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Assessment of the relationship between organizational culture and lean implementation in the aerospace industry

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Pepperdine University

Graduate School of Education and Psychology

ASSESSMENT OF THE RELATIONSHIP BETWEEN ORGANIZATIONAL CULTURE

AND LEAN IMPLEMENTATION IN THE AEROSPACE INDUSTRY

A dissertation submitted in partial satisfaction

of the requirements for the degree of

Doctor of Education in Organizational Leadership

by

Jesus Arroyo

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This dissertation, written by

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DOCTOR OF EDUCATION

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DEDICATION

This dissertation is dedicated to my family. Thank you for your love and your faith in me.

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I would like to thank my dissertation chair Dr. James Dellaneve. His support and feedback were vital in my dissertation. He provided me with positive feedback and was always supportive of my dissertation goals and aspirations.

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ABSTRACT

The aerospace industry is facing a wide range of economic and global challenges that are working together to put tremendous pressure to become more efficient. These challenges are forcing organizations to utilize the skills and competencies of its human resources more effectively. Firms must encourage behaviors and work practices that help elicit the organization's potential. For most aerospace organizations, lean—a total quality management approach—has become a tool for addressing these challenges and meeting expectations. Many researchers see lean as a general system to improve the profitability of manufacturing, but there is some discontent in implementing lean manufacturing. Some researchers explain that implementing lean requires creating a particular culture. The purpose of the quantitative study is to examine the role that organizational culture has on successful lean implementation. The purpose of this paper is to analyze and determine if there is a relationship between the organizational culture type (Clan, Adhocracy, Hierarchy, and Market) and culture dimension (Flexibility versus Control, and Internal versus External), as the Competing Values Framework and the 3 lean implementation elements (Support, Utilization, and Infrastructure) define. Understanding the relationship between organizational culture and lean implementation elements will provide leadership with useful knowledge to facilitate the implementation of strategies that enhance the effectiveness of their lean initiatives. An exhaustive literature review on the academic and practitioner research provides a foundation for understanding lean manufacturing practices. The study uses a quantitative research approach to analyze the data gathered from an aerospace organization. The researcher utilized an online questionnaire to assess the 3 components of lean implementation and the Organizational Culture Assessment Instrument to assess the organizational cultural type. A sample of 83 completed responses were received and

analyzed using one-way ANOVA tests with accompanying eta coefficients for the 3 lean

implementation elements with culture type. No significant relationship was found between

culture type and support ($p = .26$), infrastructure ($p = .24$) or utilization ($p = .15$).

Chapter 1: The Problem

The aerospace industry is facing unprecedented change (Bennis & Thomas, 2002) and an imperative to improve quality and reduce cost in order to survive (Aragon-Sanchez, Barba-Aragon, & Sanz-Valle, 2003). The forces driving this pressure for change are many: global competitiveness (Kozlowski & Ilgen, 2006), rapid technological change and changes in the complexity and fluidity of work environments.

The pace of change is increasing in the marketplace, and industry leaders are implementing lean-manufacturing practices in order to maintain competitiveness (Crute, Ward, Brown, & Graves, 2003). Lean manufacturing practices are accepted across different industries as the most efficient strategies for the design and manufacture of high-quality products (Openheim, 2011). Lean manufacturing practices consist of a set of principles that are customer focused and knowledge driven, and collectively, strive to eliminate waste and to create value, dynamically and continuously (Womack & Jones, 2003). As a result of competition and recent cuts in defense spending, aerospace organizations are pressured to embrace lean methods as the strategy to create change to meet customers' demands while maintaining relevance in the business environment (Balle & Balle, 2009).

There is a perception that in order to successfully implement lean in an organization, the culture needs to be taken into account. According to Eckes (2001) in recent years there have been a number of studies that identify the critical influence an organization's culture has on a successfully implementing a quality initiative . According to Schein (1992) culture is a crucial component of an organization's effectiveness and in most cases it is one of the most stable and influential forces that dominate the behavior of the organization. The model that is used in this study to provide structure to the concept of organizational culture is the Competing Values

Framework (Cameron, Quinn, Degraff, & Thakor, 2006). The analysis for this framework is based on the organizational functionality as it relates to the organization's values (Cameron & Quinn, 1999). The competing values model was originally developed as a way to evaluate organizations and their effectiveness, culture, and leadership behaviors (Cameron et al., 2006). The basic theoretical framework recognizes that competing values exist in all organizations. The value in using the competing values model is derived from the ability to diagnose and facilitate change in an organization. The competing values model consists of four quadrants, each representing a distinct set of organizational effectiveness indicators. The four quadrants represent four opposite assumptions that distinguish characteristics of cultural types: clan, adhocracy, market, and hierarchy.

Background of the Problem

Government reductions in defense spending have necessitated aerospace companies to offer more affordable products, enabling them to compete more effectively in a demanding market. Improving product affordability has motivated companies to embrace lean principles to eliminate waste and reduce costs. Companies that have successfully implemented lean principles have achieved results that are readily noticeable and measureable (Carreira, 2005). Lean thinking has become more than a manufacturing system. It has been argued that as a result of global competition, organizations that are not lean will not survive (James, 2005). Thus, lean initiatives are common in all facets of business (Schoenberger, 2001).

From the beginning lean tools received the most attention a fact that it's evident because most of the early lean research was conducted to define and propose the usage of specific lean tools (Shah & Ward, 2007) and techniques, which are also called lean practices (Oliver, Delbridge, & Lowe, 1996; Shah & Ward, 2003; Worley & Doolen, 2006), lean activities (Duque

& Cadavid, 2007), or lean elements (Gurumurthy & Kodali, 2009). Davies and Kochar (2002) pointed out in their literature study the difficulties practitioners still face; they raise questions about how to prioritize lean practices, how the economic environment influences the priorities of implementing lean practices, and on the dependency of the industry sector. They questioned whether lean is transportable to all industries, and whether lean practices need to be modified frequently. These difficulties lead to a low success rate in implementing lean manufacturing (Koenigsaecker, 2005; Sohal & Egglestone, 1994), which is evidence that manufacturing management does not know how to properly implement lean. If management fails to implement lean manufacturing, manufacturers will have to move their production overseas and more manufacturing jobs will be lost. In order to improve the success rate of implementing lean, in recent years researchers began to shift their research focus on lean; these researchers (Bhasin & Burcher, 2006; Gander, 2009; Mann, 2009) argued that a certain culture is necessary to implement lean practices; more specifically, a culture in which all employees are engaged in CI (Choi & Liker, 1995; Huehn-Brown & Murray, 2010; Liker & Morgan, 2006).

Lean is a methodology that reduces costs and positively affects the quality of an organization' overall s processes and services to the customer (Pande, Neuman, & Cavanaugh, 2000). As a result, a number of organizations have implemented lean with positive results, including reducing manufacturing cycle time, increasing profits, and quality improvements (Antony & Seow, 2007). Lean thinking refers to a collection of principles and tools that aim on the identification and elimination of non value-added activities (waste) that is involved in producing a product or delivering a service to customers (Womack & Jones, 2003). "The concept of lean production consists of a complex cocktail of ideas including continuous improvement, flattened organization structures, teamwork, the elimination of waste, efficient use of resources

and cooperative supply chain management" (Green, 1999, p. 133). Nationwide, numerous companies of varying sizes and across multiple industry sectors, primarily in manufacturing and service sectors are implementing lean methods. According to Openheim (2011), the rate of lean adoption is accelerating. Organizations apply lean tools to their processes to boost company profits and competitiveness. Lean tools enhance the organization's quality and reduce costs, ultimately increasing profits.

Lean also involves managing people (Balle & Balle, 2009). Managing people during a change is a challenge, resulting from the dynamics of people and technology (Pettigrew, Woodman, & Cameron, 2001). In fact, Balogun & Hailey (2004) determined that 70% of organizational change initiatives fail. Organizations must continue to develop strategies to facilitate change in order to be successful (Bolman & Deal, 2008). Leaders are aggressively searching for strategies to lead their organizations to an increased level of efficiency. Lean changes the organization's culture (Womack & Jones, 2003). Organizations might recognize the need for change, but do not implement effective strategies to facilitate the change. Creating change in any organization for the purposes of increased support and enhanced reputation is a difficult process. Robbins and Judge (2008) wrote, "One of the most well-documented findings from studies of individual and organizational behavior is that organizations and their members resist change" (p. 268).

More recent research considers lean to be an adaptable, holistic system (Gharajedaghi & Ackoff, 1984) that is dependent on the environment (Doolen & Hacker, 2005). Therefore, companies should not focus on the implementation of lean practices alone; they should focus on implementing a holistic lean system. Researchers further discussed that the underlying assumptions for implementing lean would be a culture of continuous improvement and employee

engagement (Choi & Liker, 1995; Liker & Hoseus, 2008). Huehn-Brown and Murray (2010) came to a similar conclusion, summarized their findings, and stated that lean is "aimed at continuous improvement by all team members" (p. 2). These more recent studies suggest that in order to implement lean thinking change in the organization will occur. Implementing change is difficult as Duck (1993) described change as intensely personal and argued that for change to occur fully in any organization, every leader and follower must think, feel, or do something different than they have done previously. This research will analyze the relationship between organizational culture and lean implementation to provide information to leaders that may assist them in implement lean thinking in the organization. Duque and Cadavid (2007) argued that a company's culture is influenced by their leaders, and therefore implementing a lean culture is dependent on the company's leadership support.

The Competing Values Framework, illustrated in Figure 1, is built on two cultural dimensions. Permission to use Figure 1 is shown in Appendix A. One dimension differentiates flexibility and discretion from stability and control. The other dimension differentiates internal focus and integration from external focus and differentiation. These two dimensions form four quadrants, each quadrant consists of core values that represent a specific organization cultural type (Cameron et al., 2006). For example, organizations that fall in the quadrant representing the clan culture have an internal focus and an emphasis on being flexible and adaptable to the environment. The quadrant to the right, see Figure 1, which is the adhocracy culture also emphasizes flexibility, but focuses more on external items such as competition and the customer. The lower left quadrant below the clan represents the hierarchy culture, which is both control and internal oriented. To the right of hierarchy is the market culture, and this one is also control oriented but it has a more external focus.
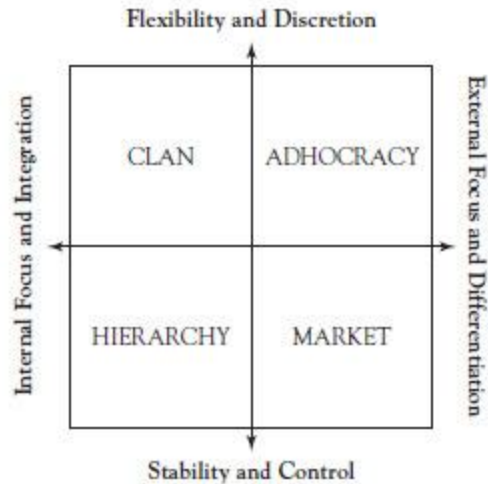
Figure 1. Competing values framework. From *Diagnosing and changing organizationalculture: Based on the competing values framework* (3rd ed). (p. 35), by Cameron, K. S., & Quinn, R. E. (2011). San Francisco, CA: Jossey-Bass.

Harry and Schroeder (2000) argued that the main elements that are critical to the successful implementation of a lean initiative are, support, utilization, and infrastructure. The element of support is mainly concerned with management involvement and the commitment to implement lean. Based on literature the continuous support from top management is essential, without it the importance of the quality initiative would be in doubt and the momentum behind it would be ineffective (Pande et al., 2000). The organization's leaders should also become versed in the change process. One change theorist, Kotter (1999), identified three phases to help ensure a successful change implementation occurs. The first step involves laying the groundwork for change. This is accomplished by conveying the need and purpose for the change. The purpose of the change should be communicated along with the benefits associated with the change. Another key ingredient in laying the groundwork and in additional stages is the leadership's commitment to the Lean initiative. The organization's leadership must create and communicate a clear and concise vision for Lean.

Another key Lean component is infrastructure. Sousa and Voss (2002) emphasized the importance of infrastructure and the clarification of all staff's roles and responsibilities in quality management. The infrastructure and role clarity help staff understand how their contribution to quality improvement helps to strengthen their motivation toward quality management. An element of lean implementation is having an adequate organizational infrastructure that can execute. Therefore, the organization's infrastructure is a component that needs to be conducive to support a successful lean implementation (Snee & Hoerl, 2003).

Lean methodology includes the utilization of statistical tools that are important elements that have been identified to be critical to successful lean implementation (Breyfogle, Cupelllo, & Meadows, 2001). Developing and implementing policies on the use of metrics and connecting with training and compensation will help influence employees' abilities and inclinations to use Lean methodology. Cameron and Freeman (1991) described the importance of altering reward systems, work procedures, objectives and work teams to influence changes in behavior. These strategies are important for ensuring the successful implementation of a Lean initiative.

Statement of the Problem

The failure rate of most planned organizational lean initiatives is extremely high. It is well known, for example, that as many as three-quarters of lean initiatives including: reengineering, total quality management (TQM), strategic planning, and downsizing efforts have failed entirely and in some cases have created problems serious enough that the survival of the organization was threatened (Cameron & Quinn, 2011). Several studies reported the most frequent reason for failure was the neglect of the organization's culture (Cameron et al., 2006).

Evidence suggested organizations that succeeded in improving business performance changed their cultures to align with process improvement frameworks (McAdam & Lafferty,

2004). Organizational culture represents a crucial component of the lean initiative (Rad, 2006). Carnell (2004) argues that a failure to consider an organization's culture would devolve lean implementation into a mindless execution of an activity performed by disinterested employees.

Current research has not yet evaluated the relationship between organizational culture in the aerospace industry and lean implementation. Based on the lack of evidence, a need exists for research that would help aerospace organizations understand the factor that organizational culture has as a component of a successful lean implementation. Understanding the factor that organization culture has on lean implement is critical in today's demanding global economy. Therefore, the intent of this study is to create new knowledge regarding the relation between organizational culture and lean implementation that can serve as a foundation for aerospace organizations seeking to implement lean in the early part of their life cycle. This study will identify if there is any relationship between organizational culture type (clan, adhocracy, hierarchy, or market) and the three lean implementation elements (support, utilization, and infrastructure). The study will also identify if there is any relationship between the two organizational culture dimensions (flexibility versus control and internal versus external) and the three lean implementation elements (support, utilization, and infrastructure).

Purpose of the Study

The purpose of this quantitative study is to explore and evaluate the role that organizational culture has on successful lean implementation and to identify if there is any relationship between the organizational culture type (Clan, Adhocracy, Hierarchy, and Market) and culture dimension (Flexibility versus Control, and Internal versus External) as the Competing Values Framework and three lean implementation elements (Support, Utilization, and Infrastructure) define.

The study of the relationship between and an organization's cultural types and key elements of lean implementation (Support, Utilization, and Infrastructure) provides valuable information showing the alignment of cultural types and lean implementation's critical elements. For example, organizations that have characteristics associated with the market cultural type, an emphasis on meeting goals and productivity, are more aligned for statistical tools' high-level utilization. This study also analyzes the relationship between the characteristics associated with a hierarchical culture, and management defined roles, this type is more conducive to the infrastructure component. The clan culture has characteristics that are associated with open communication, cooperation, and cohesiveness. These characteristics might be more conducive to management support.

In order to improve the success rate of lean manufacturing, there is a need to study the relationship between organizational culture and elements of lean implementation. Successful changes to technical systems required related changes to social systems such as organizational culture (Pasmore, 1988). According to Pasmore (1988) there is empirical research that shows that the implementation of process improvement frameworks was equally as likely to fail as to succeed. Studies indicate that organizations which were successful with process improvement initiatives consistently described changes made to culture as well as methods (Cameron et al., 2006). As Figure 2 shows organizational culture is one of the four components of a successful lean implementation, the components are: Organizational culture, Infrastructure, Support, and Utilization. Based on the literature review to for an organization to succeed with lean implementation all four of these components must be implemented to their fullest extent. This study emphasizes that lean is a total system and represents an organization's complete and comprehensive culture change. Lean represents a new way of managing the organization.

Organizational Culture

- Clan
- Adhocracy
- Hierarchy
- Market

Infrastructure

- Lean Concepts
- Specify value
- Map the value stream
- Make value flow
- Pull value
- Pursue perfection

WHY LEAN ?

Create Value: Profits

World Class

Utilization

- Lean Tools
- 5S
- 5 whys
- Value stream mapping
- Root cause analysis
- Kanban

Lean Planning

- Lean Planning
- Management Support
- Vision Strategy
- Guiding Coalition
- Communication
- Empowerment

Figure 2. Lean culture enables lean implementation.

Research Questions

Two research questions have been created to examine the relationship between organizational culture and key elements of lean implementation:

Research question 1: What is the relationship between organizational culture type (clan, adhocracy, hierarchy, or market) and the three lean implementation elements (support, utilization, and infrastructure)?

Null hypothesis 1: The organizational culture type (clan, adhocracy, hierarchy, or market) is not related to any of the three lean implementation elements (support, utilization, and infrastructure)?

Alternative hypothesis 1: The organizational culture type (clan, adhocracy, hierarchy, or market) is related to at least one of the three lean implementation elements (support, utilization, and infrastructure)?

Research question 2: What is the relationship between the two organizational culture dimensions (flexibility versus control and internal versus external) and the three lean implementation elements (support, utilization, and infrastructure)?

Null hypothesis 2: Neither of the two organizational culture dimensions (flexibility versus control and internal versus external) will be related to any of the three lean implementation elements (support, utilization, and infrastructure).

Alternative hypothesis 2: At least one of the two organizational culture dimensions (flexibility versus control and internal versus external) will be related to at least one of the three lean implementation elements (support, utilization, and infrastructure).

Significance of the Study

Becoming a lean company requires a careful strategy (Womack & Jones, 1996). Lean thinking brings significant change to corporate culture that necessitates strong project leadership, visible support from top management, and patience (Balle & Balle, 2009). It is important for management to understand that the change to a lean environment must be implemented only after careful planning and consideration (MacDonald, 1998).

