THE RELATIONSHIP BETWEEN COMPETITIVE ADVANTAGE AND SUPPLY CHAIN MANAGEMENT PROCESSES FOR UNITED STATES MANUFACTURING FIRMS

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Abstract

The purpose of this quantitative study was to investigate the relationship between the dependent variable of Competitive Advantage Index and the independent variables of Supplier Relationship Management Index, Manufacturing Flow Management Index, and Product Development and Commercialization Index, while controlling variables of the firms' number of employees, gross annual sales, and managers' level of experience in the supply chain management field within United States manufacturing firms. The research addressed the gap in the literature between organizations and management in determining the relationship between Competitive Advantage and supply chain management processes. The participants were managers with at least a 4-year college degree and a minimum of 2 years' experience in supply chain management. These participants were part of the Qualtrics audience. Qualtrics panelists completed an electronic survey, and the study analyzed a total of 118 responses with a hierarchical multiple linear regression model. The multiple linear regression analysis resulted in Supplier Relationship Management Index being significant yet having little influence on Competitive Advantage Index. Manufacturing Flow Management Index had a 3% influence on Competitive Advantage Index. Product Development and Commercialization Index had a 37% influence on Competitive Advantage Index. The number of employees in a firm had a 2% influence on Competitive Advantage Index. Both gross annual sales and managers' level of experience in the supply chain field had no influence on Competitive Advantage Index. These findings have implications on the strategic direction of United States manufacturing firms.

Dedication

This dissertation is dedicated to the two women who have shaped my life. In memory of my mother, Rosa de Gioia, who shaped my character from a young age in persevering through life's challenges and rewards with trust in God. To my wife, Kaaren Sue de Gioia, who stayed by my side through a military career and this doctorate program, both of which demanded time away from cherished time with her and my family.

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CHAPTER 1. INTRODUCTION

Introduction to the Problem

Competition has changed in the past 20 years, and has shifted from firm versus firm to supply chain versus supply chain. The roles of the supply chain in the product value chain dictate the importance of the supply chain in competition (Lummus & Vokurka, 1999). A firm's leadership needs to understand the Competitive Advantage required to capture and maintain the largest market share. Some of the needed Competitive Advantages may reside outside the firm in the supply chain. Firm leaders require an understanding of how to manage the supply chain in order to capture and maintain Competitive Advantage (Narasimhan, Schoenherr, & Sandor, 2013).

The Global Supply Chain Management Forum (1998) identified eight key processes needed to manage the supply chain. These processes deal with customer relationships, supplier relationships, product development, and the manufacturability of the product (Croxton, Garcia-Dastugue, & Lambert, 2001; Lambert & Terrance, 2001). In situations of limited resources, leaders have competitive choices to make in leading the market with the firm's product (Davies & Joglekar, 2013). Since supply chain management processes are relatively new, managers require data to understand the strength of the relationship between the supply chain management processes and gaining Competitive Advantage in the market.

Understanding the relationship between supply chain management and Competitive Advantage will allow leadership to focus their strategy in the direction where supply chain management will provide the greatest effect for gaining market shares (Mackelprang, Robinson, Bernardes, & Webb, 2014). The results of this research study will aid management in understanding the strength of the relationships between Supplier Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization processes with Competitive Advantage, along with allocating the available resources efficiently.

Background of the Study

The understanding of supply chain management has changed in recent years. The lack of a universal definition has contributed to a wide difference in opinions. At first, the supply chain included only the logistic movement of materials and distribution of final products to customers. In the 1990s, the logistics chain included the procurement function, followed by other features that add value to the product and services (Lummus & Vokurka, 1999). In the early 2000s, the supply chain process included production scheduling, order processing, and inventory management. Leadership began noticing that to manage scheduling, processing, and inventory, supply chain management leaders need to oversee both internal and external fabrication and manufacturing (Croxton, Garcia-Dastugue, & Lambert, 2001; Lambert & Terrance, 2001; Lummus & Vokurka, 1999).

As a result of the growth in the processes included in the supply chain, managers view supply chain management as taking a strategic and operational role in the company (Narasimhan et al., 2013). In today's global environment, competition has moved to

identify the supply chain that produces a reliable, on time, quality product, and service for the customer. Previously, the firm's own resources provided value to the customer. Recently, with sophisticated integrated requirements from customers, multiple companies provide the competitive value needed to deliver the final product (Davies & Joglekar, 2013). These supply chain activities require healthy relationships, both internal and external to the firm.

Through supply chain management, leaders decipher the critical requirements for the client. Management must emphasize these requirements, both internally and externally, in order to synchronize the fabrication, manufacturing, and transportation of parts, materials, and final product. As customer requirements change, the supply chain needs to integrate for executing the required change (Mackelprang et al., 2014). The identification of these eight supply chain management processes provided the awareness that strategic and operational success depend on the integration of supply chain management in the firm's processes.

Management has not widely accepted linking supply chain management processes to strategy and firm performance. Initially, leadership thought that the roles of silo functions, such as marketing, manufacturing, research and development, and finance, drove corporate success (Narasimhan, Kim, & Tan, 2006). Currently, management emphasizes that the integration of the firm's silo functions with similar supplier functions in the global environment provides the ability to meet the customer requirements of schedule, cost, and quality. The integration of internal and external silo functions has

given rise to studies in quantitatively identifying the connection between supply chain management processes and Competitive Advantage.

Marketing and sales functions champion the customer relationship management process, yet the marketing functions provide direction to the procurement process, product development, demand, order fulfillment, manufacturing flow, and supplier relationship management. Customer relationship management closely relates to customer service and returns management processes. Customer service and returns management directly affect the firm's market share in the event that the client does not return to procure the firm's product. Manufacturing flow process has linkage with supplier relationship management, order fulfillment, cost of goods sold, quality, and schedule. Currently, there is not enough data to justify the linkage between supply chain management processes and company strategy. Recent quantitative studies showing the relationship of supply chain management processes to Competitive Advantage have relied on simulated data.

This research study addressed the Supplier Relationship Management process for the growing importance of the global industrial environment. The global business has changed competition from firm versus firm, to supply chain versus supply chain. Stronger internal and external relationships produce better-synchronized firms (Basole & Bellamy, 2012; Chen & Paulraj, 2004). Furthermore, the research analyzed the effects of lean and total quality management practices on cost of the product and the relationship with the customer (Croxton et al. 2001). Lastly, the research analyzed Product Development and Commercialization, which emphasizes the importance of designing a product that the

supply chain can manufacture. Product Development and Commercialization identifies ways to make the product modular and to facilitate the assembly and commercialization of the product to a broader customer base (Davis & Joglekar, 2013).

Statement of the Problem

The research problem, caused by a gap in the existing literature, was the lack of understanding of possible relationships between Competitive Advantage and supply chain management processes. The research analyzed the following three supply chain management processes: Supplier Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization. Researchers in the body of literature have not addressed whether (a) firms' size, as measured by numbers of employees; (b) sales, as measured by gross annual sales; and (c) experience level of management, as measured by the number of years in supply chain management roles affect the Competitive Advantage of the firm.

Purpose of the Study

This quantitative, explanatory study aimed to determine the relationship between Competitive Advantage and supply chain management processes. The research also aimed to observe how the firms' size, sales, and management experience affect the relationship between supply chain management and Competitive Advantage.

The dependent variable (DV) of this study was the Competitive Advantage Index of the firm. The independent variables (IVs) were the three supply chain management constructs: Supplier Relationship Management Index, Manufacturing Flow Management Index, and Product Development and Commercialization Index. The control variables

(CV) were: (a) the firms' size, as measured by the Number of Employees; (b) sales, as measured by Gross Annual Sales; (c) and Experience Level of management, as measured in years in supply chain management roles.

Rationale

The research aimed to answer the question, "What are the relationships between Competitive Advantage Index and Supplier Relationship Management Index, Manufacturing Flow Management Index, Product Development and Commercialization Index, firms' size as measured by Numbers of Employees, sales measured by Gross Annual Sales, and Experience Level of management measured by years in supply chain management roles for the United States manufacturing firm, as perceived by manufacturing managers?"

The model in Figure 1 shows the theorized relationships. The variables represented the characteristics of the following supply chain management processes: Supplier Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization with Competitive Advantage theory. Second, the survey methodology and use of a Likert-type scale allowed United States manufacturing firms' managers to provide their perception of the firm's performance in the supply chain management processes and position in the marketplace. The results of the survey data identified if the moderating factors of the individual manager and firm characteristics have an effect on the relationship between Competitive Advantage and the supply chain management process.

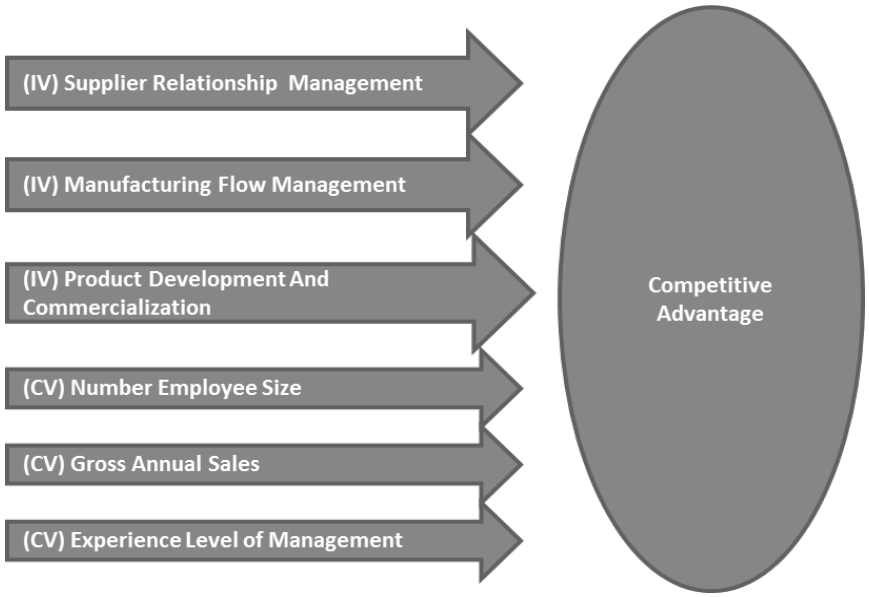

Figure 1. Model of the independent variables and control variables affecting the dependent variable of Competitive Advantage Index.

The focus of this study was to understand the relationships between Manufacturing Flow Management Index, Supplier Relationship Management Index, Product Development and Commercialization Index, and Competitive Advantage Index through the perception of managers in the fields of engineering, sales, production, purchasing, finance, and logistics. In addition, the research sought to determine if a firm's size through Number of Employees, Gross Annual Sales, and the manager's Level of Experience have an effect on the supply chain management process and Competitive Advantage relationship.

Research Question

RQ: What are the relationships between Competitive Advantage Index (DV), as perceived by manufacturing managers, and Supplier Relationship Management Index (IV), Manufacturing Flow Management Index (IV), Product Development and

Commercialization Index (IV), while controlling for the relationship between Competitive Advantage and firms' size, as measured by Number of Employees (CV), sales as measured by Gross Annual Sales (CV), and Experience Level of management, as measured by years in supply chain management roles (CV), for United States manufacturing firms?

Research Hypothesis

H_0: There is not a statistically significant relationship between Competitive Advantage Index, as perceived by manufacturing managers, and Supplier Relationship Management Index, Manufacturing Flow Management Index, Product Development and Commercialization index, firms' size as measured by Numbers of Employees, sales as measured by Gross Annual Sales, and Experience Level of management as measured by years in supply chain management roles for United States manufacturing firms.

