IMPLEMENTING LEAN CRITICAL SUCCESS FACTORS IN SOUTH ATLANTIC MANUFACTURING SMALL TO MEDIUM-SIZED ENTERPRISES

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Abstract

Lean manufacturing is a significant continuous improvement methodology utilized to enhance small and medium-sized enterprises' (SMEs) business performance. Many enterprises fall short of implementing and obtaining the benefits of lean manufacturing because of the challenges associated with the approach. There is a link between critical success factors (CSFs) and the successful implementation of lean manufacturing in SMEs. Enterprises need to pinpoint and comprehend CSFs for the winning performance of the lean manufacturing design. The purpose of this study explored the difference of importance of 13 lean CSFs in manufacturing SMEs in the South Atlantic area. A core group of employees responsible for any aspect of manufacturing in SMEs represented the targeted population for this research study, who were identified through the database of a manufacturing association. A quantitative, non-experimental study using a Likert-type survey research design was performed to assess a membership database sample that included 131 manufacturing companies. A detailed examination of the existing research studies and literature on lean manufacturing methodology and CSF theory was the foundation for the background and the theoretical model of the research study. Testing the hypotheses was completed utilizing the Mann-Whitney U test statistical method. There were two research questions. The first research question asked to what extent does the importance of the 13 lean CSFs differ among small and medium-sized manufacturing locations. The second question asked to what extent does the importance of the 13 lean CSFs differ among companies that have implemented lean and those that have not implemented lean. The key findings were there was no statistical difference in the importance of CSFs between the groups analyzed. The research study was designed to contribute material to the body of knowledge within manufacturing continuous improvement methodologies in SMEs. This research created a guide

to utilizing important CSFs to successfully implement lean manufacturing in the South Atlantic region of the United States area for small and medium-sized manufacturing companies.

Dedication

This dissertation is dedicated to my mother, Alice Marie Wesley, who never stops loving me, being my personal cheerleader, and believing in me. It is also dedicated to my two sons, Cooper and Isaiah. They are the inspiration for me to succeed in everything that I do in my life. Finally, I want to thank from the bottom of my heart, my absolute best friend, Mischelle, for all her love and support for the last 25 years, with never-ending encouragement throughout the challenging milestones of the dissertation process.

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CHAPTER 1. INTRODUCTION

In 2013, small and medium-sized enterprises (SMEs) accounted for 99% of businesses in the private sector and created jobs for more than 50% of private-sector employees (Grover & Suominen, 2014). SMEs were responsible for 98% of encompassed U.S. exporters (Grover & Suominen, 2014). SMEs have a definition of companies with less than 500 employees, and they do not have as many employees as large companies.

Productivity growth has been the primary driver of living standards and the foundation of the U.S. economy. SMEs have exposure to fierce competitive forces, with the most significant globalization and the enhanced worldwide expeditious innovation of integrated information systems, agile manufacturing platforms, and ingenious distribution channels (Knol, Slomp, Schouteten, & Lauche, 2019). This dimension of globalization, coupled with consumers who are consistently requiring exceptional operational results of manufactured products, can lead to increased global competition as well (Knol et al., 2019).

For manufacturing SMEs to remain viable in the current competitive enterprise landscape, these businesses are required to demonstrate more exceptional operational results (Armstrong, 2013). In U.S. manufacturing companies, productivity had decreased throughout the decade that started in 2001 (Molnar, 2014). Between 2001 and 2010, more than 64,000 factories shuttered their doors, and 5.7 million factory workers became unemployed through factory lay-off or closure (Molnar, 2014). Manufacturing plants' closing negatively affected SMEs (Molnar, 2014). The U.S. manufacturing base has been in decline, with the impact felt through high unemployment rates and economic retardation of growth.

Through this decline, SMEs have been attempting to find solutions that elevate their organizational productivity, profitability, and viability while creating a competitive advantage over rival firms. Manufacturing firms are determined to enhance their methodology to improve production performance, expand profitability, and the ability to prosper against their rivals (Nicholds & Mo, 2016). Firms must decide on various organizational activities to upgrade their systems, but resource limitations often result in some critical initiatives never materializing (Nicholds & Mo, 2016). Much research has been done on manufacturing improvement methodologies, throughput increases, and firm profitability (Chhikara, Narwal, & Dahiya, 2017; Goldratt & Cox, 1992; Li, Papadopoulos, & Zhang, 2016). There is a lack of research and knowledge linking manufacturing improvement methodologies to critical success factors (CSFs). CSFs exemplify important performance variables crucial for the enterprise to achieve its mission (Caralli, Stevens, Willke, & Wilson, 2004).

One example of a CSF is machine downtime. In manufacturing, if the equipment is not operating when scheduled, product and profit are not being generated. Shagluf, Longstaff, and Fletcher (2014) concluded that decreasing equipment downtime creates a higher possibility of machine performance through up-time measured by equipment effectiveness. According to Shagluf et al. (2014), minimizing downtime increases throughput and could expose undisclosed manufacturing costs. Iannone and Nenni (2013) concluded that when computing overall equipment effectiveness (OEE), it is critical to examine machines as functioning in a connected and complicated climate.

There are various manufacturing improvement methodologies, including lean manufacturing. Lean manufacturing eradicates waste in a manufacturing environment that depletes an enterprise's resources but develops no value to its customer base (Anvari, Ismail, &

Hojjati, 2011). Lean manufacturing creates lean thinking through which an extensive set of methods can boost customer value, permitting customers the chance to acquire the highest quality merchandise (Ng & Ghobakhloo, 2018). Lean manufacturing has a significant positive reputation for removing wasteful processes by incorporating minimal company resources (Karim & Arif-Uz-Zaman, 2013). Manufacturing SMEs have discovered that it is challenging to apply lean practices to obtain improved performance actions (McGovern, Small, & Hicks, 2017). Hu, Mason, Williams, and Found (2015) suggested that one prospective explanation for the challenge lies in the absence of lean manufacturing CSFs. Alhuraish, Robledo, and Kobi (2017) contended the importance of CSFs in successfully implementing a manufacturing improvement methodology, specifically lean manufacturing.

Chapter 1 establishes the foundational components of this research study so that scholars and practitioners can better understand the importance of CSFs for SME manufacturing enterprises. Manufacturing SMEs could use this understanding as part of a lean implementation plan to provide an opportunity to remain competitive. Chapter 1 consists of the background research on the evolution of continuous improvement methodologies in manufacturing settings and why they are important to manufacturing SMEs. The business problem is generally discussed and then explicitly identified. The business problem leads to the research's purpose, which was aligned with existing scholarly studies. The remainder of Chapter 1 is as follows: theoretical framework, significance, research questions, the definition of terms, assumptions, and limitations.

Background

Globalization has challenged manufacturing SMEs to examine their efficiency at operating their enterprises. Present manufacturing improvement methodologies stem from a fundamental policy of improving production efficiency by decreasing costs or increasing throughput (Stamm, Neitzert, & Singh, 2009). Manufacturing companies' enterprises must comprehend the global premise of growing marketplaces and customers' demands, with an essential link to manufacturing improvement methodologies that assist firms in achieving economic success. Enterprises should be aware of the current global marketplace practices that necessitate becoming more aggressive toward improving better quality specifications and decreased actionable times. The ratios between expenses and profits are lessoning and becoming more challenging and complicated to achieve the customer's desires (Trojanowska, Kolinski, Galusik, Varela, & Machado, 2018). Manufacturing improvement methodologies such as lean alleviate various enterprise challenges encountered during production runs. These challenges demonstrate a negative productivity impact and increase cost structures, which reduces enterprise competitiveness. The manufacturing industry's future is the implementation of the lean methodology. Lean exercises are the most effective process to significantly improve enterprise competitiveness (Kumar & Vaishya, 2018).

The research conducted by Li et al. (2016) and Nicholds and Mo (2016) regarding manufacturing improvement methodologies have framed this research study's background. Viewpoints of researchers in completed studies presented a wide array of results into which manufacturing improvement methodology offers the most favorable outcomes to assist enterprises effectively and efficiently increase throughput, thereby reducing operational costs. During the past 50 years, manufacturing improvement methodologies have significantly impacted production research in theory and practice (Li et al., 2016). This research study explained the evolution path for these methodologies starting with Total Quality Control (TQC).

The TQC model began its focus on the contraction of variation, quality of systems, and product in the 1960s (Stamm et al., 2009). Armand Feigenbaum played an influential role in developing the concept of quality and its incorporation in U.S. manufacturing enterprises (Androniceanu, 2017). Feigenbaum contended a higher level of efficiency was utilized when utilizing quality practices at the beginning of the manufacturing process and guaranteeing quality throughout the manufacturing process versus attempting to control quality in the final step (Ionescu, 2016). The TQC model evolved into the Total Productive Maintenance (TPM) model that focused on waste, loss, and downtime contraction in the 1970s (Stamm et al., 2009). TPM is consistently defined as targeting the full potential of a machine's capability. TPM institutes a rigorous preventive maintenance process for the machine's total life cycle (Kumar, Singh, & Khan, 2016).

In the 1980s, TPM evolved to the Total Quality Management (TQM) model. The TQM model returned to the TQC model's principles that focused on the contraction of variation, quality of systems, and product (Stamm et al., 2009). TQM can be characterized as a successful approach to increasing the cost efficacy and an enterprise's business results to accomplish competitiveness in every manufacturing industry, regardless of its size (Majumdar, Kundu, & Manohar, 2019). In the modern era of the competitive enterprise climate, TQM deployment is an essential cultural and significant survival instrument for manufacturing SMEs per Majumdar et al. (2019).

In 1984, the TQM model evolved to be the theory of constraints (TOC) model. TOC was founded on the principle that complex systems exhibit inherited simplicity (Goldratt & Cox, 1992). The constraints limit the system's ability to generate more of its goal (Hammad, Abbasi, & Ryan, 2018). The purpose of the TOC model is the expansion of throughput while at the same time diminishing inventory levels and operational expenses (Goldratt & Cox, 1992). In 1988, the TOC model evolved to lean, where the focus of the method was established on the approach of value creation, material, and data flow/pull. In the late1980's, Six Sigma emerged with its focus on the contraction of variation (Stamm et al., 2009). Six Sigma is a precise, concentrated, and extensively powerful application of validated quality doctrines and capabilities. Six Sigma targets little to no errors for enterprise performance (Pyzdek & Keller, 2014).

Figure 1 illustrates the evolution of significant manufacturing improvement methodologies that enterprises have implemented during the last 50 years.

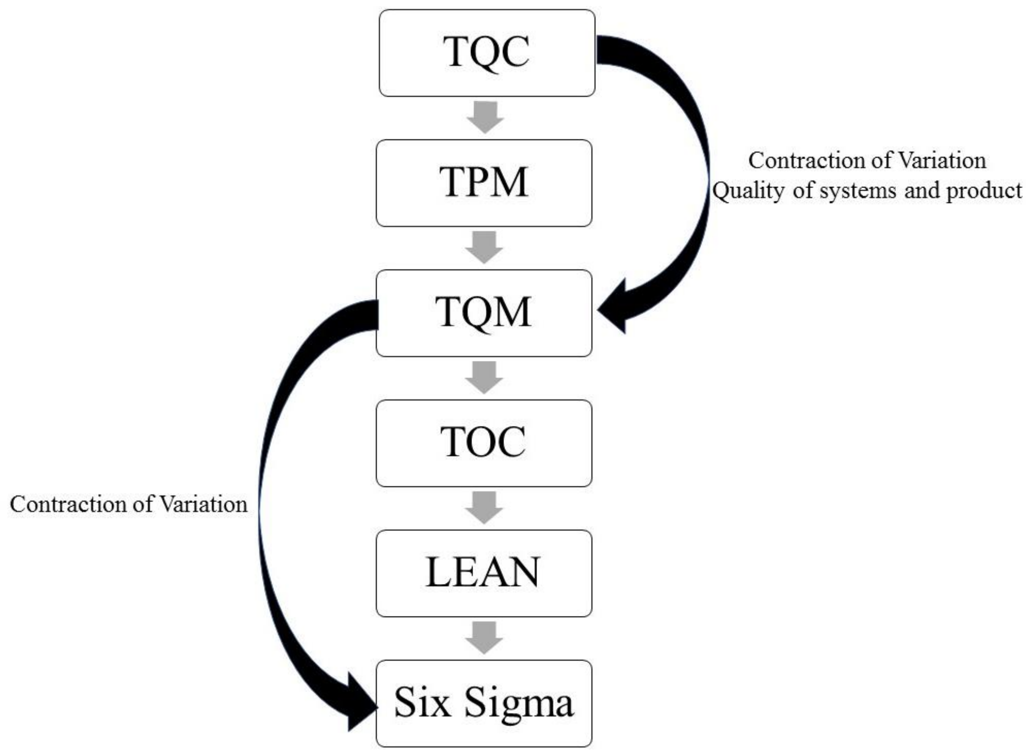

Figure 1. Research manufacturing improvement methodologies evolved over 50 years.

Business Problem

The general problem is that even with lean manufacturing developing a reputation as a transformational continuous improvement practice for productivity increases and waste elimination in companies, SMEs' resource constraints are a barrier to implementing lean (Elkhairi, Fedouaki, & El Alami, 2019). Netland (2016) suggested SMEs still have trepidation utilizing lean manufacturing methodology because of the expense of its implementation. SMEs have limited capabilities to implement continuous improvement methods successfully (Doshi & Desai, 2014). Compared to small-sized enterprises, medium-sized companies have established a more robust skillset toward lean implementation due to higher resource availability (Nidhin, Ramkumar, & Satish, 2014). Utilizing CSFs could improve the outcome for the successful implementation of improvement programs. This improved outcome could assist SMEs' business competitiveness and viability. To help enterprises that desire the successful implementation of lean manufacturing principles and eliminate expensive mistakes, researchers have suggested a group of CSFs (Netland, 2016).

The specific problem is some SMEs are having difficulty with successful lean implementation as a part of their continuous improvement methodology (McGovern et al., 2017) when the most important CSFs are not correctly identified (Hu et al., 2015). An enterprise's size can be a vital element for implementing lean manufacturing (Yang, Hong, & Modi, 2011). Studies that concluded CSFs and the application of lean manufacturing principles had demonstrated essential differences among businesses' various sizes. Lean manufacturing has been implemented. There is a significant difference among micro, small, and medium-sized companies on factors such as limited top management support, insufficient lean skills training, and the lack of employee involvement (Shrimali & Soni, 2017). Studies have investigated lean CSFs in SMEs (Alhuraish et al., 2017) and different sized companies (Shrimali & Soni, 2017). The research was limited in context to large companies compared to small and medium-sized companies, which did not include businesses in the southeastern region of the U.S.

The effects of CSFs on companies that have implemented lean methods versus companies that have not implemented lean practices is a topic that has not been readily explored at length. Studies involving the importance of CSFs in companies that have implemented lean and non-lean implementation, also known as traditional manufacturing companies, have not explicitly been found in the literature. What has been examined is that non-lean achieved manufacturing company practices compared to implemented lean manufacturing practices are considered inefficient and wasteful of organizational resources. Non-lean manufacturing businesses are skilled at identifying defects downstream of the process but were invisible during the upstream production process (Reeb & Leavengood, 2010). The lack of a formal communication element in non-lean enterprises can cause significant waste that inhibits its viability. For example, many non-lean enterprises face communication challenges throughout their various manufacturing processes. When a quality issue happens upstream during the manufacture of a product, the results can cause severe waste. The operation could have already made significant amounts of defective products before the issue is found and communicated to the appropriate operators for problem resolution (Reeb & Leavengood, 2010).

Lean is a continuous improvement methodology that assists SMEs in remaining competitive in their designated marketplace. The globalization and growth in markets have created a considerable strain on firms, especially SMEs, which built powerful competitive forces

(Munir Ahmad & Alaskari, 2014). SMEs must endorse diverse improvement frameworks to sustain a competitive advantage. These continually evolving markets demonstrating greater competitiveness among rivals and performing in a volatile market could eliminate the viability of an SME enterprise (Moon, Mo, & Chan, 2014). SMEs are attempting to identify and hold firm to their core competencies and capabilities for enterprise viability (Rajah et al., 2018). Global market activities have continued to threaten the long-term viability of SMEs. SMEs will continue to face significant survivability challenges without adopting a useful model to offset the constant external challenges. Choices are necessary when selecting a framework that can address the SME dilemma.

Research Purpose

The purpose of this quantitative, non-experimental study was to explore to what extent the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations and if there were differences between companies that have or have not implemented lean. The study was conducted in the United States South Atlantic area. The study adds to the limited existing data describing 13 independent variables (characterizing potential CSFs for lean manufacturing SMEs in the South Atlantic area) and the dependent variable, the CSF importance, as recently completed by Alhuraish et al. (2017).

The 13 independent variables for lean comprise of: (a) management support, (b) education/training, (c) communication, (d) employee involvement, (e) culture change, (f) understanding lean, (g) skills/experience, (h) customers, (i) business strategy, (j) suppliers, (k) human resources, (l) reward system, and (m) project management. Taner's (2012) survey instrument focused solely on the Six-Sigma model when he used 38 independent variables and four dependent variables to identify the most significant CSFs for implementing Six Sigma methodology in Turkish SMEs. Alhuraish et al. (2017) adopted the Six-Sigma CSF framework of Taner's (2012) study. They added the lean model as a comparative methodology to Six-Sigma in the same research study using 13 CSFs. This study contributed to the present body of knowledge base in manufacturing improvement methodologies from a researcher specializing in strategy and innovation. The topic applies to strategies of SMEs through expanding the comprehension of variables (CSFs) considered for the successful implementation of lean methods in manufacturing SMEs in the South Atlantic area of the United States.

Theoretical Framework

The theoretical foundation of the study is the critical success factor theory. Rockart (1979) launched his initial seminal examinations on CSFs in 1979. Additional original investigations of the CSF model continued in 1981 with the aid of a colleague named Bullen (Bullen & Rockart, 1981). CSFs are essential to identify, comprehend, and align toward the success of any project implementation initiative. CSFs are thought to be critical elements that definitively increase a project's implementation opportunity (Pinto & Slevin, 1987). CSFs are significant in the theoretical framework of implementing lean manufacturing because, without them, the chances of achieving a successful implementation are low (Jani & Desai, 2016).

The research study encompassed an explanatory non-experimental quantitative design that included a survey of manufacturing enterprises' leadership, attempting to identify the importance of the 13 independent variables characterizing potential CSFs for lean manufacturing for SMEs in the South Atlantic area. Manufacturing SMEs are laboring to find effective frameworks that can give their organizations a competitive advantage to remain a viable business entity in today's global economy (Şimşit, Günay, & Vayvay, 2014). The foundational comprehension of waste often translates throughput constraints through non-conformities of mass-produced goods. They are examined through quality control specifications designed to identify inaccurate tolerances for customer use resulting in scrap, rework, and unscheduled production (Zakaria, Mohamed, Rose, & Rashid, 2016). Manufacturing methodologies are process-driven toward improving operational effectiveness and capabilities by eliminating constraints that cause waste, decreasing costs, and increasing throughput (Stamm et al., 2009). As shown in Figure 2, Alhuraish et al. (2017) used a research model that comprised the 13 CSFs: management support, education/training, communication, employee involvement, culture change, understanding lean, skills/experience, customers, business strategy, suppliers, human resources, reward system, and project management.

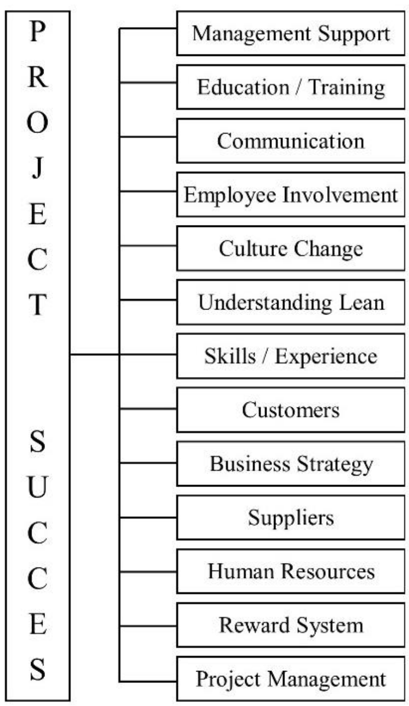

Figure 2. Thirteen CSFs evaluated the importance of ranking by manufacturing SMEs.