The intent of this research is to provide the opportunity to examine the role that organizational culture has on successful lean implementation. The outcome of this research will enhance the understating of the impacts of deploying lean initiatives by providing quantitative information on how specific cultural characteristics impact the key components of a lean initiative. Having this understanding will assist aerospace organizations that are in the process of

implementing lean initiatives by providing research that will help the success rate of lean implementation resulting on being more competitive.

Definition of Terms

Adhocracy culture: An adhocracy culture is one of the four organizational cultural types the Competing Values Framework identifies and it is hereby defined as organizations that have an external focus "characterized by a dynamic, entrepreneurial, and creative work place [in which] people stick their necks out and take risks" (Cameron et al., 2006, p. 45).

Change: In the context of this study, a workplace procedure initiated by one or more organizational leaders, intends to achieve certain results through the modification of other people's behaviors or routines, with the success or failure to achieve these modifications having consequences for the particular organizational unit or the organization (Herold & Fedor, 2008).

Clan culture: A clan culture is one of the four organizational cultural types the Competing Values Framework identifies, and is hereby defined as organizations that have an internal focus "shared values and goals, cohesion, participativeness, individuality, and a sense of 'we-ness' [in which] the organization places a premium on teamwork, participation, and consensus" (Cameron et al., 2006, p. 43).

Competing values framework: The Competing Values Framework is categorized into four quadrants with two dimensions (Cameron et al., 2006). One dimension differentiates effectiveness criteria that emphasize flexibility; discretion; and dynamism from stability, order, and control. The other dimension differentiates effectiveness criteria that emphasize an internal orientation; integration; and unity from external orientation, differentiation, and rivalry. Together, these four quadrants represent a model that provides a set of organizational effectiveness indicators by connecting an organization's strategic, interpersonal, and institutional

aspects in relationships to the dimensions of flexibility-control and internal or external orientation.

Hierarchical culture: A hierarchical culture is one of the four organizational cultural types the Competing Values Framework identifies, and its hereby defined as organizations that have an internal focus "large numbers of standardized procedures, multiple hierarchy levels, and emphasis on rule reinforcement" (Cameron et al., 2006, p. 38).

Lean tools and techniques: Lean, from an operational perspective, involves implementing a set of shop-floor tools and techniques aimed at reducing waste within the plant and along the supply chain (Liker, 2004; Treville & Antonakis, 2006). Such tools and techniques include setup time reduction, Kaizen (i.e., continuous improvement), Six-Sigma quality, visual displays (e.g., 5S), Kanban, Just-In-Time supply systems, and preventative maintenance (Shah & Ward, 2003).

Lean: For the purposes of this study, lean is defined as a set of principles aimed at the elimination of waste that when implemented, increase value for the customer (Baines, Lightfoot, Williams, & Greenough, 2006). Researchers use the terms lean, lean production, lean thinking, and lean manufacturing when discussing lean subjects. These terms are often used interchangeably in this study and are assumed to have the same meaning.

Market culture: A market culture is one of four organizational cultural types the Competing Values Framework identifies, and it is defined as organizations that have an external focus "driven by customer focus, premium returns on assets, and improved corporate competitiveness [in which] leaders are hard-driving producers and competitors [and] the long-term concern is on competitive actions and achieving stretch goals and targets" (Cameron et al., 2006, p. 40).

Organizational culture: An organizational culture can be defined as a pattern of shared assumptions and beliefs. Schein (2004) believes that culture has three levels: (a) artifacts, (b) espoused values, and (c) basic underlying assumptions. These three levels influence how the organization's members perceive, think, and act (Schein, 1992).

TQM: TQM is a management approach for continuous improvement for managing systems, involving employees, and ensuring customer satisfaction (Womack & Jones, 1996).

Key Assumptions

The study's assumptions follow:

1. The information collected from selected aerospace company managers and employees is relevant to other aerospace companies throughout the United States.

2. Aerospace managers and employees answered questions in an honest and conscientious manner.

3. It is assumed that those interviewed answered all interview questions truthfully; thus, providing a true description of the facts as they see them.

Limitations of the Study

This study's limitations include:

1. This quantitative study of the assessment of the relationship between organization culture and lean implementation suggests a deductive-reasoning approach or a statistical perspective related to the research. In a qualitative study, the researcher plays a larger role in data interpretation (Creswell, 2009).

2. This study was limited to American aerospace companies. Data collected from companies from other countries might produce different findings.

3. Data were collected only during the third quarter of 2014. The study might reflect the state of aerospace industry during this industry lifecycle.

Summary and Organization of the Study

Chapter 1 describes the background of the problem and the purpose of this research. Change is ongoing and organizations often need to alter their strategies and structure (Hannan & Freeman, 1984). Limitations and assumptions were described and key terms were defined. The purpose of the quantitative study is to examine the role that organizational culture has on successful lean implementation. To gain an understanding of any relationship between the organizational culture type (Clan, Adhocracy, Hierarchy, and Market) and culture dimension (Flexibility versus Control, and Internal versus External) as defined by the Competing Values Framework and three lean implementation elements (Support, Utilization, and Infrastructure).

Chapter 2 includes a review of the literature on lean, the historical background of lean, transformation leadership, characteristics of organizational culture, and a description of the competing Values Framework. Chapter 3 consists of a restatement of research questions, description of research methodology, process for selection of data sources, definition of analysis unit, definition of data gathering instrument, validity of data gathering instrument, data gathering procedures, reliability of data gathering instrument and data gathering procedures, description of proposed data analysis processes, sample tables for proposed data analysis, plans for Institutional Review Board approval, and a summary. Results and discussion are covered in Chapter 4 and conclusions and recommendations are explored and captured in Chapter 5.

Chapter 2: Literature Review

The intent of this chapter is to review the existing theoretical and applied research surrounding the relationship between organizational culture and successful lean implementation. This chapter includes the following major topics, as they pertain to the study: (a) lean history; (b) lean theorists; (c) leadership; (d) key elements of lean implementation, (e) organizational culture; (f) an explanation of the competing Values Framework (Cameron & Quinn, 1999); (g) description of previous studies that addressed the relationship between quality initiatives and organizational culture; (h) and summary of the literature review.

Lean History

Lean is a term that was first used at the Massachusetts Institute of Technology (MIT) to describe the Japanese production system, where use of less effort, space, and material resulted in higher output and quality (Murman et al., 2002). Lean principles are derived from the Japanese manufacturing industry. The Toyota Motor Corporation is credited the first to implement lean concepts to create a more efficient workplace, maximizing customer value and minimizing waste (Bush, 2007; Womack & Jones, 2003). The intent of lean manufacturing is to create smooth work flows by using lean techniques to reduce waste in the process and create value for the end customer (Belson, 2010). "When looked at more broadly, the Toyota Production System is about applying the principles of the Toyota Way" (Liker, 2004, p. 34). The Toyota way is based on a serious commitment to improve continuously processes. Continuous improvement "is the process of making incremental improvements, no matter how small, and achieving the lean goal of eliminating all waste that adds costs without adding value" (Liker, 2004, p. 24). The roots of continuous improvement can be traced to Henry Ford's assembly line concept (Sorensen, 1956). Lean principles were in place in the Ford Motor Company before Toyota's Ohno and Shingo

employed them in Japan (Ford & Crowther, 2003). These include small lots, single-piece flow, motion efficiency, work cells, continual improvement, visual controls, standard work, supply chain management, just-in-time inventory, dock-to-factory-floor, set-up reduction, and others (Levinson, 2002). Although the Toyota Production System borrowed ideas and inspiration from Henry Ford, its needs could not be adequately met by Henry Ford's mass production model (Liker, 2004). The most distinctive feature was the lack of natural resources, which made it necessary for the Japanese to import vast amounts of materials. For this reason Japan was at a disadvantage in terms of the cost of raw materials when compared with European and American countries (Sugimori, Kusunoki, Cho, & Uchikawa, 1977). To overcome this problem, it was essential for Japanese organizations to make drastic improvements in order to produce higher quality goods that had higher better value at an even lower production cost than those of other countries. The Toyota Production System was Toyota's response to overcome the three daunting challenges it faced after World War II: The challenges were first (a) catering to the needs of a domestic market, a market that was small but demanded better product variety, (b) inability of the capital- at that time companies were unable to make huge investments in Western technologies, and (c) competing with well-established foreign brands such as General Motors and Ford (Cusumano, 1985). This concept proved successful and came to be generalized as lean production.

The '80s and '90s saw a rise in both the conceptual and empirical understanding of the Toyota Production System concept. Beginning in 1985, MIT undertook a detailed study of Japanese manufacturing methods and a worldwide automotive manufacturing benchmarking effort known as the International Motor Vehicle Program (Womack, Jones, & Roos, 1990). The term lean production arguably was first used in a MIT Sloan Management Review article by

John Krafcik who worked as a researcher on the MIT international motor vehicle study. Krafcik (1988) wrote an article titled, "Triumph of the Lean Productions System" based on his master's thesis at MIT. In his article, Krafcik used the term lean production to describe TPS. IMVP continued Kraficik's research at MIT. Womack, Jones, and Roos (1996) published an international best-selling book called *The Machine That Changed the World*. This book provided a complete historical account of lean and brought the study's results to the attention of a wide audience of U.S. manufacturers. Womack and Jones (1996) published their follow-up book, *Lean Thinking*, to introduce the philosophy and tools of lean, based on the practices of TPS.

Most of the principles of lean are logical and simple to understand, a fact that is overlooked the moment issues appear, as people get wrapped up with their daily activities (Beckert & Posegga, 1995). Lean production is based upon TPS and was originally proposed as a set of tools that assist in the identification and elimination of waste (muda). The TPS focus is upon improving the flow or smoothness of work, thereby steadily eliminating unevenness. TPS was developed over many years to compete in a market where customers demanded diversity in the products they purchase (Ohno, 1988). Toyota's philosophy is to use and discard tools depending on the ways the tools address the organization's need. While the elimination of waste through the use of lean tools is a core concept in the establishment of a lean system, it is not the primary goal (Baines et al., 2006). The real goal of TPS is to create value for the customer (Ohno, 1988). All of its systems, people, and decisions are directed at creating that value through organizational learning and continuous improvement (Liker, 2004). Presently, many define lean as creating value for the customer through elimination of waste (Baines et al., 2006).

Shah and Ward (2007) define lean production as "an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier,

customer and internal variability" (p. 791). Therefore, the most common understanding of lean is removal of waste from a system while creating value for the customer (Womack & Jones, 2003). The term lean thinking has come to describe individual processes that work to detect waste in the form of time, inventory, motion, waiting, overproduction, overprocessing, and defects. Toyota identified seven types of wastes that can be applied to many types of business processes: "overproduction, waiting, unnecessary transport, over processing, excess inventory, unnecessary movement, and defects" (Liker, 2004, p. 28). Identifying the value stream of a product or service or a family of products or services is essential to identifying problems or waste (Womack & Jones, 1996). Value is a capability provided to a customer at the right time at an appropriate price, as defined in each case by the customer (Womack & Jones, 2003). In this context, any necessary activity can be divided into three categories: (a) Value Added (VA) elements, (b) Non-Value Added (NVA) steps, and (c) Required Non-Value Added (RVNA) steps. Value is defined as something for which the customer is willing to pay. Activity the customer is not willing to pay for is considered waste and a drain on the resources of the organization. Non-Value Added activities are those that are performed but for which the customer is unwilling to pay. Non-Value Added but necessary are those activities that the customer is unwilling to pay for, yet are required for the basic completion of the task or process. Value-Added activities are those the customer is ready to pay for and are needed for successful completion of the task (Nave, 2002).

Lean strives to eliminate waste and maximize value. With the successful reduction of waste, or nonvalue added activities, in a process or system, cycle times and costs can be reduced. According to Womack, Jones and Ross (1990), a lean manufacturing system is characterized as using less of everything to manufacture the product. It uses "half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop

a new product in half the time" (Womack et al., 1990, p. 13). Therefore, lean implementation is focused on getting the right things to the right place at the right time in the right quantity to achieve perfect work flow, while minimizing waste and being flexible and able to change (Spear, 2004).

Lean is utilized in a wide range of industries, profit and nonprofit organizations, government agencies, aerospace companies, and in other organizations as a means of producing goods and delivering services that create value for the customer with a minimum amount of waste and a maximum degree of quality (Balzer, 2010). Researchers accept the notion that lean production over the last couple of decades has become an integral part of the manufacturing infrastructure all across industrialized countries (Hopp & Spearman, 2000). The benefits of lean implementation are well accepted by both a academicians and practitioners alike (Browning & Heath, 2009). Lean has attracted much interest from the aerospace industry to help address the opportunities for increased efficiency and effectiveness, with teams of researchers synthesizing the lean practice of a number of Japanese companies. In 1993, the U.S. Air Force began to investigate whether lean concepts and practices would provide value and cost savings in the Department of Defense (George, 2003).

According to Womack and Jones (1996), in lean manufacturing, the integrated system is composed of five primary principals, which represent the core of the lean-manufacturing philosophy. These principles drive lean manufacturing's economic benefits and consist of:

1. Precisely specify value by specific product. Specifying value for the customer is critical starting point for lean thinking. Value is defined by the customer. It is more meaningful when expressed in terms of a specific product (e.g., goods or service), that meet customers' needs at the right price and at the right time. In a manufacturing

organization, value added involves activities that enhance the market form or function of the product, for which the customer is willing to pay.

2. Map the value steam. Identify the entire value stream for each service, product, or product family and eliminate waste. The value stream includes all of the specific actions required to bring a specific service or product through three critical activities in any business. By mapping the flow of the product through the manufacturing process, one can identify waste, value added activity, and nonvalue-added activity. Identifying the value stream almost always exposes enormous amounts of waste in the form of unnecessary steps, backtracking, and scrap, as the throughput travels from department to department and from company to company.

3. Make value flow. As the wasted steps are removed, the remaining value-creating steps should flow. Making steps flow means no waiting, downtime, or waste, within or between the steps. Therefore, working on each design, order, and product continuously from beginning to end of the process, until the item is ready to be consumed. This may require introducing new types of processes or technologies and getting rid of expensive processes and tools — large scale obstructions or complex technology of which necessitates operating in a batch mode or requires unique processes tailored for that technology.

4. Pull value. As flow is introduced, the customer should pull the product just as it is being completed to provide what the customer wants only when the customer wants it. Letting the customer pull the product or service from the value stream eliminates the following types of waste: designs that are obsolete before the product is

completed, finished goods, inventories, elaborate inventory-information tracking

systems.

5. Pursue perfection. A lean thinking enterprise sets its sights on perfection. Elimination

of waste is a never-ending process; the idea is to remove systematically and

continuously the root causes of poor quality, with the ultimate goal of achieving zero

defects.

These five lean manufacturing key concepts provide a conceptual framework that work as

a whole system and provide manufacturers the economic benefits and power of lean-production

systems (Womack & Jones, 1996).

Lean Theorists

Lean started with the TQM movement, led by quality gurus such as Crosby (1979),

Deming (1982), Feigenbaum (1991), Juran (1964), Shewhart (1980), and Taguchi (1986). TQM

as a holistic theory consists of many supporting theories. Each of the theorists discussed has

made significant contributions to the advancement of lean thinking by focusing on specific areas

of expertise. Lean methodology or lean thinking is not a new concept in the manufacturing

industry; lean thinking (Lucey, 2003), lean philosophy (Jobo, 2003), lean theory (McManus &

Millard, 2002), and lean manufacturing (Womack & Jones, 1996), are hereafter referred to as

lean principles.

Per Gabor (1992), Deming is considered the father of the modern quality movement.

According to her book, *The Man Who Discovered Quality*, the impact of Deming's contributions

on quality theory has been profound. His theory of management "for improvement of quality,

productivity, and competitive position" (Deming, 1982, p. 19), is applied across all industries

and is the model for organizations that have a desire to implement quality improvements. During

the rebuilding of the Japanese economy after World War II, Deming was asked to speak with Japanese manufacturing executives on ways to improve product quality. Deming's ideas about quality and productivity in the early 1950s were favorably received in Japan. Deming convinced the Japanese business community that it is always cheaper to do the job right the first time than to allow defects to enter the production line. Deming summarized the essence of his philosophy of quality management into 14 points, which, when applied accordingly, are known to improve the quality of manufacturing processes. The underlying philosophy of the 14 points remains the same since they were first introduced in February 1985, but Deming constantly improved the 14 points to reflect knowledge gained from his private consulting and management seminars (Scherkenbach, 1991). Deming's (1982) 14-point management model consists of the following:

1. Create constancy of purpose and continual improvement while long-term planning must replace short-term reaction.

2. Introduce management as well as workers to the Japanese production theory.

3. Do not depend on quality inspection—build quality into the product and process.

4. Choose quality suppliers over low-cost suppliers in order to minimize variation in raw material and supply.

5. Improve constantly to reduce variation in all aspects of production.

6. Train workers and management on the job in order to reduce variation in how a job is done.

7. Institute leadership across the organization.

8. Eliminate fear while encouraging two-way communication; encourage employees to work in the organization's interest.

9. Break down internal barriers so that departments in an organization become internal

customers to each other and must work together.