H_A: There is a statistically significant relationship between Competitive Advantage Index, as perceived by manufacturing managers, and Supplier Relationship Management Index, Manufacturing Flow Management Index, Product Development and Commercialization Index, firms' size as measured by Numbers of Employees, sales as measured by Gross Annual Sales, and Experience Level of management as measured by years in supply chain management roles for United States manufacturing firms.

Significance of the Study

The findings of this research study will add to the current body of supply chain management knowledge by identifying the relationships between Competitive Advantage Index and the three supply chain management processes: Supplier Relationship

Management Index, Manufacturing Flow Management Index, and Product Development and Commercialization Index. Furthermore, the findings measured the relationship of the firms' size, sales, and experience level of management with the firm's Competitive Advantage.

The findings of this research study will provide scholars with the relationship of supply chain management processes to the Competitive Advantage of the manufacturing company. This research addressed the gap in the literature of organization and management in determining the relationship between Competitive Advantage and the supply chain management processes. This study closed the literature gap between supply chain management and competitiveness of a United States manufacturing firm by determining the relationship between Competitive Advantage and supply chain management processes.

This research study highlighted the significance to practitioners by allowing them to identify the supply chain management processes that have the greatest impact on the firm's Competitive Advantage. This will enable practitioners to understand the integrative role of supply chain management and the strategic importance in the daily organizational and management fields. The research sought to determine which supply chain management process will have a stronger relationship with Competitive Advantage based on the perception of the surveyed sample of manager population of United States manufacturing firms.

Definition of Terms

Competitive Advantage (CA): This theory is based on Porter (1985) optimum use of resources to achieve a competitive edge on the market. The firm's competitiveness in making the product harder to reproduce by a competitor will generate higher profits. The firm's resources need to have an important role addressing the five market forces: bargaining power of supplier, bargaining power buyers, threat of new entrants, threat of substitute product, and rivalry within the industry.

Manufacturing Flow Management (MFM). This process provides the importance in lean and total quality management that affects the cost of the product and the relationship with the customer (Croxton et al. 2001).

Product Development and Commercialization (PDAC). This process emphasizes the importance of designing a product easy to manufacture by the supply chain. The design can make the product modular to facilitate commercializing the product to a broader customer base and make the assembly function faster and quicker to market (Davis & Joglekar, 2013).

Resources. Describe a firm's tangible resources and quantifiable assets. The intangible resources' value of a firm, while hard to quantify by as a single resource, are achieved by subtracting the tangible assets from the market value of the firm. The result of the subtraction provides the total intangible value of the firm (Grant, 2001).

Supply Chain Management (SCM). Describes the integration of the following activities into a unified process through an information system: sourcing of raw material

and details, development, manufacturing and assembly, warehousing and tracking, order management, distribution to the final customer, and maintenance.

Supplier Relationship Management (SRM). This process has grown in importance due to the competitive global environment of the supply chain. Stronger relationships, internally and externally, will result in a better-synchronized supply chain (Basole & Bellamy, 2012; Chen & Paulraj, 2004).

Assumptions and Limitations

Research Assumptions

The assumptions related to this research design were theoretical, topical, and methodological. This research study was based on the theoretical assumptions that the way the firm does partnerships, transactions for procuring, and employment of resources influences the firm's competitiveness.

Theoretical assumptions. The study was based on two main theories with three sub theories:

1. The theory of the firm dictates that the firm is in existence for the purpose of making money. Every cost to the firm has to be linked to the product being produced. Transaction cost analysis identifies the best cost-effective place to perform the function.
    a. Transaction cost theory guides the firm in assuming that cost drives the procurement of a certain function or resource.
    b. Resource-based view theory suggests how the firm uses resources affects the firm's profitability. A good product market fit can be

achieved by identifying the resource structure of the firm (Wernerfelt, 1984).

c. Partnership theory assumes that costs for a certain resource or function can be reduced if the partner is motivated to provide them.

2. Competition theory stresses that competitiveness is achieved by being first to market, being able to customize the product as the need changes, and having a product that cannot be duplicated (Gunasekaran, Lai, & Cheng, 2008; Porter, 2003).

These theories lead to a supply chain management philosophy that the business world "is composed of a network of interdependent relationships developed and fostered through strategic collaboration" (Chen & Paulraj, 2004). These relationships are managed internally and externally by the firm to produce a competitive product or service.

Topical assumptions. The research was based on the assumption that this research study would verify the survey respondents' knowledge in the field of research study and methodological assumptions.

1. This project was designed based on the assumption that supply chain management processes influence the outcome in a competitive market environment.
2. The research assumed that the subjects taking the survey were able to quantify their knowledge of the supply chain management activities in their firm.

Methodological assumptions. Quantitative research methodology is due to a post-positivist worldview of reality, or a belief that a measurable reality exists,

independent of human interaction or interpretation (Creswell, 2009). This post-positivist view yielded two assumptions: (a) that the phenomena can be measured and (b) that the view "determines effects and outcomes" (Creswell, 2009, p. 7). The methodological assumptions of this research study reflect that the sampling and the data collection chosen imply that the provided results will be generalizable to the stated population. For the data to be generalizable, the multiple linear regression model assumptions of random sampling, dependent variable has to be interval or ratio scale, that there must be at least two independent variables (categorical or continuous), independence of errors, linearity, homoscedasticity, no multicollinearity, no outliers, and normality of error terms were successfully addressed. Other aspects that drive the research design were addressed in the sampling methodology.

Limitations

The following limitations could have affected the study's results.

1. The population was limited to managers that Qualtrics has selected from a pool of self-selected individuals that participate in surveys. A random sample of manufacturing firm managers beyond this group was not available.
2. Possible potential for nonresponse bias could have occurred if the people who choose to participate in a survey are different from those who choose not to participate. The difference could relate to variables relevant to the research topic (Rogelberg & Luong, 1998).
3. Competitive Advantage makeup may be different in various manufacturing sectors, from oil and gas, cars, planes, computers, appliances, and

so forth. Narrowing the focus, however, would have limited the availability of subjects.

Theoretical Framework

The theory of supply chain management process has as a foundation the Theory of the Firm, which states that a firm's sole purpose is making money. Every cost to the firm has to be linked to the product that the firm is producing. Transaction cost analysis identifies the best cost-effective location to perform the function. A subset to the theory of the firm is the transaction cost theory, which guides the firm in assuming that cost drives the procurement of a certain function or resource. Resource-based view subset theory suggests that how the firm uses resources affects the firm's profitability. A good product market fit can be achieved by identifying the resource structure of the firm (Wernerfelt, 1984). Partnership subset theory to the firm theory assumes that costs for a certain resource or function can be reduced if the partner is motivated to provide them. competition is a key theory for this research, which stresses that competitiveness is achieved by being first to market, being able to customize the product as need changes, and having a product that cannot be duplicated (Gunasekaran, Lai, & Cheng, 2008; Porter, 2003).

The theory of the firm and competition theory composed this research study's main theoretical framework. Supply chain management sub-theory includes the critical requirements of the customer to drive both theories. Management needs to emphasize the customer requirements internally and externally, to synchronize the resources in fabrication, manufacturing, transportation of parts, material, and final product.

Furthermore, to satisfy the changing needs of the customer earlier than the competition, the supply chain needs to integrate substantially to execute the changes rapidly (Mackelprang et al., 2014). The following customer-related processes help supply chain management integrate the internal and external functional silos: customer service management, demand management, and order fulfillment. The following firm related supply chain management processes help the integration of functional silos: manufacturing flow management, supplier relationship management, Product Development and Commercialization, and returns management (Croxton et al., 2001). The identification of these eight supply chain management processes provided the awareness of supply chain management importance to the firm's strategic and operational success.

Management did not widely accept the linkage of supply chain management processes to strategy and firm performance. While leadership emphasized the roles of silo functions, such as marketing, manufacturing, research and development, and finance in driving corporate success (Narasimhan et al., 2006). In the global environment, these silo functions need integration with similar supplier functions to meet the customer requirements of schedule, cost, and quality. The integration of internal and external silo functions has given rise to studies in quantitatively identifying the relationships between supply chain management processes and Competitive Advantage.

This quantitative study concentrated on the relationships of Supplier Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization processes with Competitive Advantage, and assessed whether

employee or firm characteristics affect the relationship between supply chain management processes and Competitive Advantage.

Organization of the Remainder of the Study

The remainder of this dissertation will begin with a literature review of the supply chain management field, which will address seminal literature on the evolution of supply chain management. This will include logistics, followed by the supply chain view and the birth of supply chain management, an analysis of the roles of supply chain management processes, and an identification of most accurate definition of supply chain management that encompasses the functions of the processes. The researcher will evaluate the supply chain management framework composed of supply chain structure, processes, and management. The literature review will examine the two main theories of the firm and competition that support supply chain management, with their subsets of transaction cost, resource-based view, and partnership theories. The description of the research study follows the literature review by addressing the research design, the analysis of the results of the study, and a consideration of implications and recommendations from the findings.

CHAPTER 2. LITERATURE REVIEW

Documentation for this chapter started with search words or phrases, such as logistics, manufacturing firm, supply chain, supply chain management, framework, competitive advantage, supplier relationship management, manufacturing flow management, product development, and supply chain management theory. The databases used in the search included EBSCOHost, ProQuest, Google Scholar, and supply chain journals, which resulted in over 300 scholarly research papers to examine. With the field being relatively new, previous studies lacked quantifiable data to contribute to the body of knowledge. This review will highlight the evolution that has taken place in arriving to supply chain management. Afterwards, the review will address the supply chain management processes and concentrate on three of the processes: Supply Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization. Furthermore, this review includes firm Competitive Advantage strategies connection to supply chain management strategies and the theories that support the main body of this research.

Theories that Support Supply Chain Management

Supply chain management, although being a relatively new field in business and in scholarly environment, is supported by two main theories: The Theory of the Firm from 1937 (Storey, Emberson, Godsell, & Harrison, 2006) and Competition Theory by Porter (1985). The integration of many supply chain management processes includes

several sub theories which support the Theory of the Firm and Competition Theory. This review will start with the Theory of the Firm, which justifies the existence of suppliers in business structure. Afterwards, the review will describe subset theories such as the Transaction Cost Theory, which defines a way of procuring the services from a vendor versus internally. The relationship with suppliers evolves to the Partnership Theory to attract the use of best resources in financing, development, manufacturing, marketing, distribution, and service of the product. The resource-based View Theory helps identify the best cost-effective resources for the firms that provide a competitive edge (Grant, 2001). The firm can acquire a critical resource for the value chain of the product internally or externally via partnership with suppliers. A resource critical to competitiveness provides the firm with a choice to internalize the resource or strengthen the partnership.

The strategic application of resources led this research to Competition Theory as the second main theory of this study that describes the competitive edge for the firm. Competition Theory, according to Porter (1985), states that when organizations use resources strategically, it is possible to achieve and maintain a monopoly on the market. The broad aspects of resources, from tangible (technology) to intangible (relationship), affect an organization's innovation and relationship with suppliers. Technology as a knowledge resource can create barriers for competitors that would want to enter the market. The company achieves a breakthrough with unreproducible technology; therefore, technology can provide a competitive advantage.