The study investigated the differences in importance for small or medium-sized companies and if there were differences between companies that have or have not implemented lean. Figure 3 illustrates this study had two groups, which is different from previous research. The nature of this study was to identify and examine the importance of lean CSFs that could give manufacturing SMEs in the South Atlantic area of the United States an opportunity to remain a competitive business.

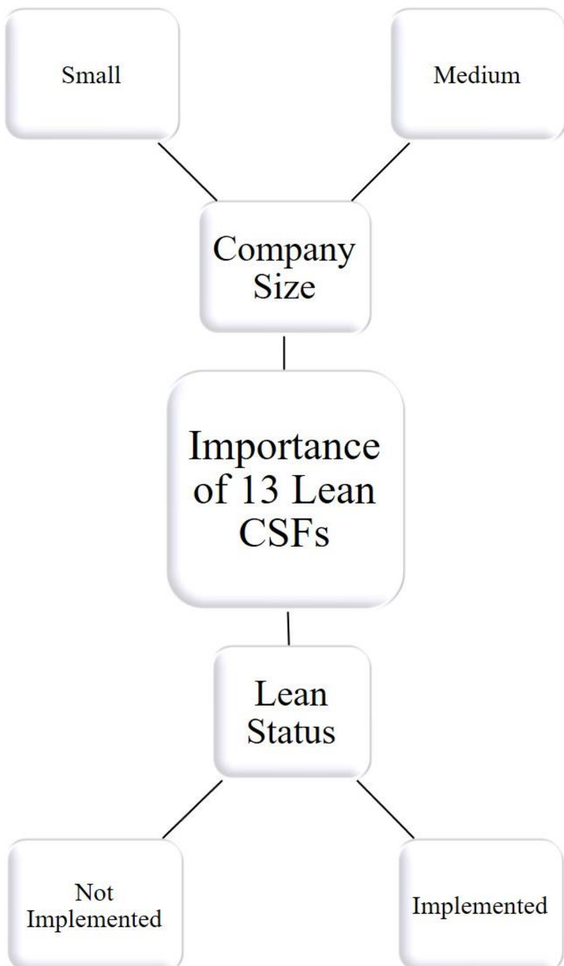

Figure 3. Thirteen CSFs evaluated for the difference in importance of two groups.

Significance

The study's objective was to contribute research to the body of knowledge within SMEs' manufacturing improvement methodologies. Continuous improvement methodologies can serve manufacturing enterprises that often are struggling with the challenge to develop improved results with fewer resources (Stojanović, Slović, Tomašević, & Simeunović, 2016). Enterprises that do not have significant resources (financial and intellectual) are consistently attempting to optimize existing resources to accomplish improved results (Stojanović et al., 2016). This topic's magnitude in the research field is critical because enterprise profitability is hugely reliant on its processes (Lientz & Rea, 2000). Proponents of each manufacturing improvement methodology contend that it can alleviate all enterprise challenges if accurately implemented (Nave, 2002). Small to medium-sized companies are extremely important. The far-reaching implications SMEs demonstrate in developing any specific region, the economy of any country, mitigating poverty, expanding employment, and providing nine or more different products at an economical price demonstrate the impact SMEs have on citizens around the world (Baporikar, 2015).

Research Questions

This doctoral research study evaluated the importance of 13 lean CSFs and determined if there was a difference between the groups representing company size and lean implementation status. The study was an extension of Alhuraish et al.'s (2017) research analyzing the importance of 13 identified factors as contributors to SMEs' success in the manufacturing sector using a lean methodology in the South Atlantic area. There are two research questions in this study.

- To what extent does the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations?

- To what extent does the importance of the 13 lean CSFs differ between companies that have implemented lean and those that have not implemented lean?

Definition of Terms

Critical success factors (CSF). "Critical success factors (CSFs) are factors that dictate the successful accomplishment of an organization's vision, mission and strategy, if performed exceptionally well" (Kalumbu, Mutingi, & Mbohwa, 2016, p. 1).

Large enterprise (LE). "A large-sized enterprise is a company that has no less than 500 employees" (Berisha & Pula, 2015, p. 20).

Lean. "Lean was primarily conceived as the practice (or group of practices) for eliminating and avoiding muda (wastes), adding more value to products and processes" (Mourtzis, Fotia, & Vlachou, 2017, p. 234).

Lean manufacturing. "Lean manufacturing is a concept that is used in multiple industries to improve the production processes by streamlining them" (Kolich, Storch, & Fafandjel, 2017, p. 1).

Medium-sized enterprise. "A medium-sized enterprise is a company that has no less than 50 employees and no more than 499 employees" (Berisha & Pula, 2015, p. 20).

Overall equipment effectiveness (OEE). "Overall Equipment Effectiveness has been shown to be a novel technique that can measure the effectiveness of a machine and it has been demonstrated to truly simplify complex production problems into simple and intuitive presentation of information" (Esmaeel, Zakuan, Jamal, & Taherdoost, 2018, p. 999).

SMEs. "SMEs are small and medium-sized enterprises" (Henttonen, & Lehtimäki, 2017, p. 329).

Small-sized enterprise. "A small sized enterprise is a company that has no less than 10 employees and no more than 49" (Berisha & Pula, 2015, p. 20).

Assumptions and Limitations

Assumptions are the aspects of a research study that are believed to be accurate and not thoroughly verified for validity, which could significantly affect the utilization of the research study's outcomes (Laanti, Salo, & Abrahamsson, 2011). There were three assumptions in this study: general methodological assumptions, theoretical assumptions, and topic-specific assumptions. Limitations can be considered possible divergences or voids in a research study, potentially affecting the generalization and the utilization of the research study's outcomes (Laanti et al., 2011).

General Methodological Assumptions

This study was based on a quantitative and non-experimental research approach. The quantitative research methodology originates from the positivist philosophy, where researchers focus on testing their ideas and manipulating variables (Burian, Rogerson, & Maffei, 2010). When hypothesis testing is required to examine and explain relationships, implementing the elements of a quantitative non-experimental methodology for the study is the correct research design (Creswell, 2014). Non-experimental research studies contain data collected from existing groups assuming that there is a noncausal relationship or only no cause and effect (Meadows, 2003).

Survey respondents were asked to be honest and truthful with their responses so that data was obtained to correlate answers to the research questions. It was assumed that their answers are truthful. The solutions supporting the research questions used a 5-point Likert scale. Likert scale surveys surmise that each respondent shares the same value of favorable/unfavorable categories. Maurer and Pierce (1998) found that using a Likert scale was an acceptable method.

Theoretical Assumptions

A theoretical assumption was that CSFs will assist an enterprise's leadership in identifying and then focusing on the essential organizational actions that efficiently use company resources for successful business results (Bullen & Rockart, 1981; Daniel, 1961; Rockart, 1979). Another theoretical assumption was that CSFs are a group of essential guiding principles that help an organization achieve its desired objectives (Rothberg & Morrison, 2012). Without CSFs, the opportunity for a successful implementation of the lean manufacturing model into an enterprise is severely reduced, which is another assumption per Jani and Desai (2016).

Topic Specific Assumptions

The specific topic of the study was manufacturing SMEs. The assumption was that all respondents had enough manufacturing experience to comprehend the model of lean manufacturing and the basic understanding of CSFs. This assumption extended to include that the participants would be answering only from the current role and size organization employed and not their respective experience, which may or may not influence responses.

Design Limitations

There were various limitations to this study. The participants in the study were all in the South Atlantic area of the United States. There may have been a bias in how manufacturing leaders manage businesses compared to other geographic locations. This study's limitations were challenging and require further investigation to understand the possible impact of the variables of geography, comprehension, and applicability of manufacturing methodologies on questionnaire results. The survey inclusion requirements included the two criteria of being employed at a manufacturing SME and responsible for manufacturing. Two conditions limited understanding of the qualifications or experience of the respondents answering the questions. The answers were the opinions of the participants. There was no quantifiable data in the design to differentiate a company's success as an organization.

Delimitations

The study did not measure the actual effectiveness of using lean CSFs and the relationship to lean manufacturing implementation success. The research also did not examine using lean CSFs and the business viability of the company.

Organization for Remainder of Study

The Capella dissertation approach requires a five-chapter process that results in a published document that demonstrates a research study of the importance of CSFs for enterprises that can allow manufacturing SMEs to remain a competitive business in the South Atlantic area. Chapter 1 focuses on the background, business problem, research purpose, research questions, rationale, theoretical framework, significance, the definition of terms, assumptions, and limitations. Chapter 2 reviews the literature concerning lean manufacturing and the 13 critical success factors related to business viability in manufacturing SMEs. Chapter 3 provides an overview of the research methodology and the research methods to answer the research question. Chapter 4 communicates the results of the study. Finally, Chapter 5 is the implications and recommendations of the research study.

CHAPTER 2. LITERATURE REVIEW

Broadening the research by Taner (2012) and Alhuraish et al. (2017), this study's fundamental purpose was to explore the dependent variable of the importance of lean CSFs in manufacturing SMEs for small and medium-sized companies. The 13 lean CSFs were management support, education/training, communication, employee involvement, culture change, understanding lean, skills/experience, customers, business strategy, suppliers, human resources, reward system, and project management (Alhuraish et al., 2017). This chapter's focal point is a detailed examination of the currently existing research studies and literature on lean manufacturing methodology and CSF theory, which was the foundation for the background and the theoretical model of the research study. Terms like lean manufacturing comprised the critical exploration of this dissertation.

The literature dynamic of lean manufacturing and the positive benefits of implementation into enterprises have many categories. During the last ten years, significant studies have been conducted by researchers and practitioners regarding the concept known as lean manufacturing, first created by the Toyota Motor Company (Womack, Jones, & Roos, 1990). All enterprises should continuously identify enhancements to company processes, systems, and innovative platforms that enable dynamic and pliable capabilities that can compete against constant shifts of the marketplace (Bhamu & Singh Sangwan, 2014; Sisson & Elshennawy, 2015). When economic challenges occur, companies and organizational leaders must implement countermeasures capable of decreasing waste and enhancing systems that maintain a competitive edge. This implementation must be completed with fewer resources and reduced monetary assistance availability, as concluded by the study found in Enterprise and Industry Italy, 2017 SBA Fact Sheet (Bevilacqua, Ciarapica, & De Sanctis, 2017). Because of the growing number of firms that have begun a lean journey to fulfill market needs, reduce costs, and gain competitive advantages over competitors, many researchers explore the connection between implementing lean practices and firm performances (Bortolotti, Boscari, & Danese, 2015).

Lean manufacturing has been a principal manufacturing improvement methodology for many years now. The lean framework is designed to help enterprises improve their competitive standing and challenging industry marketplaces, especially during turbulent economic times. Lean manufacturing's theoretical approach is a powerful one that defends and enhances manufacturing enterprises during volatile and stable financial markets, creating a strategic weapon used for long-term viability. The framework focuses on the benefits of identifying non-value-added tasks that disrupt critical processes leading to decreased productivity, which is a waste of many organizational resources. Poduval and Pramod (2015) concluded that lean manufacturing helps optimize a company's productivity while delivering high-quality merchandise and limiting process wastes. Lean equates to the reduction of expenses. Lean manufacturing introduces various tools into the manufacturing platform's different functional areas, enabling organizational members to attack inadequate performing systems for improved business operations proactively. Manufacturing SMEs are continuing an ongoing struggle with global competitiveness, market turbulence, and customers that demand enhanced value of products at a lower price creating a need to implement lean principles with the full spectrum of manufacturing techniques (Ertürk, Tuerdi, & Wujiabudula, 2016).

Methods of Searching

The literature review contains scholarly, seminal, and present-day research published in peer-reviewed journals, conference papers, and books. There are also practitioner expositions published in journals, magazines, and on various websites. Online search engines were used representing Google Scholar, Summon, and databases internal to the Capella University Library system of ABI/INFORM Global, Business Source Complete, and ProQuest Dissertations. Each search request encompassed comparable themes to the research topic, “Implementing lean critical success factors in South Atlantic manufacturing small to medium-sized enterprises.” Search terms like *lean critical success factors in the manufacturing sector, evaluation of lean critical success factors, implementation strategies of lean methodology in small to medium-sized manufacturing enterprises*, and *the practice of lean methodology* and *critical success factors* were utilized to capture specific information needed to support this research study.

Theoretical Orientation for the Study

CSFs exemplify important performance variables crucial for the enterprise to achieve its mission (Caralli et al., 2004). Organizational leaders implicitly understand and contemplate these essential areas when they establish objectives, targeted operational actions, and tasks paramount to achieving goals (Caralli et al., 2004). The approach of pinpointing and administering CSF principles toward improving an organization’s challenges is not an innovative new field of study (Caralli et al., 2004). D. R. Daniel is considered the originator of the theory of success factors implemented into the dimension of management literature in the 1960s (Daniel, 1961). The CSF theory and approach are still compelling today and applicable to many manufacturing improvement methodology fields’ challenges.

By building upon and simulating the research by Alhuraish et al. (2017), this dissertation concentrated on the CSFs for manufacturing SMEs that use the lean methodology in South Atlantic based companies. The research study Alhuraish et al. (2017) concluded that future research should consider how different national cultural dimensions interact with specific CFSs to implement lean manufacturing. The study suggested a more significant design toward diversity in the study (people, places, and industry). The emergence of lean manufacturing models has progressed to be one of the most significant methodologies for ensuring that the modern enterprise acquires and retains its competitive advantage. Lean manufacturing has commanded a strong desire to advance further research into its many beneficial attributes to companies (Manville, Greatbanks, Krishnasamy, & Parker, 2012; Näslund, 2013). Alhuraish et al. (2017) identified the value of exploring CSFs to implement lean manufacturing in SMEs.

Review of the Literature

Critical Success Factors

CSF theory is based on the approach that organizational leadership must pinpoint and concentrate their most limited resource (their time) on activities that definitively create the difference between success and failure of a project or an enterprise (Bullen & Rockart, 1981; Daniel, 1961; Rockart, 1979). The CSF model was developed and encouraged to be practiced helping managers access the most appropriate information pertinent to their job functions and accountabilities (Bullen & Rockart, 1981). It can be significant when used to determine and measure enterprise performance. It has also been extended to lean manufacturing that has become core features of many organizations implementing manufacturing improvement methodologies. As Bullen and Rockart (1981) suggested, the application of CSF theory has been extended to most professional practice (Bullen & Rockart, 1981).

The in-depth review of the current literature on critical success factors for effectively incorporating lean manufacturing into manufacturing SMEs suggested several variables for organizational success. CSFs can be characterized as a collection of crucial activities or principles that empower an enterprise to accomplish its stated goals (Rothberg & Morrison, 2012). They are elements or practices required to secure the success of an organization's business (Raynus, 2016). There is no list of CSFs guaranteeing the success of an SME business (Chong, 2012). There is evidence through research that suggests an overlap that connects CSFs and other factors or variables that could contribute to the success (Alfoqahaa, 2018). This research study concentrated on specific CSFs rather than either an expansive or restrictive combination of factors that could affect SMEs' success. It focused on chosen CSFs consistent with the implementation of continuous improvement methodologies and manufacturing SMEs. The context of these 13 CSFs serves as an essential contributor to SMEs' success and is in multiple research studies (Alhuraish et al., 2017; Taner, 2012; Timans, Antony, Ahaus, & van Solingen, 2012). These specific CSFs are (a) management support, (b) education/training, (c) communication, (d) employee involvement, (e) culture change, (f) understanding lean, (g) skills/experience, (h) customers, (i) business strategy, (j) suppliers, (k) human resources, (l) reward system, and (m) project management. Based on even earlier studies, the research of Kumar (2019) and Timans et al. (2012) used the same 13 CSFs that seem to align with the practice of CSFs and continuous improvement methodologies.

Lean

The lean foundation can be traced to the Toyota enterprise in Japan at the start of the 20th century when Sakichi Toyoda and his two sons Kiichiro and Eiji Toyoda, with critical collaborative input from a manufacturing engineer named Taiichi Ohno, developed the fundamental methodology (Dekier, 2012). According to Dekier (2012), during the conclusion of World War II, the Toyota Corporation entered into a problematic economic hardship, and as a result, was on the threshold of bankruptcy when they decided to look toward U.S. manufacturing enterprises for possible solutions toward their company sustainability. Manufacturing engineer Taiichi Ohno, now leading manufacturing operations, embarked for the U.S. city of Detroit, Michigan, to examine the production processes at Ford and General Motors (G.M.) facilities (Chen & Meng, 2010). This examination and research by Taiichi Ohno of the two U.S. automakers led him to create the Toyota production system a decade later.

U.S. companies did not immediately endorse the Toyota production system. The thought was the methodology would only be valid in Japan because of its collectivistic culture (Ballard & Tommelein, 2012). Toyota built and operated its first U.S. manufacturing plant as a joint venture with G.M. in 1982. After several years of their business model yielding success, the research studies performed by Womack et al. (1990) transformed the beliefs of many automotive and other industry detractors that the innovative methodology of lean could be a winning organizational practice. The term lean manufacturing was developed when they analyzed the correlation among U.S. and Japanese manufacturing enterprises (Womack et al., 1990), which was advanced definitively for the automotive industry to reduce the expense and enhance throughput. Similar research studies performed in different markets external to the automotive market such as aerospace (Parry & Turner, 2006) and electronics production enterprises (Doolen & Hacker, 2005) suggested lead times would decrease with the implementation of lean practices.

There has been a renewed enthusiasm toward the framework of lean manufacturing principles to enhance enterprise operations. After the economic turbulence in the early 2000s and the consistent global competition, manufacturing SMEs identified channels to improve the throughput of products and decrease production costs (Jasti & Kodali, 2015; Marodin & Saurin, 2013). Because of lean's manufacturing capability to effectively enhance industrial firms' health, the approach has again led to the reputation of being a highly acclaimed strategy for manufacturing improvement methodologies (Holweg, 2007; Netland, 2016). Lean is defined as a manufacturing improvement methodology that assimilates and extends upon models like TQM, TPM, increased throughput, and Six-Sigma (Netland, 2016).

It has been determined that enterprises use potential CSFs captured from the lean manufacturing improvement model. Netland (2016) concluded that CSFs behave as a potential source of improved results leading to the creation and adjustment to fit their definitive enterprise lean manufacturing model. There have been many different CSFs used to implement lean such as TQM, Just in Time (JIT), Six Sigma, TPM, and other comparable manufacturing improvement approaches from which to choose (Bortolotti et al., 2015; Manville et al., 2012). The above-highlighted research studies illuminated a well-connected appreciation of what establishes a CSF (Näslund, 2013), supporting evidence from anecdotal case studies and empirical research concluding that lean companies exceed non-lean enterprises from the context of organizational results (Mackelprang & Nair, 2010). A research study conducted by Netland (2016) concluded that the importance of CSFs changed based on the level of the implementation of lean application was at; some CSFs are essential at the beginning of the implementation stages, while others transform into important CSFs as enterprises advance to implement lean practices. This theoretical conception was crucial to this research topic of CSFs because success factor criticality helps SMEs concentrate their improvement exercises, empowering lean actions and enhancing operational achievements (Knol, Slomp, Schouteten, & Lauche, 2018).

There are numerous strategic plans by manufacturing SMEs that establish the intent to use lean to improve performance and increase the organization's odds for long-term survivability. Large portions of those enterprises are unsuccessful and abandon the effort to implement their lean initiatives (Schonberger, 2008). The data suggest that two out of every three enterprise transformation plans are unsuccessful (Aiken & Keller, 2009) and significantly challenging to maintain the wins of the CSFs past the first phase of the program (Netland & Ferdows, 2014). This unfortunate circumstance can lead to an extensive loss of company resources and increased organizational trepidation toward implementing lean or any other improvement methodology to help resolve business failures and create a framework for a competitive future versus the firm's rivals. According to Netland (2016), the use of CSFs is required to guide organizations toward an effective and efficient approach to implementing the lean model.

