting in employees being stakeholders in the organization who were attentive about their artisanship and firm performance. The caring about the quality of their products led to better quality products.

Employee inclusion. The participants in this study attested employee inclusion as an essential strategy to reduce COPQ. The inclusion of all employees aligns with point 12 of the TQM conceptual framework, remove barriers to worker satisfaction. Kanwarpreet & Inderpreet (2015) found when leaders involve all employees in quality improvement, their desire for a higher state of quality increases. When business leaders make all employees responsible for the quality improvement program, it increases the level of caring for the quality improvement strategy (Diamandescu, 2016; Kanwarpreet & Inderpreet, 2015). Employee inclusion can help manufacturing managers garner high levels of buy-in to a quality improvement strategy and increase the employees' desire to produce quality products. Manufacturing managers can improve quality by including their employees in the quality improvement decision-making process.

The accounts of all the participants aligned with the conceptual framework and the findings in the literature review, as they charge all employees with improving quality and they hold meetings and feedback sessions to find quality related problems and potential countermeasures. P3 stated the majority of the solutions to the quality problems would not come from management, but from those conducting manufacturing activities. P2 explained they allow everyone to provide inputs and countermeasures, which they believe can help circumvent a quality problem and they always ask for feedback from their employees before they move on to another phase of the project. The firm I research found a solution to quality problems by including their employees in the quality improvement decision making process. Including employees in the decision-making process of how to improve quality can lower the COPQ.

Employee caring. Employee caring was a theme shared by all participants. The participants explained a way to reduce COPQ is having employees who buy-in and care about the quality improvement program. P1 described to enhance quality, he needs employees to do more than come to work to collect a paycheck, and he needs his employees to care about the quality improvement program and care about the firm's performance. P3 said he needs the employees to be stakeholders in the quality of the products they deliver, so they can circumvent any potential barriers to their quality improvement strategies. P3 charged his employees as being responsible for solutions to the quality problems, and he stated they did not let him down. P1 explained having employees who care about firm's performance and the quality of their products is the second most crucial factor to lowering COPQ. P2 advised me the entire staff desires to produce products, which exceeds the customers' expectations. Charging employees as being responsible for quality and having employees who care about the quality of their products is a strategy manufacturing managers can use to lower COPQ. When employees have an interest in quality improvement, they can reduce COPQ.

The employee caring theme is uniform with the conceptual framework for this study. Quality improvement requires buy-in from all organizational members to become a quality centric organization (Deming, 1986; Marodin & Saurin, 2015). When business leaders make all employees responsible for the quality improvement program, it increases the level of caring for the quality improvement strategy (Diamandescu, 2016; Kanwarpreet & Inderpreet, 2015). Sunder (2016) found organizations with employees who buy-in to quality improvement programs produce products of high quality. Jaeger &

Adair (2016) assert a lack of caring from firm members can impede the implementation of quality improvement strategies, which may reduce COPQ. Lack of buy-in by employees may hinder quality improvement strategies, as it can create a culture unfavorable to the strategies (Marodin & Saurin, 2015). Charging employees with being responsible for quality improvement increases their level of care. When employees care about quality improvement, they create better products and an organizational culture centered on quality. Manufacturing managers can increase caring by charging all employees with the responsibility of being an agent of quality.

Theme 4: Communication Between Stakeholders

Communication between stakeholders was an emergent theme in the data, which manufacturing leaders can apply to lower COPQ. The theme had three subthemes interdepartmental communication, external communication, and feedback. Communication between stakeholders aligned with the ninth point of Deming's TQM, breaking down barriers between departments. Deming (1986) noted members of all departments must work together to thwart problems in manufacturing, and firm leaders must communicate with customers to understand their needs and how they can improve the quality of their products. Enhancing communication between departments can improve quality by strengthening interdepartmental collaboration.

Interdepartmental communication. Interdepartmental communication within the firm was a strategy I found to lower COPQ. P1 explained the firm leaders had to scrap an entire project due to poor internal communication. Following the incident, the firm leaders put mechanisms into place, which fostered interdepartmental communication

via the developers giving examples of the product requirements, reducing the amount of scraping within the firm. P2 informed me a strategy they implemented, which increased the quality of their products was having a formal process wherein sales representatives, engineers and electrical drafters must communicate via meetings, emails, and matrices to develop a product to meet the needs of the customer. P2 also explained the different department managers must formally agree on the schematics of the product design before the project may progress into another phase. Mandating and formalizing interdepartmental communication can reduce poor quality via members collaborating on the necessity of what product specifications are necessary to meet customer expectations. When the development department members communicate via examples of how to accomplish a task to the employees, they can reduce the number of scrapped projects.