Theory of the Firm

Coase (1937) looked at the company as a system functioning in the real world with a purpose of profitability. Coase elaborated that many divisions of the company have to follow rules and processes to maintain control. Coase suggested that a careful coordination of the price mechanism, through the direction of the entrepreneur, establishes the nature of the firm. The price mechanism allocates a particular value for a resource. The entrepreneur's direction in allocating proper resources to the business processes forms a relevant price to deliver a product; "the most obvious cost of organizing production through the price mechanism is that of discovering what the relevant prices are" (p. 390). The Entrepreneur has to see the relative price of buying a business process from the market or making the product internally. The involvement of the Government with taxes and other policies does affect this decision. The ability of the entrepreneur to decide the best direction for the firm to acquire parts of the value chain to develop and produce a product becomes the key of the decision process. If the open market determines the direction, the company could depend on others for some critical components of the value chain. If the entrepreneur decides on the cost-effectiveness of bringing the production of an intermediate part internally, rather than procuring the part in the open market, then the size of the firm increases. As the company brings more functions internally, the firm increases in size. At some point, the cost of producing a part inside the firm will exceed the cost of acquiring the part in the open market.

The costs of making the part and the size of the profit from the sale influence the decision process for the entrepreneur to internalize certain activities. The Theory of the

Firm justifies the internal functions of the firm and the reasons for having suppliers when the transaction cost deems profitable to have a supplier. In the internalization decision, the entrepreneur must identify the key features that make the product different and competitive. The entrepreneur decides at what cost he or she is willing to maintain control of those key features. In protecting a certain product's features and enhancing the competitiveness of the product, management must quantify the tangible and intangible costs to maintain the firm's profitability. These costs are identified in the Transaction Cost theory.

Transaction cost sub-theory. Buckley and Casson (1976) wrote that the future of the Multinational Enterprise can be considered "as the key building blocks of the modern Transaction-Cost-Based Theory of the Multinational Enterprise" (Rugman & Verbeke, 2005, p. 125). Buckley and Casson (2009) and Rugman (1986) described the evolution of the Internalization Theory from the late 60s to 2008. All three authors were involved in numerous studies and researches in the 70s that validated the Internalization Theory; in fact, Buckley and Casson took Coase's (1937) Theory of the Firm and adapted the theory to multinational enterprises. Internalization for multinational enterprise happens through Foreign Direct Investment by bringing a certain core activity internally for better control. As the Internalization Theory kept evolving, the theory gained strength and shed light upon other theories, such as Transaction Cost, Multinational Enterprise, and the Eclectic Paradigms. Finally, Rugman & Verbek (2005) discussed the strategic management perspective and the application of technology transfer vs. Foreign Direct Investment, Joint Ventures, licensing and contractual arrangements.

Chen (2005) illustrated the different relationships that could exist between the technology developer and the manufacturer that would utilize FDI; this relationship provides multinational enterprises with technology transfer options. Cannice, Chen, and Daniels (2003) identified different ways that the firm selects the technology to transfer. Other researchers have validated the selection and workings of subsidiaries in identifying intangible assets and diversification.

The transactional supply chain predicates the contractual performance with the supplier by not sharing the risk with the vendor and not sharing rewards with the prime contractor. The buyer builds the whole strategy for directly controlling the valued resources of the supply chain through the resource-based Theory. Coase (1937) emphasized the economics in running a company by stating that each business function has to contribute to building and selling the product. The Transaction Cost Theory compares the internal price of the business functions with the outside market prices of the same company functions. Madhok (2002) described the internal firm structure authoritative relationship versus the outside market price mechanism. The authoritative application of the firm resources within the firm may not indicate a failure of the business, but rather a success. The ability of the firm to organize the resources as needed allows for success of the authoritative approach. Each firm has a center of excellence where the concentration of critical resources provides a competitive advantage. The firm's competitiveness diminishes when working outside of the capabilities of the company's experience and resources. Any adventure of the firm outside the center of the

firm’s experience would dilute the company's strength and increase the cost of doing the work internally.

Richardson (1972) emphasized the difference between the company's organization of labor and the market. The production cost illustrates the difference in organization of labor and the application of resources, such as knowledge and experience, which affects the production costs. Madhok (2002) argued that market conditions dictate the effectiveness of the resources, and the cost for the competitiveness of the firm depends on the achievement of the resources. The knowledge base of the firm is a property-based asset of the firm. The property-based resource provides benefits during periods of market stability. In a volatile market environment, property-based costs can drag on the firm’s competitiveness versus the knowledge-based resources, which can adapt readily to the changing environment (Grant, 1991). The resource type argument demonstrates that the transaction cost for a particular capability depends on the time that changes happen in the market environment. Partnership arrangements could possibly address the impact of volatility of the market to the firm's costs.

Partnership sub-theory. In the event of the high market competition, Williams, Maul, and Ellis (2002) confirmed Transaction Cost as an "expensive proposition for the prime" (p. 693). The environment with high market competition requires a collaborative approach built on trust, sharing of information, standard databases, and sharing of risk and rewards (Rose-Andersen, Baldwin & Ridgway, 2011). Collaboration will help in maintain the supply chain flexible and ready for implementing change. Trust would enable collaboration and shared key resources would facilitate trust. Rose-Anderssen,

Baldwin, and Ridgeway (2011) assessed that "tight personal relationships across company boundaries enhanced early awareness of changes within the supply chain" (p. 85). Healthy relationships allow for fast communication and trust. Fast communication translates to agility, flexibility, and high market responsiveness by introducing faster new changes to the product per customer's new requirements.

Gadde and Snehota (2000) advocated that the relationship with suppliers is a source of competitive advantage. The relationships that requires high or low involvement by the buyer depends on the volume of business with the vendor. A small volume of business can require low participation and high volume of business can require a high involvement. If the buyer has high involvement with little volume, the purchaser's value chain would have to acknowledge this low volume to be critical for the execution of the business. In addition, Gadde and Snehota (2000) argued that long-term relationships with the supplier require high involvement, yet short-term relationships require little commitment by the purchaser. Furthermore, single source procurement warrants high level of participation, and multiple sourcing situations require low-level involvement. A high involvement in multiple sourcing could happen when the customer directs the utilization of certain suppliers not previously used. The involvement level of the buyer reflects an arm’s-length transaction or a strategic partnership (Ellram, 1990).

A partnership between the buyer and the supplier would require mutual commitment over an extended timeframe that would benefit both entities. Ellram (1990) defined three main business areas that need satisfying before a buyer selects a supplier for partnership: financial capability, organizational culture, and technology skills. The

financial stability factor for the long term benefits both partners. Corporate culture and strategy of the supplier requires congruency with the buyer's culture and strategy. Trust at multiple levels of the two companies must exist. The buyer has to perform an assessment of the technological capabilities of the supplier. The buyer should evaluate the speed at which the supplier can go from development to manufacturing. Additionally, the evaluation of manufacturing machines with a skilled labor force is needed to determine the technological capability that the vendor brings to the partnership. These partnerships and collaborations can also develop into risk-sharing partnership.

Risk-sharing partnership goes beyond current technological capabilities, and they address the transformation of technology to new levels that require more investments and closer integration. Rose-Anderssen, Baldwin, Ridgway, Allen, and Varga (2008) addressed risk-sharing partnership in the aeronautical industry as very competitive, technology, financially, and schedule dependent. A risk-sharing partnership requires collective investment in innovation through the steps identified by Rose-Anderssen et al. (2008; Figure 2). The opposing arguments to a strong global relationship include the fact that the buyer could become entirely dependent on the supplier. Rosetti and Choi (2005) argued the detrimental effect of full collaboration with suppliers on some critical resources. Rosetti and Choi (2005) made the case that providing key technology to foreign suppliers can provide market access strategy. In the long-term view, the firm will lose the capability to innovate and would create competitors by sending the expertise abroad. These arguments, if not taken into consideration, could affect the local environment of the prime contractor and eventually the firm’s competitiveness.

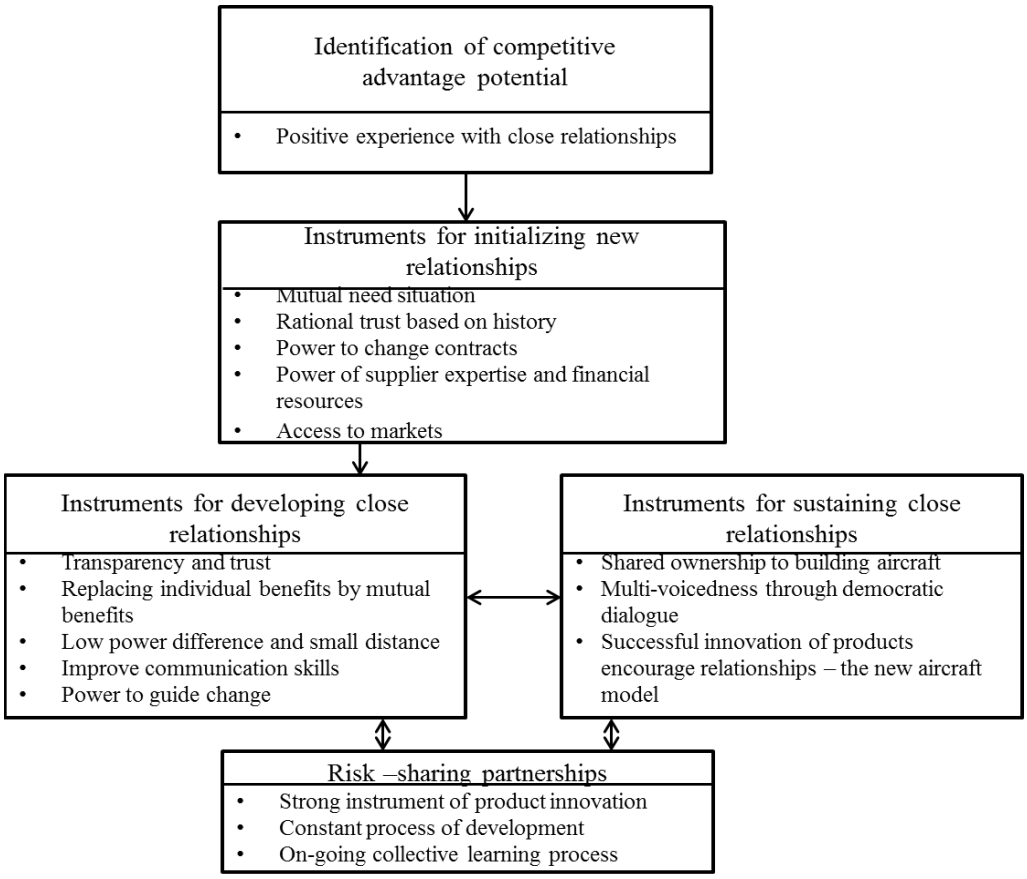

Figure 2. Depicts risk-sharing partnerships as instruments for innovation. Adapted from "Aerospace Supply Chains as Evolutionary Networks of Activities: Innovation via Risk-Sharing Partnership," by C. Rose-Andersen, J. S. Baldwin, K. Ridgway, P. M. Allen, and L. Varga, 2008, *Creativity and Innovation Management,* Volume 17, p. 315. Copyright 2008 by Blackwell Publishing.

Resource-based view sub-theory. The resource-based view sub-theory to the theory of the firm helps researchers identify the firm as a conglomeration of resources that together assist the profitability of the company in providing a competitive product/service (Wernerfelt, 1984). Previously, practitioners' views highlighted the resources composing the product. Resource-based view theory describes all the tangible and intangible resources involved in the strategic direction of the firm. A combination of resources can help the firm have an unreproducible resource through a patent and capture

a significant share of the market. Alternatively, some resources can support mass production before competitors enter the market.