Implementation of Lean Manufacturing

Lean implementation studies have been intriguing with their proposed capability to transform troubled companies into viable businesses that can now compete in their designated markets. Lean implementation studies have been captivating with its proposed ability to transform troubled companies into capable companies that can directly compete in their established markets better (Melton, 2005). The early studies (Abdulmalek, Rajgopal, & Needy, 2006; Ahlstrom, 1998; Anand, & Kodali, 2010; Karlsson, & Ahlstrom, 1996; Shah, & Ward, 2003; Shingo, 1989; Womack, & Jones, 2003) indicate lean intrigue, by the generation of so many research journals and books on associated themes (Mostafa, Dumrak, & Soltan, 2013). These early studies described above encompass the correlation between continuous improvement incorporation and the development of an incorporation progression from monitoring implementation of unsuccessful practices in those lean launches (Mostafa et al., 2013)

Implementation of lean is an enterprise strategy that concerns the alteration of culture over time. Lean does this by the selective and progressive application of lean tools that are situational relevant for that organization at that time, followed by further implementation later when the culture has caught up, which among lean practitioners is known as the lean journey (Emiliani & Stec, 2005; Hines, Found, Griffiths, & Harrison, 2011; Womack & Jones, 1996). The continuous improvement methodology covers high tech enterprise activities and strategic implementation at the organizational stage (Pearce & Pons, 2013). This methodology leaves a segment of the challenge that contemplates which lean instruments are essential for the corporation to utilize effectively in its quest to implement lean principles successfully (Pearce & Pons, 2013).

Research has concluded that the central logic surrounding the futility of acquiring lean advantages is the incomplete comprehension of the lean methodology and lean applications (Baker, 2002). Many enterprises do not accurately administer lean practices (Baker, 2002). This inaccuracy comes from a central logic of the misapplications being: implementing the incorrect instrument to resolve an issue, and implementing the same one mechanism to address the entirety of the problems, or implementing the same group of tools on each challenge (Pavnaskar, Gershenson, & Jambekar, 2003). The lean model's inaccurate practice leads to wastes of the enterprise's resources and a decrease in the confidence of an organization's membership when attempting to apply lean (Marvel & Standridge, 2009). According to Crute, Ward, Brown, and Graves (2003), the lean manufacturing's breadth and meaning of its model must be comprehensively confirmed before any lean implementation is adopted.

The success and failure of any manufacturing improvement methodology begin with comprehending the framework required to build the proposed enterprise's foundation and fundamentals. From the outset, enterprises want to embark on their new journey of incorporating lean manufacturing principles to help transition their firm into a more viable and sustainable firm. Unfortunately, lean manufacturing methodologies' successful use is far from being a simple plug and play process that assures positive outcomes. On average, SMEs are more frequently the more significant discriminate entity versus large enterprises in the sphere of instruments supported for a lean exercise excursion (Mathur, Mittal, & Dangayach, 2012). Mathur et al. (2012) concluded that due to the variables of money, time, and industrial innovation SME's confront bottlenecks. SMEs choose lean instruments that are basic in method and low in expense to implement.

SMEs have decided to implement straightforward and low expense methods, contrary to most of the lean literature. The lean writing stems from a completely integrated model using all the available tools lean has at its disposal, recommended as essential for lean success by Dorota Rymaszewska (2014). According to Hu et al. (2015), for winning the lean manufacturing improvement methodology, most of the available literature suggests the opposing viewpoint, which indicates a holistic approach of lean elements for the model's success. Unsuccessful incorporation of lean manufacturing can negatively affect enterprise resources, impact organizational members, and their morale in lean manufacturing theory (Marvel & Standridge, 2009). There have been blueprints and strategic plans created to lead firms to incorporate a lean methodology fully. In terms of lean manufacturing in SMEs, the challenges are much higher (AlManei, Salonitis, & Xu, 2017). Achanga, Shehab, Roy, and Nelder (2006) concluded that SMEs had necessitated the incorporation of expenses and the subsequent positives of lean manufacturing engagement. There must be a forecasted outcome from the onset before the dedication to a strategic plan. In contrast to large enterprises, SMEs have finite resources, and in most scenarios, the leadership is deficient in the long-term assurance demands of lean manufacturing methods (AlManei et al., 2017). Luthra, Kumar, Kumar, and Haleem (2011) concentrated on the obstacles of incorporating lean manufacturing and enjoining those challenges into seven groups: enterprise leadership, resource, intelligence, rivalry, organizational members, monetary, and previous practice.

The organizational leadership of the implementation of lean manufacturing can positively or negatively influence the methodology's success. In the context of being a roadblock to lean manufacturing incorporation, contemplating executive leadership is linked to definitive behavioral characteristics. These characteristics are low concentration for upholding lean manufacturing objectives, negligence in developing a proactive organizational mindset, promoting a short-term instead of long term vision, deficiency of required resources (workforce, finances, etc.), and blocking the incorporation of the lean manufacturing approach (Luthra et al., 2011). The characteristics are why enterprises that desire to pursue the framework of lean manufacturing processes and its cultural philosophies depend on outside assistance like consultants to implement lean manufacturing into their organizations (Luthra et al., 2011).

The lean consultant's competence is also essential. The possibility that cursory comprehension of the lean theory and deficient implementation processes fosters disorientation about lean manufacturing, with the outcome being a barrier to lean manufacturing incorporation (Luthra et al., 2011). The establishment of lean manufacturing in SMEs has suggested that the critical measures and the key obstacles in an enterprise are communicating those elements upfront about lean manufacturing barriers (AlManei et al., 2017). The positive benefits of lean manufacturing implementation improve market share, enhance delighted customers, raise the firm's viability, and improve the enterprise's inside results like higher agility, initiation of objective and critical metrics that drive performance demands (AlManei et al., 2017).

As implementation relates to lean culture, fundamental elements must be present in a lean environment (Alkhoraif & McLaughlin, 2016). The element list contains the enactment of robust feedback mechanisms horizontally and vertically throughout the enterprise. It also includes a culture, which inspires an enhanced stage of organizational engagement in decision making and strategic activities, behaviors that cover the entire company's members demonstrating personal accountability, proactive identification of optimal approaches, and a management persona that inspires those type of actions (Mann, 2009; Shingo, 1988). The lean culture is acquiring a practice that accentuates a customer-focused value process (Al-Najem, Dhakal, Labib, & Bennett, 2013; Yasin, Small, & Wafa, 2003). This approach must not be mistaken with the thought that a company's functional areas are more important than any other enterprise operational area. It should stress the outcome and how various departments avoid the silo effect that creates internal barriers inhibiting business success through improved customer value (Al-Najem et al., 2013).

Implementing the full arsenal of lean manufacturing improvement methodologies by some SMEs has not been consistent with the companies' available literature. It contrasts with L.E.s, who choose to incorporate the all-encompassing elements of the lean manufacturing model for business process improvement (Zhou, 2016). This ideology could be a factor in whether lean manufacturing is successful or less prosperous when only specific tools are implemented in manufacturing organizations instead of the entire model. When there is an unsuccessful implementation of lean manufacturing methods, it negatively affects an organization in terms of morale and monetary expense (Zhou, 2016). Implementing a successful lean manufacturing process and ideology is not a simple endeavor, even with all the roadmaps available to prospective enterprises (AlManei et al., 2017). This information suggests that each entity must be unique in its approach to implementing the lean model, with comprehension of the required resources needed to be a winning participant of the lean manufacturing framework before starting the lean process, not during (Knol et al., 2019).

Top Management Commitment and Support

The type of enterprise a company is or the industry they compete in is not the most critical variable to identify because a winning lean manufacturing implementation is much dependent on its workers, which includes its leaders and advocates (Tortorella, Fettermann, & Fries, 2016). The type of approach the leader takes when they perform and behave affects the advocates' demeanors and actions, which creates the prevailing culture inside the enterprise experiencing lean implementation (Tortorella et al., 2016). The connection between interpersonal expertise and leadership achievement was initiated in research studies after World War II. Several researchers began to examine the relationship between enterprise achievement, leadership methods, and employee development (Hunt & Baruch, 2003).

Fleishman's (1953) seminal work on leadership concentrated researchers and practitioners on leaders' design and deliberation expertise, whose results delivered leadership style theory. The effect of leadership style on employment accomplishments, gratification, stress, and turnover objectives have been broadly researched (Chen & Silverthorne, 2005; Goleman, 2000; Wilson & Thompson, 2014). Leadership techniques affect many features of an enterprise, and victorious leaders typically will not depend on one leadership technique because the appropriate match between leadership style and the stage of their advocates' preparedness (Blanchard, 2010) enhances a leader's effectiveness.

The one right path to incorporate lean manufacturing methodology ultimately is the most powerful leader of the firm, which signals the CEO's inclusion. This path includes, among other elements, like knowledge assistance and substantial commitment to the project (Chan, Ismail, Ahmad, Zaman, & Lim, 2019). The CEO's full engagement and the total involvement by an organization's members regarding lean manufacturing alternatives are the most significant variables that support winning lean manufacturing incorporation (Kumar, 2019). In comparison, middle managers are required to facilitate strategies, demonstrate the beneficial instruments of lean manufacturing and communicate their insight, have comprehension and abilities with the frontline workers to pave the road toward faith, and precisely acclimate and maintain the higher results (Kumar, 2019). One good practice used to acquire and sustain support for implementing and sustaining lean manufacturing methods is a rewards program. Executives should set the strategy and incentive program from the beginning of the lean manufacturing implementation. The lack of synergy of lean manufacturing practices with the enterprise's bonus, rewards, or incentive practice could be a determining factor that leads to its unsuccessful implementation into an SME (Chan et al., 2019).

The absence of top leadership support for a lean manufacturing implementation could materialize from their incompetence to conceive the more expansive view while remaining conservative in their approach to new company practices (Netland, 2016). This organizational mindset created by company leadership suggests that top management cannot direct an alternative strategic corporate movement, making an obstacle in the form of an unsuccessful lean manufacturing implementation project (Achanga et al., 2006). An organization's top leadership must be wholly committed in its role of inspiring employees and establishing a new culture toward a winning implementation of the lean manufacturing methodology (Garcia-Sabater & Marin-Garcia, 2011). Competent and robust company leaders are a CSF for the implementation of a lean manufacturing model. Skilled leadership develops a creative environment, which eliminates the feeling of anxiety toward the trepidation of the unfamiliar and promotes a more secure environment for the success of a lean manufacturing implementation (Antosz & Stadnicka, 2017).

This action demands a robust strategic plan, which generally requires incorporating organizational leadership to develop and institute the enterprise's goals and objectives. Top leadership is the crucial initial driver that creates the firm's new environment, philosophy, purpose, behavior, resources, and the desired positive outcomes of the launch of lean manufacturing (Salonitis & Tsinopoulos, 2016). Organizational leadership can be a negative influence on the implementation of lean manufacturing as well. Failure to support the implementation of lean manufacturing and comprehend the application's complexity positively, with a short-term vision and lack of adequate resources, can be disruptive toward a successful implementation (Sisson & Elshennawy, 2015).

Education and Training

The contemporary model for training research had its beginnings during the 1940s with the U.S. government service, training within industry (TWI). The TWI curriculum's objective was to qualify the untrained people in the workforce that was critically important to support the war efforts (Robinson & Schroeder, 1993). Once World War II ended, the TWI initiative was tempered. The training research did broaden, notably with Kirkpatrick's research study, during the latter period of the 1950s when he created a four-stage pathway to training assessments (Kirkpatrick, 1996). Ideally, training is compatible with continuous improvement and lean as it concentrates on identifying and ameliorating deficiencies (Argyris & Schon, 1997). Lean can be defined as the eradication of waste. Training can be characterized as the creation of knowledge that assists in the acknowledgment and the elimination of waste. It can be used for communal, cultural, and technical expertise in companies (Badurdeen, Marksberry, Hall, & Gregory, 2010). The value of training is illustrated through the activities at Toyota, which emphasizes the importance of training to create employees' job function expertise on resolving challenges in the Toyota production system, organizational safety, and the identification of manufacturing issues (Imai, 2012). Employee competence and expertise are directly advantageous to a company, and workers are additionally aware of their organizational culture. They can recognize opportunities for improvement of the business's sustainability (Imai, 2012).

Employees can acquire knowledge and then put into practice the lean manufacturing model without much complication (Rose, Deros, & Rahman, 2014). Lean manufacturing instruments are not complicated and are not challenging in theory to gain its principles for practical usage of the methodology (Rose et al., 2014). To guarantee that organizational members can accurately implement lean manufacturing, quality instruction, and critical educational requirements must be a significant element of the training process. The training process will improve employees' skills base and teach them how to make qualified decisions using their new competencies independently (Vamsi, Srikanth, & Sravanthi, 2019). Instructional classes can assist in greater worker gratification and self-worth. These activities set the stage for workers who demonstrate wasteful behaviors that would typically require instructional classes to understand lean manufacturing and the categories of waste that they should be cognizant of in their actions and others (Vamsi et al., 2019). Newly trained employees in lean manufacturing methodology begin educating the workforce and creating a new lean manufacturing culture in the organization without formal training. Instructional classes can assist in greater worker gratification and self-worth (Vamsi et al., 2019).

Sieckmann, Ngoc, Helm, and Kohl (2018) suggest the implementation of cascade instructional sessions as a useful model, through which managers and a group consisting of a lean expert team are initially trained and then are given the accountable task of preparing all of the middle managers in the enterprise. Once the objective has been achieved, the middle managers must distribute the new learnings to their subordinates. The cascade method's advancement necessitates every manager to completely comprehend the lean manufacturing model (Sieckmann et al., 2018). It is another attempt to enhance and push the cultural alteration, in conjunction with lean manufacturing. These managers can then establish the right behaviors and attitudes toward developing a learning organization (Rafi, 2010).

Communication

Redding and Sanborn (1964) assembled duplicates of earlier published articles on a broad spectrum of enterprise communication themes. They illustrated that work through their book *Business and Industrial Communication: A Source Book*. This publication has been heralded as the real beginning of the field of enterprise communication. Ference's (1970) examination of the enterprise decision-making systems consider the approach of a company's communication process. The method also balances the practice of knowledge exchange between individuals that acknowledges a linear design of communication. Enterprise communication is an extensive and systematic analysis of a quantitative exchange of information elements and connections. The discussion concentrates on the interdependencies and interplay through the actions of communication. The communication then distributes the intent of an enterprise (Shelby, 1993).

Exchanging information is the resource that manages company activities, and that communication process allows for the accumulation, comprehension, retention, and opportunity of pertinent information to be effective in enterprises (Blazenaite, 2012). According to Wrench and Punyanunt-Carter (2012), utilizing appropriate communication channels to broadcast organizational change, such as face-to-face communication, cannot be overestimated to express enthusiasm, commitment, and confidence.

An effective instructional program consists of a communication and feedback element in its process. The knowledge obtained from employees' training can be transferred by way of the communication movements and allows the information to be administered through the enterprise completely (Scholz, 2012). Knowledge concerning the lean manufacturing implementation's objectives moves in a top-down direction from top leadership, including the lean expert team, to the frontline personnel. Simultaneously, feedback from the manufacturing personnel should return (Sieckmann et al., 2018). The exposure to redundant processes of everyday manufacturing schedules presents employees the opportunity and capability to identify previously unforeseen issues and introduce improvement concepts. Internal information moves efficiently, the external communication is controlled, and the process then functions as an organizer and impetus for lean deliberations between colleagues (Sieckmann et al., 2018).

A lean manufacturing model necessitates robust and secure communication networks to be developed. Alhuraish et al. (2017) suggested that the exchange of information among the organizational members and the incorporation of lean manufacturing methodology must be awarded a significant preference. Worley and Doolen (2015) identified that management assistance, commitment, and communication are essential in lean manufacturing. Transferring new information, like lean manufacturing, is a demanding objective, and greater competition elicits mastering that demand extremely significant (Lindlof, Soderberg, & Persson, 2013). Donate and de Pablo (2015) underscored that heightened communication leads to greater participation, enhanced efficiency in resolving challenges, improved advertising exercises, and better achievement. Lean manufacturing literature expresses that communication is essential in change adaptation scenarios (Alpenberg & Scarbrough, 2016).

Involvement of Employees

The long-established Fordist model of mass production is founded on the Taylorist division of labor that concludes: an employee's proficiency is systematically acquired; operations are made easy through the creation of crucial segments and specified in considerable instruction, and frontline employees are rigorously managed and expected to finish their job assignments with no departure or contribution into the achievement of the works' objective (Braverman, 1974; Friedman, 1977). Some researchers recognize higher utilization of employee engagement of enterprise work methods, or employee involvement, as a defining feature of contemporary manufacturing reengineering (Vidal, 2004). Extensive employee involvement through exercises like teamwork and continuous improvement is debated to understand the central theme of lean and high-performance work enterprises (Vidal, 2004). Employers have wanted to enhance enterprise business results through many methodologies that would deliver improved accountabilities and company workers (Vidal, 2004). The phenomenon leading the trend toward expanding frontline organizational member accountability and capability is known as empowerment by researchers, practitioners, and enterprise leaders (Vidal, 2004). A critical standard of lean is the employee (Womack et al., 1990), which can be accomplished through employee engagement in resolving organizational issues, improved decision making, and continuous improvement of enterprise processes (Vidal, 2007).

Winning strategies for implementing lean manufacturing will be difficult to achieve without the involvement of SME employees. Organizational employees must understand that the application of lean will make workers' job tasks more straightforward. Studies have suggested that work intensity restricts workers' engagement in continuous improvement projects, such as lean manufacturing, and plays an essential function in allowing workers to experience greater personal effectiveness, improved work results, and enhanced worker gratification (Neirotti, 2018). Employee work intensity will not directly affect worker satisfaction concerning their employment circumstance (Neirotti, 2018).

For the implementation of lean manufacturing, working with employees to resolve problems is a CSF (Netland, 2016). Enterprises must use and involve the spirit of every employee to accomplish a successful lean manufacturing project. Abuhejleh, Dulaimi, and Ellahham (2016) suggested that the enterprise changes required when a firm decides to incorporate the lean manufacturing model must necessitate every organizational member's composition. Based on the Hofstede cultural model, an individualistic culture is more likely to significantly implement lean manufacturing by focusing on employee involvement, creativity, and efficiency (Pakdil & Leonard, 2015). It is typical for employees to resist a new culture, like a continuous improvement environment created by implementing lean manufacturing methods. A powerful antidote to combat this blockade to the success of lean manufacturing is by having managers practice concepts of teamwork and employee empowerment that necessitate greater employee involvement and a better, supportive team setting (Salonitis, & Tsinopoulos, 2016).

Culture Change

Research into leadership behavior, particularly organizational change, started with Simon's studies in 1945, which are the fundamental groundwork for an enterprise's internal business model (Simon, 1948). Cauldwell (2004) suggested a scientific approach that demonstrated the possible challenges during cultural change activities. These challenges happened when management had no comprehension of a successful company, the direction needed, or how to construct it. Leaders are required to comprehend enterprise features that establish a positive or negative structure to make a company change by using their capabilities or design (Buchanan, 2008).

The concept known as organizational culture was first characterized in U.S. literature by the publication of the "Administrative Science Quarterly" in 1979 (Hofstede, Neuijen, Ohayv, & Sanders, 1990). The concept extension can then be followed by way of the broad literature and research created on the subject. The study includes the organizational psychologist Schein's documentation, who concluded cultures are developed internally to enterprises founded on their own chronicled events and knowledge (Schein, 1996). Corporate development has witnessed a transfer in focus from the functionality of the term to successfully modifying an enterprise's culture, demonstrated through the comprehensive organizational development change approaches accumulated in the literature (Rothwell, Sullivan, & McLean, 1995).

Research conducted on cultures suggests that the impact of a psychological process is not limited to people but can also affect enterprises' sociological, political, and economic operations (Hofstede & Bond, 1984). Culture is a critical element in winning at lean implementation because it can qualify the acceptance or rejection of thought processes and decide whether an enterprise will maintain itself in a competitive market (Pakdil & Leonard, 2015). Senior leaders, and when utilized, lean consultants who are explicitly included in the lean implementation activities must comprehend the enterprise's culture, its effect on operational results, and its impact on workers' actions. Contemporary literature has concluded that numerous unsuccessful lean implementation attempts can be attributed to uncoordinated company cultures (Atkinson, 2010; Bicheno & Holweg, 2009).