The interdepartmental communication subtheme is consistent with the ninth point of TQM, breaking down barriers between departments in organizations. In the manufacturing sector, barriers preclude organizational members from working cohesively to accomplish an objective (Bloice & Burnett, 2016). Collaboration between employees is often necessary to meet the needs of the customer (Jung, 2016). Employees can find countermeasures to quality problems when departmental barriers are devoid within the firms (Marodin & Saurin, 2015). When organizations lack barriers between departments, there is a higher affinity towards collaboration between members and lower likelihood of a failure to meet the needs of the customer. Manufacturing managers should foster a collaborative work environment free of departmental barriers to improve quality.

External communication. Having good external communication with customers is a strategy manufacturing managers can use to lower COPQ. P1 explained the firm members experience a massive loss due to poor communication with external customers. P2 mentioned the same project and explained the external customer was already at the implementation phase before they awarded the contract to his firm, which put the manufacturing firm significantly behind and the customer demanded several changes during the researched firm's project execution phase. The result was the firm could not meet customer requirements due to the customer continually changing their need and specifications and the customer's unwillingness to extend the deadline for the project. P2 explained the solution to the problem was communicating with the customer transparently, by explaining if the customers make changes; his firm leaders will hold the customer responsible and make them agree on extending the timeline for delivery. Communicating effectively with external stakeholders may reduce COPQ as firm managers can garner an understanding of what the customer needs are and when they need the product. If firm leaders also communicate transparently with the customer about their capabilities they can eschew a situation, which will not allow enough time for employees accomplish the task.

If firm members and customers actively communicate, they can lower the chances of a quality failure. This theme is consistent with the ninth point of TQM, breaking down barriers between departments. When firm leaders solicit responses from their customers about their needs, they can better understand what actions the firm members must take to satisfy their requirements (Juran, 1988, 1989). Managers can complicate the work of their

employees by instituting last minute changes product specifications and expect them to finish the work in several weeks' time when the work should take a year (Deming, 1986). The findings coincide with Deming's point on unrealistic changes and Juran's point about engaging the customer in understanding their needs. I found when customers constantly change their needs they can cause firms to scrap projects. Firm leaders and customers can eliminate such a COPQ by agreeing to extend timelines and by the firm leaders seeking to find the voice of the customer by asking about their needs.

Feedback. Feedback is another theme that emerged under the communication between stakeholder's theme. Feedback between employees and managers is a useful quality improvement strategy. Feedback between firm members and the customer can also improve the quality of products. P3 stated his employees give the feedback necessary to improve processes and enhance quality. P1 shared an experience wherein he had an employee who presented an idea to enhance the quality by offering what he believed could improve quality, the implementation of the process was expensive initially but saved the firm more than the initial investment. According to P3, external feedback with the customer is the most effective manner to assess the quality improvement strategy. P2 acknowledged when customers give feedback about the firm's product; it gives them an idea of where their quality level is and how they can improve their products and meet the customers' expectation. Manufacturing managers can reduce COPQ by finding solutions to quality problems from their employees. Following-up for feedback on product quality with the customer can help to offer a gauge as to the manufacturing firm's product quality.

The finding of feedback as an effective quality improvement strategy aligns with the ninth point of the TQM conceptual framework. When writing about the ninth point, Deming (1986) noted employees learn much about the quality of their products from their customers and internal feedback via quality control feedback circles with employees fosters improvement with quality. Marodin & Saurin (2015) found feedback with customers improves the quality improvement programs, as the feedback informs the manufacturing firm of quality problems. Incorporating quality feedback sessions with employees can enable a culture of quality within the firm (Deming, 1986; Juran, 1989; Schroder et al., 2015). Singh & Singh (2015) noted many Japanese business leaders rebuilt their economy and infrastructure with quality as their foundation and used bottom-up quality feedback circles to restore their economy following the Second World War. When manufacturing managers seek feedback from their customers and employees, they can reduce COPQ and increase quality through assessing the quality of their products, developing a quality culture, and understanding what quality problems exist within the firms.