The intangible resource of winning the customer loyalty can create obstacles for the competitor (Wernerfelt, 1984). In building competitive advantage, a company needs to identify, acquire, and use resources effectively. In analyzing an essential resource for the company to lead the market, the firm has to perform an internal and external transaction cost economics analysis. Transaction cost economics would help identify all the needed costs to build the product internally. In addition, transaction cost economics would determine the costs of procuring the resource externally. In the event that a critical resource costs less to procure from the market, the firm has the following options to investigate: acquire the supplier, build a strong relationship with the vendor, or invest internally (Williams et al., 2002). The outcome of transaction cost economics allows the buyer to have control of critical resources for staying competitive. Transaction cost economics analysis also reflects the resource-based view discussed by Dyer and Singh (1998); these authors stated that a combination of resources could provide a competitive advantage. A relational rent evolves from a positive outcome in combining resources. When the buyer thinks strategically on resource utilization, the buyer can achieve a monopoly in the market (Porter, 1985).

In addition, Wernerfelt (1984) stressed the use of resources dynamically. The firm strategically plans when to move from one market to another, and plans how to move from one resource to another in capturing the market. Wernerfelt's argument supported the thesis that acquisition and implementation of resources need to meet the competitive

advantage's strategic objective. Grant (2001) viewed Research Based View as a way of formulating a firm's strategy by doing an analysis of the firm's resources. Grant identified the generated rents by the resources and their capabilities. Afterword, selecting a strategy that exploits the competitive position will allow the investment in maintaining the competitive edge of the resources. Figure 3 depicts Grant's point of view of building a strategy around the Resource Base View Theory. The investments needed to increase the resources' capability through innovation facilitate the firm staying competitive through the strategic movement from one market to another.

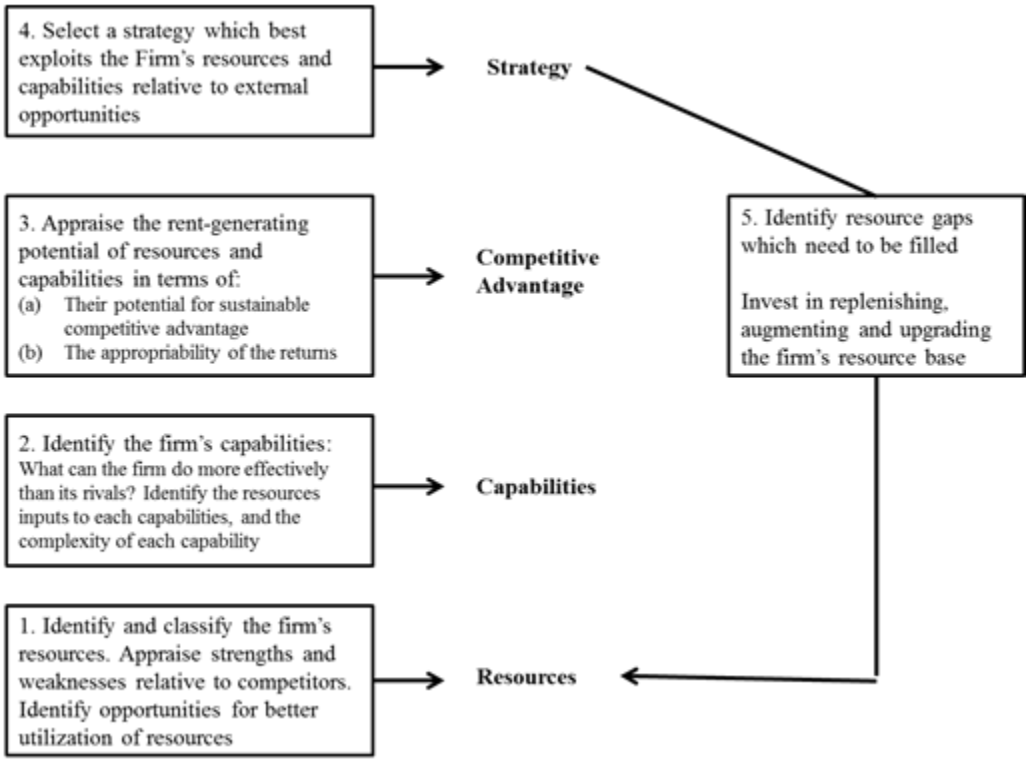

Figure 3. Illustrates a resource-based approach to strategy analysis.
Adapted from "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation," by R. M. Grant, 1991, *Knowledge and Strategy*, 3, p. 115.
Copyright (2001) by R. M. Grant.

Innovation addresses both sides of competitive advantage, market share, and profits. The product change allows the firm to achieve higher market share by being first to the market with a specified high demand product for the customer. Rose-Anderssen et al. (2008) pointed out that "creating innovative solutions goes beyond the improvement of adopting practices within other industries and by competitors" (p. 304). An innovation with radical changes can attain competitive advantage. Radical change can happen through a breakthrough in technology or process that makes the previous technology obsolete and costly. When the firm achieves the competitive edge, the company has to continue investments in research and development to meet the changing demand of the customer faster than the competition. A strong relationship with the supplier helps alleviate innovation expenditures, and change becomes a shared investment. These shared finances allow for risk sharing with suppliers. By sharing the investments' costs, the firm's profits increase.

The introduction of innovation in the manufacturing process can also reduce the costs of making the product. When the company invests in new manufacturing tool technology and processes, the business allows profits to increase. Moreover, Moser and Blome (2008) reinforced the rise in profits by stating that innovation in supply chain management not only generates "cost reduction of material and services but also … [contributes] to sales increase" (p. 45). Moser and Blome (2008) reported that technology innovation, when used strategically in manufacturing and fabrication, addresses all the forces of competitive advantage: quality, performance, schedule, and cost. Innovation in fabrication positively affects performance, schedule, and cost through better tooling and

material; changes in lean processes affect manufacturing. The changes positively affect quality, performance, and cost. By improving quality and performance, manufacturing costs lower and profits increase. Another aspect of resources, which contribute to competitive advantage, revolves around the relationship between buyer and supplier.

Competition Theory

Competition Theory describes the five forces in a market that can affect the position of the firm in the market discussed by Porter (1980, 1985, 1998, 2008; Figure 4). Porter's five forces model is applicable in understanding the modern competitive environment. The five competitive forces that determine industry profitability are the threats of new entrants, bargaining power of buyers, bargaining power of suppliers, threat of substitute product or services, and rivalry among existing firms. Utilizing the five forces on a national level is straightforward if global companies do not enter the local market. Currently, most markets have global participants that make the competitive strategy more complex.

The first force to analyze is the Threat of New Entrants. As new entrants come into the market, the profits will be lower. Six barriers can make entry difficult for the new entrant into the market.

1. The Economies of Scale that allows a firm to be able to spread the fixed costs over a large production volume. A new entrant would have high costs for the firm's small production volume.

2. Product differentiation creates customer loyalty for an existing firm; this differentiation forces a new entrant to invest heavily in order to overcome customer loyalty.
3. Capital requirements needed to enter the market could be high enough to cause a large financial drain to the new entrant.
4. Switching cost for a customer to move to the new entrant product can create a barrier if the move is too costly for the customer.
5. Access to distribution channels could be difficult for a new entrant if the existing firms in the market have secured the distribution channels.
6. Cost disadvantages independent of scale can cause a barrier if the existing firms in the market own certain parts of the value chain of the product.

The second force from Porter (1980) is the bargaining power of buyers. The buyers become powerful and dictate the cost that they are willing to spend and the quality they want in the following six situations:

1. When the buyers buy in large quantities, s/he can dictate the price s/he is willing to spend;
2. When the products the buyers buy are standard and do not require differentiation, the buyers have more power of negotiation;
3. If the buyer faces low switching costs, s/he can dictate a lower cost;
4. If the buyer has low profits from a certain product, s/he will have an incentive to lower the purchasing costs;

5. When a buyer has enough knowledge to backward integrate, s/he can force a supplier to keep costs down;
6. When industry does not demand higher quality for the buyer's product, then the buyer has more bargaining power.

The third force from Porter (1980) is similar to the previous force but this force specifically addresses the bargaining power of suppliers. The larger the power of suppliers, the more profit the supplier will be able to squeeze from the firms utilizing the vendor's products, which could possibly push a firm out of a certain market or force the buyer to vertically integrate. The factors that make suppliers powerful mirror the ones of powerful buyers above.

1. A small group of suppliers in the industry can dictate the cost of the item;
2. Sources of substitute products are not available for the product;
3. When suppliers sell to multiple industries, they have more power over one specific industry;
4. When the supplier's product is an important part of the value chain of the final product;
5. When the supplier's product is differentiated enough to cause a high switching cost for the buyer;
6. When the supplier has enough manufacturing knowledge of the product, it can forward integrate to the final product.

The fourth competitive force from Porter (1980) is the threat of substitute product or services. Normally, substitute products tend to lower the profit for the existing firms

and can pick up some of the market share from manufacturers of the current products. Substitute products that deserve the most attention strategically are those that (a) are subject to trends improving their price performance trade-off with the industry's product, or (b) are produced by industries earning high profits; “Substitutes often come rapidly in the market if some development increases competition in their industries and causes price reduction or performance improvement” (Porter, 1980, p. 45).

The fifth competitive force from Porter (1980) addresses the intensity of rivalry among competitors and how rivalry affects profits. Intense rivalry is usually caused by the following environmental factors:

1. The firms are equally balanced in knowledge and the firm with financial strength can have the upper hand;
2. When the industry has small growth, the firms fight to increase their market share;
3. With high capital investments, the firm will have pressure to increase production, but increased production will cause lower price;
4. Lack of switching cost for the buyer will increase the competition;
5. When capacity is added in large increments, capacity will create disruption in the supply and demand side of the industry;
6. High exit barriers.

High exit barriers, such as specialized assets or management's loyalty to a particular business, keep companies in competition even though they may be earning low or negative returns on investment. Firms with excess capacity remain functioning and the

profitability of the healthy competitors suffers as the weak competitors hang on; “If the entire industry suffers from overcapacity, the firm may seek government help - particularly if foreign competition is present" (Porter, 1980, p. 45). Government assistance is of particular importance when competing globally.

During the strategy analysis phase of the firm, these five forces are critical for analyzing the external and internal environment and their effect on the firm’s vision, mission, and strategic objectives. In strategy formulation, the five forces show a firm how to attain a competitive advantage. The competitiveness of the firm is accomplished by ensuring product differentiation and by addressing the customer’s need at a lower cost than what the customer would invest in purchasing a different product. Having proper internal controls within the strategy implementation phase, can ensure the firm maintains cost competitiveness in an intense market rivalry. In addition, controls on the supply chain that affect the core function of the firm would indicate the negotiating power of the suppliers in building the final product. Furthermore, by effectively implementing Knowledge Management throughout the organization and through the value chain of the product, Knowledge Management would ensure competitiveness through innovation. All these factors in strategy implementation are guided by monitoring and analyzing the relation of the firm’s strategy to the five forces. The following discussion will show how the global environment affects the five competitive forces, and how organizations evaluate the ways to counter the forces and gain competitive advantage.

Addressing new entrants in the market. The fact that a firm goes global provides the potential of extending the firm’s area of operation. Gupta et al. (2001)

posited that “larger scale will create competitive advantage only if the company systematically undertakes the tough actions needed to convert scale in economies of scale” (p. 47). The conversion to economy of scale provides an opportunity for the firm to spread the fixed costs, such as research and development and marketing, through a larger volume of sales. A new entrant in the international market needs to ensure the critical resources of the firm’s value chain are concentrated in few strategic places, taking into account transportation costs from location of manufacturing to the rest of the market, tariffs, and political stability. In going international, a national firm needs to reevaluate the value chain of activities and break the value chain down into different elements. When the decision to compete globally is determined, the firm needs to analyze the best location to accomplish the different elements of the value chain. Elements that can influence the value chain decisions are labor costs, employee skill levels, modes of transportation, quality, political stability, exchange rate, and tariffs. “Optimizing the location for every activity in the value chain can yield one or more of the three strategic benefits: performance enhancement, cost reduction, and risk reduction” (Gupta et al, 2001, p.49). Vestring et al. (2005) reported that a decision to go global has to be companywide, not solely for the business unit. A new entrant in a market can start by placing the subsidiaries in clusters of technologies and knowledge, for example the Silicon Valley. The subsidiary will improve the capability in order to respond to the new technology requirements of the cluster. This knowledge can migrate back to the firm and maintain the firm’s competitiveness.