Significant lean manufacturing transformations require the company to identify and address its culture (Ahmad & Azuan, 2013). The changing of a SMEs culture in the pursuit of lean manufacturing implantation is exceptionally challenging. The enactment of lean manufacturing in standard enterprises demands an expansive company change (Pearce & Pons, 2017). Change management is fundamentally problematic, so enterprises typically fail to maintain the required lean methods. Enterprises have a limited opportunity to incorporate lean manufacturing except in cases where they have focused on the appropriate culture and the essential expectations that could create the foundation for integrating the alterations (Ahmad & Azuan, 2013). Changing a culture necessitates the use of an enterprise's resources for success.

At the same time, employees who have specific leadership roles must work diligently to build their organization's capability to implement and maintain lean thinking on the manufacturing floor, leading to the prerequisite of a change management process (Lodgaard, Ingvaldsen, Gamme, & Aschehoug, 2016). Cultural change is challenging for lean because behavioral change is problematic in implementing lean manufacturing as lean is a mental approach and requires people's involvement and a difference in their behavior (Alhuraish et al., 2017). People's actions and social influences can demonstrate a vital function in the winning incorporation of lean (Grant & Hallam, 2016).

Lean manufacturing requires employees to change their behavior, engage new processes to solve problems, and cooperate. These factors can be taught, but it is more challenging to introduce the cultural and behavioral changes consistent in the lean-approach. Ortiz (2012) concluded it is challenging for workers to change tendencies when administering lean. The methodology of lean is simple to understand. There are a few issues with the organizational members' daily implementation because of lean tools like 5S that necessitate behavioral alterations (Alhuraish, Robledo, Kobi, & Laris, 2016). The lean 5S practice demands a standard for a clean and organized workplace by which employees routinely sustain (Gupta & Jain, 2015). Ensuring this new process is consistently carried out and maintained will not be a simple task, and employees could revert to previous routine behaviors (Mann, 2014).

Lean behavioral alterations are not limited to actions on the shop floor. Research has concluded that the essential behavioral changes that must occur are at the top of organizations when implementing lean manufacturing principles. Shokri, Waring, and Nabhani (2016) concluded that top management must demonstrate behaviors that exemplify a concise strategic and operational vision, which is especially crucial to a winning lean implementation project. van Dun and Wilderom (2016) pinpointed vital and framework transparency as a significant facilitator of high performing lean teams. This research corresponded with the study completed by Stilwell, Pasmore, and Schon (2016), suggesting that managerial communication that assists organizational members in comprehending the desires for alterations will positively affect workers' feedback to change. This insight creates a decisive behavioral success factor to an employee's magnitude internalizing the advantages of a firm's plan.

Lean implementation as a new operational approach outweighs the possible changes and trepidation to their current job function; these individuals are more likely to behave positively (Rafferty, Jimmieson, & Armenakis, 2013). The previous examination has also been established as a specific significant element in current research studies involving organizational change readiness (Straatmann, Kohnke, Hattrup, & Mueller, 2016). Stilwell et al. (2016) defined behaviors necessary by top corporate managers at every critical stage of a transformational change process: exchanging information, coordinating operations and organizational members, and interacting with workers. Through lean manufacturing lenses, departmental leaders' definitive influential strategies with their direct reports have critical ramifications on organizational members' responsibility for implementing lean initiatives (Lam, O'Donnell, & Robertson, 2015).

Understanding Lean

After the seminal work of Womack et al. (1990) chronicled the Toyota production system's initiation, the lean doctrine has progressed. Corporations have implemented it throughout the world. Lean is the practice of eradicating any activities that do not produce value for the enterprise's customers while achieving the highest-level productivity and the most succinct consummation of company resources (Bruce, Scott, & Roberts, 2011). Any type of waste is characterized as an individual exercise that consumes resources but results in no return of value (Womack & Jones, 1996). Lean techniques were developed to boost enterprise sustainability and minimize operational wastes by utilizing a precise execution practice called the PDCA configuration: plan, do, check, act/adjust (Alsyouf, Al-Aomar, Al-Hamed, & Qiu, 2011).

Lean has its strengths in reducing manufacturing consumables during mass production: decreased employee labor, reduced space requirements, reduced expenditures in tools and machinery, decreased person-hours, and decreased in-house inventory (Womack et al., 1990). The decrease in the utilization of valuable resources results in higher throughput and efficiency of production processes that should translate into meaningful monetary savings. Lean has sometimes been referred to as a delicate approach due to many companies that often inaccurately apply it during the implementation stage (George, 2002; Womack et al., 1990). Lean can deliver products with greater agility and expediency capabilities required to face worldwide competition

(Blackburn, 1991). Fullerton, McWatters, and Fawson (2003) researched 253 U.S. production enterprises. It was found that a definite link occurs between increased monetary gain and the scale that determines waste decreasing manufacturing activities when lean is implemented.

There are four pillars of lean manufacturing. Those four pillars (Kumar, 2019) are

- just in time;
- supply chain integration;
- cellular manufacturing; and
- Kaizen.

Just in Time

The lean technique JIT attempts to distribute a product, at the most precise moment, position, and quality in the correct amount for an accurate cost (Mayr et al., 2018). The advantages of incorporating a JIT process contains enhanced quality, higher responsiveness, decreased expense, lowest on-hand inventory levels, better throughput, shorter lead time, and diminished downtime (Nimeh, Abdallah, & Sweis, 2018).

Supply Chain Integration

The lean manufacturing model can only be successful when executed and the production ecosystem initiated from the suppliers to the customers. The supply chain ecosystem will be negatively impacted should any participating entity in the system fail to fulfill their functional responsibility (Kumar et al., 2016).

Cellular Manufacturing

Cellular manufacturing is a production system, a JIT production branch and lean manufacturing, including faction technology. Cellular manufacturing aims to generate the most significant number of comparable products or parts while making as little waste possible

(Lucherini & Rapaccini, 2017). Cellular manufacturing involves multiple *cells* in an assembly line fashion (Jain & Jain, 2018). Every section is designed to be effective and efficient. The cell is comprised of single or multiple contrasting machines built to perform a specific job. The product flows through each section in a particular order, with every available station finishing a production process (Jain & Jain, 2018).

Kaizen

Kaizen is composed of small improvements in an endless effort ameliorate organization, and it has three main characteristics: process orientation, minor step improvements, and people-orientation (Tortorella, Marodin, Miorando, & Seidel, 2015). Kaizen is process-oriented instead of results-oriented, and its orientation suggests that performance improvement could only be reached if sound processes are created (Darlington, Francis, Found, & Thomas, 2016). The standard Kaizen team is comprised of eight to twelve employees engaged in the process to be upgraded, such as the frontline supervisor who has accountability for the entire process, maintenance, technicians, quality, logistics, finance, and human resources are examples (Heymans, 2015).

There are many different types of lean tools available to incorporate into SMEs to improve the viability of any manufacturing business, and some of the more popular tools used in lean manufacturing (Kumar, 2019) are

- 5S;
- TPM;
- SMED;
- Kanban system; and
- VSM.

Skills and Expertise

The seminal work by Katz (1974), illustrating the skills guide to leadership, concluded that leadership is founded on three skills: technical, interpersonal, and theoretical. Technical skill focuses on expertise, based on detailed insight, and in a specific field of labor. Technical skills belong to a proficient and informed individual. This skill relates to the activities, the regulations, the standard operating procedures, and the goods and services specific to a company (Katz, 1974; Yukl, 2006). Technical skill is also critical at the front-line leadership stage, not as significant for intermediate leaders, and minimally essential for senior leaders like CEOs.

Interpersonal skills are the expertise demonstrated by interacting with individuals founded on their knowledge concerning people and in the manner they act, in the way they behave in groups, in the way they exchange information effectively with the group, and in the form their reasons, mindsets, and perceptions (Mumford, Zaccaro, Connelly, & Marks, 2000). Interpersonal skills necessitate sufficient leverage on superiors, peers, and direct reports toward attaining enterprise objectives. These specific capabilities allow a leader to leverage group members to interact in sync to achieve enterprise strategic plans. Interpersonal skill expertise is characterized as leaders understanding their thoughts on various challenges and, at the same time, being aware of the perceptions of other individuals (Mumford et al., 2000). Leaders with enhanced interpersonal skills can adjust their thought processes when employees present personal or professional challenges that could cause organizational difficulties. This capability assists in accomplishing enterprise objectives expeditiously and accurately (Mumford et al., 2000). These leaders are responsive and compassionate of the drivers that move people's behavior, aids in developing an environment of trust for their advocates, and take the desires and ambitions into consideration when contemplating actions required to accomplish enterprise objectives (Mumford et al., 2000). Interpersonal skills are compulsory at all three stages of management: front line, intermediate, and senior management (Katz, 1974; Yukl, 2006).

Conceptual skills permit leaders to mull over and eventually decide how to use strategic designs. Managers with greater heights of conceptual skills are useful at thinking through the plans that shape an enterprise and its vision for prospects moving forward while comprehending and communicating the economic fundamentals that support their company's success (Mumford et al., 2000). These leaders are relaxed and confident when querying thoughtful questions with theoretical designs to other individuals. Conceptual skills also permit leaders to deliver theoretical design interpretation and comprehend the abstract model for their superiors, peers, and direct reports (Mumford et al., 2000). These skills are essential for senior leaders, less critical for intermediate leaders, and least essential for frontline supervisors (Northouse, 2010).

With its various tools, techniques, and methodology, Lean manufacturing has been described as simplistic and user-friendly as a continuous improvement model for manufacturing SMEs. Research has suggested that a critical skill and expertise is required to implement a lean manufacturing methodology successfully. The study includes organizational leadership at each enterprise (Alhuraish et al., 2017). Lean leadership is a collection of leadership skills, applications, and actions to effectively implement and benefit from a lean manufacturing model (Poksinska, Swartling, & Drotz, 2013). Leadership also consists of advocating worker accountability, worker empowerment, instructional doctrines, promoting teamwork, and an organizational based approach to resolving business challenges (van Assen, 2018).

Enterprise leadership must demonstrate positive management attitudes toward partnerships, alliances, recognition, and motivational proposals. Realistic influencing is essential and powerful predictors of worker commitment to continuous improvement objectives (Lam et al., 2015). Organizational member engagement, coaching, and cultivating external stakeholders while developing a culture of trust and respect for employees are critical socio-cultural features of lean leadership (Zu, Robbins, & Fredendall, 2010). The lean leader paradox necessitates the leader to act precisely and competently with a high command level. The leader must also know when the right circumstance is occurring to permit employees to perform while empowering them to demonstrate their creativity and continuous improvement knowledge, skills, and abilities (van Assen, 2018). Lean leadership conduct is of fair practice and results oriented.

Connecting Lean Methodology and Customers

Strategic business approaches that incorporate a reliable customer service platform's model deliver beneficial advantages to the organization, and it is invaluable customers. When organizations achieve or surpass a customer's expectations, it develops trust between the enterprise and the customer, which drives increased customer loyalty (Woods, 1999). Building advantages, through extraneous or internal customer partnerships aid both the enterprise and the customer. The critical path to these relationships is the logic that neither participant can flourish unless the other partner prospers. This critical path leads to the suggestion that nurturing those relationships creates equal value for both the enterprise and the customer (Woods, 1999).

External customers receive increased customer service when they focus on the customer's specific needs, leading to improved customer loyalty and better financial results. This hypothesis was examined by Frederick F. Reichheld and Thomas Teal (1996), who reported the outcomes in their seminal work. Reichheld and Teal (1996) concluded that when improvements in customer partnerships lead to increased financial results, the enterprise could contribute additional resources to enhance customer service practices further. Utilizing a measurement system at every critical stage of the enterprise and customer partnership can help gather valuable information to provide direct customer service improvement activities (Reichheld & Teal, 1996). Customers are the focal point for every enterprise. As a result, the idea of just manufacturing products without understanding their needs will be problematic in the competitive global market of the 21st century.

Some researchers (Gligor, Esmark, & Holcomb, 2015) have emphasized that possibly elastic and lean manufacturing companies could expeditiously achieve consumer requirements by acknowledging customers' constant alternative demands. Increasing throughput, supply engagement, and consumer successes are essential variables to execute elasticity in a firm (Gligor et al., 2015). Al Samman (2014) suggested the execution of flexible and lean methods illustrate positive outcomes for enterprises. The ways are fast, effective responses to turbulent market requirements that keep enterprises competitive, including consumer input. Lean manufacturing achieves better customer service levels and higher profit margins due to lower customer lead-time and higher customer satisfaction at lower prices and product quality (Camacho-Miñano, Moyano-Fuentes, & Sacristán-Díaz, 2013).

Customers must be linked with the design framework at the inception of the process. The beginning consumer requirements (final requirements unnecessary) could be distributed and molded at the new goods or service stage (Singh Sangwan, Bhamu, & Mehta, 2014). Company connections with consumers and repeat customers are also essential in lean manufacturing applications (Singh Sangwan et al., 2014). Consumers contemplate their purchases based on concepts such as price, lifestyle, brand loyalty, and value before buying a product, so it is critical to creating an excellent business connection with them (Naveen, Sunil, Sanjay, & Abid, 2018). Developing excellent business relationships with consumers will allow the enterprise to comprehend and achieve their requirements and anticipate their customers' desires correctly, with the critical intent to acquire an accurate link among market requirements and manufacturing movements (Naveen et al., 2018).

Connecting Lean Methodology and Enterprise Strategy

Skinner (1969) concluded manufacturing throughput was the missing link in corporate strategy as described in his seminal work and several research studies of structured performance. Strategic models have since been created to aid the work with throughput strategy in the manufacturing industry (Hayes & Wheelwright, 1979; Hill & Hill, 2009; Miltenburg, 2005; Slack & Lewis, 2011; Wheelwright, 1984). These models have demonstrated beneficial knowledge for manufacturing enterprises when developing future throughput systems or enhancing preexisting systems. A manufacturing enterprise's strategy is essential to effectively lead various production functional departments, mainly through turbulent issues. A production strategy assists an enterprise in delivering operational and strategic decisions. These decisions pursue a coherent model that supports the enterprise strategy and the firm's competitive preferences (Hill & Hill, 2009). The absence of an approach leads to decisions that could be subjective and unreliable (Miltenburg, 2005), culminating in an underachieving manufacturing process. Manufacturing strategy includes decisions that form the long-term capabilities of a manufacturing enterprise. They are competitive in the industry through industry requisites and manufacturing resources (Miltenburg, 2005; Slack & Lewis, 2011).

The strategic importance of implementing lean manufacturing into an SME business model could be the difference between the firm's success and failure as an entity in the challenging global competitive industries. Manufacturing strategy has established itself as a critical function in accomplishing the objectives that a manufacturing company's enterprise strategy has planned (Chatha & Butt, 2015). Lean manufacturing is widely known as a management theory that persists in the process-oriented eradication of waste. The process is a system of operations, through a collection of interdependent work activities, to manufacture products at an adequate and effective standard (Yang et al., 2011). Lean manufacturing delivers numerous business advantages, like decreased lead times, higher throughput, and lower amounts of scrap and rework (Elmoselhy, 2013). Cost contractions are one of the most critical elements of a successful lean manufacturing strategic initiative. They can establish superior business results because the entity is now a lean manufacturer (Ghobakhloo & Hong, 2014).

Strategic planners have used manufacturing methods to gain a competitive edge among their rivals and market challenges that embrace lean methodology (Inman, Sale, Green, & Whitten, 2011). Strategy and alignment are intrinsic to maintain lean manufacturing advantages for an enterprise. The plan is about improvement and setting the direction of the organization. The arrangement ensures that everyone understands the strategy and that everything they do contributes to achieving the organizational goals (Buckley, Prewette, Byrd, & Harrison, 2017). The most effective approach is to measure and monitor the enterprise strategy's advancement and lean manufacturing methodology by implementing and using key performance indicators (KPIs) per Buckley et al. (2017). There must be a secure connection among KPIs, the strategy, and the lean manufacturing improvement project if the business meets its improvement objectives (Buckley et al., 2017).

Connecting Lean Methodology and Suppliers

Resource dependence theory has grown more significant over the years for researchers attempting to interpret enterprises' activities in inter-organizational accords (Hillman, Withers, & Collins, 2009). Resource dependence theory is primarily leveraged through the seminal work of Pfeffer and Salancik (2003). They deliberated the actions of enterprises that are not selfsufficient in contributing to the necessary resources for business sustainability on their terms (Paulraj & Chen, 2007). Enterprises consummate transactional connections so they may acquire admission to the resources they desire and need (Pfeffer & Salancik, 2003). When the principal enterprise does not have access and command of the resources required for their business to produce, the operation faces anxiety regarding their sustainability (Hillman et al., 2009). These buyer-supplier relationships characterize two long-term transactions (Dwyer, Schurr, & Oh, 1987) that, over time, reciprocate outcomes of vertical cooperation between a purchasing and supplying enterprise (Hakansson, 1982).

Manufacturing processes that concentrate on decreasing waste and non-value-added exercises within plant activities are valuable benefits of lean manufacturing. Enterprises have also declared their endorsement of lean manufacturing methods through their logistics partnerships (Perez, de Castro, Simons, & Gimenez, 2010). A supplier ecosystem is an essential element of a useful lean manufacturing model (Furlan, Vinelli, & Dal Pont, 2011). Enterprises that adopt lean manufacturing believe in the strengths of a superior supplier framework that can enhance business operations. Close relationships with suppliers are indispensable for the triumph of lean methodology. A lean methodology system requires buyers and suppliers to work together as strategic collaborators for mutual benefits to eliminate waste. One of the essential requirements of a lean methodology system is on-time delivery from suppliers (Godinho Filho, Ganga, & Gunasekaran, 2016). Suppliers must be able to deliver materials on a JIT basis. For this purpose, the buyer must design a transportation system compatible with JIT delivery. These facilitate the suppliers to deliver their products as promised.

Another supplier network attribute is a long-term relationship with suppliers (Godinho Filho et al., 2016; Sharma, Dixit, & Qadri, 2015). Rose et al. (2014) suggested that companies maintain a long-term relationship with fewer suppliers that have been proven credible and certified for quality. Numerous aspects, such as enhanced quality of materials, improved product quality, reduced lead-time, and increased productivity, are significant benefits of long-term relationships with fewer suppliers (Kaynak, 2002). Lean methodology systems require a high capability of suppliers to ensure the smoothness of production. Supplier development programs should regularly be conducted by a lean manufacturer to safeguard their capacity (Jayaram, Vickery, & Droge, 2008; Shah & Ward, 2003). Through the plans, the suppliers can be more involved in various parts of companies' activities.

Developing alliances with logistic partners at collaborative and critical planning stages, manufacturers identify hidden chances that could equate to more exceptional manufacturing dependability. The partnerships can attract supply chain collaborations capable of assisting in the pursuit of enhancing enterprise monetary value of their cost of goods sold and holding a competitive edge in the marketplace (Perez et al., 2010). Lean manufacturing has shown the ability to affect a firm's supply chain and logistics functions through collaboration and alliances, with external partnerships dedicated to improving process flow. Through teamwork and associations, there is a joint commitment to improve the system of a process flow. The improvement equates to monetary savings and best practices that can, in turn, help the external partnerships grow with other clients creating business value for every client in the business ecosystem. The approach also enhances the competitive edge over rivals who are not entertaining the model of lean manufacturing.

Connecting Lean Methodology and Human Resources

Drucker (1954) created the phrase human resources in his seminal work "The Practice of Management" and concentrated on utilizing it to direct operations, lead managers, and guide individuals in their job functions. Scholars and practitioners both give acclaim to the employees' approach as the most significant irreplaceable resource of any company. The people are accountable for exercising proper judgment to complete organizational activities at every level of the enterprise (Haslinda, 2009). Companies have progressed from a diminished manufacturing-driven entity to an increased employee-centric body. The role of human resources in enterprises has transitioned in the context of its service and leverage to the entire organization (Thoman & Lloyd, 2018). Human resources' intent has transformed from the human capital director's primary functional responsibility to the strategic function of cultivating and preserving a compelling, well informed, and forward-looking career-oriented workforce (Thoman & Lloyd, 2018).