Theme 5: Holding All Firm Members Accountable for the Quality

The fifth theme that emerged was holding all members accountable for quality. All participants shared this theme. Within the holding, all firm members accountable for the quality theme were three subthemes documentation, serialization and standardizing work. Holding all firm members accountable for quality enabled them to accomplish a high level of quality in their products and a reduction in COPQ. This theme is consistent with point seven of Deming's (1986) TQM, adopt and institute leadership. Deming

(1986) claimed business leaders must focus on product outcomes by developing standardized work and processes to meet design specifications. I found through this research study, the leaders of this firm institute documentation and standardized work to help their employees achieve strategic objectives.

Documentation. Documentation is the first subtheme that emerged under the holding all firm members responsible for the quality theme. P1 described a project they took on, which led to multiple layoffs and almost rendered the firm insolvent due to a lack of documentation. P2 informed me about the same project and told me department managers would have a conversation about a change for the schematics in the design phase and would not correctly document the change, by the time the fabricators assembled the product, they did not incorporate the new change due to a lack of proper documentation. The lack of documentation led to some confusion, and the products failed to meet product specifications. After seeking outside consultation on their quality problems, the firm leaders instituted a new documentation methodology to improve quality and hold employees accountable. When asked about what strategies his employees use to lower COPQ, P3 stated documentation as a crucial strategy to reduce COPQ and poor documentation could be a barrier to implementing a quality improvement program. He also told me an additional methodology to document who is responsible for each product is the application of serial numbers, and the use of serial numbers makes it easier to find who fabricated the device; quality assured it and tested it before it left the shop. P3 mentioned the serialization also helps to conduct causal analysis if there is a quality failure. Having employee and managers document

schematics and projects reduces COPQ via eliminating confusion among differing departments. Serializing is another form of documentation, which improves quality because it helps managers track who fabricates each product and it helps to find causes of quality failures.

Documentation aligns with TQM point, institute leadership. Supervisors should be leaders and construct processes to improve quality (Deming, 1986). Teixeira et al. (2015) found companies who use documentation procedures enables production managers to manage quality efficiently and experience fewer quality failures. Managers should be leaders and institute processes to improve quality and meet strategic goals. One strategy firm leaders can institute to reduce COPQ is procedures requiring documentation procedures to enhance quality.

Standardizing work. Standardizing work is a subtheme I found under holding all firm members accountable for the quality theme when I assessed the data. Before the implementation of the researched firm's quality improvement program, they were not able to meet the customer's need because they did not standardize work. After the implementation of the quality improvement program, sales, customers, engineering and electrical drafting personnel must hold meetings to ensure the design will meet the demand of the customer and standardize the work via checklists managers give to the employees. P1 explained when managers standardize work in cookie-cutter fashion; it is easier for employees to meet quality goals. P3 admitted a barrier to implementing quality improvement strategies is a lack of standardization, especially in his firm's sector as each project is unique and designers have to create a prototype for each project. P2 mentioned

the firm members experienced a quality failure when they were under tight deadlines and completed tasks, which were word of mouth and not formally scrutinized between departmental managers. After the quality failure, they instituted a mechanism wherein the production managers pass a logbook from corporate leaders explaining the specific work to the fabrication workers, which illustrates what the fabricators must accomplish to achieve project success.

The strategies implemented by the senior managers align with the TQM seventh point, adopt and institute leadership. Deming (1986) noted managers must be leaders and must focus on standardizing work under the institute leadership principle. Business leaders can reduce the likelihood of a quality failure by standardizing the work for the employees (Diamandescu, 2016). Manufacturing leaders can reduce COPQ by lowering the possibility of a quality failure. Managers who lead and take actions to standardize work, the employees' propensity to cause a quality failure declines.

Theme 6: Training

Training is an emergent theme I found to lower COPQ. The participants detailed how training increases job knowledge and the employees' ability to create products of superior quality. P1 provided an example wherein the managers would conduct training events to train new employees on how to assemble panels, and the products they produced were of the same level of quality of someone who worked for the firm for several years. P2 admitted if managers do not train subordinates on what firm leaders expect of him or her, the employee will lack the understanding of what good quality is and there is a higher likelihood of him or her producing a product of poor quality. P3

stated failing to provide guidelines and instructions to employees could be a barrier to implementing a quality improvement program. Firm leaders can reduce COPQ by training individuals on how to accomplish a task and the expectation of what the standard of quality is from organizational leaders. If firm leaders do not provide training and instructions to employees, they could impede the implementation of their quality improvement strategies.