Minimize bargaining power of customers. A firm that has economies of scale for a certain product has leverage over the suppliers because of the large quantity of supplier material that the firm needs to procure. Allowing the firm to pool purchasing power over suppliers leads to volume discounts and lower transaction costs. Large emerging markets, which have a base of low-income customers, need to approach the market with different strategies states a study performed by London and Hart (2004). Evidence from the study suggested that "Successful pursuit of low-income markets in emerging economies require firms to fundamentally rethink their business model. Scalability, flexibility, decentralization, knowledge sharing, local sourcing, fragmented distribution, non-traditional partners, societal performance, and local entrepreneurship appear to be important to the success of such business ventures" (London & Hart, 2004, p. 367). Using a pyramid for illustration, the consumers at the top of the pyramid require different marketing strategies than low-income consumers at the base of the pyramid. Products built for the top echelon could not be adapted to the base of the pyramid market. On the other hand, a product that fits the low-income market could be customized by inserting disruptive technologies and adapting the product to the top of the pyramid customer and challenge established products. Therefore, a firm that incubates in the base of the pyramid market addressing the low-income consumer can address the need of the top echelon customer and enlarging the economies of scale.

Control bargaining power of suppliers. Suppliers that create a relationship with the firm are able to address their needs by ensuring the supplies are at the proper location and at the proper time. A single supplier can provide consistency in quality and

reliability. Competitive advantage is drastically diminished without a structured linkage from the supplier to the buyer.

The flow of knowledge can empower the supplier, as Inkpen (2007) noted. As the firm is exploring different technologies that better differentiate the product, the firm will need to ask the supplier to modify the supplier's product to meet the new specifications. The adaptation of the supplier to the new technologies provides knowledge that will allow the supplier to be more competitive with other suppliers of the same product; "This flow of technology and knowledge works best in long established buyer – supplier relationships" (Kotabe et al., 2002, p.312). A shared supplier-buyer business plan and arrangement, therefore, would be able to control the competitive advantage that the supplier would bring.

A new entrant in the market would require a supplier that handles the local distribution channels. The supplier would have customer knowledge and awareness of local laws. Arnold (2000) pointed out that the initial relationship with a local distributor could start in a positive direction, but eventually sales would drop and the firm would have to make tough decisions if they allow the distributor to be in charge of marketing and local strategy. The arrangements would work better if the firm treats the distributor as a partner, in which the firm retains responsibility of marketing and strategy but includes the distributor in the market development. The firm's decision to enter a particular area has to be followed by commitment of money, managers, and marketing ideas. The firm cannot choose to rely on the distributor to market the product, in the hope that the firm could save on some of the resources. A distributor is an important supplier

for the local economy and the firm needs to choose the appropriate distributor that fits their strategy and build a strong relationship.

Lower the threat of substitutes. The strategic location of technology centers of excellence is important for a firm. The technology centers allow the firm to solicit local ideas and technologies. Fallah and Lechler (2008) pointed out that distributed local research and development centers close to customers can provide a high velocity of innovation processes and integrate them culturally. Under the old paradigm, the firm would rely on a centrally located research and development organization in the home theater to direct the resources required and the technologies to invest. This old paradigm would cause the firm to be trailing when a new substitute product comes to market, especially in the bottom of the pyramid customer. "In the new paradigm, competitive advantage comes from the ability to recognize new innovation opportunities wherever they may be and leverage them to market efficiently" (Fallah & Lechler, 2008, p. 73).

Manning, Massini, and Lewin (2008) pointed out that science and engineering is one of the key capability needs of a firm. They mention that the developing countries are evolving in center of excellence in science and engineering fields. A firm that is able to integrate the developing location's science and engineering capability in geographically dispersed areas is able to transform the once-centralized science and engineering function into a dispersed function. This dispersion of science and technology capabilities will allow the firm to be more innovative and responsive to the local markets.

Handling the intensity of rivalry in the industry. Rugman and Verbeke (2004) stated that 80% of the total sales of firms occurs in the "Triad Region" (p. 16). Rivalry is

very strong within a region, especially when a firm tries to enter the market of other regions. To handle the competition in the other regions a firm can look at strategic alliances and/or partnerships. By electing this course of action, the firm will have the speed needed in entering other region's market with a time-sensitive product. Dyer and Singh (1998) stated that strategic alliances work for firm's that have in their organizational structure a division responsible for identifying the possible alliances, doing a survey of the prospective partner, managing the alliance and terminating the alliance if needed. During the process of vetting the potential partner, the due diligence team looks at the partner's "resources, capabilities, and culture. During the culture evaluation, the team examines the potential partner's corporate values and expectations, organizational structure, reward systems and incentives, leadership styles, decision making processes, work practice and history of partnership" (Dyer & Singh, 1998, p. 39).

The formation of the alliance provides clear signals to the rivals and the market place of the firm's commitment and intentions for the share of the market. The purpose and intentions of the alliance needs to be clear and unambiguous to both organizations. This structure will also facilitate the exchange of knowledge, which facilitates a competitive advantage that may be hard to duplicate.

The firm that learns the fine art of collaborating effectively with suppliers, partners, and customers will be able to achieve a competitive advantage over the rivals. MacCormack and Forbath (2008) pointed out that these firms understand that collaborating takes a special effort and the organization needs to restructured to facilitate collaboration. The tools and processes need to be adapted to allow an unconstrained

sharing of data. Some firms have “a chief collaboration officer who oversees all partnered efforts and focuses on building the firm’s overall collaborative capabilities” (MacCormack & Forbath, 2008, p. 24). The authors pointed out that a competitive advantage for a firm is the ability to integrate the efforts of the partners.

Building strong competencies is critical for a CEO trying to fine-tune the firm’s architecture. Just closing down two facilities and opening a new one in a lower labor-cost area may not be the correct solution, due to the competencies of the labor in the new area. The productivity level and quality may fall below the acceptable limits for holding on to the share of the market.

Smooth and timely communication between nodes in the value chain allows for lean operations and timely marketing events. This coordination has to be extended with the suppliers and partners. “The pursuit of seamless coordination requires creating eagerness among those managers whose cooperation is essential” (Gupta, 2001, p. 54).

Porter (1985) reported that the profit level of an industry does not revolve around the attractiveness of the technology within a product, but the profits reflect the structure of the industry. The suppliers can influence the cost of the raw material, the buyer power can affect the price of the product; some competitors can change the price of the product. In addition, the threat of a new entrant can influence the price of the product, and a threat of differentiation affects the investment levels in new goods or advertisements that will affect the overall profits of the firms. Porter (2008) emphasized the strategy that a company undertakes relates to countering one or more of the five forces affecting

competition (Figure 4). Through strategy, a firm can influence the future of the whole industry positively or negatively.

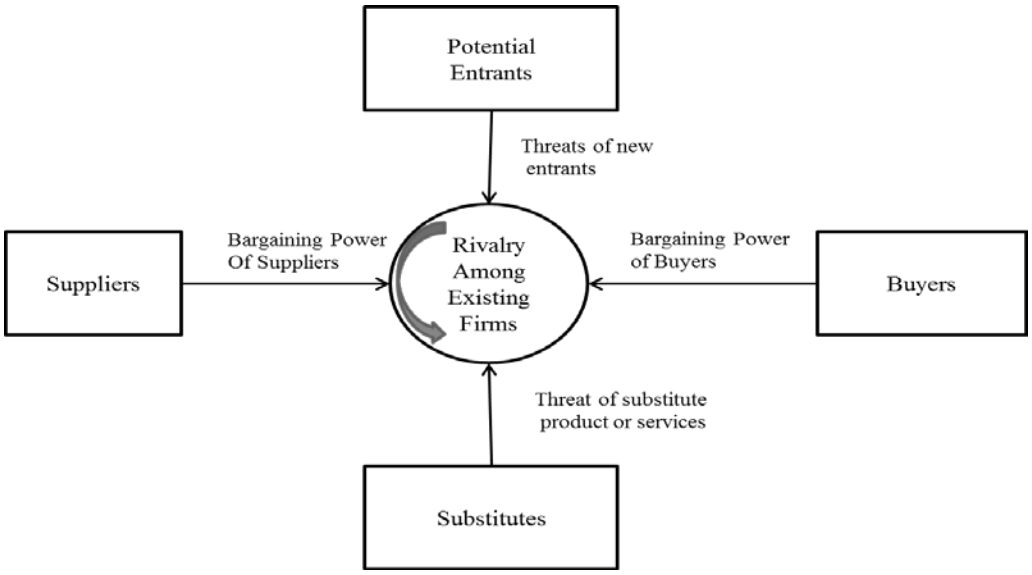

Figure 4. Five competitive forces that determine industry profitability. Adapted from *Competitive advantage: Creating and sustaining superior performance.* (p. 5), by M. E. Porter, 1985, New York: The Free Press. Copyright 1985 by M. E. Porter.

A company can create a sense of monopoly by controlling the market through key resources. The free market allows the competitor to have choices, either to invest or collaborate with a supplier. Collaborating could enable the partner to achieve the same level of technology sooner than the time the original trendsetter company invested. The trendsetter company needs to invest continually in research and development and create new technology barriers to continue leading the market. The increased investment in research and development could continue ad infinitum, but the increased investments would affect profits. Dyer and Singh (1998) posited that a particular relationship with

specific suppliers would help provide the needed funds and talent to maintain the competitive advantage in the industry.

The partner relationship highlights that a firm can lower expenses by utilizing suppliers strategically. Vendors can stay competitive by providing resources to achieve a common goal with the buyer. Supplier relationship management could therefore be critical in addressing the firm's competitive strategy. Alternatively, Product Development and Commercialization can direct the company's strategy of continuous investments toward maintaining the product differentiated. The increased investments in Product Development and Commercialization can keep new entrants away from the market by increasing the cost of entrance.

A firm with cost reduction strategies and reduction in buyer bargaining power would provide a high-quality product by utilizing manufacturing flow management process. Depending on the market structure, the company's positioning strategy in the market and different supply chain management processes can provide the firm competitive advantage to address the five competitive forces. Supply chain management leaders, therefore, need to follow the firm's long-range strategic vision and plan (Chen, Paulraj, & Lado, 2004; Chen & Paulraj, 2003; Lambert et al., 2005; Tan et al., 1999).

Evolution of Supply Chain Management

The understanding of supply chain management has changed in the last 20 years. The lack of a universal supply chain management definition contributed to misunderstanding supply chain management. At first, the supply chain included only the logistic movement of materials and distribution of final products to customers. In the

1990s, the logistics chain added the procurement function, followed by other functions that add value to the product and services (Lummus & Vokurka, 1999). The Transaction Cost Theory guides the supply chain management process through the procurement function in identifying the activities needed to procure externally vs. internally manufactured. In the early 2000s, the supply chain process included production scheduling, order processing, and inventory management. In order to manage scheduling, processing, and inventory, supply chain management needs to oversee both internal and external fabrication and manufacture (Croxton, Garcia-Dastugue, & Lambert, 2001; Lambert & Terrance, 2001; Lummus & Vokurka, 1999).