Organizational members experience tremendous trepidation when faced with the idea that their company will be implementing a new approach to their business operation through the improvement methodology of lean manufacturing. Human resource management can assist in the appropriate guidance of the challenge's employees experience during the implementation of lean. Enterprise workers demonstrate opposition to functional alterations, exhibit emotional concerns, show non-lean actions that can lead to the absence of employee empowerment (Zhang, Narkhede, & Chaple, 2017). Lean is designed to eliminate waste and decrease expenses, which employees have seen many times as a threat to their future employment. According to Zhang et al. (2017), this phenomenon equates to workers not engaging the lean manufacturing implementation and could cause employees to oppose the alterations demanded by successful lean incorporation. A recent research study on the use of lean in a tire manufacturing enterprise concluded that human resource leaders could exhibit a significant role in managing that alteration effectively (Shah & Patel, 2018).

Human emotional challenges, like safety, ergonomics, the absence of a keen interest in learning new required competencies and disregarding the exchange of relevant information and teamwork will create an impediment to winning lean incorporation into any enterprise (Zhang et al., 2017). Organizational members' empowerment to make decisions and resolve lean manufacturing implementation challenges can significantly enhance a worker's inspiration, energy, and gratification (Zhang et al., 2017). Lean manufacturing and human resources are also connected from an emotional and guidance standpoint, and Beauvallet and Houy (2010), toward the social aspect, are critical to comprehending the technical segment of lean from an alternative view. Alagaraja and Egan's (2013) research study highlighted the influencer characterization of cross-functional standards through human resource management while simultaneously embracing lean manufacturing (Yorks & Barto, 2013). Human resource management can be contemplated as the mirrored image of the lean manufacturing methodology (Magnani, Carbone, & Moatti, 2019). This conclusion is supported by a study that examined and suggested human resource processes and human-oriented principles support lean manufacturing advocacy (Sparrow & Otaye-Ebede, 2014). Gollan, Kalfa, and Xu (2014) proposed a synergistic connection between lean and human and technical aspects.

Human resource management provides knowledge, skills, and abilities when interpreting continuous improvement models such as lean manufacturing processes that enhance the social aspect assimilation (Sparrow & Otaye-Ebede, 2014). Researchers contend that human resource management, when concentrating on the cultivation of mutual lean proficiencies, does appear to create strategic employee actions that support the enhancement of the lean endorsement application gradually (De Koeijer, Paauwe, & Huijsman, 2014). Some researchers also suggested that when human resource practitioners do not engage in the endorsement, workers and leaders enhance their unwillingness to embrace lean methodology completely (Thirkell & Ashman, 2014). Human resource management processes and governing doctrines, which are images of the human element, promote collaborative employee actions. In conjunction with building knowledge, skills, and abilities, human resource activities are critical in implementing lean (Magnani et al., 2019). Human resource management activities show a construct of positive employee attitudes toward converting to lean manufacturing methodology to mentor organizational members' future expected behaviors (Magnani et al., 2019). Lean manufacturing affects employee professional growth, continuous learning, and team activities (Magnani et al., 2019). Employee growth initiatives and collaborative behaviors among managers and employees appear to foster the position of singular and collective lean applications (Magnani et al., 2019).

Reward Systems

There is a strong correlation between recognition and performance. Fred Luthan's seminal works have been influential in proving the positive reinforcement impacts of gratitude related to results. Beneficial effects of reward systems on organizational workers' outcomes have been identified in manufacturing enterprises (Luthans, Maciag, & Rosenkrantz, 1983; Ottemann & Luthans, 1975; Welsh, Luthans, & Sommer, 1993). Allen and Helms (2001) tried to recognize enterprise performance's motivations with reward practices as the independent variable. These researchers discovered four reward applications to be statistically significant prognosticators of enterprise performance: employee stock ownership plans, single employee-based performance plan, consistent announcements of gratitude by leaders at every level of the organization to employees, and customer satisfaction auditing connected to rewards.

A research study on the implementation of lean manufacturing methods in pharmaceutical SMEs concluded that reward systems could positively affect workers' inspiration.

Reward systems consisting of financial or non-financial enticements can successfully change organizational members (Sieckmann et al., 2018). The application of employee monetary and non-monetary compensation to stimulate alteration is an essential management command procedure (Merchant & Stede, 2012). Non-financial enticements or individual development enticements through training or educational engagements, which are appropriate in SMEs because of monetary constraints, are compelling in building a continuous learning environment (Sieckmann et al., 2018). Reward systems are definitively critical when organizations are engaged in implementing lean, which requires many workers to participate in the model's success (Netland, Schloetzer, & Ferdows, 2015). Reward systems can inspire an entire manufacturing unit's workers to enhance their section of the production system continually (Fullerton et al., 2003). In specific instances and environments, financial bonuses linked to process improvements, such as lean manufacturing, can be hugely successful (Veldman, Klingenberg, Gaalman, & Teunter, 2014).

Project Management Skills

The inception of contemporary project management has its roots in the 1950s and 1960s through engineering accomplishments, specifically by the U.S. military and defense contractors. Current project management has excelled in the modern era and was stimulated by the eighteenth-century doctrine, which demonstrated undeniable conviction to the elements of logic, science, and advancement (Giddens, 1990; Hamilton, 1996). Project management accentuates a project's design mastery while establishing concise project goals and restrictions at the start of the initiative (Gauthier, & Ika, 2012). This mastery definitively creates a connection of contemporary project management to the scientific management methodology (Joffre, Aurégan, Chédotel, & Tellier, 2006). The project management model's purpose is to optimize the opportunity, expense, and quality triangle. This model directs prudent and capitalistic, identifying the most economical approach to accomplish objectives and producing earnings in a competitive marketplace (Gauthier & Ika, 2012).

The practical implementation of lean manufacturing processes can be complicated for organizations that do not use a systematic framework to manage it. The absence of a coordinated effort supports an organizational management process that can result in a complex lean implementation and can lead to the possibility of a non-synergistic approach (Kosieradzka, 2017). It is apparent that seeking enterprise excellence in the classification of manufacturing management methodologies, such as lean manufacturing, necessitates concurrently and coordinates every cited management process (Kosieradzka, 2017). Research has suggested that the most effective and efficient means to incorporate lean manufacturing is by using project management proficiencies (Losonci & Demeter, 2013). Losonci and Demeter (2013) contend that project management methodology can extensively affect an enterprise's performance from lean manufacturing implementation. The impact is on inventory turnover, quality assurance, production periods, labor performance outcomes, utilization of available warehouse square feet, production capacity, elasticity, product mix, and expenses.

The previous concepts described above that identify a strong correlation between implementing lean manufacturing and project management principles are available to increase the lean manufacturing implementation (Dal Forno, Pereira, Forcellini, & Kipper, 2014). Monitoring, controlling, and documentation are the core components of any project management endeavor. Even if an enterprise does not consider another approach, a useful, authentic project management model based on the Project Management Institute's standards can still be achieved successfully. The alignment of an established support system, the completion of enhancements, and in alignment with activities that guarantee the preservation of the lean manufacturing process, additional frameworks of the monitoring, controlling, and documentation processes are applied for success (Sieckmann et al., 2018).

The lean manufacturing implementation's performance goals can be established and continuously measured by a designated KPIs sequence. KPIs are required to be coordinated with the enterprise's strategic objectives and consistently be examined in an explicit configuration so that every stakeholder can follow the advancement of the lean manufacturing implementation (Prasanth, Jagathy, & Pramod, 2015). Should an apparent divergence occur in the established plan, corrective actions must be enjoined. All completed lean manufacturing connected activities are recorded in a systematic approach that delivers knowledge, skills, and abilities foundation for new projects and the enterprise's continuous education (Prasanth et al., 2015). Displaying and deliberating the accomplished performance outcomes to the organization on dashboards helps organizational members inspire and ensure support of the enterprise’s leadership moving forward (Sieckmann et al., 2018).

Synthesis of the Research Findings

Whenever enterprises decide they want to implement a new project into their company, one of the immediate questions is how large a monetary investment will it require to launch. More importantly, what financial return on investment will be acquired after the project's launch and in what period is answered. One of the well-documented practices of lean manufacturing is to possess the proper elements of the appropriate quality and amount in the proper location and the right moment (Fullerton & Wempe, 2009; Womack et al., 1990), concluding that waste is eradicated under this framework of the lean model. One could hypothesize that lean manufacturing enterprises will demonstrate higher manufacturing results and financial achievement (Fullerton & Wempe, 2009; Hofer, Eroglu, & Hofer, 2012; Yang et al., 2011; Zhu & Lin, 2017). The advancement in operational results should power a decrease in expenses and non-value added activities, and subsequently affect financial results (Fullerton, Kennedy, & Widener, 2013; Gustafsson & Johnson, 2002; Sila, 2007; Sila, 2018). The enhancement of the throughput decreases a manufacturing enterprise's operational expenditures and improves the company's monetary bottom line (Fullerton et al., 2003; Yang et al., 2011).

Zhu and Lin (2017) suggested explicitly or inexplicitly that lean manufacturing bolsters the idea that it creates higher financial results and organizational value for investors. There has been some research that has concluded that the financial performance of lean manufacturing is varied at best (Fullerton, Kennedy, & Widener, 2014; Fullerton & Wempe, 2009). A single research study by Zhou (2016) definitively expressed the exact monetary effect (profit margin) of lean application in SMEs, which demonstrates a significant void in the scholarly study of SMEs. Small enterprises are uncomfortable incorporating lean manufacturing methods into their company because of high expenses and resource commitments. Unlike large companies, small and medium enterprises use limited resources to commit to lean activities and often have restricted connections to capital (Kennedy & Hyland, 2003). Kennedy and Hyland (2003) featured firms that concentrated only on waste eradication without comprehending the distribution of useful resources could not accomplish prosperity in relationship to receptivity. The challenge is additionally precarious in SMEs.

This challenge is the deficiency of specific talent that can give insight into the requirement to employ increased human resources to assist in the real incorporation (Achanga et al., 2006) because of the criticality to have enough organizational members to perform in the process of creating a lean program that delivers success (Achanga et al., 2006). Qualified training must be presented to the entire leadership team members, which is another necessity for success. Skills and lean framework capability are critical components needed for positive application mechanisms and processes brought into the organization through its leadership (Achanga et al., 2006). The framework constitutes considerable financial resources and human capital resources dedicated to lean manufacturing training and comprehension activities that may not be available in SMEs (Cassell, Worley, & Doolen, 2006).

Cassell et al. (2006) also suggested that lean processes' winning implementation strategies necessitate firms to create a definitive human resource that displays superior leadership skills to enlist tenacious project leadership and exchange information throughout the enterprise's abilities. The human resource aspect is critical because (Achanga et al., 2006), too many SMEs deploy organizational members below capable knowledge and cannot improve their intellectual competence. The conclusion of this examination highlights the negative aspects of lean at the fundamental center of manufacturing improvement methodological frameworks, like the lean manufacturing theory because of various interruptions along the operational, procedural path that necessitates an enterprises member illustrate knowledge, skills, and abilities (Achanga et al., 2006).

Organizations to comprehend the advantages gained from utilizing lean manufacturing methodology, the implementation process must demonstrate effectiveness in practice, and the most appropriate CSFs are required to be analyzed (Driouach, Zarbane, & Beidoduri, 2019). Lean manufacturing will be subject to many barriers along the path to the completion of its implementation. The examination of important CSFs that could mitigate these obstacles and deliver a successful lean manufacturing conversion is contingent upon many factors. It is then imperative to pinpoint the essential CSFs that can allow enterprises, particularly SMEs, to implement successful specific continuous improvement methods such as lean manufacturing (Driouach et al., 2019).

Critique of the Previous Research Methods

SMEs are essential economic foundations for the United States and countries abroad. Specifically, manufacturing SMEs create employment, wages, medical benefits, goods, and build robust businesses that strengthen a nation's economic competitiveness (Kiatcharoenpol, Laosirihongthong, Chaiyawong, & Glincha-em, 2015). By implementing lean manufacturing methodology, firms could accomplish advanced process improvement with a quantum leap in more significant financial results and production volume, quality products, and customer satisfaction. Manufacturing SMEs typically encounter a challenging uphill battle to implement a lean methodology (McGovern et al., 2017). One of the major arguments by researchers contends that the absence of critical success factors is a significant reason why lean manufacturing methodology is challenging to implement in SMEs (Hu et al., 2015).

The methodological strengths of the literature reviewed for this study helped comprehend essential CSFs from previous research conducted on manufacturing SMEs that could help in a more effective, efficient, and successful lean manufacturing implementation for SMEs looking to improve operational performance. Research studies that analyze current knowledge about manufacturing SMEs and the application of lean using CSFs help reduce the void in the literature by contributing additional awareness into the most CSFs within enterprises that previously have effectively incorporated those methodologies (Alhuraish et al., 2017). The method's performance outcomes will help enterprises develop more accurate and meticulous decisions that involve CSF methodology. In the pre-implementation phase, enterprises can establish how to deploy their competencies, capabilities, and resources to achieve the CSFs to implement lean manufacturing (Alhuraish et al., 2017).

The research methodology of the literature reviewed has some limitations. The beliefs of lean manufacturing practitioners can be an inaccurate measure of critical success factors. They can divulge what these organizational stakeholders believe assists success instead of what is impartially proven to assist progress (Netland, 2016). Another limitation that could be considered is that practitioners might be biased toward what comprises CSFs. The possibility of a universal and mutual, yet not unquestionably accurate comprehension of success factors is stemming from the examination of the literature and enterprise stakeholders (Netland, 2016). The limitation is further expanded in the research literature through the elements of similarity and commonality. The literature reviewed encompasses manufacturing SMEs of similar sizes, industries, regions of the globe, and challenges to implementing lean. Similarity and commonality should not be rejected because of the measure of the deviation in lean manufacturing implementation, even with those enterprises being comparable in size, industry, geographical locations, and industry segment (Bon & Kee, 2015). The literature also consists of different sectors and geographic places worldwide, with performance outcomes that may not be generalizable to other nations. Earlier research has suggested that country dissimilarity could affect lean manufacturing implementation and results (Ahmad & Schroeder, 2003). The present research study eliminated that challenge by utilizing only enterprises located in the United States' South Atlantic region.

An opposing viewpoint of lean manufacturing is whether its methodology can be utilized successfully in every organization regardless of its size. Some researchers suggest lean manufacturing is best suited for large enterprises. Lean manufacturing has been steadily gaining momentum as a legitimate enterprise improvement methodology for every business category that could boost every operation aspect. Several researchers have concluded that the predominately large companies have launched successful strategic lean manufacturing initiatives with the intent to improve their business (Bhamu & Singh Sangwan, 2014). This conclusion provokes the question of lean's applicability to SMEs. Another opposing viewpoint is how challenging lean manufacturing is to implement into any enterprise. Scholarly and managerial literature have suggested that lean manufacturing is an extremely professional approach and a simplistic pathway toward a business's process enhancement, increased capacity, and other value-added business improvements (Viagi, Panizzolo, & Biazzo, 2017). In contrast, researchers have concluded that lean manufacturing approaches equate to complicated and elaborate principles that may be effectively deployed in a corporation like Toyota but may not establish comparable effective outcomes in other enterprises per Viagi et al. (2017).

Although lean has extensively enhanced the manufacturing industry, academic research on the topic is limited, specifically research conducted on what approach supports an effective and efficient lean implementation for SMEs (Kiatcharoenpol et al., 2015). By performing the research study through the rationale of the dissertation's theoretical section, the limitations and contrasting arguments of previous research studies can be more closely comprehended surrounding lean manufacturing in SMEs and the utilization of CFSs toward effective organizational implementation. Lean manufacturing is a unified set of standards, procedures, instruments, and techniques constructed to resolve the underlying causes that create a substandard operational performance (Nguyen, 2018). Lean manufacturing is a systematic approach developed to remove the causes of inefficiency from an enterprise's complete value stream to reduce the void between actual performance and the planned performance demands of customers and stakeholders (Nguyen, 2018). Simply stated, lean manufacturing aims to optimize expenses, production, quality of products, and delight customers.

CSFs linked with lean manufacturing methodology are utilized to empower lean cognition and collaborations between them that delivers an effective lean implementation (Jani & Desai, 2016). CSFs are considered a finite dimension of satisfactory outcomes that will ensure a winning competitive performance for the organizational member, departments, or enterprises (Nguyen, 2018). It is critical to pinpoint and examine the factors that can establish a successful approach toward a lean manufacturing implementation and negate the possibility of failure (Nguyen, 2018). Suppose CSFs are not identified, linked, and accentuated with the application of lean manufacturing. In that case, there could be a clear distinction in the success achieved regarding deficits of enterprise resources, such as time and monetary expense (Jani & Desai, 2016). When SMEs are determined to initiate a lean manufacturing project implementation, CSFs represent indispensable components that give the application an opportunity for success, and without them, that opportunity diminishes significantly (Jani & Desai, 2016).

Summary

Found in this section resulted from combining the Chapter 2 relevant literature and its established position on the research study's questions and theoretical framework, the research of CSF theory, with the application and practice of lean methodology. Chapter 2 explained manufacturing improvement methodologies by describing the effect the lean approach can have on increasing enterprise business viability. Specifically, Chapter 2 also examined the relationship between CSF theory, the chosen CSF elements to be researched in a lean manufacturing model with applicability toward the context of enhancing manufacturing SMEs. The ever-changing scale of the economy related to global competitiveness has pushed U.S. manufacturing companies to become better at their capability, withstand the surge of constant rivals in their industries, and quickly take an offensive position. This approach requires the incorporation of proven methodologies designed to eliminate misuse of enterprise resources. The method also improves processes that sustain and, in many instances, bolster a competitive edge, which solicits smaller needed enterprise resources to remain viable in the marketplace.

Lean methodology has been researched and is a legitimate manufacturing improvement method that, when implemented accurately, is a proven approach that effectively and efficiently transforms underperforming businesses into highly productive and financially winning organizations. Lean manufacturing has emerged as an important segment of the viability response to global competitiveness and enterprise viability (Cherrafi, Elfezazi, Chiarini, Mokhlis, & Benhida, 2016). CSF theory suggests that leaders of enterprises have a limited amount of time to spend on organizational actions. It is imperative to quickly identify the required results-driven exercises and implement them for effective and efficient performance results (Bullen & Rockart, 1981). CSFs play a significant role in determining the most practical elements required to use the manufacturing improvement methodology of lean manufacturing successfully.

Lean manufacturing can be characterized as a management philosophy founded on the Toyota production system whose objective was to eliminate waste throughout the production process continuously. Lean manufacturing has been globally acknowledged as an engaging enterprise model that demonstrates a meaningful proportion of manufacturers, incorporating some type of deviation of the practice (Abolhassani, Layfield, & Gopalakrishnan, 2016). The operation of lean manufacturing is not effortlessly correct for all businesses. When enterprises begin to learn how to administer lean manufacturing approaches in their plants, there will be astounding blockades and issue boundaries with challenges for an effective lean deployment

(Almeida Marodin, & Saurin, 2015). There are significant challenges and hurdles to overcome when attempting to identify the most appropriate manufacturing improvement methodology. It is essential to do further research and determine the significance of CSFs. This research study may extend the research model created by Taner (2012), endorsed by Alhuraish et al. (2017) with recommendations for the identified limitations.

CHAPTER 3. METHODOLOGY

The purpose of this study was to explore to what extent the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations and if there were differences between companies that have or have not implemented lean. The study was conducted in the United States South Atlantic area. The literature review provided insight into the various continuous improvement methodologies, CSF theory, lean manufacturing implementation, and the 13 specific CSFs studied. This study analyzed the 13 independent variables (characterizing potential CSFs) for manufacturing SMEs and the dependent variable, which was the importance of the CSF, as similarly demonstrated by Taner (2012) and recently adapted by Alhuraish et al. (2017).

The study included analyzing differences of CSF importance between company size and lean implementation status. Lean manufacturing methodologies have been widely used in many companies worldwide. Quite a few enterprises have experienced tremendous challenges in successfully incorporating and sustaining a lean manufacturing model (Alhuraish et al., 2017). Enterprises need to identify and comprehend the critical success factors for effectively incorporating lean manufacturing improvement methodologies (Alhuraish et al., 2017). The study analyzed the importance of CSFs and any difference between companies' sizes and lean implementation status. There were two research questions and hypothesis based on the literature of Alhuraish et al. (2017) as follows:

RQ1. To what extent does the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations?