The training themes align with the sixth point of TQM, institute training on the job. Training employees on quality enhances the quality of their products (Patyal & Maddulety, 2015; Wu, 2015). Training on how to improve quality also increases the employees' ability to find countermeasures to quality related problems (Nagi & Altarazi, 2017). Training employees about quality standards and quality improvement enable employees to produce products of higher quality and find solutions to quality problems. Manufacturing managers could use the strategy to raise the level of quality in their products and reduce COPQ.

Applications to Professional Practice

The outcome of this research study was a set of strategies manufacturing managers can use to lower the COPQ and increase profits. I found reducing COPQ could increase unemployment rates within the community through both my review of the professional and academic literature and via my qualitative case study. Deming (1986) noted firm leaders who reduce COPQ could increase employment rates within their communities. The managers of the firm I investigated hired some employees they had to lay off, due to COPQ, after implementing quality improvement strategies. I also found

reducing COPQ could enhance the business performance of the firm via market share and profits in both my review of academic literature and my research. Drohomertetski et al., (2014), Hunold (2014), and Parihar et al., (2015) found managers who use quality improvement strategies reduce COPQ and increase profits. The firm I researched increased both their profits and revenues after implementing their quality improvement strategy. The findings of this study are manufacturing managers can reduce COPQ and increase profits by implementing six strategies. The six strategies are (a) continuously improve all aspects with quality within a firm and apply a lessons learned and training program, (b) implement a quality assurance program wherein quality assurance professionals inspect and test all products, (c) make all employees agents of quality and include them in quality decision making to foster an environment wherein employees care about quality, (d) encourage communication between all internal and external stakeholders and seek their feedback about the quality of products and quality problems, (e) hold firm members accountable for quality by incorporating documentation and serialization practices, and (f) institutionalize training.

Manufacturing leaders can use the strategies in this study to enhance their performance. The firm I investigated experienced a COPQ wherein their leaders suffered a loss in revenue of over $450,000. The firm had to spend an additional $6,000 for overtime compensation for employees to rework the project. The firm leaders also lost some business in the short term due to reputational costs and they had to lay off three employees after the incident of poor quality. For a small firm, the loss was significant. The firm implemented the strategies found in this study, increased their market share,

increased revenues and profits. Through the increase of their profits and revenues, the business leaders were able to hire back some of the employees they had to lay off due to their poor quality, as they had additional capital to hire other employees. The firm members do seldom experience some small quality failures, which require little rework, but they no longer suffer significant COPQ. Manufacturing leaders can use the quality improvement strategies found in this study to reduce COPQ, increase profits and revenues and increase employment rates.

Implications for Social Change

Reductions in COPQ in firms can reduce unemployment rates within their local area (Deming, 1986). The findings of this study (a) continuously improve all aspects with quality within a firm and apply a lessons learned and training program, (b) implement a quality assurance program wherein quality assurance professionals inspect and test all products, (c) make all employees agents of quality and include them in quality decision making to foster an environment wherein employees care about quality, (d) encourage communication between all internal and external stakeholders and seek their feedback about the quality of products and quality problems, (e) hold firm members accountable for quality by incorporating documentation and serialization practices, and (f) institutionalize training are strategies senior manufacturing managers can use to low COPQ. One finding of this study is reducing COPQ improves unemployment rates. P1 provided an example wherein the company had to lay off employees in the past due to COPQ. The firm leaders hired some of the employees whom they laid off back into the firm after they implemented their quality improvement program and firm leaders did not

have to lay off the employees since the integration of the quality improvement program. Before the layoffs, the organization did not have a quality improvement strategy, so by implementing a quality improvement strategy, the firm leaders were able to increase employment, as they grew their firm size by 33% via hiring new workers.

Using the quality improvement strategies found in this study could increase individuals' job knowledge and personal value. Individuals can enhance their skill level through continuous employment in their career discipline and increase their value through pay and benefits (Rannenberg, 2015). Business leaders can use the data in this study as a study to develop their quality improvement program. The strategies worked effectively enough to hire and retain some who lost their job in the past due to COPQ. If business leaders employ the strategies and reduce COPQ, they could hire and retain individuals, which could positively affect their job knowledge and personal value.

Reducing COPQ and increasing employment rates can increase individuals' sense of self-worth and their sense of contributing to society. P1 highlighted how his employees take personal pride in the job they do, and they take pride in how they help the firm meet the needs of the customer. Employed individuals have a high sense of self-accomplishment, dignity, autonomy via their sense of belonging and social contribution (Wahab & Ayub, 2016). If manufacturing leaders implement the quality improvement strategies I found through this research study, they can enhance the sense of social inclusion and social contribution within their community.