10. Eliminate slogans (exhortations) on the job site.

11. Eliminate numerical targets; rather, manage by objective.

12. Remove barriers to worker satisfaction; instead include annual appraisals.

13. Encourage self-improvement and education for all workers.

14. Ensure that everyone is responsible for continual improvement in quality and
    productivity, especially top management. (p. 56)

Shewhart (1980) focused on the importance of reducing variation in a manufacturing process. Shewhart pursued his concept of quality control during the early part of the century, according to Hounshell (1984) perhaps the golden age of mass production. Deming (1982), credit Shewhart with the invention of the control chart model. Shewhart's model combines creative management thinking with statistics and establishes process stability as a valuable goal that is directly related to the economics and quality of production (Shewhart, 1980). The Shewhart variation model consists of the following three components: (a) a centerline, usually equal to the mathematical average of all the samples plotted; (b) upper and lower statistical control limits, which define the constraints of the variations; and (c) performance data plotted over time associated with quality patterns. Shewhart (1980) viewed statistical control as a unique approach to assuring quality:

By the elimination of assignable causes of variability we make the most efficient use of raw materials, maximize the assurance of the quality of the manufactured product, minimize the cost of inspection, and minimize loss from rejections. Statistics in mass production can be made to pay good dividends, and has a bright future. (p. 47)

Juran (1998) came to be known for his trilogy diagram, a method devised to measure for

quality accurately. His trilogy diagram consisted of three processes: Quality Planning, Quality Control, and Quality Improvement. Juran's trilogy diagram placed emphasis on the importance of creating customer value and reducing waste during production. Juran defined customers as internal and external. Internal customers are part of the organization and are impacted by peers' activities. External customers are not part of the organization but are impacted by organizational activities (Juran, 1988). Juran further contributed to the development of quality theory by stating that quality theory has universal applicability, for example: (a) in service industries as well as in manufacturing industries, (b) in business processes as well as in manufacturing processes, and (c) in support operations as well as production operations. Juran's contributions to quality theory affirmed that quality in production is associated with an additional cost aspect, adding about 10% to the workload of the management teams overseeing quality improvements.

According to Crosby (1985), the performance standard is zero defects, rather than acceptable quality level. He also made an argument that quality is a cultural revolution taking place—one that moves the whole company from the 'conventional culture to a culture in which quality is first among equals with cost and schedule" (p. 164). According to Crosby:

> A cultural change regarding quality must be carefully planned to ensure that everyone in the company understands and has an opportunity to participate in this "new way of doing business." The plan must also provide for actions that move the whole company from the "conventional" culture to a culture in which quality is first among equals with cost and schedule. This overall plan, or strategy, is vital to quality improvement. (p. 163)

Feigenbaum (1951) formalized the concept of Total Quality Control and provided the first delimitation of quality in modern literature. Feigenbaum (1991) defined quality as "the total composite product and service characteristics of marketing, engineering, manufacture, and

maintenance through which the product and service in use will meet the expectations o f the customer" (p. 7). Feigenbaum was the first to publish total quality control concepts. Feigenbaum's 10 principles of quality are:

1. Quality is the responsibility of everyone in the organization.

2. Quality is what the customer expects to receive.

3. Quality and cost are a sum, not a difference.

4. Quality requires both individuals and teams to work together.

5. Quality is a way of managing the behavior of employees.

6. Quality and innovation are mutually dependent.

7. Quality is the right thing.

8. Quality requires continuous improvement – never ending process.

9. Quality is the most cost effective, least capital intensive route to productivity.

10. Quality is implemented with a total system connected with customers and suppliers.

Taguchi (1986) is regarded as the father of Japanese quality engineering. He strongly believes that quality should be designed into the product and not inspected into it (Ross, 1996). Taguchi claims quality losses as a result of product variation can be modeled and predicted through a quadratic function (Evans & Lindsay, 2005). Taguchi's three quality concepts or three-phased approach includes:

1. System design—Quality should be designed into a product, not inspected into it.

2. Parameter design—Quality is best achieved by minimizing deviations from a target.

3. Tolerance design—Cost of quality should be measured as a function of deviation from the midpoint of the specification or tolerance limits; any losses should be measured system wide.

Leadership

The term known as leadership has been around since the early 1800s, first appearing in text covering British Parliament's political influence and power throughout the first half of the 19th century (Uma & Glenice, 2006). Leadership refers to leaders who are influential and inspire others to act. It is essential that organizations have the right leadership in place, as research derived from a variety of fields has concluded that leadership matters. According to Shelton (2009), leadership can be the single most impactful contributor to the success or failure of an organization. To define further leadership, Northouse (2008) provides the following quote: "Leadership is a process whereby an individual influences a group of individuals to achieve a common goal" (p. 3).

According to research, leadership is essential and the right leadership is necessary to help organizations grow and succeed. However, leadership is not the same across organizations. Organizations that are contemplating transforming to a lean environment require the right leadership in order to have a successful implementation (Conca, Llopis, & Tarí, 2004; Lucey, 2008; Mann, 2009). The right leadership is necessary because implementing lean thinking into an organization requires total commitment of executive leadership to be able to make the necessary organizational and cultural changes within the company (Womack & Jones, 1996). A careful plan and strategy is required from leadership in order for companies to implement lean thinking. According to Luecke (2003), the transformation into lean thinking brings significant change to corporate culture, change that necessitates strong project leadership, visible support from top management, and patience. Resolving issues that arise within organizations is the responsibility of its senior leadership. It requires leaders to be nimble and to improvise and execute solutions in a short timeframe. Weick and Quinn (1999) believe that the right leadership

can support continuous change by allowing an organization to stay relevant and react quickly to disturbances. In order to react quickly, according to a study performed by Bass (1990), leadership's needs to reduce roadblocks and empower employees to be able to execute and implement positive change in the organization.

It is important for leadership to support lean implementation because, as Kotter & Rathgeber (2006) point out, if an organization wants to stay in business, it will need to create a lean shop. Creating a lean shop requires strong, top-down leadership, especially at the beginning of the process (Womack et al., 1990). Based on the literature, commitment from top-down leadership is required because the role of the leadership team changes dramatically in lean companies and ultimately the management team's leadership behaviors are of importance to the eventual success of the transformation (Womack et al., 1990; Womack & Jones, 1996). The transition to lean can be a difficult transition and there is growing support in lean and other continuous-improvement philosophies that leadership is needed to support lean implementation (Lucey, 2008; Mann, 2009).

Lean manufacturing requires companies to change their traditional management styles and organizational structures, while changing the role of workers into continuous improvement agents (Liker, 1997). Heifetz and Linsky (2002) declared that leadership inspires people to change, raise challenging questions, and forces people to evaluate their values, assumptions, and norms. As leaders, "every day you have the chance to make a difference in the lives of people around you" (p. 2).

Avolio and Bass (2002) investigated different leadership styles and their impact on organizations; they argued that transformational leadership is superior to transactional leadership to improve continuously organizations. This approach of leadership theory is known as

transformation leadership, which requires leaders who act in a visionary and inspirational capacity (Bass, 1998; Burns, 1978). Transformational leadership as a theoretical model came into prominence with Burns's (1978) book, *Leadership.* In his book, Burns (1978) developed the concept of transformational leadership; he saw leadership not in isolation but in relationships. He depicted transformational leadership as an engagement between a leader and a follower based on an increased level of motivation and morality (Stewart, 2006). Bass (1985) further developed the transformational-leadership theory in studying the military and industry. Bass (1985) described four leadership components grounded in moral foundations, which characterize transformation leadership: (a) idealized influence and charisma with strong role models with high ethics; (b) inspirational motivation, including having a high team spirit and shared vision; (c) intellectual stimulation that can encourage problem solving and creativity; and (d) individualized consideration with supportive climate and use of delegation.

Lean transformations as well as other organizational changes that fail are often attributed to the leader's inability to convey the business, strategic, organizational, and cultural components of the change or system (Kotter, 1999; Schein, 1992, 1999; Womack & Jones, 1996). Having the correct selection is critical to success of the company. According to research, there is a critical transition as organizations move through lean transformation, a point when leaders must become coaches and employees become proactive. Leaders must be successful during this phase, as the success of the lean transformation will often determine the corporation's ultimate financial success. Leaders who are leading lean transformations are responsible for the company's future viability when thrust into the role of organizational change agents. Leaders must provide the platform for workers to challenge continually the way the job is being done and look for ways to improve efficiency (Liker, 2004).

In order to create the foundation for lean manufacturing, a significant organizational and cultural change must occur within the company (Ohno, 1988; Womack & Jones, 1996). Kotter (1999) asserted that managers organize and control, whereas leaders motivate and inspire. Per the literature review, leaders with a transformational leadership style are needed to implement lean manufacturing because they possess the qualities needed to transform the company's culture and facilitateadherence and belief in these lean principals (Womack & Jones, 1996; Womack et al., 1990). Transformational leadership style is preferred to deal with a continuously changing economic environment. According to Bass & Avolio (1993), transformational leaders change organizational cultures by empowering the people who are doing the work (Ohno, 1988). This is accomplished by developing a learning organization based on a culture that values empowering the individual to excel and grow as well as improve the organization's effectiveness (Womack & Jones, 1996).

Achanga, Shehab, Roy and Nelder (2006) argued that leadership plays a significant part in implementing lean, and discussed the need for a supportive organizational culture to implement lean. Schein (1992) proposes that the links among organizational change, leadership, and culture are vital. In Schein's book *Organizational Culture and Leadership* he proposes, "Planned change cannot be understood without considering culture" (p. xiv). In order to adapt to an ever-changing environment, Duque and Cadavid (2007) argued that a company's leaders influence its culture, and therefore, implementing a lean culture is dependent on the company's leadership support. According to Schein (1997), "The bottom line for leaders is that if they do not become conscious of the cultures in which they are embedded, those cultures will manage them" (p. 375). The connection between leadership and the success of lean implementation

appears to be important in implementing a lean supportive culture (Kaye & Anderson, 1999; Macey & Schneider, 2008).

Key Elements of Lean Implementation

This study will assess the relationship between organizational culture and lean thinking implementation. The elements used to assess organizational culture type will be from the competing values framework: clan, adhocracy, hierarchy, market. The elements to assess lean implementation are support, utilization, and infrastructure.

A key element of lean is support. This element is essential to successful lean implementation and it pertains to the involvement of top executives of an organization. Based on National Science Foundation research, evidence was found that management support does play a key role in driving lean implementation (Worley & Doolen, 2006). Based on this research it is more effective to have Top executives and managers push down for lean improvements. According to Schutta (2006), having management involvement that communicates and demonstrates commitment to lean implementation increases the chances of success. Beer (2003) researched and concluded that leadership influences lean's success or failure by taking action. The result of this study is important to the concept of lean support, because one of the fundamental tenets of leas in management support. According to Beer (2003) this involves managers that make decisions that support training throughout the organization, are aligned with the initiative, and create a climate of transparent communication about the implementation process. In addition, management must provide a business process involving planning and strategic thinking (Schutta, 2006). Furthermore, it is a cultural change which supports the idea of businesses focusing on the customer, key processes, and steps to continuously deliver a product that satisfies existing and new customers. In his research Schutta (2006) identified that leadership

must assemble key business indicators with the purpose to monitor organization performance and to help them determine the status of the processes, as well as customer satisfaction, and the overall operational performance of the organization. This agrees with the argument that Basu and Wright (2003) make that leadership must demonstrate involvement in the lean initiative through expectation of results, performance, and recognition.

Another key element of lean is utilization, which includes utilizing the appropriate lean tools to improve effectively productivity in the organization. Lean tools are utilized in categories separated by general purpose: quality-continuous improvement tools, lean-process tools, and support-system tools. The implementation of lean tools is helpful with the expectation that the organization will develop a better understanding of the underlying principles of lean as its members utilize the tools. Lean tools are not the sole solution to transform the organization; an understanding of lean principles is required; otherwise, there is a risk of implementing tools and practices that do not fit the organizational context. However, those organizations that have gained the most embrace the lean principles rather than just the tools and techniques that are used at Toyota (Liker, 2004; Standard & Davis, 1999).

A third key component of lean is having an infrastructure that utilizes subject matter experts to mentor, train, and facilitate lean events. The concept of using a Kaizen (continuous improvement) expert is at the heart of the lean implementation process. Imai (1986) generalized Ohno's thinking to all of Japan and explained, "Kaizen is the single most important concept in Japanese management-the key to Japanese competitive success" (p. xxix). Kaizen is at the heart of the lean implementation process, challenging the status quo in the context of long-term, stable relationships. The term kaizen means to make it better, but in English, the word has become a verb meaning to take a process or a product (service) or a design, and using the power of internal

experts, the people on the shop floor, and those in the design room, to make something measurably better. To kaizen, a process requires much planning, concentration, and focus until the job is done (Moody, 1997). Kaizen is the belief that many incremental acts of development will accumulate into a substantial gain that stands in contrast to Business Process Reengineering is concerned with an elaborate fundamental organizational redesign. The kaizen process starts with the process owner, which normally is a person in command, but depends on broad multifunctional team participation. Kaizen process is not common across all best practice but it is a way of developing the lean tools and techniques that are uniquely appropriate for a specific situation, given its particular core strengths and competitive advantage (Allen, 2001).

The infrastructure of kaizen experts, the use of tools that provide graphical and statistical analysis, and the strong support from senior management are lean fundamental components that must be in place. Effective utilizing these three components—support, utilization, and infrastructure—are critical to the success of a lean initiative (Breyfogle et al., 2001). This study involved an assessment of the relationship of organizational cultural characteristics (clan, adhocracy, hierarchy, market) with each of these three key lean elements (support, utilization, and infrastructure).

Organizational Culture

It is essential that leaders understand the significance of organizational culture as an asset as they implement an organizational initiative. Treating organization culture as an asset eases communication, facilitates organizational decision making and control, and possibly generates higher levels of cooperation and commitment (Whitfield & Landeros, 2006). Organizations that integrate organizational culture theory and assessment into their strategic planning processes have successfully increased their effectiveness and have achieved better results in market share,

sales growth, profitability, innovation, employee engagement, and customer satisfaction (Baker, 2006; Cameron & Quinn, 1999). Researchers agree that there has been an abundant amount of research conducted on the subject of organizational culture (Sims, 2000).

Organizational culture has been studied for more than 50 years (Dadzie, Winston & Dadzie, 2012). The topic has grown in popularity, starting with a handful or articles published prior to 1990. However, in the late 1990s, there was an explosion of interest on the subject of organization culture among scholars generating thousands of articles. Hartnell, Ou, and Kinicki (2011) noted that more than 4,600 articles have examined organizational culture since the late 1990s. It is likely that interest in organizational culture is based on its recognition as a factor in organizational effectiveness (Schaeder, Tears, & Jordan, 2005).

Organizational management researchers have attempted to establish a single operational definition for organizational culture. However, their attempts resulted in the development of multiple definitions. According to the literature review there are not many concepts in organizational theory that have as many different definitions as that of organizational culture. As Tierney (1981) stated, "Widely varying definitions, research methods, and standards for understanding culture create confusion as often as they provide insight" (p. 2).

Ouchi's (1981) described organization culture as an organization's operating philosophy. Martin and Siehl (1983) suggested that organizational culture is the glue that holds individuals in an organization together and might lead to positive business outcomes. Gordon (1991) described 11 dimensions of culture, including clarity and direction, encouragement of individual initiative, conflict resolution, performance clarity, performance emphasis, action orientation, and human resource development. According to Gordon (1991) organizational culture is a set of processes that binds together members of an organization based on a shared pattern of beliefs. Schein

(1988) provides a definition for organizational culture as the total sum of all the shared assumptions that an organization has learned during its history. Tierney (1981) defined organizational culture as "the study of particular webs of significance within an organizational setting…that is, [to] look at an organization as a traditional anthropologist would study a particular village or clan" (p. 4).

Gordon (1991) described organizational culture as an organization-specific system of widely shared assumptions, values and ideas that result in typical behavior patterns. Kotter, and Heskett (1992) defined organizational culture as a system that consists of two levels, and each level being different in its visibility and in its resistance to change. Examining each level more closely it reveals the values that the members of the group share. These values are less visible yet are persistent even if the membership of the group changes over time. Denison and Mishra (1995) defined the term organizational culture as those sets of beliefs and assumptions that drive or shape behavior in organizations. Schein (1999) viewed organizational culture as operating at three levels: assumptions, values, and artifacts. First artifacts consist of behaviors that are visible and consisting with organizational structures and external manifestations of culture. Artifacts are the most superficial and easiest to change. These layers vary on a continuum ranging from superficial to deep. Cameron and Quinn (1999) identified two dimensions of organizational culture: content dimension and pattern dimension. Content dimension refers to those components of an organization's culture that help each organizational member recognize and understand the organization's values. Pattern dimensions refer to those aspects that serve as a profile of an organization's culture and that can be determined by a cultural assessment instrument.

Hodgetts and Luthans (2003) defined culture as a system of common values, beliefs, and assumptions that people across the organization share. Some of the characteristics of

organizational culture, as Hodgetts and Luthans identified, are: (a) the way in which work gets done, (b) the levels of cooperation between employees and management, (c) the relationships that employees have with each other, (d) common behavioral rules, (e) language, and (f) formal procedures. Hodgetts and Luthans's work was intended to help employees understand the concept of culture, defining these different elements to make it more specific and tangible. According to Schein (2004), the culture of a group can be defined as:

> A pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 17)

According to Bolman and Deal (2008), "Culture forms the superglue that bonds an organization, unites people, and helps an enterprise accomplish desired ends" (p. 253). Likewise, Hofstede (2001) stated that organizational culture constitutes a social environment members' psychological or collective programming , and that organizational culture is what distinguishes that group from others. Similarly, Shekari, Rahmdel, and Rajabian (2012) presented a holistic view of organizational culture in which they described culture as the sum of the various traditions, beliefs, common expectations, mode of dress, interactions, decisions, policies, and procedures that make up the organization.

Determining an individual organization's culture is a complex task that requires defining the organization, identifying its values, determining how it operates, and recognizing how it is viewed internally and externally (Atkins & Turner, 2006). One of the most common themes in definitions of organizational culture is the organization members' shared values and beliefs and these values are used to make decisions in the performance of duties (Lamond, 2003). Values are

the fundamental concepts and beliefs that identify standards of success within an organization.

Organizational culture is a key theoretical construct that helps researchers better understand

organizations and their performance outcomes (Delobbe, Haccoun, & Vandenberghe, 2002).

Organizational culture has been shown to affect employee turnover (Baker, 2006); innovation

(Schein, 1983); personal involvement, self-confidence, and ethical behavior (Deal & Kennedy,

1999); strategic involvement (Carney, 2006); and commitment to the organization (Kotter &

Heskett, 1992), and can, in turn, influence an organization's bottom line. Denison (1984)

believed culture played a key role in shaping an organization's activities, an asset that could be

leveraged to increase a firm's financial performance.