RQ2. To what extent does the importance of the 13 lean CSFs differ between companies that have implemented lean and those that have not implemented lean?

The Chapter 3 outline consists of the following sections: the research studies design and methodology, population and sampling, setting, data collection process, instrumentation, hypotheses, data analysis, validity and reliability, ethical considerations, and the summary of the chapter. Chapter 3 intends to detail the research study's methodology utilized to analyze the importance of CSFs and if there is any significant difference between companies' sizes and their lean implementation status. The findings can help manufacturing enterprises improve their lean manufacturing implementation and realize the benefits of a more significant competitive business.

Design and Methodology

Research design is a strategic process that researchers implement into a scientific examination that captures empirical confirmation (data) concerning isolated variables of significance. Researchers commonly conclude assumptions concerning the constructs of their research question from the information they acquired. The research study's approach is to decrease bias, misrepresentation, and random error (Wang, 2015). This research study's methodological path and design were parallel with its research purpose and research questions, which suggested utilizing and analyzing the research framework and hypotheses recommended by Taner (2012), and later adapted by Alhuraish et al. (2017). This research study investigated the significance of 13 identified potential CSFs to comprehend the magnitude of their importance to SME manufacturing companies in the South Atlantic area. Taner (2012) built the model on the concept, theory, and method of CSFs (Bullen & Rockart, 1981; Daniel, 1961; Rockart, 1979). This research study included the independent and dependent variables, constructs, test hypotheses, and responses to definitive research questions measured by the scholarly models of an explanatory, quantitative, and the Likert type survey research design of Taner (2012).

Research design and methodology are applicable principles and processes implemented to acquire and examine the scope of the fluctuations stated in the research study's problem. Inferential statistical methods tested the hypotheses of any difference in importance for 13 independent variables (CSFs) and the dependent variable (significance of the CSF) between two separate groups of two categories. Measuring and analyzing the independent and dependent variable relationships were a guide for defining which CSFs were rated important by the participants. It was critical to ensure that the research design was devoid of any unintended bias or mistakes that could skew the data toward inaccurate conclusions.

Population and Sampling

The population criteria for this study encompassed a group currently involved with the leadership of SME manufacturing enterprises. In SMEs, as it relates to lean, this group included individuals that function as managers and supervisors. In organizations, titles and departments of individuals may or may not describe their actual function. The population targeted was individuals who are responsible for any aspect of manufacturing in the enterprise. The selection criteria stemmed from employment at a manufacturing SME and an individual's answer to whether they are involved with the company's manufacturing leadership. With the population defined, the estimated sample size of the sample was calculated.

Population

The study included manufacturing SMEs in the South Atlantic region. Specific contact information from an area manufacturing association membership base was used. There were 201 member companies in the association. Of that membership base, 131 were manufacturing companies. The population was the employees of the 131 manufacturing SMEs responsible for manufacturing.

Sample

The core group was identified through the database of a manufacturing association. The manufacturing association's database includes specific contact information on individual employees from membership information. This membership database contains approximately one-third of the total population of SME manufacturers in the geographical region chosen for the study. As described in Chapter 1, the membership database includes 131 manufacturing companies. Using a census survey method, all the employees who have contact information in the 131 manufacturing companies were contacted. The individuals' data responding to the study included that they met the company's criteria of function (responsible for any aspect of manufacturing), and the company matched the definition of an SME. Exclusion criteria were if the participant did not answer all the questions, their data was not included. Creswell and Creswell (2017) emphasized the selection of participants in a study should authentically represent the entire population within the segmented target.

Power Analysis

As stated in the previous section, the target population total was estimated as 131 persons. When planning this study, an essential step was calculating the minimum sample size required to meet the study objectives (Flight & Julious, 2016). Estimating the number of participants is required to give a meaningful result in any research study (Flight & Julious, 2016). The survey used a five-point Likert scale for the question supporting the hypotheses.

Likert scale data are ordinal and discrete with a limited range. In the two-sample *t*-tests are used in calculating differences in mean in Likert scale data (Gliem & Gliem, 2003). G*Power was engaged in calculating the sample size, a confidence level of 80%, an effect size of .5, and a margin of error of 5%. A minimum sample size of 58 was necessary.

Employees responsible for any aspect of manufacturing in SMEs represented the targeted population for this research study. This information was established by answering the question in a survey. These individuals were the most likely organizational members to have the knowledge, background, and experience necessary to answer each manufacturing enterprise's research questions. The SMEs were manufacturing companies located in the South Atlantic area of the United States of America with contacts in an area manufacturing organization database.

The survey recruitment and enrollment for participants in the research study began with collecting contact information from previous consultant work performed in the South Atlantic area. This work led to an area manufacturing association and its current Chairman of the Board, who offered to recruit potential participants through its extensive membership database. The membership database allows access to manufacturing contact information, including company names, employee names, job departments, phone numbers, and e-mail addresses. A job department may or may not indicate whether the employee is responsible for manufacturing in any organization. Due to no standard department nomenclature, all names in the database were invited by e-mail to voluntarily engage in the research study.

If the employee responded to the request, SurveyMonkey was used to provide general information, the survey questions, and collect the survey data. The survey began with a brief description of the study purpose and privacy information. There were questions asked to understand the employees responsible for manufacturing and whether the company is an SME. If the participant did not qualify to answer the survey, they were excluded and directed to a message thanking them for their time. If the participant did qualify, they were directed to the body of the survey. The survey utilized a 5-point Likert scale to establish answers to the 13 independent variables and the one dependent variable. If the employee did not answer all the questions, their data were excluded.

Setting

Previous consultant work performed in the South Atlantic region led to an area manufacturing association. The association has an extensive membership database, including 131 manufacturing companies. Higher than 90% of the member companies are SMEs, making the data from the membership list an appropriate source of participants for the study.

Globalization and the rapid advancement of innovation have affected manufacturing businesses around the world. SMEs who do not have substantial resources to implement the latest technology to remain competitive in their market must engage other methods to stay a viable company against their rivals. One approach that can help keep SMEs sustainable is implementing a continuous improvement method like lean manufacturing. Lean manufacturing will establish itself as the accepted manufacturing method in the new millennium (Rinehart, Huxley, & Robertson, 1997). A successful lean implementation benefits companies to become more effective and efficient with their manufacturing processes, creating higher performance results per Alkhoraif, Rashid, and McLaughlin (2019). Many SMEs have saved millions of dollars by decreasing expenses by utilizing the lean theory of waste eradication (Minh & Nguyên, 2015). There is a contrast to the success of implementing lean manufacturing as well. Lean can be a complicated and costly initiative for organizations that do not comprehend its methodology, ultimately leading to a failed implementation and lost resources. That is where the strength of CSFs becomes imperative to a successful lean implementation. An effective lean manufacturing conversion relies on many factors. It is required to highlight the most significant

CSFs that can enable corporations, particularly SMEs, to implement continuous improvement practices like lean manufacturing successfully (Driouach et al., 2019).

This research study was advantageous for the organization, its affiliated membership of manufacturing SMEs, and the researcher. The research study was beneficial because it provided data on whether there was a significant difference of importance between the 13 lean CSFs among small and medium-sized manufacturing locations and SMEs that have implemented lean and not implemented lean. This study concerning lean CSFs provided a robust framework for effective and successful implementation of any future lean manufacturing initiatives desired by the stakeholders associated with this research that requires gaining a competitive advantage.

Data Collection

A local manufacturing association's contacts list was utilized to identify potential participants, and those qualified individuals were sent invitation emails representing manufacturing companies in the South Atlantic area. The system used to deliver information and collect responses was SurveyMonkey. Exclusion questions were programmed into the beginning of the survey to allow for individuals not qualified to opt-out from responding. Each of the questions in the survey instrument was formatted into SurveyMonkey as a separate page. As per Kelley, Clark, Brown, and Sitzia (2003), every prospective respondent received a cover letter containing background information concerning the study, the researcher's full name, and phone number. The letter also specified why the possible participants were chosen, the research purpose, potential benefits and abuses, and the data disposition. The cover letter encouraged the respondent to participate in the study and explained the informed consent protocol (Kelley et al., 2003). The recruiting process incorporated an e-mail that explained the purpose of the research study, including the survey, when the questionnaire was open to complete, estimated average time to finish the inquiry, and when the ability to finish the investigation was closed. The survey was left open for a response for two weeks. The survey was completely anonymous, but the system identified which individuals had not responded to the survey. Reminder emails were sent to encourage participation response. Data from the responses was exported into MS Excel for storage and organization. Respondents that did not fully complete the survey had their answers not included.

Informed Consent

Capella University has developed informed consent templates authorized for use by Capella doctoral students for their research studies and approved by the IRB per Creswell and Creswell (2017). The participant informed consent was captured through the survey study's first electronic page. Each participant then had the opportunity to read the entire contents of the informed consent document and, upon completion of the material, had the option of either acknowledging the terms and conditions of the research study and agreeing to participate or to decline to participate in the research study. Participants that agreed with and accepted the informed consent document were then forwarded to an electronic survey. Simultaneously, those who declined to participate in the study showed an automated thank you message, and the survey window closed automatically. The informed consent protocol outlined above has been deemed appropriate, viable, and meets academic rigor (Leach, Kalinowski, Onwuegbuzie, Leach, & Benedict, 2015).

Instrumentation

The foundational survey created by Taner (2012) on the merits of Six Sigma and a comparable survey that included Six Sigma and lean methods developed by Alhuraish et al. (2017) was the framework for the instrument in this research study. The tool examined the survey respondents' prospective thoughts on CSFs from manufacturing leaders in SMEs in the South Atlantic area through the lenses of lean improvement methodologies. The instrument was found to have rights of permission through the Elsevier publishing company, Copyright Clearance Center's RightsLink® service. Authorization of use was requested and granted through an online account sign-in and request process. The survey incorporated 12 questions for lean manufacturing previously used by Alhuraish et al. (2017) to understand the efficacy of the principles in the manufacturing SMEs studied. Alhuraish et al. (2017) and Taner (2012) developed the original survey instruments for their research studies that were adopted to generate data critical to answering the research questions. These are the CSFs used by Alhuraish et al. (2017):

1. Top management commitment and support;
2. Education and training;
3. Communication;
4. Involvement of employees;
5. Culture change;
6. Understanding the tools and techniques within lean methodology;
7. Skills and expertise;
8. Linking the lean method to customers;
9. Linking the lean method to business strategy;

10. Linking to suppliers;

11. Linking the lean method to human resources;

12. Reward systems; and

13. Project management skills.

This next section of the survey was followed-up with the number of employees at their location, quality initiatives undertaken, and reasons for not implementing quality initiatives (Taner, 2012).

Interval scales have the capability of nominal and ordinal scales theory with the addition of one more capability. The interval scales integrate the equality of interval, a proportional radius between 1 and 2, equals the proportional range between 2 and 3 (Cooper & Schindler, 2014). Simply stated, interval scales can be characterized by equal intervals between scale units (Cooper & Schindler, 2014). Researchers prefer the incorporation of attitude scales as an interval (Cooper & Schindler, 2014).

The respondents made use of the Likert scale of 1 to 5 while rating the importance of CSFs; for example, a rating of 1 corresponded to *not important at all*, 2 corresponded to *not important*, 3 corresponded to *neither important nor not important*, 4 corresponded to *important*, and 5 corresponded to *very important* in Taner's (2012) study. In the study, the 5-point Likert scale was also utilized in the same range of responses for each item in the survey instrument. The Likert scale was appropriate for this type of research.

Critical Success Factor Instrument

The survey incorporated 12 questions for lean manufacturing previously used by Alhuraish et al. (2017) to understand the efficacy of the principles in the manufacturing SMEs studied. The survey was intended to measure the importance of the 13 CSFs between the groups of small and medium-sized companies and between companies that have or have not implemented lean. A five-point Likert scale was used. Alhuraish et al. (2017) and Taner (2012) developed the original survey instruments for their research studies that were adopted to generate data critical to answering the research questions.

Privacy and Data Storage

SurveyMonkey was the vehicle that sent surveys to respondents and collected the data from completed studies. SurveyMonkey uses various ways to protect participants' data. The company utilizes a vulnerability management program, chooses to host providers that comply with security best practices, and has ongoing training for privacy and security for their employees. Any data exported out of SurveyMonkey for use in any way were deidentified by not including participants' names or companies. The data was transported to an external drive and secured in a locked box. After seven years, the drive data will be destroyed per current electronic security practices of clearing the external drives back by formatting back to factory settings (Creswell, 2014).

Hypotheses

Research Question 1 and Hypothesis

RQ1: To what extent does the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations?

$H1_0$: There is no statistically significant difference in the importance of lean CSFs by small and medium-sized companies.

$H1_a$: There is a statistically significant difference in the importance of lean CSFs by small and medium-sized companies.

Research Question 2 and Hypothesis

RQ2*:* To what extent does the importance of the 13 lean CSFs differ between companies that have implemented lean and those that have not implemented lean?

$H2_0$: This is no statistically significant difference in the importance of lean CSFs by companies that have and have not implemented lean.

$H2_a$: There is a statistically significant difference in the importance of lean CSFs by companies that have and have not implemented lean.

Data Analysis

Data analysis is a process of inspecting, cleansing, transforming, and modeling data to discover useful information. As stated in the Research Design section and further described in the Survey Scale section, a 1 through 5 Likert scale was used to answer questions and precisely the hypotheses questions. Some treat Likert data as ordinal and the associated statistics used to analyze data (Parker, McDaniel, & Crumpton-Young, 2002). The categories in each research question were organized into a categorical variable, dichotomous groups. While some treat Likert data as ordinal, Cronbach's alpha reliability (Cronbach, 1951) is frequently used to analyze the reliability of Likert scale data to measure internal consistency reliability (Bonett & Wright, 2015). Cronbach's alpha was calculated for each research question.

For the 13 CSF's of the two groups for both research questions, the mean, standard deviation, variance, skewness, and kurtosis were calculated. Valid and missing data were determined. The distribution of data for each group was determined with a histogram, called an independent-samples Mann-Whitney U test, showing both groups independently. This distribution graph was used to evaluate an assumption of the test method.

As just described, valid and missing data were calculated in the overall descriptive statistical analyses. The research design had taken a step before analysis to address missing data. The survey results were established with exclusion criteria. If a respondent met the inclusion criteria but did not answer all the questions, his data were excluded from the analyses. Having these exclusion criteria resulted in no analyses having missing data.

The hypotheses were evaluated using the Mann-Whitney U test. This test did not require normal data. The Mann-Whitney U test did have four assumptions. If all assumptions were not met, the same test could still be used by reporting results based on medians or distributions. The Mann-Whitney U test (new procedure) has a seven-step method for data analysis, according to Laerd Statistics (2015):

Step 1. The first step was to ensure the study design's data being incorporated conforms to the requirements of assumption one, which was either a continuous or an ordinal dependent variable. For this study, the data was ordinal. The second assumption required the independent variable to have two or more categorical and independent groups. Each research question had two categorical and independent groups. The third assumption required independence of observations. All responses were independent.

Step 2. The SPSS exercise was to prepare the two variables by selecting the variable view cell of the SPSS program and then transcribe the data into the data view cell of the SPSS program.

Step 3. This step was a decision. SPSS has two processes available to perform the Mann-Whitney U test, which is either the new procedure or the legacy procedure. In this study, the new procedure was selected.

Step 4. The SPSS exercise was completed to execute the six-step new procedure in the SPSS program that performed the Mann-Whitney U test. A part of this procedure was performing the Mann-Whitney U test so that SPSS outputted the required assumption four population pyramid figure. The figure was required to qualify whether the distribution of the two groups was an independent variable and was similarly distributed.

Step 5. The SPSS exercise was completed to execute the six-step means procedure that generates medians for the two groups being examined.

Step 6. Data and graphical data were examined. A decision was completed whether the distributions of the two groups of the independent variable were similarly shaped.

Step 7. If the results from step six of the new procedure demonstrated that the data had similarly shaped distributions of the two groups of the independent variable, it was concluded whether there are any statistically significant median differences between the research questions' two groups. If the results from step six resulted in dissimilar shaped groups' distributions, the mean rank of one group could be determined as higher or lower than the other group.

Descriptive Statistics

Descriptive statistics is a framework of arranging, compiling, and introducing data in an advantageous and educational format (respondent demographics) (Fienberg, n.d.). Descriptive statistical methods adopted by this model include graphical and numerical methods, which were selected once the type of information the researcher was attempting to uncover was decided upon (Fienberg, n.d.). Quantitative data analysis was used to organize data from the research instrument and transform it into logical formats for additional examination. This analytical research objective was to determine differences between groups through inferential statistical methods, with further interpretation by using other techniques such as descriptive statistics and graphical designs. The statistical analyses were carried out by computer programs known as SPSS and G*Power. Each of the research questions' groups was described using count and standard deviation. Mean and rank values were calculated for overall ratings and individual groups. For the highest-ranking CSFs, minimum and maximum values were reported.

The survey contained an open-ended question to list the companies' current inefficiencies. The research study was about lean CSFs. The interest was to determine if the lean methodology could improve the identified inefficiencies. A review of the participants' generated answers found general categories. Categories were populated, and the occurrences in each counted. A histogram was created to illustrate the results. Also related to lean methodology was a question about factors hindering lean implementation. The responses were formatted into a bar chart by percentage to evaluate the data.

Hypotheses Testing

Hypotheses testing for both research questions was completed using the nonparametric Mann-Whitney U test because it allowed comparing the dependent variable (CSF importance) for the independent variables between the two groups' non-normal data (Laerd Statistics, 2015). Per Laerd Statistics (2015), the 2-tailed *p*-value from the Mann-Whitney U test indicated a statistical difference between the groups if the *p*-value is less than .05. The test was completed for both questions. The statistical software SPSS was used for descriptive and inferential statistics. For both research questions, the null hypothesis test of H_0: $p0 = p1$ was determined if the Mann-Whitney *p*-value was greater than .05. If the Mann-Whitney *p*-value was less than .05, then the null hypothesis was not retained, and the alternative hypothesis was retained. Hypotheses testing was completed to determine if there were differences between two sets of two distinct groups. There were different sizes in samples, and the distribution was not normal. The

Mann-Whitney U test method was an acceptable test for the data analyses of the hypotheses' tests (Usman, 2016).

Validity and Reliability

Robust scholarly research must test for the validity and reliability of the data used to analyze study results. The analysis must also acknowledge the contribution to the present literature. After examining the study variables, each construct was measured for reliability and validity by running coefficients for each construct and reporting each scale's Cronbach's alpha values (Cho & Kim, 2015).

Validity

In the study conducted by Taner (2012), variables and survey construct incorporated in this research signify people's viewpoints concerning CSFs and the attributes of success in manufacturing improvement projects measured in implementing Likert scales. Survey elements and scales incorporated in this research are also consistent with those employed by Taner (2012). "The original Likert scale is a set of statements (items) offered for a real or hypothetical situation under study, which estimates satisfaction level. Participants are asked to show their level of agreement (from *strongly disagree* to *agree strongly*) with the given statement (items) on a metric scale" (Joshi, Kale, Chandel, & Pal, 2015, p. 397). Likert measurement estimates the level of satisfaction. The respondents used the Likert scale of 1 to 5 while rating the importance of CSFs (Taner, 2012). A Likert rating scale measurement can be a useful, reliable, and valid instrument for measuring self-efficacy (Maurer & Pierce, 1998). Using this instrument kept the survey uncomplicated leading to completion, which is an essential factor in capturing holistic, successful survey data.

Reliability

Reliability can be measured in multiple ways depending on the instrument (Polit & Beck, 2012). Typical reliability measurements are a test-retest that correlates data feedback from identical respondents at various moments, internal consistency relating to data feedback versus other data feedback, and scorer reliability that corresponds one researcher to another researcher if a scorer is finishing the instrument (Hagan, 2014). Examiners can expect the instrument's marks to be trustworthy, correct, and more probable to be assumed accurate to other examples, moments, scorers, and examples of actions, if reliable (Hagan, 2014). Implementing Cronbach's alpha reliability (Cronbach, 1951) is a measure of reliability extensively called upon in the research methodology of social and organizational sciences.