Because of the growth in the processes included in the supply chain, supply chain management recently achieved a strategic and operational role in the firm (Narasimhan et al., 2013). In today's global environment, the competition has moved to identify the supply chain that produces a reliable, on time, quality product, and service to the customer. The resource-based view theory assists in identifying the resources that will make the product more reliable and with higher quality. Previously, the firm created the value to the customer. Recently, because of sophisticated integrated requirements from customers, multiple connected firms provide a competitive value to the customer (Davies & Joglekar, 2013). These supply chain activities require healthy relationships, internal and external to the firm. The relationship with the customer guides the supply chain management process. The relationship with strategic suppliers though partnership theory addresses the competition theory in controlling the bargaining power of the suppliers.

The marketing and sales functions championed customer relationship management. Customer relationship management affects other firm functions, including procurement process, product development, demand, order fulfillment, manufacturing flow, and supplier relationship management. Customer relationship management closely relates to customer service and returns management processes, and directly affect the market share of the firm in the event the customer does not return (Mentzer, Stank, & Esper, 2008). Manufacturing flow process has linkage with supplier relationship management, order fulfillment, the cost of goods sold, quality, and schedule. Currently, academia and practitioner only recently considered supply chain management as a strategic asset, which has enabled the scarcity of quantitative data connecting the supply chain management processes to the firm's competitive advantage (Min et al., 2008). Recent researchers have shown the relationship of supply chain management processes to competitive advantage, but have relied on simulated data.

Logistics

Traditionally, logistics encompassed the supply chain. Mentzer et al. (2008) described traditional logistics as the planning and execution of the flow of material from the raw state through manufacturing, storage, and final consumption by the customer. Initially, in the 1960s and earlier, logistics added value to the product through the speed of transportation (Madhuri, 2013). Opportunities of adding value started by managing the logistics through reduce of costs inside and outside the firm.

As costs of the product became critical, logistics managers have developed a system called Just In Time logistics. Just In Time streamlined the flow and reduced

inventory costs by keeping little or no inventory (Madhuri, 2013; Mentzer et al. 2008; Narasimhan et al., 2013). To continue steady production, Just In Time identified the need to manage the complexity of customer need, material producers, manufacturing cycle, transportation, and customer satisfaction (Narasimhan et al., 2013). In the 1990s, the complexity of logistics highlighted the need to connect other functions to the logistic chain and start managing the whole supply chain.

Supply Chain

The design of the linked functions of the supply chain, internal and external to the firm, has the utmost importance. The design optimizes the synchronization of the flow of material from customer requirements to customer consumption (Graham, 2007). The design of the supply chain involves the evaluation of the competitive environment, identification of the weak links in the chain, development of the competitive supply chain, and the integration (Lambert & Pohlen, 2001).

Evaluating the competitive environment becomes the first step in understanding the discriminators needed for success in the market. The evaluation may point to alternative solutions needed to address the customer needs better than the competition. The customer needs, ranked in order of importance to the customer, will provide the basis for designing the supply chain (Graham, 2007). Before creating the supply chain, the competitive organization must identify which product addresses the critical customer needs. The firm needs to identify the areas in the supply chain that can best position the product at a competitive advantage.

Min and Mentzer (2004) pointed out that in today's market environment, supply chains, not the singular firm, determine the competition. The supply chain with the best product at competitive pricing captures a leading position in the market. This phase of the supply chain design does a cost analysis of the various links in the chain and addresses options for optimizing the cost of having those links in the supply chain. Furthermore, the ranking of the customer needs will help determine the areas in the supply chain that have a greater effect on the success of the product, therefore, greater value. Through transaction cost analysis (Coase, 1937; Madhok, 2002), organizations can identify the best location of high value supply chain links.

The high value of the supply chain links can exist internally, externally, or in both places of the supply chain. Integrating the internal and external functions of the supply chain allows each chain element to see their contribution in capturing the market share of the product. Just developing the supply chain and identifying the critical links that add the best value to the product does not make the supply chain effective (Kotzab, Teller, Grant, & Sparks, 2011). Managing all aspects of the supplies allows the effectiveness of the supply chain by achieving the ultimate goal of customer satisfaction and greater market share (Lambert et al., 1998).

Supply Chain Management

The Council of Logistics Management in the early 1990s described logistics management as a part of supply chain management that plans, controls and implements the efficient flow of material, services, or information from the point of origin to final consumption (Lambert, Cooper, & Pagh, 1998). The Global Supply Chain Management

Forum in 1998 defined supply chain management as "the integration of key business processes from end user through original suppliers that provide products that add value for the customer" (Lambert et al., 1998, p. 1).

Supply chain management relies upon an understanding of the critical requirements for the client, an internal and external emphasis upon these requirements, and synchronization of the fabrication, manufacturing, and transportation of parts, materials, and final product. As the customer requirements change, the supply chain needs to substantially integrate and execute the required change (Mackelprang et al., 2014). The following processes for dealing with the customer and for dealing with firms help supply chain management integrate the internal and external companies' functional silos. Processes affected by the customer include customer relationship management, customer service management, demand management, and order fulfillment. Processes affected by firms are manufacturing flow management, supplier relationship management, product development and commercialization, and return management (Croxton et al., 2001). The identification of these eight supply chain management processes by the Global Supply Chain Forum in the late 90s provided the awareness that the firm’s strategic and operational success depends on supply chain management.

Management has not widely accepted linking supply chain management processes to strategy and firm performance. While the roles of silo functions, such as marketing, manufacturing, research and development, and finance drove corporate success (Narasimhan et al., 2006). In a global environment, the integration of firm and supplier silo functions allows the supply chain to meet the customer requirements of schedule,

time, cost and quality. The integration of internal and external silo functions has given rise to studies in quantitatively identifying the connection between supply chain management processes and competitive advantage.

Supply Chain Management Processes

As material flows from suppliers to manufacturing, distributors, to the end user, different businesses processes integrate the supply chain and allow the needed information to reach the appropriate functional group. Stakeholders manage each process and share information with another supply chain management process. The Global Supply Chain Forum identified eight processes encompassed in supply chain management (Figure 5).

The customer relationship management process ensures the identification of the customer's requirement in priority order for the production of the right product, at the right time, and at a competitive price. Customer service management process ensures the product has the reliability and maintainability needed by the customer. Demand management process forecasts the product's quantity needs and ensures that the supply base and manufacturing have the appropriate tools and resources to meet the required rate of production. Order fulfillment process interfaces with customer relationship management and customer service management to ensure the fulfillment of the customer order. Order fulfillment requires the integration of the manufacturing, logistics, and marketing plans to provide the lowest possible cost for meeting the client's requirements.

The supplier relationship management process identifies key suppliers that add value to the product. Additionally, supplier relationship management maintains this

relationship the same way as the customer relationship management. This process ensures the integration of key suppliers' functional areas into the supply chain management processes to provide the value added function that maintains relevancy and timing requirements. Manufacturing flow management process provides a streamlined, efficient, and effective flow required to produce the product in the factory by meeting the quality and timeliness required by the customer.

The product development and commercialization process allows the firm to stay relevant and competitive. This process integrates the customer with supplier processes to ensure the supply chain can quickly respond to market changes and maintain competitiveness (Croxton et al., 2001; Lambert et al., 1998; Mentzer et al., 2001).

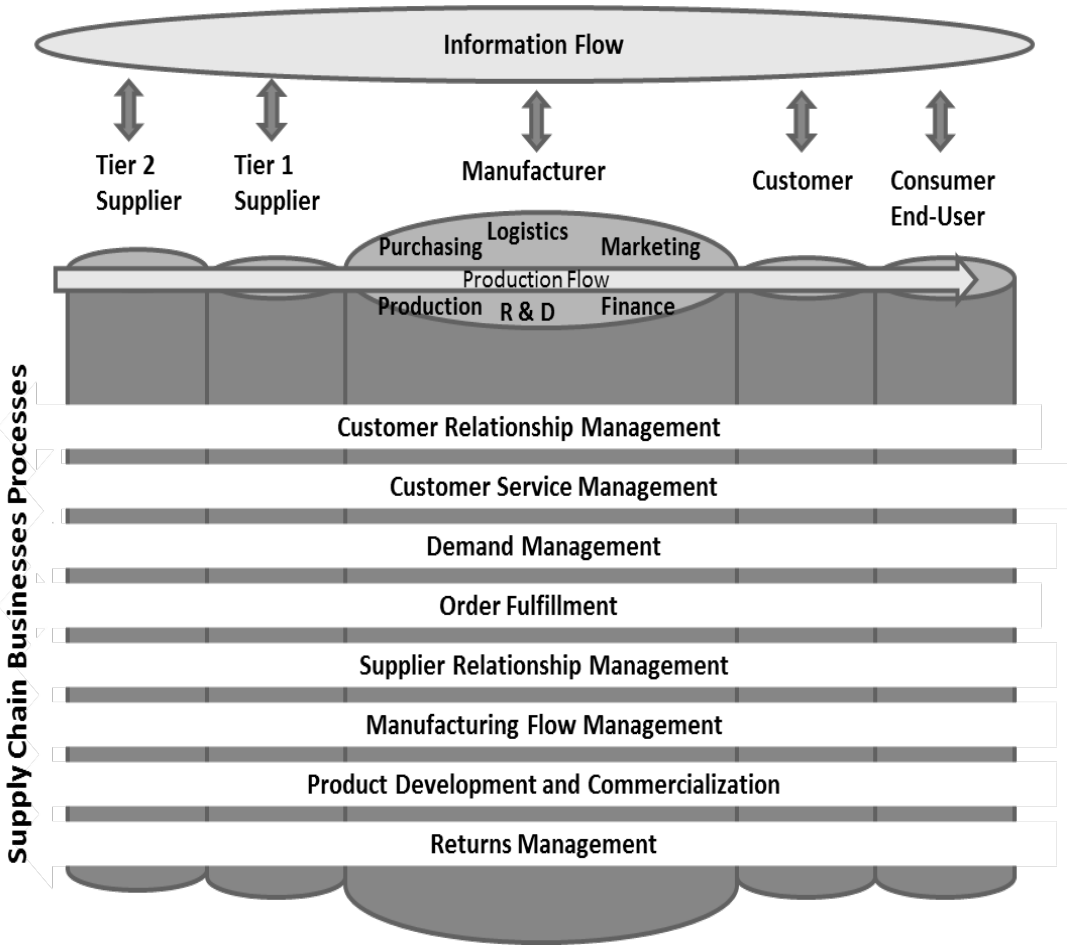

Figure 5. Supply Chain Management as a process by integrating and managing business functions across the supply chain.
Adapted from "Supply Chain Management: Implementation Issues and Research Opportunities," by D. M. Lambert, M. C. Cooper, and J. D. Pagh, 1998, *The International Journal of Logistics Management, 9*, p. 2.

Supply Chain Management Definition

Because of supply chain management's evolution, the early descriptions dealt with the total flow of distribution from supplier to the final product (Lummus & Vokurka, 1999). Other definitions included integrating functions (Mentzer et al., 2001). Further, in the mid-1990s, the definition included management and leadership of the supply chain to include customer, tier one, tier two, and three, if applicable (Otto & Kotzab, 2003).

Managing and leading supply chain management became more accurate by including the synchronization aspect of the requirement, material, small amount of inventory, and low unit cost (Graham, 2007). Lummus and Vokurka (1999) combined different supply chain management definitions and elaborated on the activities involved in supply chain management. These events allowed delivery of the final product to the customer through sourcing of the raw material, manufacturing, and assembly. Additionally, storage and tracking the inventory, management of the order, distribution, delivery, and the information flow that integrates and maintains the activities synchronized describe supply chain management.