Recommendations for Action

The scope of this study was to find successful strategies to lower COPQ in manufacturing. Reducing COPQ can reduce waste and increase profits (Drohomertetski et al., 2014; Hunold, 2014; & Parihar et al., 2015). Firm leaders without quality improvement strategies experience higher COPQ than firms without such strategies (Teixeira et al., 2015). Senior manufacturing managers can improve their performance by (a) continuously improve all aspects with quality within a firm and apply a lessons learned and training program, (b) implement a quality assurance program wherein quality assurance professionals inspect and test all products, (c) make all employees agents of quality and include them in quality decision making to foster an environment wherein employees care about quality, (d) encourage communication between all internal and external stakeholders and seek their feedback about the quality of products and quality problems, (e) hold firm members accountable for quality by incorporating documentation and serialization practices, and (f) institutionalize training to lower their COPQ.

Open communication between all stakeholders and internal and external feedback from customers and employees can improve processes and find quality failures early in the fabrication process, which reduces COPQ. Manufacturing managers can use the open communication strategy and minimize compartmentalization via the removal of barriers to foster good interdepartmental communication. This approach can reduce poor quality by having effective product designs. Continuous process improvement strategies can reduce COPQ via lessons learned. Manufacturing business leaders can incorporate a Quality Assurance program and inspections into their quality improvement strategy to

find quality failures before the delivery of products to the customers. Senior managers can charge all employees with being stakeholders and agents of quality to increase buy-in, accountability and improve quality. The inclusion of all employees can bring multiple perspectives to bear on a potential quality problem and countermeasures necessary to eschew a quality failure. I will use the opportunity when teaching this subject as an adjunct and as a continuous process improvement instructor to share the findings with the groups and explain if they apply such strategies, they could reduce the COPQ and increase profits. I will also try to find opportunities to speak on the matter in professional project management forums.

Recommendations for Further Research

This study is a qualitative single case study. A limitation of such research method and design is a lack of generalizability. A recommendation for future research is for a quantitative study whereby researchers test the strategies I found via statistical analyses. Future researchers could increase the number of participants and organizations. This study was limited to only a small sized organization; others could research medium and large size firms. The findings are specific to the manufacturing sector in the southeastern region of the United States. COPQ can occur within other industries (Arshad & Su, 2015). Researchers could explore successful strategies to lower COPQ in different sectors such as finance, healthcare, and aerospace. Researchers could conduct inquiries in differing geographic locations, which could add breadth to the body of knowledge about strategies to lower COPQ.

The findings of this study include successful strategies to lower the COPQ. Future researchers could study the relationship between these strategies and quality improvement. Another recommendation for future research is to investigate external stakeholders' perceived quality after the implementation of the strategies found in this research study. A suggestion for future research is to alter the research question and explore what successful strategies employees use to lower the COPQ and increase profit, as I only examined what strategies senior managers found successful. Researchers could investigate what customers, and end users believe are strategies, which could lower COPQ. Investigating employees and external stakeholders could garner a different perspective on the research question.

Reflections

I decided to complete both a Master of Business Administration and a Doctorate of Business Administration when I neared the completion of my Bachelor's degree in 2014. Mastering as many aspects of my life is my goal, as I want to live a full life and without regret. In 2014, I had a moment wherein I noticed I mastered many aspects of my life but not education. In 2015, after I completed my Masters, I believed I could attain the Doctorate. The experience was demanding but rewarding. My doctoral study changed my perspective. I conducted much research on the topic of TQM. During the preliminary stages of the investigation, I believed my findings would be consistent with the TQM conceptual framework, as I experienced COPQ in my professional career and my best practices are consistent with Deming's (1986) TQM conceptual framework.

I overcame my bias by adhering to the protocols I developed to meet the need of the IRB. The findings changed my mind, as the firm I investigated, which almost went out of business, instituted a quality improvement program and their quality improvement differed somewhat the TQM conceptual framework. The differing point was consistent with other researchers who experienced differing phenomena than Dr. Deming. The experience taught me, we as a society could learn from the experiences of others and enhance our business performance via applying best practices from differing theorists.

Another experience during this process, which altered my thinking, was during the timeframe of my literature review. I noticed there were many findings aligned with my conceptual framework, ISO 9000 initiatives, Six Sigma, and Lean. Some researchers had results not aligned with my conceptual framework and quality improvement initiatives. The information changed my thinking insomuch as what works within one geographical setting and timeframe may not work in another. Now my mindset is one wherein I believe we as academics should conduct much research on the topic using different research designs and methods in varying locations. I think by using such logic, we can find proper solutions to our business problem regardless of our business sector, geographical location, and unique circumstances.