Taner (2012) had tested for internal consistency, and Cronbach's alpha values had been calculated for each performance measure. The result had been all of Cronbach's alpha values showed satisfactory levels, which were above 0.70. Cronbach's alpha reliability explains the reliability of a total or average of q measurements when understanding the q measurements could symbolize q raters, possibilities, different modes, or survey/test components (Bonett & Wright, 2015). When the measurements express numerous survey/test components, which is the most typical application, Cronbach's alpha is indicated as a measure of "internal consistency." A reliability figure will reflect 0.70 or higher outcomes (Bonett & Wright, 2015). Reliability can be demonstrated in multiple formats. Cronbach's alpha method is the most popular approach used in social and organizational science today. The premise originates from its strong capability to measure how closely approximated a set of elements are as a class or group, particularly in numerous Likert questions in a survey that develops into a scale. The researcher required the reliability of the scale.

Ethical Considerations

The research study was conducted in an ethical manner reflected in the internationally recognized *Belmont Report*. In 1979, the *Belmont Report* determined the navigation of the standards of respect for individuals, beneficence, and justice (U.S. Department of Health & Human Services, 1979) that lead present university IRB models. There was respect for all persons involved in the research study as self-governing participants, and informed consent was obtained from all persons per Institutional Review Board (n.d.). Participants received written documentation outlining the research study, the data wanted, along with a signed Informed Consent Form requirement that must be approved and signed before participating in the survey. For privacy and anonymity, an online survey site was established so participants can log in anonymously. The survey used a completely anonymous sampling of employees, leaving no record of the subjects. Study participants electronically confirmed their voluntary participation. The identity of the participants and any associated company was not disclosed, nor was there any communication asked a subject's employer, occupation, or industry. Three ethical principles guide all research involving human subjects: beneficence, justice, and respect for persons (Cugini, 2015).

The ethical processes of the article are in alignment with providing appropriate safeguards to the researcher and participants. The Capella Institutional Review Board (IRB) gave committee permission before administering the substantive data collection process. The entirety of every online reply was kept confidential until the eventual consent was given from Capella's IRB. This study provided insight into manufacturing SMEs' leaders challenged to sustain business operations that there are improvement methodologies available to increase organizational performance.

Summary

Chapter 3 detailed the research study methodology involving the importance of lean CFSs in SMEs located in the South Atlantic area in the United States. The research design selected for the research study was quantitative. The research study was a quantitative explanatory design with a Likert-type survey (Taner, 2012). The Likert-type survey captured the data from respondents. It was believed to be the most efficient and effective approach to answering the research study's questions about the importance of lean CSFs (Alhuraish et al., 2017). A quantitative research study aims to categorize characteristics by totally their sum and building statistical models that seek to interpret what has been observed (McCusker, & Gunaydin, 2015).

Researchers can also utilize instruments, like surveys, to collect numerical data (McCusker & Gunaydin, 2015). The survey results can be converted into data numbers and statistics using a computer program called SPSS for administering statistical analysis to generalize the results back to the more significant population (Creswell & Creswell, 2017). The research instruments were reliable, valid, and suitable for data collection purposes in this research study because of its implementation in a number of prior research studies. Chapter 4 is the next section of this research study. The chapter examines and deliberates the data analysis results, which incorporated both descriptive and inferential statistics that ultimately were used to test the study's hypotheses.

CHAPTER 4. RESULTS

Introduction

This quantitative study's fundamental purpose was to explore to what extent the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations and if there were differences between companies that have or have not implemented lean. The study was conducted in the United States South Atlantic area. Research has analyzed numerous CSFs that could affect the successful implementation of lean manufacturing methodology. It is imperative to identify the most important CSFs per Lodgaard et al. (2016). Chapter 4 consists of results from the research study, which includes a full description of the sample employed, a data analysis explanation that includes inferential statistical tests, descriptive tests, hypothesis testing, and ends with a detailed summary.

Data Collection Results

The core sample group was identified through the database of a manufacturing association. The manufacturing association's database includes specific contact information on individual employees from membership information. The research results were acquired from an electronic survey delivered to participants through the Survey Monkey platform. G*Power was used to calculate the sample size needed with a power of .80, an effect size of .5, and a 5% margin error. A minimum sample size of 58 was required. The database contact information resulted in sending 523 survey invitations to potential participants' email addresses. The survey was open for a response from April 29, 2020, at 12:01 AM until May 12, 2020, at 11:59 PM. There were 86 responses to the request. Not meeting the inclusion requirements were 14 individuals. This outcome resulted in 72 people answering the survey. Only 64 respondents of the 72 answered all the questions. The 64 wholly completed questionnaires were included in the sample. The survey responses used in data analysis (*N* = 64) was more than the minimum sample size of 58.

The data collection process was executed with the required number of samples to answer both research questions with statistical significance. The response rate was not as expected. In the first two days of opening, there were 42 responses from the 523 invitations. In the next four days, there were an additional three responses. A change of plan was executed, and reminder emails were sent to the individuals that had not yet responded. The reminder email resulted in an additional 19 responses. Reminder emails delivered more answers, and the plan was implemented to have reminders delivered every second day until the survey close date. Emails were scheduled to be distributed for all dates using the SurveyMonkey tool. The process and modified approach of reminder emails resulted in a 16% response rate. The researcher's expectation was a higher response rate since there was the full support of the manufacturing association to complete the survey.

Descriptive Analysis

The number of respondents employed in data analysis was used to calculate the power of the sample. Each research question had the same number of participants (*N*=64). The actual responses per question’s category are in Table 1, with the group's respective standard deviation.

Table 1. *Descriptive Statistics for Sample Size and Group*

Research Question 1	Description	*n*	Research Question 2	Description	*N*
Group 1	Small Size	17	Group 1	Implemented	43
Group 2	Medium Size	47	Group 2	Not Implemented	21

For Research Question 1, using G*Power t-tests (effect size = 1.43, n1 = 17, n2 = 47), the resulting power of the sample is .998. For Research Question 2, using G*Power t-tests (effect size = 1.43, n1 = 43, n2 = 21), the resulting power of the sample is .999.

The differentiation of the number of employees to define the size and continuous improvement methods were given. For Research Question 1, the reported number of employees was used to describe the participants as members of one of the groups of small or medium-sized companies. For Research Question 2, the respondents were asked which quality initiative(s) their manufacturing location implemented in the past and present. Table 2 shows the breakdown among types of lean and non-lean companies.

Table 2. *Summary of Quality Initiatives Implemented in Past or Present*

Quality Initiatives	Count	%
Lean	43	28%
Kaizen	33	22%
ISO certification	29	19%
Six Sigma	24	16%
No initiative was undertaken	9	6%
TQM	8	5%
Other	2	1%

Sample Data Description

The number of participants invited to answer the survey was 523. There was a response rate of 16%. The included number of responses was 58. The data collected did not have any demographic information from the participants. Cronbach's alpha value was used to test the reliability of the survey data. The alpha values greater than 0.7 indicate the data was acceptable, and values greater than 0.8 are good (Bonett & Wright, 2015; George & Mallery, 2003; Gliem & Gliem, 2003). A summary of the research question group values is shown in Table 3. All values were 0.79 or higher.

Table 3. *Reliability Summary*

Research Question 1 Group	α	Research Question 2 Group	α
Small	0.81	Implemented	0.82
Medium	0.81	Not Implemented	0.79

Analysis of Hypotheses

Descriptive statistics for the research questions' hypotheses are shown in Table 4. Research Question 1 data is shown as "SizeCSF," and Research Question 2 data is labeled as "LeanNonLeanCSF." The mean statistic was almost the same for both research questions with values of 4.30. A value of 4 on the Likert scale corresponded to *important*. Research Question 1 had a higher standard deviation, variance, and skewness value.

Table 4. *Descriptive Statistics for Hypotheses*

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
LeanNonLeanCSF	26	4.299	.328	.108	.123	.456	-.914	.887
SizeCSF	26	4.302	.335	.112	.201	.456	-.906	.887
Valid N (listwise)	26							

All data for both research questions were valid and none missing. Table 5 illustrates the details.

Table 5. *Statistics of Valid and Missing Data*

Description	*n*	Valid	Missing	%
LeanNonLean	26	26	0	50
LeanNonLean CSF	26	26	0	50
Size	26	26	0	50
Size CSF	26	26	0	50

Research Question 1 and Hypothesis

The participants were asked how important 13 CSFs were to their manufacturing location and separated into groups of small and medium-sized companies. The importance of the 13 CSFs was rated using a 1 – 5 Likert scale. For the results, the following was used for the numeric values of the Likert scale:

- 1 corresponded to *not important at all*;
- 2 corresponded to *not important*;
- 3 corresponded to *neither important nor not important*;
- 4 corresponded to *important*; and
- 5 corresponded to *very important*.

The number of employees reported by the participants' responses was used to group the companies. Group 1 was small manufacturers and included 50 and fewer employees (n = 17). Group 2 was medium-sized manufacturers that have 51 to 500 employees (n = 47). The dependent variable of the importance of lean CSFs (measured by ordinal data, Likert scale) was ranked for each of the 13 CSFs (independent variables). Inferential statistics were then used to test the hypothesis and answer the research question.

When determining if there is a difference in two groups, having ordinal, non-normal data, the Mann-Whitney U test is appropriate if the assumption of testing is met (Laerd Statistics, 2015). The assumptions of the Mann-Whitney U test are listed next with the results of the evaluation.

- The dependent variable should be measured at the ordinal or continuous level. The data was a 5-point Likert scale and ordinal. This assumption was met.
- The independent variable should consist of two categorical, independent groups. There were two independent groups (small and medium-size companies). This assumption was met.
- There should be independence of observations. A participant was either in one or the other group. No participant's answers were in both groups. This assumption was met.
- The data should have distributions with the same shape. A population pyramid histogram was plotted in SPSS (Figure 4). The groups' distributions did not have similar shapes. This assumption was not met. Differences in distributions were investigated.

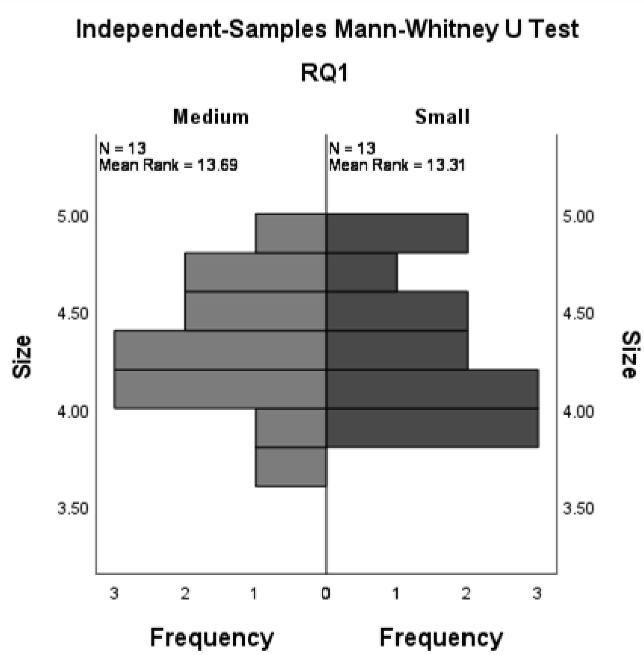

Figure 4. Distribution graph for Research Question 1.

The Mann-Whitney U test was used to test the hypothesis. The Mann-Whitney U test analysis was completed to determine the *p*-value. A *p*-value greater than .05 retained the null hypothesis. The *p*-value is shown in Table 6 and Table 7 as .920.

Table 6. *Research Question 1 Hypothesis Test Summary*

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of SizeCSF is the same across categories of Size.	Independent-Samples Mann-Whitney U Test	.920[c]	Retain the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

c. Exact significance is displayed for this test.

Table 7 also shows the Mann-Whitney U value (*U*) as 82.0 and the standardized test statistic (*z*) as -.128.

Table 7. *Research Question 1 Mann-Whitney U Test Detail*

Description	Value
Total N	26
Mann-Whitney U	82.000
Wilcoxon W	173.000
Test Statistic	82.000
Standard Error	19.497
Standardized Test Statistic	-.128
Asymptotic Sig.(2-sided test)	.898
Exact Sig.(2-sided test)	.920

A Mann-Whitney U test was completed to determine if there was a difference in importance of 13 lean CSFs between groups of small and medium-sized manufacturing companies. The distribution of the importance values for small and medium-sized companies was not similar, as determined by visual inspection. There was no significant difference in the importance of lean CSFs between small and medium-sized manufacturing companies, $p = .920$, $U = 82.0$, and $z = -.128$, using the exact sampling distribution for U (Dineen & Blakesley, 1973). The null hypothesis is retained.

Research Question 2 and Hypothesis

The participants were asked to what extent the importance of the 13 CSFs was to their manufacturing location with groups separated into companies that have and have not implemented lean. The importance of the 13 CSFs was rated using a 1 – 5 Likert scale. For the results, the following was used for the numeric values of the Likert scale:

- 1 corresponded to *not important at all*;
- 2 corresponded to *not important*;
- 3 corresponded to *neither important nor not important*;
- 4 corresponded to *important*; and
- 5 corresponded to *very important*.

The status of lean implementation grouped the participants' responses into two categories. Group 1 was manufacturing sites that have implemented lean (n = 43). Group 2 was manufacturing enterprises that have not implemented lean (n = 21).

The dependent variable of the importance of lean CSFs (measured by ordinal data, Likert scale) was ranked for each of the 13 CSFs (independent variables). Inferential statistics were then used to test the hypothesis and answer the research question.

When trying to determine if there is a difference in two groups, having ordinal, non-normal data, the Mann-Whitney U test is appropriate if the testing assumptions are met (Laerd Statistics, 2015). The assumptions of the Mann-Whitney U test are listed next with the results of the evaluation.

- The dependent variable should be measured at the ordinal or continuous level. The data was a 5-point Likert scale and ordinal. This assumption was met.
- The independent variable should consist of two categorical, independent groups. There were two independent groups (small and medium-size companies). This assumption was met.
- There should be independence of observations. A participant was either in one or the other group. No participant's answers were in both groups. This assumption was met.

- The data should have distributions with the same shape. A population pyramid histogram was plotted in SPSS (Figure 5). The groups' distributions did not have similar shapes. This assumption was not met. Differences in distributions were investigated.

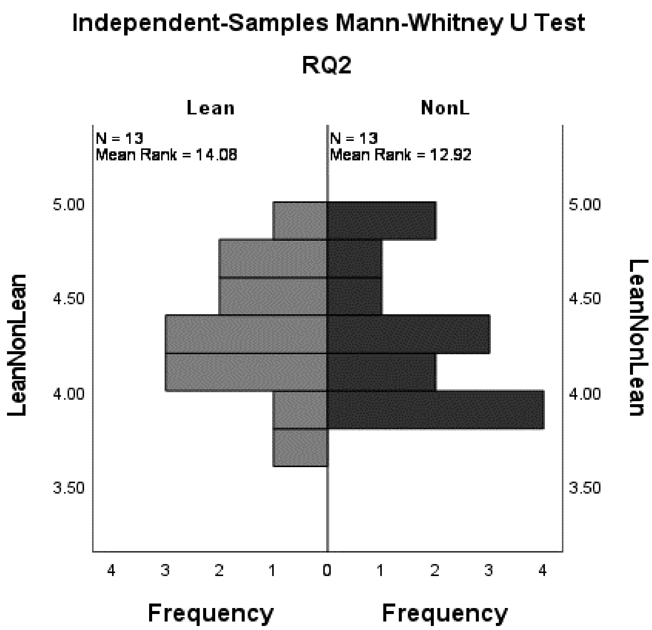

Figure 5. Research Question 2 distribution of data.

The Mann-Whitney U test was used to test the hypothesis. The Mann-Whitney U test analysis was completed to determine the *p*-value. A *p*-value greater than .05 retained the null hypothesis. Table 8 and Table 9 show the *p*-value as .724.

Table 8. *Research Question 2 Hypothesis Test Summary*

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of LeanNonLean CSF is the same across categories of LeanNonLean.	Independent-Samples Mann-Whitney U Test	.724[c]	Retain the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

Table 9 also shows the Mann-Whitney U value (*U*) as 77.0 and the standardized test statistic (*z*) as -.385.

Table 9. *Research Question 2 Mann-Whitney U Test Detail*

Description	Value
Total N	26
Mann-Whitney U	77.000
Wilcoxon W	168.000
Test Statistic	77.000
Standard Error	19.483
Standardized Test Statistic	-.385
Asymptotic Sig.(2-sided test)	.700
Exact Sig.(2-sided test)	.724

A Mann-Whitney U test was completed to determine if there is a difference in importance of 13 lean CSFs between groups of companies that have and have not implemented lean. Distribution of the importance values for lean implemented and non-implemented lean companies were not similar, as determined by visual inspection. There was no significant difference in the importance of lean CSFs between manufacturing SMEs that have or have not implemented lean, p = .724, U = 77.0, and z = -.385, using the exact sampling distribution for U (Dineen & Blakesley, 1973). The null hypothesis is retained.

Summary of the Hypotheses Testing

There are two research questions with respective hypotheses.

Analysis of Research Question 1 and Hypothesis

RQ1: To what extent does the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations?

$H1_0$: There is no statistically significant difference in the importance of lean CSFs by small and medium-sized companies.

$H1_a$: There is a statistically significant difference in the importance of lean CSFs by small and medium-sized companies.

There was no significant difference in the importance of lean CSFs between small and medium-sized manufacturing companies, p = .920. The null hypothesis was retained. The analysis resulted in the importance of CSFs between groups was not found to be statistically significantly different.

Analysis of Research Question 2 and Hypothesis

RQ2*:* To what extent does the importance of the 13 lean CSFs differ between companies that have implemented lean and those that have not implemented lean?

$H2_0$: This is no statistically significant difference in the importance of lean CSFs by companies that have and have not implemented lean.

$H2_a$: There is a statistically significant difference in the importance of lean CSFs by companies that have and have not implemented lean.

There was no significant difference in the importance of lean CSFs between SME manufacturing companies that have implemented lean and those that have not implemented lean $p = .724$. The null hypothesis was retained. The analysis resulted in the importance of CSFs between groups was not found to be statistically significantly different.

Post-hoc Analyses

A question in the survey requested participants to list the current inefficiencies in their company. The responses to this question are not causally related to the hypotheses. This question was an open-ended question that allowed participants to write any reply. When reviewing the data, the participants appeared similar inputs that, if analyzed, could assist in understanding what the companies are trying to improve. The listed inefficiencies were taken and collated into main categories. This data was then counted for the number of occurrences listed with the highest four incidents. As shown in Figure 6, waste was recorded 25 times with the other inefficiencies at a frequency of half or less than waste.

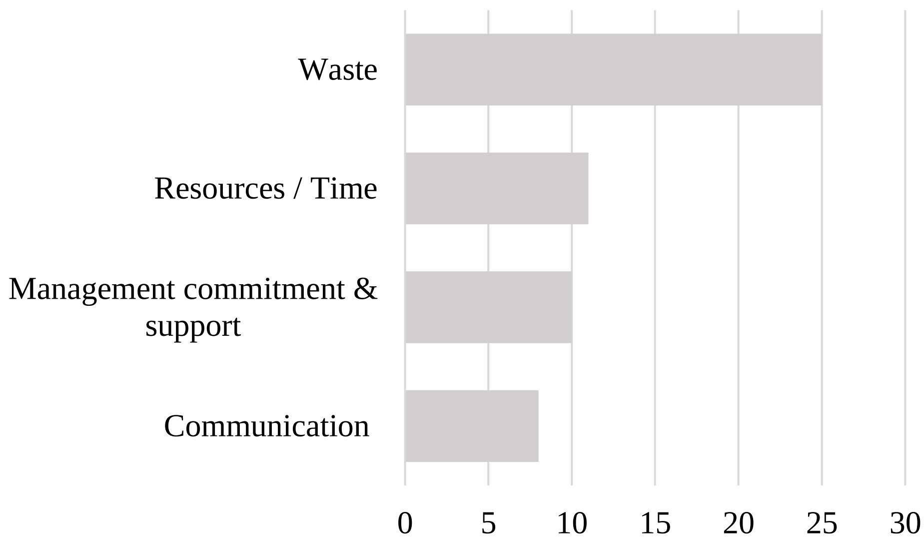

Figure 6. Company inefficiency categories.