> Schein (2010) best summarizes how organizational culture will be defined for this study:
> A pattern of shared basic assumptions learned by a group as it solved its problems of
> external adaptation and internal integration, which has worked well enough to be
> considered valid and, therefore, to be taught to new members as the correct way to
> perceive, think, and feel in relation to those problems. (p. 17)

Schein indicated that no one culture is more correct or more acceptable than an other culture and

that cultures grow out of three sources: "(1) the beliefs, values, and assumptions of founders of

organizations; (2) the learning experiences of group members as their organization evolves; and

(3) new beliefs, values, and assumptions brought in by new members and new leaders" (p. 219).

Competing Values Framework

Organizations are complex and have many values they want to satisfy, which might each

be worthy but cannot all be satisfied at the same time or to the same extent. To address this

problem Quinn (1988) developed this concept into a theory called Competing Values Framework

(CVF). The framework was originally developed in the 1980s and has since been rigorously

tested (La Belle, 2010; Quinn & Cameron, 1983).

It is important to assess an organization's culture. Doing so can be challenging, as several factors might influence that culture. The competing values create tension within the organization. One manifestation of competing values for employees is stress. Babcock (2003) stated:

Fatigue, irritability, difficulty in concentrating, difficulty in sleeping, upset stomach, low morale, and lack of job satisfaction are all signals of stress in the workplace.…Characteristics of low-stress, high-productivity facilities include…management actions that are consistent with organizational values. (p. 59)

This framework suggests that the ability of managers to perform well is based on how they use these different and conflicting sets of skills: boundary spanning, human relations, coordinating, and directing skills (Babcock, 2003).

The competing values framework continues to be used to describe all levels of the organization while assisting managers with examining the role of different levels of organizational hierarchy and it's the model that has been chosen for this study. Quinn and Rohrbaugh (1983) first proposed the Competing Values Framework during their organizational effectiveness study. The competing values model Quinn developed is an analytic framework built around two dimensions, forming four quadrants that represent competing orientations or values in the organizational context (Edwards, Yankey, & Altpeter, 2001). Cameron et al. (2006) believe that the Competing Values Framework taps into fundamental organizing frameworks people use when they draw inferences about the world. Cameron et al. (2006) believed the congruence of frameworks occurs because people are similar in their deeply rooted psychological processes.

The competing values model developed is an analytic framework built around two

dimensions forming four quadrants representing competing orientations or values in the organizational context (Cameron et al., 2006). Denison and Spreitzer (1991) stated the horizontal dimensions or x-axis portrays the conflicting demands,

> …created by the internal organization and the external environment. One end of the axis represents a focus on integration and buffering to sustain the existing organization, while the other represents a focus on competition, adaptation, and interaction with the environment. (p. 5)

According to Cameron and Quinn (1999), organizations focusing externally tend to be concerned with the market, new customers, and competitors as opposed to organizations with an internal focus, which tend to be concerned with employee morale and the way work is accomplished. This dimension consists of a spectrum that ranges from flexibility and versatility at the one end to consistency and durability at the other.

The vertical dimension constitutes the organization's flexibility in dealing with issues while the horizontal dimension deals with the organization's internal focus (Edwards et al., 2001). The y-axis assesses the choice between flexibility and control. One end of the dimension "reflects an emphasis on flexibility and spontaneity, whereas the other represents a complementary focus on stability, control, and order" (Denison & Spreitzer, 1991, p. 4). Cameron et al. (2006) argued that organizations, such as Google and Hewlett-Packard, that are associated with harmonious internal characteristics. These characteristics are in contrast to organizations that focus on challenging and competing with rivals, such as Toyota. From one extreme to the next the dimension consists of a continuum that ranges from having internal cohesion at the one end to independence at the other.

The Competing Values Framework is categorized into four quadrants with two

dimensions (Cameron et al., 2006). One dimension differentiates effectiveness criteria that

emphasize flexibility, discretion, and dynamism from stability, order, and control. The other

dimension differentiates effectiveness criteria that emphasize an internal orientation, integration,

and unity from external orientation, differentiation, and rivalry. Together, these four quadrants

each represent a distinct set of organizational effectiveness indicators. Cameron and Quinn

(2011) believe these quadrants explore the artifacts and espoused value dimensions of Schein's

(2004) model. Cameron and Quinn (2011) termed theses four types of organizations Clan,

Adhocracy, Hierarchy, and Market (see Figure 3).
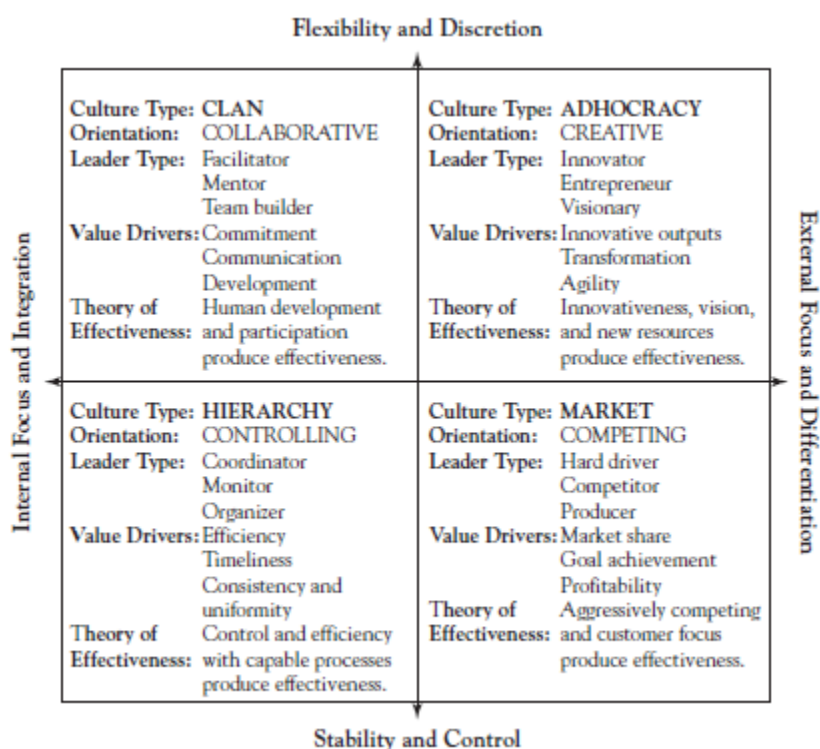
Figure 3. Competing values framework. From *Diagnosing and changing organizationalculture: Based on the competing values framework* (3rd ed.; p. 35), by Cameron, K. S., & Quinn, R. E. (2011). San Francisco, CA: Jossey-Bass.

Clan culture defined as "shared values and goals, cohesion, participativeness,

individuality, and a sense of 'we-ness' [in which] the organization places a premium on

teamwork, participation, and consensus" (Cameron et al., 2006, p. 43). According to the

literature review the clan culture has been acknowledged for its encouragement of trust-based practices with emphasis on flexibility and cohesion. According to Cameron and Quinn (1999), clan leaders are visionaries who inspire and motivate organization members by ensuring they share values and objectives. Clan cultures promote cohesion, a family-type environment, and a group similarity. Customers are thought of as partners, the organization is in the business of developing a humane work environment, and managers' roles are to empower employees and facilitate their commitment and loyalty (Cameron et al., 2006). There is a sense of togetherness along with an encouragement for teamwork and participation in this cultural type. According to Cameron and Quinn (1999), the clan culture focuses on internal maintenance with flexibility, concern for people, and sensitivity to customers. The strategic emphasis in clan culture type is toward developing human capital, commitment, and morale. These type organizations define success by the internal climate and the concern for the organization's members (Cameron et al., 2006). Fong and Kwok (2009) found clan culture to be critical to the success of knowledge management at project and organizational levels. Cameron et al. (2006) found organizations with clan cultures to have high employee commitment and improved communication.

Adhocracy culture, is "characterized by a dynamic, entrepreneurial, and creative work place [in which] people stick their necks out and take risks" (Cameron et al., 2006, p. 45.) The adhocracy culture concentrates on external positioning with a high degree of flexibility and individuality. This culture is geared toward innovation, risk taking, and individuality. Leaders within the adhocracy culture break rules in order to adapt quickly to new opportunities. The culture is flexible, focuses on competitive positioning, and is most responsive to accelerating and changing conditions outside the enterprise; thus, the emphasis is on risk-taking, experimentation, and dynamism. Cameron and Quinn (2011) stated that adhocracy cultures are often found in

most start-ups and entrepreneurial ventures, and research and consulting organizations.

Hierarchy culture is defined as "large numbers of standardized procedures, multiple hierarchy levels, and emphasis on rule reinforcement" (Cameron et al., 2006, p. 38). Hierarchy cultures are characterized by a controlling environment and adherence to order, formal rules, and policies for the maintenance of organizational stability. In this culture, it is important to have clear, standardized lines of communication in production efforts. Strongly hierarchical organizations value the efficiencies found by ideas such as the efficient assembly line or supply chain. Under this culture leadership strategies are more focus on improving the quality of processes by reducing variation and consistency of outcomes and having a leadership style with characteristics of organizing and monitoring. According to Cameron and Quinn (1999) hierarchy cultures stresses efficiency, by having policies and procedures that are the nucleus that united force of the organization. These organizations put an emphasis on value and obtaining results by increasing certainty and eliminating anything that causes variation on the outcome. Cameron et al. (2006) stated that hierarchical organizations are good for markets that are tightly regulated and do not change frequently, and in which organizations have to maintain standardized procedures or uniform quality. A possible concern in this culture is that there may be inadequate research and development, and solving problems is difficult in new situations as it requires a paradigm shift. The emphasis is to continue executing by doing the things that have worked in the past rather than on seizing new opportunities (Goodman, Zammuto, & Gifford, 2001). This type of culture places overall emphasis on having a strategy that aims on stability, predictability, and smooth operations.

Market culture is defined as "driven by customer focus, premium returns on assets, and improved corporate competitiveness [in which] leaders are hard-driving producers and

competitors [and] the long-term concern is on competitive actions and achieving stretch goals and targets" (Cameron et al., 2006, p. 40). The basic assumptions in a market culture are that the external environment is hostile rather than peaceful, consumers are interested in value, and the organization must increase its position. Cameron et al. (2006) identify the mantra for this quadrant as "compete hard, move fast and play to win" (p. 44). In this quadrant the emphasis is on having strategies that are focused on producing short-term profitability for stakeholders, and the leaders tend to be more aggressive and competitive. The primary objective of leaders in these organizations is to increase results and profits and to place less focus on internal cohesion and dynamics. Winning is seen as the only option in these cultures, and outpacing the competition is a virtue. Obtaining prompt feedback from customers is the highest priority and the strategic emphasis is towards making changes that will lead to competitive advantage and market superiority (Goodman et al., 2001).

According to researchers the Competing Values Framework focuses squarely on organizational culture attributes rather than organizational climate attributes. It assesses "how things are" (Cameron et al., 2006, p. 147) in the organization rather than how individuals feel about them (Cameron et al., 2006). The Competing Values Framework was originally developed for use in educational organizations and is the basis for the Organizational Culture Assessment Instrument (OCAI) (Cameron et al., 2006).

To provide additional granularity the four cultural types are further defined by six dimensions. The dimensions include characteristics associated with, leadership style, organizational glue, organizational climate which is the existing work environment of the organization, criteria of success, and management style. The dimension of dominant characteristics refers to the core values of the organization, such as the degree of teamwork or the commitment to goals. Organizational glue refers to the bonding mechanisms that hold an organization together, such as cohesion, commitment, and loyalty. Organizational climate consists of the existing work environment of the organization. The dimension of management style refers to how employees are treated and the degree of consultation or participation (Cameron et al., 2006).

The tool that assesses the culture of an organization into these four quadrants is the OCAI (Cameron et al., 2006). In the organizational culture literature, the most popular and widely researched quantitative-based assessment instrument of culture is the OCAI. The OCAI is an instrument for assessing organizational culture; it is designed to help identify the current culture and the culture organization members believe should be developed to meet future needs (Cameron & Quinn, 2011). The OCAI was developed to diagnose six key aspects of organizational cultures (Cameron & Quinn, 1999). These subsystems are integrated by the Competing Values Framework into the four theoretical culture types or archetypes of organizational effectiveness. These groupings assess basic assumptions (dominant characteristics, organizational glue); interaction patterns (leadership, management of employees); and organizational direction, strategic emphases, criteria of success (Cameron et al., 2006). The OCAI permits organizations to analyze easily their current and preferred culture types using the main dimensions described above (Kimberly & Quinn, 1984).

The OCAI was developed as an instrument to measure organizational culture by utilizing a scenario approach that measures typologies of an organizational culture quantitatively and is based on the Competing Values Framework. "It is a framework that was empirically derived, has been found to have both face and empirical validity, and helps integrate many of the dimensions various authors have proposed" (Cameron & Quinn, 2011, p. 54). The OCAI assesses how much an organization reflects the values of each culture type by including six domains with four items to be assessed within each domain. The typological instrument uses the ipsative method, in which participants are asked to distribute a total number of points, usually 10 or 100, across a set of given statements (Jung et al, 2009). Using the OCAI, these four factors provide the basis of cultural classification within the workplace. Additionally, the OCAI allows predictions to be made using the reciprocal opposition process, which in the context of this measure concerns the factors diagonally opposite each other in Figure 1 (i.e., Clan and Market cultures, and Hierarchy and Adhocracy cultures). Quinn and Spreitzer (1991) determined that the use of the scenario approach resulted in fixed-choice data in which correlations were perfectly correlated with each other. The measures were not suitable for correlation-based statistical analysis, such as regression and factor analysis.

To arrive at the basis of the competing values framework, Quinn and Rohrbaugh (1983) analyzed a list of 39 indicators purported to be a comprehensive list of criteria for measurement of organizational effectiveness. Through statistical analysis the list was consolidated into two primary dimensions and four major clusters. As seen in Figure 1, the two competing dimensions focused on control or flexibility and internal or external constituents. By crossing the two dimensions, it was possible to designate four quadrants, which correlated to four organizational cultures (Cameron & Quinn, 2011; Howard, 1998). While the culture types appeared to be linked

to a designated constituent group, Quinn's theory premised each of the cultures existed within all organizations. Since organizations differed in their values, based upon the industry in which they operated or the relative age of the organization, the dominant values shifted dependent on factors that influenced the organizational culture (Howard, 1998). Organizations tend to have none or more than one characteristic, for example it is common for an organization to be characterized by having no specific dominant culture type or by having multiple dominant culture types (Quinn & Spreitzer, 1991).

The aerospace industry operates in global economies with pressures and treats coming from different areas and subsequently based on the challenge must operate in each of the four quadrants, in order to adapt to the challenges and be able to continue to survive. There are situations that having strong values of the group dimension such as being able to provide team support and encourage participatory decision making will allow leaders to be more effective and maintain or improve productivity. According to Quinn (1988) it is normal to have tension between the demands of each of the four cultures in fact it is instrumental to an organization's effectiveness as opposed to simply mastering just one of the dimensions. An organization that is aware of the importance of having a balance between the dimensions will be in a better position to respond to a wide variety of environmental conditions.

The Competing Values Framework and OCAI were selected for use in this study based upon the comprehensive review of the literature. According to Yu and Wu (2009), "The Competing Values Framework is one of the most influential and extensively used models in the area of organizational culture research" (p. 37). Numerous studies were conducted to test the validity of the Competing Values Framework model. Validation was performed based on a Likert-scale instrument, Q-sort methodology, and structural equation modeling and found the

model to be valid (Kwan & Walker, 2004). While there were a significant number of models and scales for measurement of organizational culture. When compared with each other the Competing Values Framework provided empirical validity in ample research and broad organizational applications with fewer dimensions. The combination of validity and a quantitative method to measure organizational culture and culture change was the best fit for this study. According to Cameron and Quinn (2011):

> The OCAI is designed to help identify an organization's current culture or the culture that exists today.…The same instrument helps identify the culture that organization members believe should be developed to match future demands of the environment and the opportunities to be faced by the organization in the coming five years. (pp. 23–24)

Relationship Between Quality Initiatives and Organizational Culture

Creating a lean workplace requires changing the corporate culture. Lean thinking incorporates the best aspects of flexibility, quality, and low price and it brings significant change to corporate culture, change that necessitates strong project leadership, visible support from top management, and patience Bhasin and Burcher (2006), Gander (2009), and Mann (2009) argued that a certain culture is necessary to implement lean practices; more specifically, a culture in which all employees are engaged in continuous improvement. Cameron and Quinn (1999) found in their research that total quality management and organizational culture are closely intertwined, and that the success of the quality initiative is dependent on "having the improvement strategies embedded in a cultural change" (p. 30). Lean success is defined as the existence of a kaizen culture (kaizen means make better) in which lean tools are effectively applied, by enthusiastic employees, to eliminate waste every day (Roper, 2005). Roper wrote:

If this is true, then many organizations should probably quit their Lean programs now, as they will never succeed by this definition. There is no roadmap for achieving a kaizen culture, and left to their own device, most organizations will run out of time and patience before they discover the path. (p. 3)

Chang and Weibe (1996) performed a study using the Competing Values Framework. The researchers analyzed the relationship if any between organizational culture and lean implementation. The research used data gathered from Total Quality Management Center by surveying 122 participants. The objective of the study was to determine if there is an ideal culture for quality management. The findings of the study showed that the ideal culture to successfully implement a quality management initiative is in a culture that has characteristics associated with a climate of trust, strong support, and the fostering of creativity.

Another study was performed by Shortell, Levin, Obrien, and Hughes (1995) utilizing the Competing Values Framework to determine the relationship between organizational culture and quality improvement. The results of this study showed that the types of organizational cultures that are more conducive to implementing a successful quality management initiative are the group and developmental cultures.

Al-khalifa and Aspinwall (2000) also utilized the Competing Values Framework to understand the relationship between an organization's culture and TQM implementation. According to the researchers, understanding the relationship between the organization's culture and the lean thinking can provide insight into how to approach lean implementation. A questionnaire using was given to 72 quality professionals, and based on the results, covariance analysis was applied to analyze the dependent variables. The findings indicated that the characteristics of the clan culture and the developmental culture were best suited for lean

implementation. The authors emphasize that the Competing Values Framework is a useful tool to drive desired changes in order to reach the desired quality culture.