Supply Chain Management Framework

Lambert et al. (1998) analyzed three parts of the supply chain management framework composition: the structural dimension of the supply chain, the business processes that link the supply chain internally and externally, and management of the supply chain (Figure 6). In developing the supply chain, the focal firm needs to distinguish between primary suppliers and secondary suppliers. Porter (1985) defined the primary members of the supply chain and supporting members. The principal member's functions of the firm add value to the product from the point of origin to the point of consumption. The supporting members of the supply chain provide the resources required for raw material, financing, knowledge, and machines for the primary member to utilize. The identification of members of the supply chain starts the structural domain of the supply chain.

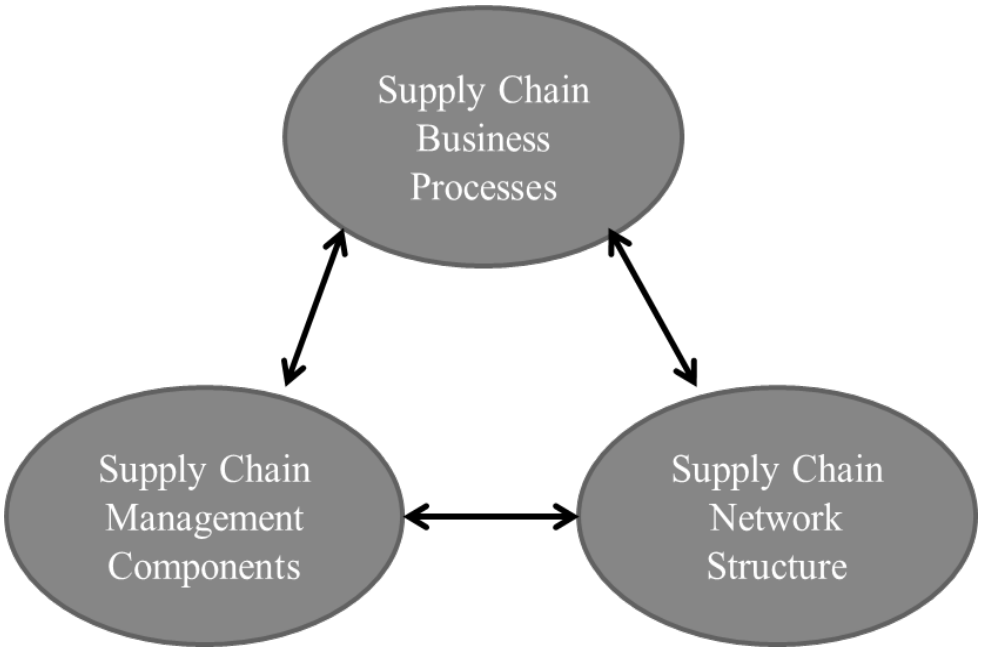

Figure 6. The three elements of the Supply Chain Management framework. Adapted from "Supply Chain Management: Implementation Issues and Research Opportunities," by D. M. Lambert, M. C. Cooper, and J. D. Pagh, 1998, *The International Journal of Logistics Management, 9*, p. 4.

The organizational structure of the supply chain framework depends on the product, the value added functions, and how much of the value creation resides inside the company or outside, but close to the firm (Lambert et al., 1998). This includes two organizational dimensions: the vertical organization, which addresses how many suppliers are at each tier level, and the wide organization, which refers to having many vendors at each tier. On the contrary, a narrow organization has a small number of suppliers per tier.

The number tiers required to produce a product reflects a horizontal organization. Lambert et al. (1998) referred to the horizontal organization as either long, having many tiers, pr short, having very few tiers. The location of the focal firm in the build cycle of the value stream dictates the position of the focal firm in the organizational structure. The

focal firm position at the end of the supply chain flow would have responsibility of final assembly and delivery. The beginning of the supply chain position for the focal firm would require performing the development of the product and leaving the remaining functions to suppliers. Lambert at al. (1998) pointed out that outsourcing these functions could make the supply chain longer and wider, which would influence the horizontal position of the Original Equipment Manufacturer firm. The value stream of the product dictates the linkages that the Original Equipment Manufacturer has with the supply chain structure (Figure 7).

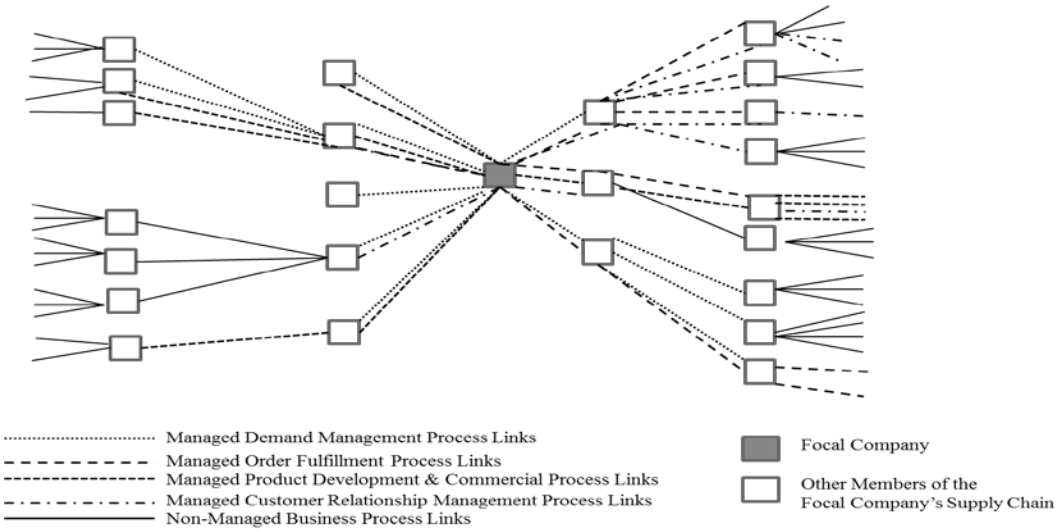

Figure 7. Supply Chain Management framework network structure with key supply chain members and managed business processes links.
Adapted from "Supply Chain Management: Implementation Issues and Research Opportunities," by D. M. Lambert, M. C. Cooper, and J. D. Pagh, 1998, *The International Journal of Logistics Management, 9*, p. 13.

The supply chain framework provides the processes linkages that dictate how the Original Equipment Manufacturer manages the supply chain. Lambert et al. (1998) posit three types of linkages: actively managed firms, the progress of firms along the length of chain, and the uninvolved linkage in which the sub-tiers manage their sub-tier. The value

chain of the product to the customer dictates the utilization of the appropriate business process link.

The Global Supply Chain Forum (1997) identified eight supply chain business processes, which are illustrated in Figure 2. These include four processes of dealing with customers: customer relationship management, customer service management, demand management, and order fulfillment. In addition, the forum identified four processes for dealing with firms: supplier relationship management, manufacturing flow management, product development and commercialization, and returns management (Lambert, Garcia-Dastugue, & Craxton, 2005). The managed links relate directly to the business process links internal and external to the firm. The original equipment manufacturer would manage some process links that directly influence the company's performance and competitiveness. Additionally, the original equipment manufacturer would monitor other process links to ensure the production of the right product, at the right place and on schedule. After establishing the supply chain organizational structure and the businesses processes links, the supply chain management framework requires a management domain.

The management domain remains critical for the supply chain effectiveness. Each successful management practice in the organization and supply chain needs common business processes. The actual links in the supply chain reflect the standard management components (Lambert et al., 1998); more links correspond to more integration of the business processes. The management portion of the supply chain reflects two groups, the technical/physical management and the social group. The technical/physical management

components deal with the structure that facilitates the flow of product, information, facilities, and organization (Otto & Kotzab, 2003).

Leadership can see and measure the effect of the technical/physical management component. Leadership sees the behavioral component managing the elements of the supply chain as intangible, but the behavior of the supply chain facilitates the integration of the whole supply chain business processes. Each link of the supply chain needs to share the same management methods, leadership structure, risk, rewards, and culture for becoming a well-integrated and competitive supply chain.

In mapping the supply chain framework, each business process structure maps to the managed and non-managed links; afterwards, the superimposed business process maps to the integration of the whole supply chain management structure (Lummus & Vokurka, 1999; Mentzer et al., 2001). The shared leadership behavior, management methods, culture of the firms, and shared risks and rewards for the whole supply chain structure, affects the success of the integration process (Marujo, 2006).

From the above eight supply chain management processes, the current research analyzed the Supplier Relationship Management process for the growing importance of the global environment. Since competition has changed from firm versus firm, to supply chain versus supply chain, the stronger the relationships, internally and externally, provides better-synchronized firms (Basole & Bellamy, 2012; Chen & Paulraj, 2004). The second business process, manufacturing flow management, emphasizes the importance in lean and total quality manufacturing that affect the cost of the product and the relationship with the customer (Croxton et al. 2001). Lastly, the selection of the

product development and commercialization business process emphasizes the importance of designing a product to the manufacture of the product by the supply chain. An objective of product modularity by the product development and commercialization process allows for commercialization of the product to a broader customer base and facilitates the assembly function that directly affects the unit cost (Davis & Joglekar, 2013). The following section will address each of the three selected supply chain business processes.

Supplier Relationship Management

In the last ten years, managers have identified supplier selection as critical in building a competitive strategy (Monser & Blome, 2008). In today's global market, a competitive supply chain provides a strategic advantage (Porter, 1985). The complimentary resources of the suppliers provide synergy in enhancing the competitiveness of the product (Grant, 2001). From a market and resources perspectives, the selection of vendors becomes a critical aspect for the firm achieving a monopolistic position in the market, according to Porter (1985).

The supply chain reaches the strategic market position by combining the resources of the buyer firm with the supplier firms in such a way that competing firms cannot match. Thus, the intercompany linkages can create a competitive position by buying the supplier or through a robust Supplier Relationship Management that ensures same leadership, social, cultural, risk, and reward management structure (Lambert et al., 1998). Consequently, having the resources does not guarantee a competitive market position, but having the resources to standard behavioral management components will

ensure an integrated synergistic approach to achieving a competitive market position. In a global market, Rosetti and Choi (2005) pointed out that strategic Supplier Relationship Management can be negative for a national economy.

Rosetti and Choi (2008) discussed the supplier relationship management that the Boeing Company fostered by letting foreign suppliers co-invest in the product. Additionally, allowing the suppliers to provide critical resources for creating a price competitive product. According to Rosetti and Choi, the co-investing strategy depleted the internal knowledge base of The Boeing Company, and at the same time exhausted the National suppliers' ability to grow and stay competitive for future products. Rosetti and Choi's concern indicated that supplier relationship management has to look at the long-term aspect, not just the current product and short-term gains. The important selection of suppliers must look at the long-term aspects of the resources in achieving and maintaining a cost, quality, schedule, and technology advantage.

Manufacturing Flow Management

Manufacturing flow management pertains to all activities undertaken to move the product through the firms. The manufacturing process analyzes the flexibilities in the supply chain and within the firm to allow smoother and faster ability to produce a product at the lowest possible cost (Goldsby & Garcia-Dastugue, 2003; Swink, Narasimhan, & Kim, 2005). The ability to instill flexibility provides a variety of products customized to particular customers. The achievement of flexibility requires planning and execution of the manufacturing flow. The material requirements planning database accomplishes integration of multiple sources of material, inventory locations, suppliers lead times, and

manufacturing lead times to meet the customer's need dates. The manufacturing flow management also addresses the quality of the product (Gonzalez, Queseda, & Mora Monge, 2004).

The material that the manufacturing firm buys from suppliers dictates the quality of the product sold. To stay competitive in meeting the customer's reliability and maintainability needs, the manufacturer has to ensure the material, which flows through the factory, has high quality and ability to integrate with other material by not jeopardizing the overall quality of the final product. Gonzalez et al. (2003) observed that the supplier selection allows for good quality and timeliness to influence the competitiveness of the product.