Previous research has found that one of the most significant barriers for SMEs to implement continuous improvement methodologies, including lean, is a lack of resources (AlManei et al., 2017; Chaple, Narkhede, Akarte, & Raut, 2018; Moeuf, Tamayo, Lamouri, Pellerin, & Lelievre, 2016). A question in the research study had participants respond with their opinion of factors hindering lean implementation. While not related to the hypothesis, the researcher wished to understand if the manufacturing SME's in the South Atlantic region had the same hindering factors. Participants identified the most significant factor hindering the implementation of a lean manufacturing initiative in their manufacturing location as the availability of resources (Figure 7).

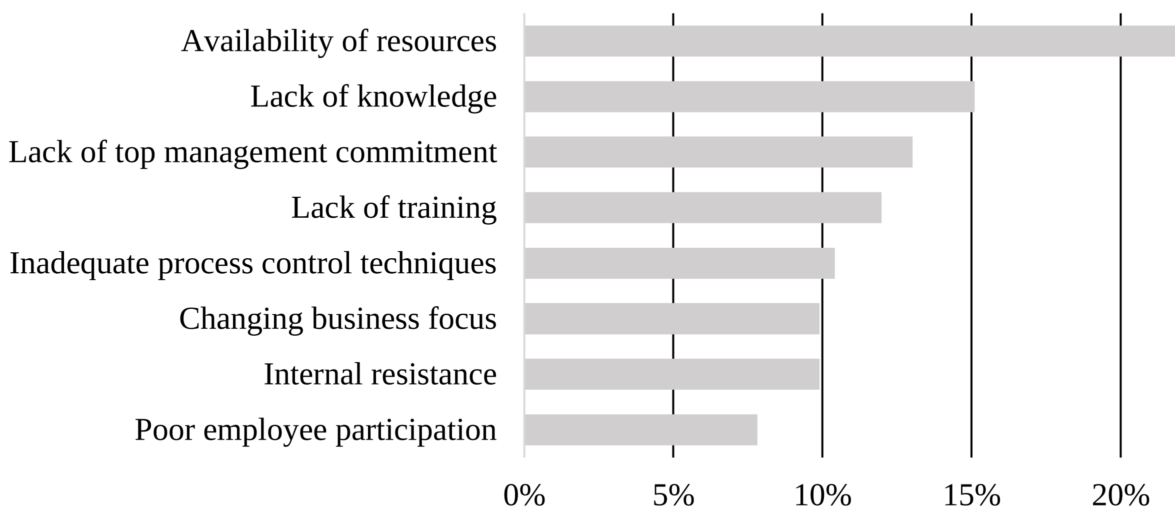

Figure 7. Factors hindering lean implementation ranked by percentage.

Summary

This quantitative study's fundamental purpose is to explore the difference of importance of lean CSFs in manufacturing SMEs in the United States' South Atlantic area for SMEs. Two research questions were used to evaluate two dichotomous groups of small and medium-sized companies and companies that have and have not implemented lean. The sample power for both research questions of the included respondents were .99 from a sample population of 64. For Research Question 1, the null hypothesis was retained. There was no difference in the importance of lean CSFs. For Research Question 2, the results support the null hypothesis that there is no difference in importance for lean CSFs between companies that implemented lean and companies that have not implemented lean. Chapter 5 explores the data for further understanding and interpretation.

CHAPTER 5. CONCLUSIONS

Introduction

Competitive forces from globalization, innovation, and rivals have increasingly put economic pressure on manufacturing SMEs to identify continuous improvement methodologies that can keep their businesses viable and sustainable. Implementing lean into SMEs has demonstrated the capability to transform underperforming companies into competitive entities utilizing its powerful principles. Research has concluded that implementing lean can be complicated and costly to achieve. Resource constraints are a vital impediment to many SMEs and the prospects of any enterprise improvement initiatives. CSF theory and lean CSF studies suggest that utilizing important CSFs with lean manufacturing principles creates a successful implementation initiative. The union of these two approaches allows for a higher chance of SMEs not wasting their limited resources and improving their business performance.

By broadening the research of Taner (2012) and Alhuraish et al. (2017), the fundamental purpose of this study was to explore to what extent the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations, and if there were differences between companies that have or have not implemented lean. The study was conducted in the United States South Atlantic area. The literature review provided insight into the various continuous improvement methodologies (Nave, 2002), CSF practice (Jani, & Desai, 2016; Näslund, 2013; Netland, 2016), lean manufacturing (Bhamu, & Singh Sangwan, 2014; Womack & Jones, 1996), lean manufacturing implementation (Achanga et al., 2006; AlManei et al., 2017; Hu et al., 2015) and the 13 specific CSFs (Alhuraish et al., 2017; Taner, 2012) to be studied. There were no new findings published while the dissertation was being researched and completed. The literature reviewed remained consistent in journal articles highlighting the relationship between important

CSFs and adopting for successful lean implementation. A 12-question survey examined the respondents' perspective thoughts on CSFs from manufacturing leaders through the lenses of lean improvement methodologies. The data analyses included inferential statistical methods that tested the hypotheses of any difference in importance for 13 independent variables (CSFs) and the dependent variable (significance of the CSF) between two separate groups of two categories. For Research Question 1, the results retained the null hypothesis that there were no significant differences of importance for the 13 lean CSFs between small and medium-sized companies. For Research Question 2, the results retain the null hypothesis that the importance of CSFs was not significantly different between companies that implemented lean and the companies that have not implemented lean.

Chapter 5 provides a summary of the research study that includes the results, implications, and recommendations. Chapter 5 then evaluates the two research questions and concludes if the outcome of the study's purpose was achieved in this chapter's summative evidence. Chapter 5 then continues with the contribution to the business problem; a discussion on recommendations for future research is then completed. Finally, the conclusion ends the chapter by summarizing the essential points of the study.

Evaluation of Research Questions

Manufacturing enterprises are required in the fast-changing global marketplace to take decisive actions to enhance their competitive position. These businesses have significant threats facing the viability of their enterprises. They manufacture a diversity of products with a limited lead-time window, decreased inventory, and a customer base seeking world-class quality features at a minimum price point. SMEs have begun endorsing lean manufacturing to increase enterprise processes, profitability, corporate social responsibility, and environmental performance (Chaplin, Heap, & O'Rourke, 2016). Lean manufacturing is a methodology, an operation’s strategy, and a set of practices that are designed to meet customers’ needs utilizing a minimum amount of all company resources (Jani & Desai, 2016). Lean is a unified enterprise’s approach implemented to eradicate non value-added practices, to diagnose and remove wastes permanently. Lean develops an organizational work culture that inspires employees at various levels to increase their productivity continually (Jani & Desai, 2016). Manufacturing SMEs have discovered that it is very challenging to implement lean methods (McGovern et al., 2017). One possible logic for this is the absence of CSFs (Hu et al., 2015). CSFs are the finite number of satisfactory outcomes that will secure successful competitive results for employees, functional departments, or enterprises (Minh & Nguyên, 2015). Many enterprises have implemented lean manufacturing instruments and methods. Almost everyone has encountered significant issues that could have been averted and conquered by identifying the CSFs of lean manufacturing instruments (Minh & Nguyên, 2015).

The study investigated differences in CSF importance for small or medium-sized enterprises and if there were differences between companies that have or have not implemented lean. The study was conducted in the United States South Atlantic area. The general problem was SMEs have limited capabilities to implement continuous improvement methods successfully (Doshi & Desai, 2014). The specific challenge examined was that some SMEs had difficulty with successful lean implementation due to their continuous improvement methodology (McGovern et al., 2017) when the most important CSFs were not adequately identified (Hu et al., 2015). Using CSFs is crucial for South Atlantic area manufacturing SMEs implementing lean manufacturing practices successfully.

Evaluation of Research Question 1 and Hypothesis

RQ1: To what extent does the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations?

$H1_0$: There is no statistically significant difference in the importance of lean CSFs by small and medium-sized companies.

$H1_a$: There is a statistically significant difference in the importance of lean CSFs by small and medium-sized companies.

Research Question 1 analyzed whether there were any statistically significant differences in the importance of lean CSFs by different sized manufacturing locations (small versus medium size). It was hypothesized that there would be no statistically significant differences in the importance of lean CSFs by different sized manufacturing locations. The null hypothesis test of H_0: $p0 = p1$ was used to determine if the 13 CSFs Mann-Whitney U test *p*-value was greater than .05. There was no significant difference in the importance of lean CSFs between small and medium-sized manufacturing companies, $p = .920$, $U = 82.0$, and $z = -.128$, using the exact sampling distribution for *U* (Dineen & Blakesley, 1973). The null hypothesis is retained.

These findings answer Research Question 1 through the results concluding there were no differences in importance for the 13 lean CSFs between the groups of companies by different sized manufacturing locations. The dichotomous groups of small and medium-sized companies have no difference of importance for CSFs.

Evaluation of Research Question 2 and Hypothesis

RQ2: To what extent does the importance of the 13 lean CSFs differ between companies that have implemented lean and those that have not implemented lean?

H2_0: This is no statistically significant difference in the importance of lean CSFs by companies that have and have not implemented lean.

H$2\alpha_a$: There is a statistically significant difference in the importance of lean CSFs by companies that have and have not implemented lean.

Research Question 2 analyzed whether there was a statistically significant difference in the importance of lean CSFs for enterprises that have implemented lean and those that have not implemented lean. It was hypothesized that there would be no statistically significant difference in the importance of lean CSFs by implementation status. The null hypothesis test of H_0: $p0 = p1$ was used to determine if the 13 CSFs Mann-Whitney U test *p*-value was greater than .05. There was no significant difference in the importance of lean CSFs between manufacturing SMEs that have or have not implemented lean, $p = .724$, $U = 77.0$, and $z = -.385$, using the exact sampling distribution for *U* (Dineen & Blakesley, 1973). The null hypothesis is retained. The research question was answered by finding that there were no CSFs statistically significantly different for importance by lean implementation status. CSFs were valued the same between the two groups.

Fulfillment of the Research Purpose

This quantitative study's fundamental purpose was to explore to what extent the importance of the 13 lean CSFs differ between small and medium-sized manufacturing locations and if there were differences between companies that have or have not implemented lean. The data supports that there were no statistically significant differences for CSFs by different sized manufacturing locations. Another finding of the research study concluded that the importance of the 13 CSFs was not different between companies that have implemented lean and companies that have not implemented lean.

The specific business problem was some SMEs had difficulty with successful lean implementation as a part of their continuous improvement methodology (McGovern et al., 2017) when the most important CSFs were not correctly identified (Hu et al., 2015). Examining important CSFs and their impact on the successful implementation of the lean manufacturing model demonstrated a consistent and valid research study supporting SMEs' approach to adopt a lean continuous improvement methodology. The significance of this study's findings was the guidance given to scholars and practitioners when they were attempting to create a best practice framework. This framework can be utilized for implementing a lean manufacturing model in SMEs that identifies the proper CSFs, decreases the chances for project failure and wasted resources. This framework also aligned and agreed with the theoretical framework explained in Chapter 1 and previous literature reviewed in Chapter 2. CSFs were considered significant in the theoretical framework of implementing lean manufacturing because, without them, the chances of achieving a successful implementation was low (Jani & Desai, 2016).

Previous literature reviewed by researchers (Alfoqahaa, 2018; Elkhairi et al., 2019; Minh & Nguyên, 2015) had the same theoretical conclusions as did Jani and Desai (2016) on the significance of linking CSFs with lean manufacturing for a successful implementation of its principles. This study's business needs focused on identifying and implementing continuous improvement methodologies to help manufacturing SMEs remain competitive in a turbulent global economy. The U.S. manufacturing base has declined with the impact felt through high unemployment rates and economic retardation of growth. Through this decline, SMEs have been attempting to find solutions that elevate their organizational productivity, profitability, and viability while creating a competitive advantage over rival firms. Lean is a highly effective continuous improvement methodology that can improve an enterprise's performance and elevate its competitiveness in the industry they serve. The study was an explanatory non-experimental quantitative design utilizing two research questions. The research questions were created to understand the importance of lean CSFs. It adds to the limited existing data describing 13 independent variables (characterizing potential CSFs for lean in manufacturing SMEs) and the dependent variable, the CSF importance, as recently completed by Alhuraish et al. (2017).

Contribution to Business Problem

Findings Evaluated via Theoretical Framework and Previous Literature

The findings of this research study are consistent with the theoretical framework and previous research on the importance of CSFs and lean manufacturing implementation. There is presently a limited amount of research and literature on lean manufacturing methodology and CSF theory, which is the foundation for the background and the theoretical model of this research study. Comparative studies on CSFs suggest that the assurance of a winning lean manufacturing implementation and evading the harmful exposure of wasting valuable enterprise resources is its significant strengths (Hamid, 2011). The previous research studies on CSF theory and practice have been broadly endorsed and utilized in various research fields to identify critical success factors that are definitively important to achieving any scheme or method (Minh & Nguyên, 2015). The importance of the appropriate CSFs contributes advantageous knowledge that strengthens the imperative decision-making process required for the strategy of lean manufacturing utilization in enterprises, according to Minh and Nguyên (2015). This research study concentrated on 13 specific CSFs rather than either an expansive or restrictive combination of factors that could affect SMEs' success. It was focused on a chosen group of CSFs consistent with the implementation of continuous improvement methodologies and manufacturing SMEs as demonstrated in similar research studies (Alhuraish et al., 2017; Taner, 2012; Timans et al., 2012).

Interpretation of the Findings

There were two research questions. Research Question 1 was created to understand if there was a difference in how small companies value CSFs compared to medium-size enterprises. Research Question 2 was created to understand if there was a difference in how companies value CSFs before and after lean implementation. The responding SMEs had different variables associated with them, such as the company's size, continuous improvement methodologies, industry, and the application of lean manufacturing. The group of CSFs was generic from previous studies (Alhuraish et al., 2017; Taner, 2012). The results expected were to conclude a statistically significant difference in the importance of CSFs between small and medium-sized companies and between companies that implemented lean and the enterprises that have not implemented lean. The results for both Research Question 1 and Research Question 2 concluded that there were no statistically significant differences in the importance of CSFs between small and medium-sized companies and between companies that implemented lean and the enterprises that have not implemented lean. The results of this study aligned with comparable research conducted by Timans et al. (2012) that concluded that their group of 12 CSFs was acknowledged as important because the entirety of the importance estimates was greater than 3, which corresponded that study's value of *important* using a 5-point Likert scale. There were no statistically significant differences in the importance of the CSFs analyzed. The underlying assumption for manufacturing SMEs was that the importance of critical success factors must be understood before any lean manufacturing exercises are implemented if the potential enterprise expects to achieve any success with lean practices (Knol et al., 2018). Maximizing lean manufacturing practices necessitates the most appropriate collection of important CSFs.

Implications for Practice

The global narrative for manufacturing SMEs is that businesses will consistently face fierce competitive forces from every corner of the world. This competition necessitates continually developing a strategy to mitigate rivals' attempts to capture enterprises' market share. Modern-day enterprise climates require manufacturing companies to continuously improve organizational procedures and activities to guarantee a sustained competitive edge over competitors and establish viability for the near future (Prashar, 2016). Manufacturing that thrives is vital for driving sustainable economic growth (Rodseth, 2016). Sabet, Adams, and Yazdani (2016) argued that manufacturing sectors are wealth-producing, while service sectors are wealth consuming.

This research study and current literature suggest that the implication of the importance of using CSFs is strong. Findings from this study provide empirical evidence that there is no difference in importance of CSFs between lean implementation status. The implementation of lean manufacturing, like any productivity improvement project, will entertain significant challenges. The research study indicated the availability of resources as the highest implementation challenge. Attempting to assist the progress of a successful implementation approach, experts and researchers alike have recommended utilizing multiple CSFs (Elkhairi et al., 2019).

Many of the case studies have concluded that lean manufacturing improvements enhance performance and decrease waste of manufacturing SMEs (Choomlucksana, Ongsaranakorn, & Suksabai, 2015). The current research study found waste was the highest inefficiency by respondents. Lean manufacturing is a method that may be chosen by manufacturing SMEs to decrease waste. In a recent case study conducted by Chowdary and Fullerton (2019), implementation of lean manufacturing principles can be advantageous to that specific enterprise in terms of decreasing production lead-time by 37%, reduce in processing time by 8%, decreasing work in process stock by 71%, and decrease change over time 38%. Another research study by Choomlucksana et al. (2015) concluded post-application of the lean manufacturing principle of reducing waste reported production time decreases by 63%, and non-value-added practices decrease 67%. With limited resources, utilizing CSFs for implementing lean could provide an even better outcome.

Recommendations for Future Research

Recommendations Developed From the Data

The survey utilized a Likert scale for questions. The resulting data from those questions are commonly used in research studies and generated qualitative and ordinal data. This data resulted in categorical responses and were assumed linear. The data may not have been linear as individual categories may have different meanings between respondents (Chimi & Russell, 2009). The Likert scale does not consider the knowledge and background of the individuals rating the answers. The study could be improved by using a continuous scale type response versus the Likert categorical answers.

Recommendations from Methods, Research Design, or Other Limitations of the Study

With sufficient time and resources, interviewing the respondent instead of sending an electronic survey could allow for counter questions and more in-depth explanations for the researcher. This approach may answer which of the 13 listed CSFs in this study are the most critical and why. The creation and reliance on specific factors are exceedingly more important to

SMEs' success than LEs. The research study carried out by Rockart (1979) concluded that CSFs could be utilized to enhance essential categories of performance so that enterprises can achieve intended business missions. Pinpointing and recommending CSFs for lean manufacturing implementation is a subject matter of significant interest in the operations management literature and practice.

This research study evaluated the importance of the 13 lean CSFs. For further research, it is crucial to find the inter-relationship between already established CSFs with the performance of lean manufacturing implementation practices. This research should be undertaken to comprehend the actions of CSFs that could affect the incorporation of the lean manufacturing methodology. The preference of CSFs can be enhanced with one-on-one and industry expert interviews that enable additional questions asked, leading to a deeper understanding of the inter-relationship dynamics of CSFs and performance outcomes (Halim, Azman, & Malim, 2019).

Recommendations Based on Delimitations

The current study had limitations that should be reviewed for research comprehension and future research study improvements. There were respondent limitations for CSFs because the delivered survey in the targeted geographic area of the manufacturing SME's contained only two criteria. One of those criteria was being a manufacturing SME employee. The second criterion was having responsibility for production. There was no understanding of the participant's CSF knowledge base, experience level, and how that related or affected their answers. Future studies could ask for that information to help correlate data or have further details for an examination.

The study involved lean implementation, but only 28% of the participants had any lean implementation exposure as an enterprise initiative. This exposure may or may not equate to them having experience with lean methodology. An additional question could be included to further understand the participants' knowledge, skill, and experience level related to lean and implementation.

Conclusion

The current research study was designed to contribute material to the body of knowledge within manufacturing continuous improvement methodologies in SMEs. The nature of this study was to understand the importance of CSFs for enterprises interested in implementing a continuous improvement methodology, specifically lean, that can give manufacturing SMEs in the South Atlantic area of the United States an opportunity to remain a competitive business. The approach was to determine if manufacturing SMEs in the South Atlantic area valued the importance of critical success factors. The research study concluded that there was no significant difference in the importance of lean CSFs for small and medium-sized enterprises. The result was duplicated when the same question was asked with a different set of groups: enterprises that had implemented lean and enterprises that have not implemented lean. The enterprises' lean implementation status concluded there was no difference in the importance of the 13 CSFs.

According to Aguilera and Treviño (2019), operational excellence can only be effectively incorporated if the enterprise can identify and operate in the opportunity ranges, administering the most significant applicable critical success factors that accomplish success a competitive advantage over their rivals. The assistance given by CSFs to lean manufacturing implementation allows struggling enterprises and the organizational members that are committed to focusing on a platform of continuous improvement, the capability to improve.

This research created a guide to utilizing important CSFs to successfully implement lean manufacturing in the South Atlantic region of the United States area of the United States for small and medium-sized companies. The 13 selected CSFs demonstrated their significance in supporting a successful implementation of lean manufacturing, which permits senior leadership to adopt a more concise utilization of company resources. The saved resources can then be utilized in other areas of an enterprise's needs allowing for an even more incredible opportunity to improve business performance and competitiveness.

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