Tang, Kim, and O'Donald (2000) developed a "Japanese organizational culture scale or JOCS based on theory and suggested research in the literature" (p. 1). JOCS surveyed 300 U.S. and Japanese employees. Based on the JOCS results, the authors argued that a strong organizational culture can be a competitive advantage, and that their study investigated the shared beliefs and values between Japanese mother companies and the Japanese-U.S.–owned plant, and compare that to a U.S.-owned plant.

Detert, Schroeder, and Mauriel (2000) looked at culture as it relates to the implementation of improvement initiatives in organizations, with contingency theory, articulating that there is no best way for a company to adjust to its environment. They used other researchers' instruments for measuring culture, such as the Competing Values Framework (Cameron & Freeman, 1991) or the Organizational Culture Profile and then discussed how various cultural profiles relate to TQM. The authors then extracted from their literature study eight dimensions of culture in a proposed model of TQM values and beliefs. They used Schein's model of culture and focused on the value level of culture; they linked these eight cultural constructs to a set of values and beliefs, which they argued are the foundation of successful TQM adaption. These researchers argued that change initiative researchers have, in general, focused on the implementation of visible and tangible artifacts or practices, as in the case of appropriate lean practices, and that the cultural level of values and beliefs need to be paid more attention, otherwise, change initiatives such as TQM will be difficult to implement in the organization. Davies and Kochhar (2002) pointed out in their literature study, the difficulties practitioners face implementing lean practices; difficulties that lead to a low success rate in implementing lean.

Bhuiyan and Baghel (2005) defined continuous improvement "as a culture of sustained improvement targeting the elimination of waste" (p. 761). It is a culture where everyone knows the importance of the engagement of all employees in the continuous improvement process. This type of culture fosters continuous improvement and encourages evolutionary improvements, which result in revolutionary results that may take place over time.

Dahlgaard and Dahlgaard-Park (2006) conducted a qualitative literature-research study on lean production and company culture with a comparative analysis combined with a Danish case study to discover the differences lean production and six sigma. They reported the importance of building the right culture in order to be successful in implementing a lean philosophy. They also came to the conclusion that lean production and and six sigma came from TQM and are essentially the same. The authors also argued that to build a proper culture to support lean implementation, its needs a strategy aimed at satisfying both mental and spiritual needs of the people in the organization.

Huehn-Brown and Murray (2010) surveyed the impact of continuous improvement and culture in automotive suppliers. The researchers focused on understand the impact of continuous improvement in leadership, learning, and collaboration. The findings of the study showed that only 30% of the researched companies used lean or Six Sigma approaches and among the companies there were significant inconsistencies in the implementation of lean throughout these organizations. This research targeted employees at all levels of the organization to capture more accurately the perception of all employees and not just managers or workers. Huehn-Brown and Murray (2010) concluded in their study that there are many uncertainties on create a continuous improvement supportive culture and all employees, including suppliers; need to be involved in the lean initiative process.

Bhasin and Burcher (2006) performed a detailed literature analysis. In their conclusion they recommend implementation of five or more lean practices, viewed lean as long-term continuos improvement, and made numerous cultural changes to embrace empowerment of employees and to sponsor lean throughout the supply chain. They argued that the right culture is needed to implement lean, and listed a total of 13 cultural values. This is one of the few articles with a holistic approach to lean; the authors tried to combine lean practices with a lean culture and promoted lean leadership without specifying this in more details.

Liker and Morgan (2006) abandoned the idea of implementing lean practices dependent on patterns and opined that a true lean culture is more important than the lean tools and techniques companies use. They described lean practices as short-term oriented and stated that true lean companies need to be "long-term lean enterprises" (p. 5). They expanded the lean idea beyond the manufacturing floor to lean supply-chain management, customer focus, faster development cycles, better quality, and standardized processes in development.

Cheng and Liu (2007) performed a research utilizing the Competing Values Framework to research and determine if there is any relationship between organizational culture and the implementation of a quality management initiative. According to the researchers, appreciation for the need to make appropriate culture changes in order to match TQM philosophy is important to lean implementation's success. From the results, Cheng and Liu (2007) found that the ideal organization culture would have leadership with characteristics associated with a hierarchy culture, management and employees associated with a clan culture, and with strategic emphasis associated with an adhocracy culture. This verified Quinn's (1988) argument that organizations have values in all four cultures and it is normal to have more than one value system in order to be successful.

Duque and Cadavid (2007) developed a framework to implement lean using five dimensions: elimination of waste, continuous improvement, continuous flow and pull system, multifunctional teams, and information. They specified a number of suggestions: percentage of suggestions implemented, percent scrap, and percent rework as measurements for continuous improvement construct. They questioned which aspects of organizational culture were most important to implement lean, hinting at the crucial need for a supportive organizational culture.

Macey and Schneider (2008) researched employee engagement in a recent literature-research article. They concluded that the general consensus is that having engaged employees is a desirable condition, that it may be a competitive advantage, and that it is difficult for competitors to imitate a state of behaviorally engaged employees. The authors defined three separate engagement elements: Trait engagement, state engagement, and behavioral engagement. Macey and Schneider (2008) explained that trait engagement contains personality attributes, suggesting employees need "to experience work in positive, active, and energetic ways" (p. 24), going beyond what is necessary to achieve positive organizational outcomes. Macey and Schneider further explicated that trait engagement is a cause for state engagement (feelings of passion, energy, enthusiasm, and activation), which concerns the positive activity from trait engagement with the job and work settings. They continued that organizational commitment and job involvement are all parts of how individuals have invested themselves in the organization. The third construct of EE is stated as behavioral engagement, which is "broadly defined as adaptive behavior" (p. 24), where employees go beyond the status quo and initiate change to adapt to the changing environment. Macey and Schneider clarified the notion that employee empowerment is part of a state engagement construct; lean literature often recommends empowered work teams, which these authors defined as part of the employee engagement

construct. Macey and Schneider's that wider construct of employee engagement as a major construct for lean culture. In addition, Macey and Schneider argued that transformational leadership creates trust in employees and will lead to higher engagement and better performance.

Anand, Ward, Tatikonda, and Schilling, (2009) investigated the infrastructures needed in companies to implement continuous improvement. These authors defined continuous improvement as the base capability for lean and Six Sigma, defined continuous improvement initiatives as a set of tools and techniques similar to lean practices, and defined organizational learning as the underlying theory of continuous improvement. They used a qualitative method to collect evidence, interviewing executives from five companies. Anand et al. defined the purpose of the company, processes such as continuous improvement and standardization, and training of their people as the infrastructural framework of their work. The authors pointed out that it is important to create and sustain a culture of constant change, but in their research they only found middle management focusing in these changes, whereas shop-floor workers were not involved. All companies used a project-management approach to sustain their improvement efforts. This research summarized the current state of continuous improvement, pointed out the importance of the needed infrastructure to implement lean, and supported the notion that continuous improvement is a basic condition for implementing lean.

The literature reveals that throughout the years many studies have been performed using the Competing Values Framework to demonstrate a relationship between organizational culture and lean implementation. Based on the cited studies, the Competing Values Framework has been used widely by researchers and their results show a strong correlation between the developmental and clan cultures that will support a successful lean implementation. In addition, some of the studies analyzed the relationship between culture and total quality management,

however, researches agree that similarities between lean and total quality management exists (Flott, 2000). Therefore, this study will explore the relationship between lean implementation and organizational culture and anticipates similar results.

According to Schmidt and Finnegan (1992), in most studies the organizations culture is the dependent variable and quality management is often the independent variable. They came to this conclusion in a study that found quality management practices are the premise to an organizational culture characterized by empowerment, employee development, and teamwork.

The literature also reveals that there are contrasting perspectives on whether organization culture drives lean implementation or lean implementation drives organizational culture. One perspective that is covered in the literature is the premise that quality management practices result by implementing cultural changes in the organization. Furthermore, according to Al-khalifa and Aspinwell (2000), found out in his research that organizational culture is impacted and often changes as result of the implementation of quality methodology or initiative. The contrasting perspective is that organizational culture is required to be in place prior to implementing quality management (Prajogo & McDermott, 2004).

There have been a number of studies that support the perspective that an organization's culture will determine the success of a quality management initiative. Prajogo and McDermott (2004) conducted an extensive analysis of the literature pertaining to the relationship between organizational culture and TQM. After their review of the literature Prajogo and McDermott (2004) designed a study based on the hypothesis that organizational culture will transform as result of implementing a quality initiative and their results showed that TQM implementation results in an organizational culture change. Bright and Cooper (1993) determined, based on the

results of their study, that it is culture that influences how an organization's members interpret and implement quality management practices.

Summary

The literature review reveals that lean is used across industries. Further, the connection between leadership and the success of lean implementation appeared to be important in implementing a lean supportive culture (Kaye & Anderson, 1999; Macey & Schneider, 2008). As Preskill and Torres (1999) state, "All too often, organizational leaders have not considered the systems and structures that are needed to support employees' involvement in teams" (p. 23). Transformational leadership will support a higher degree of lean practices applied in the organization. The literature review concludes that leaders with a transformational leadership style are needed to implement lean thinking in an organization. The literature review also concludes that the leader of an organization has to support lean implementation and has to have strong transformational-leadership traits. Sosik and Dionne (1997) proposed a correlation between leadership styles and TQM.

The literature review also concludes that there is a significant correlation between lean culture and continuous improvement initiatives. The literature reviewed established the definitions and relevance of organizational culture and organizational change, including the validation of the Competing Values Framework when researching the dimensions of organizational culture. This study targeted the gaps in the literature regarding the role of organizational culture change in effective lean implementation.

Chapter 3: Methodology

The purpose of this chapter is to focus on the research design and methodology to study the role that organizational culture has on successful lean implementation. This chapter discusses the research methodology that the researcher plans to use, including the research questions and hypotheses, the subjects that will participate on the study, the survey instrument that will be used to capture the data that will be analyzed to provide results, as well as the validity and reliability of the instrument. A description of the sample and the data analysis that will be utilized is included. The study's limitations are also provided. This study focuses on the relationship of organizational culture and elements of lean implementation as it relates to the successful deployment of lean systems at a leading *Fortune* 500 corporation, which for the purposes of this study is called the XYZ Aerospace Company.

Restatement of Research Questions

Two research questions have been created to examine the relationship between organizational culture and key elements of lean implementation.

Research Question 1: What is the relationship between organizational culture type (clan, adhocracy, hierarchy, or market) and the three lean implementation elements (support, utilization and infrastructure)?

Null Hypothesis 1: The organizational culture type (clan, adhocracy, hierarchy, or market) is not related to any of the three lean implementation elements (support, utilization, and infrastructure).

Alternative Hypothesis 1: The organizational culture type (clan, adhocracy, hierarchy, or market) is related to at least one of the three lean implementation elements (support, utilization, and infrastructure).

Research Question 2: What is the relationship between the two organizational culture dimensions (flexibility versus control and internal versus external) and the three lean implementation elements (support, utilization, and infrastructure)?

Null Hypothesis 2: Neither of the two organizational culture dimensions (flexibility versus control and internal versus external) will be related to any of the three lean implementation elements (support, utilization, and infrastructure).

Alternative Hypothesis 2: At least one of the two organizational culture dimensions (flexibility versus control and internal versus external) will be related to at least one of the three lean implementation elements (support, utilization, and infrastructure).

Description of the Research Methodology

This is a quantitative correlation study on the relationship between organizational culture and the implementation of three key lean elements. A quantitative research methodology is a reliable and repeatable research methodology that lends itself to accurate representation and interpretation of the evidence. This study in nonexperimental in design because no random assignment, control groups, or measures will be needed; this type of research does not require changing or manipulation of the variables. This quantitative research was conducted using a survey that was designed to address the research questions. Through the use of surveys, researchers can gather data that can be analyzed through quantitative analysis. The survey was given to more than 240 participants. A nonrandom convenient sample of professionals who work in XYZ's Defense Systems division was surveyed to measure their respective perceptions of organizational culture and lean implementation. Kettner (2004) stressed that quantitative analysis is extremely useful in identifying parameters and performance measures in relation to the topic.

Design of the Study

According to Creswell (2007), an independent variable "causes, influences, or affects outcomes" (p. 94). An independent variable is one that is fixed—controlled—and generally is believed to have a degree of impact on a dependent variable (Creswell, 2009).This study's independent variables are derived by using the Competing Values Framework to measure the organizational culture type. The Competing Values Framework is an organizational culture model that is based on extensive research on how an organization operates and the values that are shared by the employees in relationship to the two cultural dimensions of flexibility-control and internal-external orientation. The Competing Values framework consists of the cultural types of clan, adhocracy, hierarchy, and market (Cameron & Quinn, 1999). To measure the independent variables this study used a survey that participants' completed by responding to 24 questions (Appendix B), included in the survey's organizational culture section. These questions are based on the Organizational Culture Assessment Instrument. The scores from the Likert-type questions were treated as interval data.

In this study the dependent variables are three elements that are involved with lean implementation: support, utilization, and infrastructure. The independent variables of organizational culture clan, adhocracy, hierarchy, or market were evaluated for interrelationships. Each independent variable (Table 1) was interrelated to the dependent variable as well as the combination of independent variables to the dependent variable. The dependent variables are the key elements involved with lean implementation: support, utilization, and infrastructure (Appendix C, Section 2). The scores for the dependent variables were calculated from responses to a series of questions about how the respondents perceive their organizations in the implementation of each of these components. The respondents ranked each question from a

low of 1 to a high of 5, based on a scale where 1 signifies very low utilization of the lean

component and 5 signifying very high utilization.

Table 1

Dependent and Independent Variables

Independent Variables—Culture Type	Dependent Variables
1 Clan	1 Support
2 Adhocracy	2 Utilization
3 Market	3 Infrastructure
4 Hierarch	

Population and Sample

Creswell (2007) noted that researchers get samples from the population in which are

ultimately interested. Aerospace employees were the people of interest for this study. The

sampling method was a stratified sampling with the sample being employees from an aerospace

company. Appendix D provides the e-mail message that was sent to employees of company

XYZ, and it described the survey, included a link to the electronic survey, and invited the sample

members to participate in the survey. This method ensures participation in the survey was strictly

voluntary.

XYZ's Defense Systems division is made up of more than 80,000 employees located

throughout the United States. The sample for this study includes XYZ's Defense Systems

division lean leaders, change agents, and lean practitioners who are actively leading and assisting

the transformation to a lean-manufacturing enterprise. These employees are located in 10 sites

throughout the United States. There are approximately 450 lean leaders and change agents at

these 10 sites. The researcher anticipated 30% participation, which equates to 135 lean-transformation leaders and change agents.

Instrumentation

Organizational culture is measured by using the OCAI. Appendix B contains the version of the OCAI that was used in this study. Quinn and Spreitzer (1991) developed it to diagnose six key dimensions of organizational culture, which are integrated by the Competing Values Framework into the four cultural types of clan, adhocracy, hierarchy, and market (Cameron & Quinn, 1999). Even though the OCAI is a public-domain document, permission was obtained to use the instrument see appendix C.

The OCAI has been repeatedly tested for reliability. Several researchers have provided evidence for adequate reliability and validity of the OCAI in measuring organizational culture as well as its effectiveness in a variety of organizations (Cameron & Freeman, 1991; Cameron & Quinn, 1999; Quinn & Spreitzer, 1991). For instance, Quinn and Spreitzer (1991) reported a Cronbach's alpha coefficient of greater than .70 for each culture type in a sample of 800 participants from 86 different public utility firms. Yeung, Brockbank, and Ulrich (1991) studied more than 10,000 business executives and found a Cronbach's alpha coefficient close to .80. Quinn and Spreitzer (1991) determined these results supported the reliability of the OCAI and have consistently proven the ability to measure organizational culture.

The other instrument that was used in this study is a survey instrument that was pre-evaluated by a pilot group consisting of 10 lean experts (four lean experts-trainers, two managers, and four nonsupervisory engineers) to ensure clarity, comprehensiveness, and acceptability (Aday & Cornelius, 2006). The pilot group was asked to review the proposed survey and provide comments and suggestions for improvement. The pilot group validated the

survey's clarity by ensuring that the questions flowed and were easy to complete before administering to the larger population. The pilot group agreed to refine survey questions, to provide feedback, and not to contribute directly to the data. The survey was modified according to the suggestions received from the pilot group. A copy of the survey is included in Appendix C.

Data-Gathering Procedures

Data collection started with an in-depth literature review, which is examined in Chapter 2 of the study. The literature helped to formulate the research questions and the guidelines for participant selection. In general, there are several methods to acquire data (Aday & Cornelius, 2006; Fowler, 2009). For this dissertation, a web-based survey type was chosen, using commercially available SurveyMonkey software. SurveyMonkey was chosen because, first, it protects the participants' anonymity and the link to the web-based survey can be sent to the exact focus group (Aday & Cornelius, 2006). In this case, employees in XYZ's Defense Systems division were the participants in the survey. Second, the cost per unit is low for a web-based survey, compared to a sending a printed survey to various companies (Fowler, 2009). Third, it provides tracking capability, and convenience for the respondent is higher because there are no constraints on when and where to answer the survey (the respondent must carry printed surveys to be able to fill it out wherever and whenever he or she chooses). Fourth, the throughput time of a web-based survey is dramatically lower than that of a paper-based version. The process of printing and mailing does not apply to a web-based version. Finally, data can be exported easily to other applications, and data collected during a web-based survey is directly accessible electronically and can be further processed by any spreadsheet software (e.g., Microsoft Excel).

To collect data for this study, two data collection instruments were provided to the participants via web-based pages with multiple questions, as described above using SurveryMonkey. One of the data collection instruments is the revised version of the OCAI (Appendix B). Quinn and Spreitzer (1991) developed an instrument in which a Likert-scale instrument was used to identify the four quadrants. Likert scales ask participants to indicate their level of agreement or disagreement with a series of predefined statements. The OCAI for this study is composed of 24 items with a 5-point Likert-like scale. The scale ranged from 1 (strongly disagree) to 5 (strongly agree), with participants rating the extent to which they agree with each statement. With the 5-point scale, scores range from 24 to 144, with a higher score indicating a higher level of strength of that type of organizational culture.