Conclusion

The purpose of this qualitative single case study was to explore what quality improvement strategies senior manufacturing production managers used to reduce COPQ and increase profit. Manufacturing companies may incur 100% losses due to the COPQ, which come in the form of internal and external failures, rework, and scrap (Ahmad et al.,

2015). By conducting a literature review, I garnered a deeper understanding of the phenomenon I investigated for the research study. I used multiple sources of data. I conducted semistructured interviews and document reviews to find data necessary to answer the research question.

While analyzing the data, I noticed six prominent themes. I modeled the naming of the themes from information gleaned during the literature review and the TQM conceptual framework. When coding the data via NVivo, I noticed six emergent themes of strategies the participants used to lower COPQ, which increased their profits and revenues and ability to employ additional workers. I compared the findings the findings of the literature I reviewed and the TQM conceptual framework. The findings for this study are manufacturing managers can reduce COPQ and increase profits by (a) continuously improve all aspects with quality within a firm and apply a lessons learned and training program, (b) implement a quality assurance program wherein quality assurance professionals inspect and test all products, (c) make all employees agents of quality and include them in quality decision making to foster an environment wherein employees care about quality, (d) encourage communication between all internal and external stakeholders and seek their feedback about the quality of products and quality problems, (e) hold firm members accountable for quality by incorporating documentation and serialization practices, and (f) institutionalize training.

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Appendix A: Invitation to Participate in the Study

Dear _____,
My name is Matthew Faciane, I am doctoral student at Walden University. I am conducing a doctoral study where I am attempting to find strategies manufacturing managers use to lower the Costs of Poor Quality (COPQ). The purpose of this qualitative case study is to explore strategies senior manufacturing managers use to lower the COPQ. The managers' knowledge of strategies may help other firms in the business community lower COPQ and increase communal employment rates and enhance environmental sustainability.

Your participation will consist of an initial interview consisting of approximately 30 minutes and a follow-up member checking session, which will consist of approximately 20 minutes. The study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. If you decide to be in the study now, you can still change your mind later. You may stop at any time. Your information and identity will be confidential. Feel free to contact me regarding your interest in the study.
Thank you for considering participating in the study.

Sincerely,
Matthew Faciane

Appendix B: Interview Protocol

What I will do	What I will say - script
Introduce the interview and set the stage	Good afternoon, I will ask seven open-ended questions about lowering the costs of poor quality.
🕐 Watch for non-verbal queues 🕐 Paraphrase as needed 🕐 Ask follow-up probing questions to get more in depth	1. What was the total COPQ experienced in your organization last year? 2. What strategies do senior production managers take to reduce COPQ? 3. How do you assess the effectiveness of your organization's strategies for reducing the COPQ? 4. What are the most effective quality improvement strategies members of your organization using to lower COPQ? 5. What were the key barriers to implementing your strategies for reducing COPQ in production? 6. How did you address the key barriers to implementing the strategies for reducing COPQ in production? 7. What additional information regarding the strategies production managers have used successfully to lower COPQ would you like to add?
Wrap up interview thanking the participant	These are all the questions I have for you today. Thank you very much for participating in the interview.
Schedule follow-up member checking interview	The next interview will be for member checking. I will ask if my interpretations of your accounts of strategies to lower costs of poor quality are correct. Is there a good day I can schedule our follow-up?

I will share a copy of the succinct synthesis for the participant's response to each question	I synthesized your responses to the interview questions. Here is a copy of my interpretations.
I will bring in probing questions related to other information I may have found relating to strategies to lower costs of poor quality in manufacturing. I will read the question and ask: Did I miss anything? Or, what would you like to add?	1. Question and succinct synthesis of the interpretation one paragraph or as needed. 2. Question and succinct synthesis of the interpretation one paragraph or as needed. 3. Question and succinct synthesis of the interpretation one paragraph or as needed. 4. Question and succinct synthesis of the interpretation one paragraph or as needed. 5. Question and succinct synthesis of the interpretation one paragraph or as needed. 6. Question and succinct synthesis of the interpretation one paragraph or as needed. 7. Question and succinct synthesis of the interpretation one paragraph or as needed. 8. Question and succinct synthesis of the interpretation one paragraph or as needed. 9. Question and succinct synthesis of the interpretation one paragraph or as needed. 10. Question and succinct synthesis of the interpretation one paragraph or as needed.