The OCAI was supplemented by a second data collection instrument (Appendix C) that measured the dependent variables, which are the key elements involved with lean implementation, including support, infrastructure, and utilization. These dimensions were developed into a series of 16 questions based on a 5-point Likert scale. The response options ranged on a scale of 1 to 5, where if the respondent answers 1 it signifies that there is a low utilization of the lean component and answering 5 signifies high utilization of the lean component in that organization.

It is essential to maintain confidentiality throughout the research process (Creswell, 2007). Confidentiality was maintained in this study by not using the participants' real names or business names. The researcher will not share names of the participants with anyone. The researcher removed names from any documents and the company names are concealed. Survey data and analyses, including consent-related information, were stored on a removable computer solid state drives to limit access, and are controlled by the researcher. All research data,

including electronic survey results, will be stored for at least 1 year following publication of the dissertation on a password-protected hard drive and locked in an undisclosed location and will be destroyed after the required retention period but before 3 years following publication.

A database was created to capture the electronic mail addresses of the potential participants. Once approval from IRB was obtained an e-mail message was sent to each of the 240 sample members, which described the purpose of the study, invited participation in the study, and included a link to the survey. The researcher's telephone number and e-mail address were included in the e-mail message. This enabled any participant or prospective participant who had questions about the study to contact the researcher by using either telephone or e-mail. Participants who accept the informed consent text (Appendix E) were given passwords and instructions for completing the survey. The timeframe for responding to the survey was 3 weeks, based on the date of the original e-mail message. The researcher utilized two follow-up e-mail messages (one each week) in order to ensure the anticipated response rate was attained.

Data-Analysis Procedures

The dimensional score of flexibility versus stability was calculated as follows (Figure 4): the respondent's clan and adhocracy scores were totaled together and then the respondent's hierarchy and market scores were subtracted from the clan plus adhocracy total. A positive score represents an organization that is somewhat to very flexible while a negative score represents an organization that is somewhat to very stable. The dimensional score of internal versus external was calculated as follows: the respondent's clan and hierarchy scores were totaled together and then the respondent's adhocracy and market scores was subtracted from the clan plus hierarchy total. A positive score represents an organization that is somewhat to very internally focused while a negative score represents an organization that is somewhat to very externally focused.
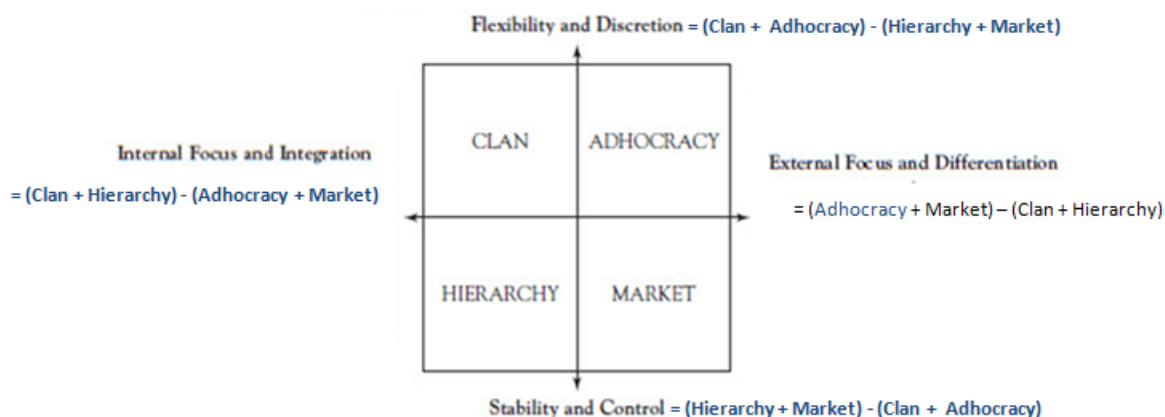
Figure 4. Dimensions of the competing values framework. From *Diagnosing and changing organizational culture: Based on the competing values framework* (3rd ed.; p. 35), by K. S. Cameron, and R. E. Quinn 2011. Copyright by Jossey-Bass.

The alpha level for this study was set at $p < .05$. However, because of the exploratory nature of this study, findings significant at the $p < .10$ level were noted to suggest possible avenues for future research. Data were initially tabulated using standard summary statistics (means, standard deviations, frequencies, and percentages).

Statistical Approach for Research Question 1was a MANOVA, followed by three one-way ANOVA tests with eta coefficients. As an additional set of analyses for Research Question 1, the four OCAI scores were correlated with the three lean practices scores using Pearson correlations.

Statistical Approach for Research Question 2 was a MANOVA, followed by three one-way ANOVA tests with eta coefficients. As an additional set of analyses for Research Question 2, the two dimensional scores (flexibility versus control and internal versus external) were correlated with the three lean practices scores using Pearson correlations.

A total of 121 surveys were completed, for an initial response rate of 50%. After examination of the responses for missing data, outliers, and nonresponse patterns, the resulting sample size of 83 respondents (35%) was obtained. Griffis, Goldsby, and Cooper (2003)

commented about the decline in web-based survey responses, stating, "The traditional benchmark of 20% usable responses seems less common today than ever before" (p. 237). Larson and Poist (2004) support Griffis's et al. (2003) findings on the decline rate for survey responses. Wright and Schwager (2008) performed online survey research in an effort to improve response factors. Their sampling frame of $N = 1,696$ resulted in 280 usable responses, or approximately 16.5%. Accordingly, the response rate for this survey is not unexpected. Based on the cited literature review, the sample size can be characterized as adequate for this study.

Plans for IRB

The safeguard of human subjects is an essential ethical consideration. Having the IRB examine the plans is an integral component of the dissertation process so that potential risks for the study participants can be assessed (Creswell, 2007). Pepperdine University's (2009) policy states, "The primary goal of the GPS IRB is to protect the rights and welfare of human subjects participating in research activities conducted under the auspices of Pepperdine University" (p. 62). Pepperdine University's policy states that ethical principles and guidelines aid the IRB in resolving ethical problems that might arise from research conducted with human subjects.

The researcher was required to and completed training on federal guidelines for the protection of human participants-subjects, as required by Pepperdine University (2009), and as shown in Appendix F. In addition, research done at Pepperdine University must adhere to all other appropriate federal, state, and local laws and policies. One component of being in adherence with the IRB guidelines is that an informed consent form is created for participants to sign prior to participating in the research. This form indicates the participants acknowledged that their rights were protected throughout the data collection process and after it. According to Creswell (2007) elements of the form include voluntary participation and the right to exit the

study at any time, the study's likely impact on them as well as its purpose, the study's procedures, the right to receive a copy of the results, the right to ask questions and have their privacy respected, benefits of the study that are applicable to the participant, and the signatures of the participants showing that they agree to these terms. Appendix E contains a copy of the consent text that was used in this study and it encompassed all of the required elements . When the dissertation committee reviewed and approved the proposal, an application was submitted to the Pepperdine University IRB for an expedited review. The activities on this research show that there is minor amount of risk to human subjects, therefore per the guidelines, expedited review applies. The proposed survey plan was submitted to the Pepperdine IRB for approval before commencing the study. An overview of the proposed research plan is represented in Figure 5.

| Request IRB Approval | Conduct a pilot study | Rework Survey (If Required) | Distribute Survey | Obtain Informed Consent | Collect completed surveys | Perform data analysis |
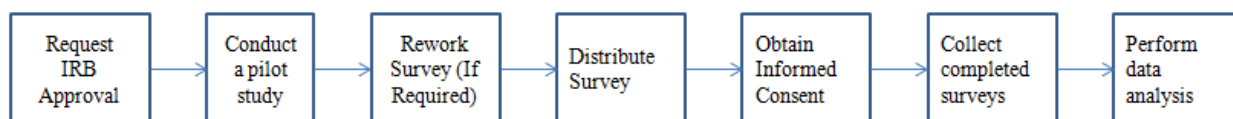
Figure 5. Research plan.

Summary

This chapter contains a restatement of the research questions, description of the research methodology, process for selection of data sources, definition of analysis unit, definition of data gathering instruments, validity of data-gathering instruments, data-gathering procedures, reliability of data-gathering instrument data procedures, description of the data-analysis process, and IRB plans. Consistency is kept with the goals stated in Chapter 1 for this research design. Lean practitioners were interviewed to collect data. The researcher reviewed the survey responses and synthesized and interpreted the information gathered after collecting the data. The items presented in Chapters 4 and 5 are outcomes, conclusions, implications, and suggestions.

Chapter 4: Presentation and Analysis of the Data

The purpose of this quantitative study was to explore and evaluate the role that organizational culture had on successful lean implementation and to identify if there were any relationships between the organizational culture type (Clan, Adhocracy, Hierarchy, and Market) and culture dimension (Flexibility versus Control, and Internal versus External) as the Competing Values Framework and three lean implementation elements (Support, Utilization, and Infrastructure) define. A total of 83 respondents participated in this study.

Table 2 displays the frequency counts for selected variables. Most in the study (71.1%) were nonmanagement technical-professional workers. Among the participants, 80% had at least an undergraduate degree and 45.8% had at least one graduate degree. The years with the company ranged from 1 to 43 years ($M = 22.93$, $SD = 9.99$). The most common general work environment was system engineering (38.6%) and pertaining to specific work environment, 65.1% answered that they were in a technical environment. Based on the results of the OCAI, the most common organizational culture types was hierarchy (38.6%) followed by market (28.9%) and clan (26.5%; Table 2).

Table 2

Frequency Counts for Selected Variables

Variable	Category	*n*	%
Job Role			
	Non-Management Technical/Professional	59	71.1
	Supervisory	3	3.6
	Middle Management	14	16.9

(*continues*)

Variable	Category	*n*	%
	Senior Management	7	8.4
Educational Experience			
	High school graduate	9	10.8
	Certificate or associates degree	8	9.6
	Undergraduate degree	28	33.7
	Graduate degree	38	45.8
Years with Company [a]			
	1 to 9 years	8	9.6
	10 to 19 years	15	18.1
	20 to 29 years	37	44.6
	30 to 43 years	23	27.7
General Work Environment			
	Manufacturing	7	8.4
	System Engineering	32	38.6
	Program Management	11	13.3
	Other Environment	33	39.8
Specific Work Environment			
	Business environment	29	34.9
	Technical environment	54	65.1
Culture Type			
	Clan	22	26.5

(*continues*)

Variable	Category	*n*	%
	Adhocracy	5	6.0
	Hierarchy	32	38.6
	Market	24	28.9

[a] Years with company: *M* = 22.93, *SD* = 9.99.
Note. (*N* = 83)

Table 3 displays the psychometric characteristic for the aggregated scale scores. The total lean implementation score had a mean of *M* = 3.47 (*SD* = 0.69) with the highest of the three lean elements being support (*M* = 3.73, *SD* = 0.80). Among the four OCAI scores, the highest was market (*M* = 3.60, *SD* = 0.85) while the lowest was adhocracy (*M* = 3.19, *SD* = 0.93). The Cronbach alpha reliability coefficients ranged from α = .79 to α = .93 with the median-sized coefficient α = .87. This suggests all scales had acceptable levels of internal reliability.

Table 3

Psychometric Characteristics for the Aggregated Scale Scores

Scale	Number of Items	*M*	*SD*	Low	High	α
Lean Support	5	3.73	0.80	1.40	5.00	.86
Lean Infrastructure	6	3.34	0.76	1.17	5.00	.86
Lean Utilization	5	3.35	0.70	1.40	5.00	.82
Total Lean Implementation	16	3.47	0.69	1.50	5.00	.93
OCAI Clan	6	3.34	0.95	1.00	4.83	.90
OCAI Adhocracy	6	3.19	0.93	1.00	4.83	.89
OCAI Market	6	3.60	0.85	1.17	5.00	.90
OCAI Hierarchy	6	3.53	0.71	1.00	5.00	.79

Note. (*N* = 83)

Answering the Research Questions

Four independent variables of organizational culture clan, adhocracy, hierarchy, or market and three dependent variables of lean implementation, support, utilization, and infrastructure, were used to answer the study's research questions.

Research Question 1

Research question 1 stated: What is the relationship between organizational culture type (clan, adhocracy, hierarchy, or market) and the three lean implementation elements (support, utilization, and infrastructure)? The related null hypothesis predicted: The organizational culture type (clan, adhocracy, hierarchy, or market) is not related to any of the three lean implementation elements (support, utilization, and infrastructure). Table 4 displays the one-way ANOVA tests with accompanying eta coefficients for the three lean implementation elements with culture type. No significant relationship was found among culture type and support ($p = .26$), infrastructure ($p = .24$), or utilization ($p = .15$). As an additional analysis, the total implementation score was compared to culture type. No significant relationship was found ($p = .18$). This combination of findings provided support to retain the null hypothesis.

Table 4

Relationship of Lean Implementation Scores Based on Culture Type

Lean Score	Culture Type	n	M	SD	η	F	p
Lean Support					.22	1.36	.26
	Clan	22	3.67	0.82			
	Adhocracy	5	3.16	1.07			
	Hierarchy	32	3.89	0.78			

(*continues*)

Lean Score	Culture Type	*n*	*M*	*SD*	η	*F*	*p*
	Market	24	3.68	0.72			
Lean Infrastructure					.23	1.42	.24
	Clan	22	3.26	0.64			
	Adhocracy	5	2.80	0.86			
	Hierarchy	32	3.50	0.73			
	Market	24	3.32	0.86			
Lean Utilization					.25	1.81	.15
	Clan	22	3.44	0.45			
	Adhocracy	5	2.76	0.82			
	Hierarchy	32	3.47	0.78			
	Market	24	3.25	0.73			
Total Lean Implementation							
	Clan	22	3.44	0.56	.25	1.70	.18
	Adhocracy	5	2.90	0.87			
	Hierarchy	32	3.61	0.70			
	Market	24	3.41	0.72			

Note. ($N = 83$)

Research Question 2

Research question 2 stated: What is the relationship between the two organizational culture dimensions (flexibility versus control and internal versus external) and the three lean implementation elements (support, utilization, and infrastructure)? The related null hypothesis predicted: Neither of the two organizational culture dimensions (flexibility versus control and

internal versus external) will be related to any of the three lean implementation elements

(support, utilization, and infrastructure). To answer this question, Table 5 displays the Pearson

product-moment correlations between the two organizational culture dimensions with the three

lean elements plus the total lean implementation score. Inspection of the table found none of the

eight correlations to be significant at the $p < .05$ level. This combination of findings provided

support to retain the null hypothesis. Pearson product-moment correlation matrix was used to test

this hypothesis, testing for pair-wise correlation between the independent variables and

dependent variables. Correlation is a parameter of the bivariate distribution, and is used to

describe the association between two variables. Both dependent and independent variables are

assumed to be random in this statistical technique. The magnitude of the correlation and

statistical significance are used to examine and quantify these relationships.

Table 5

Relationship Between Organizational Culture Dimensions With Lean Implementation Elements

Lean Implementation	Flexibility	Internal
Lean Support	-.01	.09
Lean Infrastructure	-.07	.12
Lean Utilization	.11	.14
Total Lean Implementation	.00	.13

* $p < .05$.
Note. ($N = 83$)

Summary

This study used data from 83 surveys to explore and evaluate the role that organizational

culture had on successful lean implementation and to identify if there were any relationship

between the organizational culture type (Clan, Adhocracy, Hierarchy, and Market) and culture

dimension (Flexibility versus Control, and Internal versus External) as the Competing Values Framework and three lean implementation elements (Support, Utilization, and Infrastructure) define. Hypothesis 1 (culture type with lean elements) was not supported (Table 4). Hypothesis 2 (culture dimensions with lean elements) was not supported (Table 5). In the final chapter, these findings will be compared to the literature, conclusions and implications will be drawn, and a series of recommendations will be suggested.

Chapter 5: Summary, Conclusions, and Recommendations

Summary of the Results

The purpose of this quantitative study is to investigate and determine if there is a relationship between perceived organizational culture type (Clan, Adhocracy, Hierarchy, and Market) and culture dimension (Flexibility versus Control, and Internal versus External), as the Competing Values Framework and the three lean implementation elements (Support, Utilization, and Infrastructure) define. Two research questions were created to examine the relationship between organizational culture and key elements of lean implementation:

Research question 1: What is the relationship between organizational culture type (clan, adhocracy, hierarchy, or market) and the three lean implementation elements (support, utilization, and infrastructure)?

Null hypothesis 1: The organizational culture type (clan, adhocracy, hierarchy, or market) is not related to any of the three lean implementation elements (support, utilization, and infrastructure)?

Alternative hypothesis 1: The organizational culture type (clan, adhocracy, hierarchy, or market) is related to at least one of the three lean implementation elements (support, utilization, and infrastructure)?

Research question 2: What is the relationship between the two organizational culture dimensions (flexibility versus control and internal versus external) and the three lean implementation elements (support, utilization, and infrastructure)?

Null hypothesis 2: Neither of the two organizational culture dimensions (flexibility versus control and internal versus external) will be related to any of the three lean implementation elements (support, utilization, and infrastructure).

This research was performed on survey data collected from the XYZ Aerospace Company. The survey was sent out to 240 employees of varying job classifications throughout a 4-week period. The survey was web-based and hosted through SurveyMonkey.com, as described in Chapter 3. A total of 121 surveys were completed, for an initial response rate of 50%. After examination of the responses for missing data, outliers, and nonresponse patterns, the resulting sample size of 83 respondents (35%) was obtained. Subsequently, statistical analyses were performed on this dataset to examine these relationships. The results indicate that the null hypothesis is supported for both research questions. The findings in this study do not demonstrate a significant positive correlations among all related constructs, which were organizational culture type (clan, adhocracy, hierarchy, or market), organizational culture dimensions (flexibility versus control and internal versus external), and three lean implantation elements (support, utilization, and infrastructure).

Literature Review Analysis

There is a wealth of information written on the subject concerning organizational culture and lean implementation. However, quantifiable evidence is not available from current studies and literature on the relationship between organizational culture and lean implementation in the aerospace industry. A possible explanation is provided by Schein (1992), who argued that measuring organizational culture through questionnaires is not easy to accomplish, as the responses are only reflective of personal attitudes.

As discussed in the first chapter, the aerospace industry is facing unprecedented change (Bennis & Thomas, 2002) and to thrive in this competitive environment, it's imperative to improve quality and reduce cost in order for the organization to survive (Aragon-Sanchez et al., 2003). As a result of the current environment, industry leaders are implementing lean-

manufacturing practices to maintain and gain competitiveness (Crute, Ward, Brown, & Graves, 2003). The literature supports the claim that lean methods are necessary for companies to be competitive and to "confront the challenge of achieving global competitiveness" (Kojima & Kaplinsky, 2004, p. 199). The question that leaders' face is to determine the best approach to implement lean in an organization. Determining the best approach to implement lean is crucial for leaders since the failure rate of most quality planned organizational change initiatives is high. According to the literature, the difficulties range from ignoring the organization culture type to not providing enough employees training (Koenigsaecker, 2005). Cameron and Quinn (2011) argue that most lean initiative fail and based on their research, as many as three quarters of reengineering, TQM, strategic planning, and downsizing efforts have resulted in serious enough problems that the survival of the organization was threatened.

The literature review supports the assertion that organizational culture represents a crucial component on lean implementation's success (Rad, 2006). Carnell (2004) argues that the failure to consider the organization's culture would merely devolve lean implementation into a mindless execution of an activity performed by disinterested employees. The literature also shows evidence that organizations that succeeded in improving business performance changed their cultures to align with process improvement frameworks (McAdam & Lafferty, 2004). Therefore, the purpose of this research was to analyze the relationship between organizational culture and lean implementation in the aerospace industry using the Competing Values Framework and three elements of lean implementation. The findings of this research might provide leaders with information that shows the importance of considering organizational culture when implementing lean initiatives in aerospace organizations.

Literature in Support of the Findings

The objective of this study was to quantify the relationship between organizational culture and lean implementation. The findings for the two research question showed no correlation among any of the four organizational culture types and the three lean implementation elements. Therefore, the study concludes that there are no relationships among organizational culture type and lean implementation elements.

The findings presented in Chapter 4 are supported by several researchers' studies, which also found no significant interactions between the hierarchical culture and quality management initiatives. According to Duque and Cadavid (2007), continuous improvement, regardless of organization culture type, is the core engine of lean manufacturing (Choi & Liker, 1995; Duque & Cadavid, 2007). Other researchers (Mann, 2009) argued that the culture that is necessary to implement lean is a culture in which all employees are engaged in continuous improvements (Choi & Liker, 1995; Huehn-Brown & Murray, 2010; Liker & Morgan, 2006). This research confirms those arguments by indicating that there is no significant correlation between the organizational culture type (clan, adhocracy, hierarchy, or market) and lean implementation.

Cameron and Freeman (1991) performed a study of United States universities and concluded that hierarchical culture was not significantly related to any aspect of organizational effectiveness. Quinn and Spreitzer (1991) performed a similar study and came to the same conclusion in their research on organizational performance.

Literature Not in Support of the Findings

The findings on this research are in contrast to the research of Macey and Schneider (2008), who argued that transformational leadership will lead to higher engagement, which in this study it is considered one construct of lean culture. Also, the findings for the first research

question are in contrast with previous research findings that concluded that the role of supportive leadership has a relationship with the implementation of lean practices (Conca et al., 2004; Lucey, 2008; Mann, 2009), as well as with the research conducted by Achanga et al. (2006), who also makes the argument that leadership plays a significant part in lean implementation.

The findings of this study are inconsistent with Shortell et al. (1995) study regarding the relationship between organizational culture and quality management. This study surveyed 61 United States hospitals and concluded as a result of their study, that out of the four organizational cultural types, that the group and developmental culture types are conducive to successful quality management implementation. In addition, a study of 72 quality professionals conducted by Al-khalifa and Aspinwell (2000) found that the group culture and the developmental culture were considered to be important types for quality management implementation. Mann (2009) achieved similar results in his study of 270 members of the National Association of County Behavioral Health.

This research does not align with recent research that focused on implementing lean initiatives that consider organization culture a crucial component to support lean implementation Liker & Morgan, 2006), as well as other research that has explored the impact of leadership in implementing lean (Achanga et al., 2006), and discussed the need for a supportive organizational culture to implement lean.

Literature Review Synthesis

One possible explanation for the difference in results between this study and other studies could be that other studies were qualitative and had different sampling or instrumentation. Many researchers conclude that all organizations can gain a measure of success in any lean implementation as long as they persist in its own context and apply lean principles to its current

context (Green & May, 2005). Much of the existing research studies have shown that the common lean production tools and practices will produce benefits for discrete product producers. Green and May (2005) do suggest that even inappropriate use of the tools or implementation without full commitment to the lean principles does provide benefits.

Per the literature, there is a strong belief that organizational culture can be an enabling force to lean implementation. There are well-established and accepted theoretical frameworks that support this viewpoint. Lean production implementation is responsible for large-scale improvements in production facilities (Carreira, 2005). Research has shown that the organizational context is instrumental in a successful lean implementation. Researchers generally believe that, in order to be effective, lean production strategies, tools, and procedures must be in line with the organization (Liker & Morgan, 2006).

Considerable resources must be dedicated to lean implementation. Having knowledge that maximizes the potential impact of lean implementation is valuable. This study gives researchers and practitioners a better understanding of contextual effects on lean implementation in the aerospace industry.

The findings in this study support several researchers' claims in the literature that continuous improvement not or organizational culture is the engine of lean implementation (Duque & Cadavid, 2007). Lean production is an operations management theory that seeks to increase competitiveness of a company through removing variability and provide value for the customer through the elimination of waste (Standard & Davis, 1999). Lean production is a value-laden systems theory in which the organization's individuals learn and participate in the organization's evolution (Liker & Morgan, 2006; Standard & Davis, 1999).

Conclusions and Implications

The context of this study is unique because of the environment in which it was performed. This research is the first to investigate the relationship of organizational culture and lean implementation in an aerospace organization. This research has provided an opportunity to study a cross section of an aerospace organization. Cameron and Quinn (2011) speak of an organization's cultural congruence, where a company's strategy, leadership style, and management systems all emphasize the same set of cultural values. In this environment, the appearance of cultural incongruence drives the need for cultural change. This study improves one's understanding of the dynamics of this change.

The findings of this study do not support the role that culture has in relationship to lean implementation. The study's results do not indicate that aerospace organizations that are implementing a lean initiative would be well served to utilize an approach that takes into account the organization's culture type. This is significant because it provided quantifiable data that supports the null hypotheses stated in Chapter 1 and had been written about extensively as being missing in the literature. The implications for organizations are potentially important in that leaders may purposefully implement strategies, structures, and policies in order to enhance the success of lean implementation.

This study, designed to evaluate the relationship between organizational culture and lean implementation, added additional knowledge to the overall body of knowledge by providing quantitative data to help determine which specific organizational cultures are more conducive to lean initiatives. Using the competing values framework this study explored the cultural relationship to key component of the implementation—upper management support, organizational infrastructure, and utilization of lean methodology. The purpose of the study is to

allow lean initiatives that improve problem solving and reduce waste to be applied in aerospace organizations that are under increasing pressure to reduce costs and improve quality. Gaining information about the relationship of organizational culture and lean implementation could help contribute to the effectiveness of a lean initiative. There are opportunities to influence and guide key organizational practices by understanding the role and cultural characteristics that lead to greater implementation of key lean components.

The study addressed two research questions related to the relationship between the group and developmental cultures and lean management support. The hypotheses that organizational cultural type has significant interactions with lean management support were not supported. These findings are consistent with previous studies conducted on the relationship between quality management and organizational culture. The results provide additional support to the position that lean methods can allow an organization to achieve improvement in performance without considering organizational cultural type. According to Johnson, Sun, and Johnson (2007), the most important benefit for any company is cost savings through the elimination of waste, which is the key element that makes up the foundation of lean manufacturing.

The results of this study and previous studies indicate that characteristics associated with the group culture, such as collaboration, involvement, and learning are not significant factors for and effective lean implementation. Particularly significant was the reaction that occurred with group culture and management support. The leadership style of a group culture leader consists of collaboration and employee involvement. Leaders assume a role of mentors who focus on developing strong relationships with the organization's members. These results are inconsistent with the study that was conducted by Dellana and Hauser (1999) with 1,000 members of the American Society for Quality, and found group culture to have a positive relationship with

leadership support. The group culture is characterized by a focus on internal relationships and a commitment to and the development of human resources, encouraging learning and teamwork—key elements in quality initiatives.

Organizational leaders who are considering implementing lean might be well served to focus on thorough training of employees and involving employees as much as logistically possible in various aspects of the initiative. Frequent and bidirectional communication about the initiative will help employees to understand and commit to utilizing lean practices. Leaders who role model and mentor employees about using these practices will expedite and reinforce the standard utilization of lean practices.

The characteristics of the developmental culture, a focus on flexibility, change, and innovation, were also not significant factors for a lean initiative. Understanding the key steps involved with a change process will help facilitate the integration of lean practices within the organization. The developmental culture's emphasis on risk and innovation are congruent with the lean tenet of continuous improvement.

The hypothesis that the hierarchical culture will significantly interact with lean infrastructure was not supported and the hypothesis that the rational culture will significantly interact with lean methodology was also not supported. These findings were not consistent with studies that found a positive relationship between the rational culture and quality management methodology. Although the results of this study did not indicate a positive interaction between the rational culture and the use of lean methodology, it would appear that there are characteristics of the rational culture that would be useful for a lean implementation, including the focus on strategic planning and achievement.

This study added to the findings of previous studies demonstrating the relationship between organizational culture and quality management. The nature of this relationship is not clearly defined, as there are different perspectives in the literature on whether organizational culture can be managed. It would appear that the relationship is somewhat bidirectional. An appropriate organizational culture must exist to implement effectively quality management. Lean initiatives are more likely to succeed if the prevailing organizational culture is compatible with lean assumptions. This conclusion is consistent with a recent study from the Massachusetts Institute of Technology Lean Advancement Initiative (Rebenstich, 2008) which shows that there is no evidence that the maturity of lean implementation in aerospace is at more than an introductory level. Among the many reasons believed to be contributing to this situation, a survey (Rebenstich, 2008) points to the lack of prioritization and underlying models to define appropriately value in support of resource allocation decision making in engineering activities as sources of problems in implementing specific components of lean methods.

Cameron and Quinn (1999) indicated that if an organization's culture is significantly different than the values and assumptions that form the foundation of lean, the implementation process will be slow and difficult. By understanding the cultural characteristics that lead to greater implementation of key lean components, there are opportunities to influence and guide key organizational practices.

Recommendations for Future Research

A survey methodology results in a broad yet shallow picture of the overall phenomena (Robson, 2002). So, while this study provides a general picture of lean over the aerospace industry sector, it does not give specific information about what would work the best in an individual company in a specific context. Further research is necessary on the part of any

organization wishing to use this study to inform an implementation process. Alternative methods such as written surveys, questionnaires, or personal interviews may help improve the response rate as well as alleviate some concerns with common method bias. In addition, the survey queried only a selected aerospace organization; not all aerospace organizations were surveyed.

Respondents to the survey come from departments of an aerospace organization that are implementing lean as well as departments that have not implemented lean. Some attempts were made to separate these two categories of organizations in the analysis; however, it is not possible to separate completely the two categories, as organizations will utilize lean tools whether they intend to implement fully lean concepts. As a result, it is possible that the results of this study do not reflect fully the effectiveness of the lean in organizations that have implemented lean.

The results of this study may not be transferable to different industry sectors. Different industry sectors have different environments in which they compete and must tailor their systems for that environment. James-Moore and Gibbons (1997) used a structured-interview process to compare lean practices described in the literature, and compared the practices to the practices used in a highly differentiated, low-volume industry: the aerospace industry. As much as 90% of lean practices have relevance in the aerospace industry; only 48% were used. The authors concluded that different industries have different requirements and that some practices are not transferrable to other industries without modifications.

In analyzing these findings, it can be concluded that the choice of industry sector will have an impact on lean adaptation. This finding will also lead to questions in other research results that have been conducted outside the automotive industry. In addition, if industry segments make a difference, different times and different economic conditions could also make a difference. Such research about the transportability of lean into different industries would help

answer these questions. Operations strategies and process constraints inherent in these other industry sectors may alter the effectiveness of various lean tools. Future research is needed to examine how the effectiveness of these tool sets differs across the sectors. Companies competing in the same markets should have similar challenges and so the strategies developed should be similar; however, lean philosophies are not yet universal (Bendell, 2005; De Toni & Tonchia, 2002).

Another recommendation for future research is to measure productivity. The participants in the survey were asked for their perceptions of the effectiveness of the lean tools for improving productivity. The reason that perceptions were used instead of productivity measurements are that productivity has many contributing factors and lean tools are often synergistic. Also, companies may not use all the tools in a tool set or even use them the same way. Direct measurement could easily be misleading. The response rate to the survey would probably have been much lower if the survey had asked for measurements. Productivity measurements are more time consuming for participants to determine and constitute more sensitive information than perceptions. However, productivity measurements would provide much more precise data.

As highlighted above, this research provides insight into the relationship between organizational culture and lean implementation. Aspects for future research arise from this study. While researchers agree culture is deep-seated and difficult to change completely, there are a number of strategies that leaders of an organization may utilize to help influence the organization's culture. Leaders have the task to influence culture and to be successful they need to determine to focus items that are crucial to the success of the organization and to be able to measure the progress. In addition, leaders can adopt a conduct that can influence the organization by leading by example which includes teaching, and coaching other employees.

Future research should use longitudinal studies throughout a period of time to clarify the lean-culture relationship. Ployhardt and Vandenberg (2010) present a host of concerns to consider when designing a long-term longitudinal research study. Understanding issues such as the number of observations to be made and the understanding and handling of attrition are essential to the design of a follow-up study. Friedrich, Byrne, and Mumford (2009) suggest testing alternative plausible models based on pertinent research. In this way, causal ordering of the relationships potentially can be confirmed. Therefore, it would be valuable to conduct a longitudinal study to explore any correlation between lean culture and lean leadership style.

There were a number of potential research areas that emerged from the results of this study. An organization's integration of lean components is connected to factors such as trust and participation in decision making. Previously cited research has revealed that a climate of trust and involvement in decision making tend to be more associated with the flexibility and developmental group cultures. There is likely to be less resistance to a lean initiative found in these two cultures. For managers implementing lean, it would be advisable to emphasize teamwork and involvement. One potential area for future research is the causal relationship between organizational culture and quality management. This study was based on the premise that an organization's culture has an influence on the implementation of quality management practices. There is an opposing perspective regarding the relationship between organizational culture and quality management, which maintains that the implementation of a quality management initiative serves to change an organization's culture. This study did not explore the direction of causality between lean implementation and organizational culture. It is not clear whether the organizational culture determines the success of lean implementation, if the lean implementation modifies the organization's culture, or if it is a bidirectional occurrence. The

bidirectional model would involve the need for appropriate cultural characteristics to exist for the successful implementation of lean, and similarly, the lean implementation could have an influence on the organization's culture. While the bidirectional model appears plausible, additional research is needed to explore the causal relationship between organizational culture and quality management implementation.

Another potential area for future research involves the paradoxes associated with quality management. Researchers maintain that to understand better the relationship between culture and quality initiatives, there needs to be an understanding of the paradoxes associated with quality management. An example of one of these paradoxes is the importance of promoting creativity while also emphasizing the importance of control and lack of variation. How an organization can effectively manage these paradoxes is a potential subject for future research.

There are different perspectives involving the researching of organizational culture. This study was based on a quantitative approach. Another perspective on researching organizational culture is the qualitative perspective. Future research could be conducted utilizing a combined methodology approach to the study of organizational culture—both qualitative and quantitative.

Final Summary

This research is the first to investigate the relationship between organizational culture and lean implementation elements in the aerospace industry. In addition, this study provided information on the relationship between organizational culture and lean in the aerospace industry using the competing values framework. The findings contribute to the literature on which cultural types have more influence on the implementation of key aspects of a lean initiative. A study of this relationship is important for several reasons. It provides information on how specific cultural characteristics, particularly the group culture, impact the key components of a

lean initiative. The information generated from this study may assist aerospace organizations that are considering implementing lean initiatives by providing an understanding of what cultural values correspond with effective lean implementation. Managers who are conscious and knowledgeable of the relationship between organizational cultural type and lean implementation elements will be able to adjust their organizations' practices and systems to implement better lean methodology.

A comprehensive analysis of the literature revealed that organizational culture is an important factor in quality management initiatives (Shortell et al., 1995). The literature also revealed that particular cultural types are more positively correlated with various components of lean initiatives. The findings of this study do not support the conclusions from the literature that there is a positive relationship among management support, the group, and developmental organizational cultures in the aerospace industry.

The results of this study indicated that the qualities associated with the group culture had no significant relationship with the management support component of lean implementation. Characteristics associated with the group culture, such as collaboration, involvement, and learning, are not key factors for a lean initiative.

The results from this study suggest a number of potential areas for future research. Although this study did not provide support for the relationship between cultural types and lean components, it also did not explore whether the organizational culture determines the success of lean implementation, if the lean implementation modifies the organization's culture, or if it is a bidirectional occurrence. Continued research into the relationship between lean and organizational culture will increase the understanding of what factors are essential for successful lean implementation.

Successful lean implementation could help improve aerospace systems and processes, clarify policies and strategies, and provide an organizational structure that will result in improved performance. Those aerospace organizations that have successfully implemented lean initiatives have reported stronger organizational performance by reductions in engineering errors, reduction of waste, cost savings, and increases in revenue. Process improvements will lead to reductions in audit findings and higher quality in aerospace organizations resulting in significant impact on future contracts.

The hypothesis that the hierarchical culture has a significant interaction with lean infrastructure was not supported. This hypothesis was based on the hierarchical culture's focus on being internal and control oriented. This culture is characterized by a strict adherence to formal rules, procedures, structure, and authority. This culture emphasis is on structure stability, with employees' roles clearly documented and enforced through policies and procedures. This focus on control and on clearly established roles would appear to correspond with the infrastructure practices that are associated with lean. These finding of no significant reaction are consistent with previous studies, which also found no significant interactions between the hierarchical culture and quality management.

The hypothesis stating the rational culture significantly reacts with utilization of lean methodology was not supported. The rational culture is focused on achievement, productivity, and being results-oriented. These characteristics would appear to be consistent with the utilization of measurement and lean methodology. Leaders tend to be goal-oriented and directive and focus on efficiency and control (Quinn & Spreitzer, 1991). There is also an emphasis on competition, which perhaps might result in inconsistencies with the use of lean methodology.

The results of this dissertation show that Hypothesis 1 (culture type with lean elements) was not supported. Hypothesis 2 (culture dimensions with lean elements) was also not supported. These new results may help change agents better implement lean in their organizations. It is also recommended that these correlations be investigated on other companies within the aerospace industry to determine if the findings hold true to the aerospace industry or if the research findings are phenomena only for individual aerospace organizations.

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APPENDIX A

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APPENDIX B

Organizational Culture Assessment Instrument (OCAI)

Please rate your level of AGREEMENT with each of the following items:
1=strongly agree; 2=agree; 3=neither agree nor disagree; 4=disagree; 5=strongly disagree

1. Dominant Characteristics
1=strongly agree; 2=agree; 3=neither agree nor disagree; 4=disagree; 5=strongly disagree

    A.   My organization is a very personal place. It is like an extended family. People seem to share a lot of themselves.
            1   2   3   4   5

    B.   My organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.
            1   2   3   4   5

    C.   My organization is very results oriented. A major concern is with getting the job done. People are very competitive and achievement oriented.
            1   2   3   4   5

    D.   My organization is a very controlled and structured place. Formal procedures generally govern what people do.
            1   2   3   4   5

2. Organizational Leadership
1=strongly agree; 2=agree; 3=neither agree nor disagree; 4=disagree; 5=strongly disagree

    A.   The leadership in my organization is generally considered to exemplify mentoring, facilitating or nurturing.
            1   2   3   4   5

    B.   The leadership in my organization is generally considered to exemplify entrepreneurship, innovating, or risk taking.
            1   2   3   4   5

    C.   The leadership in my organization is generally considered to exemplify a no-nonsense, aggressive results-oriented focus.
            1   2   3   4   5

    D.   The leadership in my organization is generally considered to exemplify coordinating, organization or smooth-running efficiency.
            1   2   3   4   5

3. Management of Employees
1=strongly agree; 2=agree; 3=neither agree nor disagree; 4=disagree; 5=strongly disagree

    A.   The management style in my organization is characterized by teamwork, consensus, and participation.

1	2	3	4	5

B. The management style in my organization is characterized by individual risk-taking, innovation, freedom, and uniqueness.

1	2	3	4	5

C. The management style in my organization is characterized by hard-driving competitiveness, high demands and achievement.

1	2	3	4	5

D. The management style in my organization is characterized by security of employment, conformity, predictability, and stability in relationships.

1	2	3	4	5

4. Organization Glue
1=strongly agree; 2=agree; 3=neither agree or disagree; 4=disagree; 5=strongly disagree

A. The glue that holds my organization together is loyalty and mutual trust. Commitment to this organization runs high.

1	2	3	4	5

B. The glue that holds my organization together is commitment to innovation and development. There is an emphasis on being on the cutting edge.

1	2	3	4	5

C. The glue that holds my organization together is the emphasis on achievement and goal accomplishment. Aggressive and winning are common themes.

1	2	3	4	5

D. The glue that holds my organization together is formal rules and policies. Maintaining a smooth-running organization is important.

1	2	3	4	5

5. Strategic Emphasis
1=strongly agree; 2=agree; 3=neither agree nor disagree; 4=disagree; 5=strongly disagree

A. My organization emphasizes human development. High trust, openness, and participation persist.

1	2	3	4	5

B. My organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.

1	2	3	4	5

C. My organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant.

1	2	3	4	5

D. My organization emphasizes permanence and stability. Efficiency, control and smooth operations are important.

1	2	3	4	5

6. Criteria of Success
1=strongly agree; 2=agree; 3=neither agree nor disagree; 4=disagree; 5=strongly disagree

    A.   My organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.
           1   2   3   4   5

    B.   My organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.
           1   2   3   4   5

    C.   My organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is key.
           1   2   3   4   5

    D.   My organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low-cost production are critical.
           1   2   3   4   5

APPENDIX C

Permission to Use the Organizational Culture Assessment Instrument

Use of the OCAI for dissertation study

Meredith Smith [▬▬▬▬▬▬▬▬]

Sent: Monday, November 24, 2014 7:17 AM

To: Arroyo, Jesus (student)

Dear Jesus,

Thank you for your inquiry regarding the Organizational Culture Assessment Instrument (OCAI). Kim Cameron copyrighted the OCAI in the 1980s, but because it is published in the Diagnosing and Changing Organizational Culture book, it is also copyrighted by Jossey Bass.

The instrument may be used free of charge for research or student purposes, but a licensing fee is charged when the instrument is used by a company or by consulting firms to generate revenues. As a graduate student, you may use it free of charge. Please be sure all surveys include the appropriate copyright information (© Kim Cameron). Professor Cameron would appreciate it if you would share your results with him when you finish your study.

We do have a local company (BDS, Behavioral Data Services, ▬▬▬▬▬▬▬▬ which can distribute the instrument on-line, tabulate scores, and produce feedback reports for a fee. These reports include comparison data from approximately 10,000 organizations--representing many industries and sectors, five continents, and approximately 100,000 individuals.

I hope this explanation is helpful. Congratulations on your program, and I wish you well on your project.

Best wishes,

Meredith Mecham Smith

Assistant to Kim Cameron

APPENDIX D

Survey Instrument

Section 1 - General Questions

1.   What is your role?
         1. Non-Management Technical/Professional
         2. Supervisory
         3. Middle Management
         4. Senior Management

2. What is your educational experience?
         1. Did not complete high school
         2. High school graduate
         3. Certificate or associates degree
         4. Undergraduate degree
         5. Graduate degree

3. How many years have you worked in this company?
         Number of years: _____

4. Type of work environment?
         1. Manufacturing
         2. System Engineering
         3. Program Management
         4. Other: _____

5. Is your primary work in a business environment? _____ or in a technical environment? _____

6. When thinking about your work environment how would you rate your job?
         1. It is completely business oriented
         2. It is mostly business oriented
         3. It is equally business and technically oriented
         4. It is mostly technical
         5. It is completely technical

7. How many years has your company been using Lean methods
         Less than 1 year   1-2 years   3-5 years   More than 5 years

8. How many lean professionals (Black Belts) does your business site have?
         Don't Know   1 -15   16-30   31-50   More than 50

Section 2. Lean Practices

On a scale from 1 to 5, please indicate your level of agreement or disagreement with the following statements.
1=strongly agree; 2=agree; 3=neither agree nor disagree; 4=disagree; 5=strongly disagree
Support

1. Our Company's senior management has objectives for and assumes responsibility for lean performance.
     1   2   3   4   5

2. Management supports employees who come up with a continuous improvement idea.
     1   2   3   4   5

3. Management is knowledgeable of lean improvement tools and methodology.
     1   2   3   4   5

4. Lean improvement projects have positively impacted our organization's performance.
     1   2   3   4   5

5. We use a Lean expert (black belt/green belt) infrastructure for process improvement.
     1   2   3   4   5

6. Members of lean project teams have roles and responsibilities clearly identified.
     1   2   3   4   5

7. We have trained most staff in Lean process improvement methods.
     1   2   3   4   5

8. Our internal work processes have improved due to the lean initiatives.
     1   2   3   4   5

9. We keep data to track work improvements all lean projects.
     1   2   3   4   5

10. We use measures to evaluate process improvements.
     1   2   3   4   5

11. Our lean improvement efforts have positively impacted the quality of our services in the last two years.
     1   2   3   4   5

12. Implemented improvements enable employees to become more efficient.
     1   2   3   4   5

13. The number of audit findings has decreased due to our lean improvement initiative.

1   2   3   4   5

14. Our lean improvement efforts have greatly reduced the number of engineering errors
    occurring in our company.
    1   2   3   4   5

15. Our lean improvement efforts have had a significant impact in controlling costs in the last
    two years.
    1   2   3   4   5

16. Our company uses lean thinking improvement method for development and implementation
    of projects and process improvement.
    1   2   3   4   5

Section 3- Organizational Culture - The Organizational Culture Assessment Instrument will be
used.

Thank you for your participation in this survey. If you are interested in learning about the results
of the survey, please do not hesitate to contact me. Once the study is complete. I would be happy
to send you a summary of the results.

APPENDIX E

Academic Research Project Participant Notification E-Mail to Potential Participants

I am a doctoral student who is researching the relationship between organizational culture and lean implementation as part of a doctoral dissertation through the Pepperdine University Graduate School of Education and Psychology (GSEP). I am contacting employees from XYZ Defense Systems division to study this relationship. The findings from this study will assist aerospace organizations that are implementing quality initiatives by providing an understanding of what cultural values correspond with successful Lean implementation.

Participation in the study involves completing an electronic survey that takes approximately 15 minutes to complete. Anonymity and confidentiality of survey participants will be preserved at all times. The names of the participants and the participants' employer will not be disclosed or referenced in any way in any written or verbal context.

Participation is completely voluntary; you may choose not to complete any response, and may discontinue participation at any time. No information that identifies you personally will be kept, and your responses will be considered confidential. The data will only be used in an aggregate form, will be kept in a secure manner for 3 years, and may be used by this researcher in future research. There are no negative consequences for not participating or for withdrawing from the study.

To participate in this study, please visit the following link (by pasting the link into your browser or by holding down the CTRL key and clicking on the link below) the planned cutoff date for completing the survey is February 27, 2015.

http://surveymonkey.com/s.asp?u=XXXXXXXX

This research has been reviewed and approved by the Graduate and Professional Schools IRB at Pepperdine University. Approval to conduct the study has been granted by the IRB during the period from January 20, 2015 through January 20, 2016.

If you have any questions about this research, please contact Jesus Arroyo at ▮▮▮▮▮▮▮ or at ▮▮▮▮▮▮▮▮▮▮▮▮.

Thank you for your consideration.

Jesus Arroyo
Doctoral candidate
Pepperdine University
Graduate School of Education and Psychology
Organizational Leadership program

APPENDIX F

Informed Consent Text

My name is Jesus Arroyo, and I am a student in Organizational Leadership at Pepperdine

University, Graduate School of Education and Psychology, who is currently in the process of

recruiting individuals for my study entitled, Assessment of the Relationship between

Organizational Culture and Lean Implementation in the Aerospace Industry. The professor

supervising my work is Dr. Dellaneve. The study is designed to explore and evaluate the role that

organizational culture has on successful lean implementation and to identify if there is any

relationship between the organizational culture type (Clan, Adhocracy, Hierarchy, and Market)

and culture dimension (Flexibility versus Control, and Internal versus External) as the

Competing Values Framework and three lean implementation elements (Support, Utilization, and

Infrastructure) define, so I am inviting individuals who work in the aerospace industry to

participate in my study. Please understand that your participation in my study is strictly

voluntary. The following is a description of what your study participation entails, the terms for

participating in the study, and a discussion of your rights as a study participant. Please read this

information carefully before deciding whether or not you wish to participate.

If you should decide to participate in the study, you will be asked to click on a link that will take

you to a web-based survey. It should take approximately 15 minutes to complete the survey you

have been asked to complete. Please complete the survey alone in a single setting.

Your identity will be kept anonymous and the name of you organization will be kept confidential

at all times and in all circumstances where research based on your responses are presented.

Although minimal, there are potential risks that you should consider before deciding to

participate in this study. These risks include that the participant's information may be revealed.

As identified above the researcher will take every step to ensure the anonymity of responders and the name responder's aerospace organization. In the event you do experience any concerns, please feel free to contact Jesus Arroyo, Principle Researcher at

(███████████████████), or Dr. James Dellaneve, Adjunct Professor at Pepperdine University (███████████████████). This research study will be reviewed by Graduate and Professional Schools (GPS) Institutional Review Board, Pepperdine University. For research-related problems or questions regarding participants' rights, please contact Dr. Thema Bryant-Davis, Chairperson, GPS IRB at Pepperdine University at

████████████████, ████████████.

The potential benefits to you for participating in the study are that this study will assist aerospace organizations that are considering implementing lean initiatives by providing an understanding of what cultural values correspond with successful lean implementation. If managers are aware of the cultural underpinnings of the lean initiative and are attentive to the influence of culture-shared values and norms, the initiative is more likely to be successful. A successful Lean implementation could help improve the organization's systems and processes.

The process improvements and the reductions in system breakdowns and engineering errors could have a significant impact on reducing the costs associated with engineering products.

If you should decide to participate and find you are not interested in completing the survey in its entirety, you have the right to discontinue at any point without being questioned about your decision. You also do not have to answer any of the questions on the survey that you prefer not to answer--just leave such items blank

By clicking on the first radio button, I acknowledge that I understand the nature of the study,

potential risks as a participant, and the means by which my identity will be kept confidential. I also acknowledge that (a) I am over the age of 18, and that (b) I give my permission to be voluntary participant in the outlined study.

Sincerely,

Jesus Arroyo

APPENDIX G

Certification for "Protecting Human Research Participants"

Figure G-1 shows the certification for Protecting Human Research Participants that was received by the researcher.
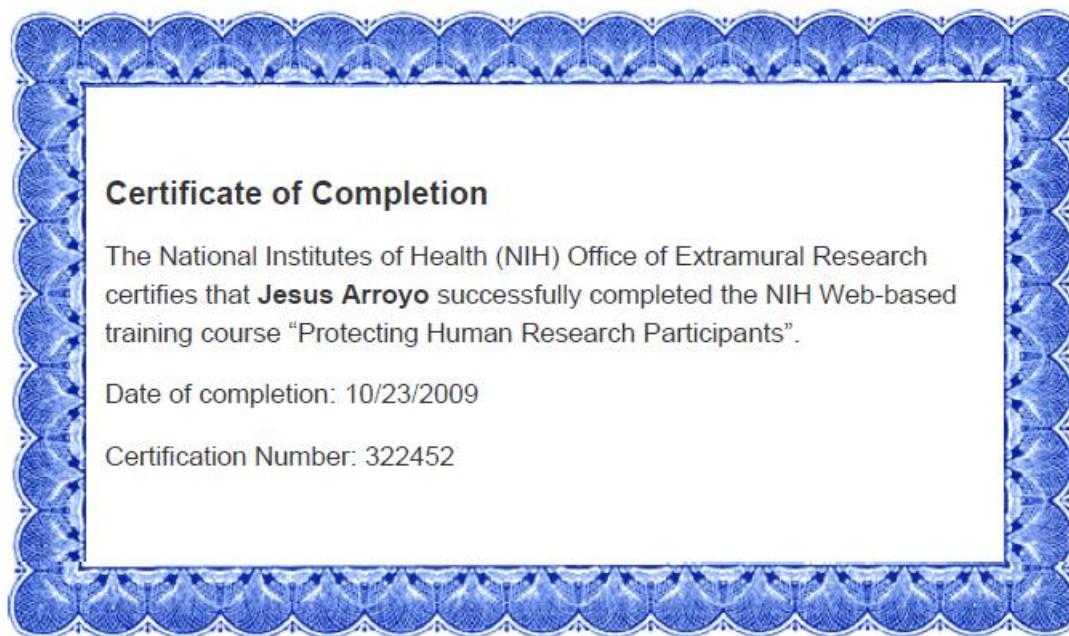

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Jesus Arroyo** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 10/23/2009

Certification Number: 322452

Figure G1. Certification for "Protecting Human Research Participants".

APPENDIX H

Institutional Review Board Approval Letter

PEPPERDINE UNIVERSITY

Graduate & Professional Schools Institutional Review Board

January 20, 2015

Jesus Arroyo

[REDACTED]

Protocol #: [REDACTED]
Project Title: Assessment of the Relationship between Organizational Culture and Lean Implementation in the Aerospace Industry

Dear Mr. Arroyo:

Thank you for submitting your application, *Assessment of the Relationship between Organizational Culture and Lean Implementation in the Aerospace Industry,* for exempt review to Pepperdine University's Graduate and Professional Schools Institutional Review Board (GPS IRB). The IRB appreciates the work you and your faculty advisor, Dr. Dellaneve, have done on the proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations (45 CFR 46 - http://www.nihtraining.com/ohsrsite/guidelines/45cfr46.html) that govern the protections of human subjects. Specifically, section 45 CFR 46.101(b) (2) states:

> (b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:

> **Category (2)** of 45 CFR 46.101, research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: a) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

In addition, your application to waive documentation of informed consent has been **approved.**

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit a **Request for Modification Form** to the GPS IRB. Because your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the GPS IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the GPS IRB as soon as possible. We will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the GPS IRB and the appropriate form to be used to report this information can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* (see link to "policy material" at http://www.pepperdine.edu/irb/graduate/).

Please refer to the protocol number denoted above in all further communication or correspondence related to this approval. Should you have additional questions, please contact Kevin Collins, Manager of the Institutional Review Board (IRB) at gpsirb@peppderdine.edu. On behalf of the GPS IRB, I wish you success in this scholarly pursuit.

Sincerely,

Thema Bryant-Davis, Ph.D.
Chair, Graduate and Professional Schools IRB

cc: Dr. Lee Kats, Vice Provost for Research and Strategic Initiatives
        Mr. Brett Leach, Compliance Attorney
        Dr. James Dellaneve, Faculty Advisor