Manufacturing best practices suggest that the focal firm needs to manage the relationship with suppliers to ensure the quality and Just In Time flow of the supplies. Furthermore, the manufacturing process should lead to cost efficiency, flexibility, and new product flexibility (Swink et al., 2005). The best practices of quality process require continuous improvement of the manufacturing process, ensuring the inclusion of quality control techniques. The application of Total Quality Management Theory requires constant improvement. The Just-In-Time process integrated throughout the supply chain eliminates waste by streamlining the movement of material and minimizing the time the material stays idle. Just in Time reduces the lot size, streamlines facility layout with a decrease in setup time. Davis and Jolekar (2013) emphasized the importance of product development process for the manufacturing flow by designing the product modular. A modular assembly allows for flexibility in meeting customer requirements. The

modularity of the product can allow the supply chain responsibility of different modules and the focal firm customizes the assembly and delivery of the product. the product development and commercialization process affects the whole supply chain and is addressed in the next section.

Product Development and Commercialization

New product development and commercialization process requires alignment of different functions within and outside the firm. Acur, Kandemir, and Boer (2012) characterized the functional arrangement of research and development with marketing and manufacturing. Brettel, Heinemann, Engelen, and Neubauer (2011) emphasized that the isolation of the research and development function in a firm would allow the product to go through continuous changes with multiple technology insertions. The constant changes in technology would make the product too expensive for the customer, and the added features would not reflect the user's needs. Integrating the marketing function with research and development provides boundaries to the insertion of new technology and limits the technology to address only the key customer's needs. Brettel et al. (2011) asserted that marketing can guide the development of technology that allows the firm to beat the competition to the market. In Competition theory, Porter (1985) pointed out that the development of non-reproducible technology makes the firm highly competitive, in addressing high market share capture. The commercialization phase of the product addresses the manufacturability of the product with sample testing before full distribution of the product to market.

In isolation, the manufacturing function would procure and implement the best manufacturing equipment that would allow producing the current product faster and at a reduced cost. Acur et al. (2012) highlighted that manufacturing has to receive inputs from marketing to know the demand and timing for the customer needs. In the event that customer need and competition requires new technology development, manufacturing has to integrate with research and development and guide the development with manufacturing needs. The integration of marketing, manufacturing and research and development functions would make the product easier to produce and assemble. Brettel et al. (2011) emphasized that miscommunication between research and development and manufacturing may delay the procurement of new manufacturing tools. The delay of the tools will jeopardize the market entry of the product. The entry delay can translate into a loss of market share. More integration between product development, manufacturing and marketing needs to happen with complex products (Brettel et al., 2011).

A more complex product calls for radical innovation. Rose-Anderssen et al. (2008) pointed out that "creating innovative solutions goes beyond the improvement of adopting practices within other industries and by competitors" (p. 304). An innovation called for radical changes to attain competitive advantage. Radical change could happen through a breakthrough technology or process that makes the previous technology obsolete and costly. Breakthrough innovation, does not have to occur internally to the focal firm, but could develop in any portion of the supply chain (Moser & Blome, 2008). The breakthrough can occur in manufacturing process changes that would allow a significant reduction in costs with a respective increase in market share (Porter, 1985).

Strategic Application of Supply Chain Management

Supply chain management processes do not change from firm to firm, but the implementation of each process makes supply chain management strategic. Sehgal and Vivek (2011) emphasized that the strategic business objectives of the company dictate the strategic application of supply chain management. The strategic goals drive the specificity needed for the supply chain process that will create competitive advantage (Sehgal & Vivek, 2011). The specificities that enhance the productivity gains of the value chain could reside in the partner firm (Dyer & Singh, 1998). A relational investment by the supplier would allow improvement in specificity. Dryer and Singh asserted that only combined related investments in distinct specificity, from the buyer and supplier, will help achieve the competitive advantage needed. In an arm's-length transaction between buyer and supplier, the supplier does not have incentives to invest in specificities. when combining scarce resources, sharing knowledge, lower transaction costs, and better governance of the involved processes help the partner firm achieve relational profits. The following three specificities create competitive advantage the site, physical asset, and human asset (Dyer & Singh, 1998). The proximity of immobile manufacturing phases will improve the value of the product. The acquisition of tools that enhance productivity and quality of the product will improve the value of the product. An active buyer-supplier relationship will increase the value of the product.

Rosetti and Choi (2005) challenged the relational profit partnership of Dyer and Singh (1998) from an aerospace industry perspective. In the aerospace industry, the original equipment manufacturer firm establishes long-term contracts with mutual

dependent relationships. The original equipment manufacturer's quest for short-term gains and demanding lower costs has placed the suppliers in direct competition with the original equipment manufacturer. The aftermarket customer support highlighted the competition with suppliers. The vendor developed direct communication with the original equipment manufacturer's customer and provided the aftermarket product faster and at a lesser cost. Rosetti and Choi (2005) stressed that the focus by the original equipment manufacturer on short-term gains relationship with the supplier created a knowledgeable competitor. Dyer and Singh (1998) emphasized that mutual trust in the relationship helps achieve relational profits.

The firm's strategic direction guides the marketing strategy. The market strategy highlights the specificities for supply chain management strategy business needs to emphasize competitiveness. Juttner, Christopher, and Godsell (2010) asserted that marketing and supply chain management strategies integrate the business concepts of quick response, agile supply chain management, and demand chain management. The competitive environment could dictate the importance of time to market and needs more specificity. The business concept of agility would need a specificity of flexibility in the supply chain to exploit the changing needs of the customer. The demand chain management business concept stresses the need to align the supply chain to the changing needs of the market. Juttner et al. (2010) asserted that the integration of marketing strategy with supply chain management strategy aligns demand creation with fulfillment and makes the supply chain adaptive and responsive to the market needs. The supply chain management Strategy has to design the supply chain starting with customer and

ending with the raw material. Through the supply chain design process highlight the specificities that add value, provide responsiveness, and flexibility to the client's needs.

Customer Value

The value of a product or service aligns with what market allows for that particular product. The price of the product minus the cost of production and delivery cost by the firm, quantifies the value of the product (Porter, 1985). The primary functions required to produce an item encompass inbound logistics, operations, outbound logistics, marketing, sales, and services (Porter, 1985). A firm can insert value in a product through individual core specificities that differentiate their value chain from the competition (Juttner et al., 2010). Stank, Esper, Crook, and Autry (2012) argued that in pursuing a differentiation strategy, the firm has to abide by cost controls. The structure of the company should allow the combined approach by integrating marketing and sales with supply chain management. Marketing and sales would bring the demand characteristics of the customer and supply chain management would identify cost-effective ways to insert value in the product (Stank et al., 2012). The segregation of the supply chain and the demand chain in minute details allows the capability to understand the value chain. The association of the costs to value activities allows management to determine the cost-effectiveness of the activities. Key drivers in the value chain point to differentiators and costs to develop a competitive advantage.

The linkages of the value chain can help distinguish the cost drivers within or outside the firm. Porter (1985) identified that the linkage between the supplier's and the buyer's value chains, can identify better cost-effective ways to link the activities

vertically. The outbound activity of the supplier value chain, packaging and inspecting the product before shipment, can affect the inbound function of the buyer's value chain. The material used in packaging will help in reducing the buyer's time to in-process the product and avoid doing the inbound inspection. Continuous linkages of the value chains can also achieve low inventory costs by providing the material in time for the production or assembly function. The buyer may not be aware of the benefits that individual differentiations may be providing. Closer integration of the marketing and supply chain functions can translate the benefits to the buyer regarding overall cost, schedule, quality, and flexibility.

Stank et al. (2012) and Porter (1985) posited that the strategy of the firm will dictate the emphasis of the value chain. The strategic posture of the company in the industry can determine the cost advantage or differentiation. Coase (1937) affirmed that successful management needs to apply Transaction Cost Analysis in every step of the supply chain. Transaction Cost Analysis will help determine the place to perform the task, internally or externally to the firm, based on cost. Manufacturing flow management processes can also affect the cost strategy through the implementation of Just in Time supplies and procurement of tooling that will simplify the manufacturing process. In the event that the firm wants to compete in the industry through a differentiation strategy, the product development and commercialization process will guide the value chain (Stank et al., 2012). The firm will identify the product that best address the customer needs through the integration of marketing and sales with manufacturing. The new differentiated

product will dictate where to find the supplies required for manufacturing. Speed in launching the differentiated product dictates the competitiveness of the firm.

Speed

The speed of the supply chain depends on the responsiveness to the customer demand. Roh, Hong, and Min (2014) posited that there are two supply chain strategies: the lean supply chain and the agile supply chain. The lean supply chain qualifies the product in the market while the agile supply chain emphasizes the lead-time required for the product. Shorter lead-time wins the order. The differentiator between two strategies could depend on the speed of supply chain operations. Roh et al. (2014) emphasized that current global competitiveness demands shorter development time; a product needs to have multiple varieties. The customer feels that the product has to have quality and reliability but for the firm to win the sale, the product needs to have innovation and enticement. Bloome, Schoenherr, and Rexhausen (2013) and Roh et al. (2014) characterized an agile supply chain strategy to have the ability to develop quickly and reconfigure a supply chain to meet the rapid changes in the market.

The supplier relationship management process of an agile supply chain would require a partner based supplier relationship (Roh et al., 2014). In an agile supply chain, rapid decision-making requires closer networked trusted suppliers to respond to high uncertainties in vendors and demand. The development of the product should allow for quick assembly and faster customization to address strong demand risks. In addition, the manufacturing flow management process can have a positive effect on the speed of the agile supply chain. Automated tools and lean activities can reduce the lead-time for the

product and allow for the required quantities (Grunasekaran, Lai, & Cheng, 2006; Richey et al., 2012; Roh et al., 2014). All three supply chain processes can positively affect the speed needed to implement the agile supply chain strategies. The following section will describe how flexibility in the supply chain affects the strategy.

Flexibility

Flexibility in supply chain has close relationship with agility, but remains different. Flexibility in the fabrication and assembly process allows the supply chain to address the customization of the product to individual customer requirements (Brattel, Heinemann, Engelen, & Neubauer (2011). Close collaboration in the supply chain through the integration of sales, marketing, manufacturing, research, and development allows the firm to achieve the customer requirements through efficient manufacturing processes (Brattel et al., 2011). Close collaboration with buyer and suppliers that have complementary technology allows for better flexibility and effectiveness; and this collaboration becomes strategic if achieved before the competitor's supply chain collaboration (Richey, Adams, & Dalela, 2012). Roh et al. (2014) affirmed that an agile and flexible supply chain strategy allows sharing of knowledge and competencies for achieving responsiveness to the customer requirements.

MacPherson and Pritchard (2007) argued against close collaboration with a supplier. Close collaboration allows the supplier to become smarter and take more of the responsibility for the product through co-investments and, in turn, become a competitor. This argument reflected allowing work to flow out of the country and collaborating with foreign firms, primarily for market access. MacPherson and Pritchard revealed that this

type of collaboration allowed the technology and future work to flow out of the country. Rose-Anderssen et al. (2008) advocated for a risk-sharing partnership with the aerospace industry for achieving innovation and responsiveness to the market by the supply chain. The high technology involvement for the suppliers requires close collaboration. Anderssen advocated partnership for achieving a flexible innovative supply chain. Roh et al. (2014) affirmed that multiple stages of supply chain integration with customers, suppliers, internal, and advanced technology manufacturing allow the supply chain flexibility in pulling production that provides timely responsiveness to market needs (Figure 8).

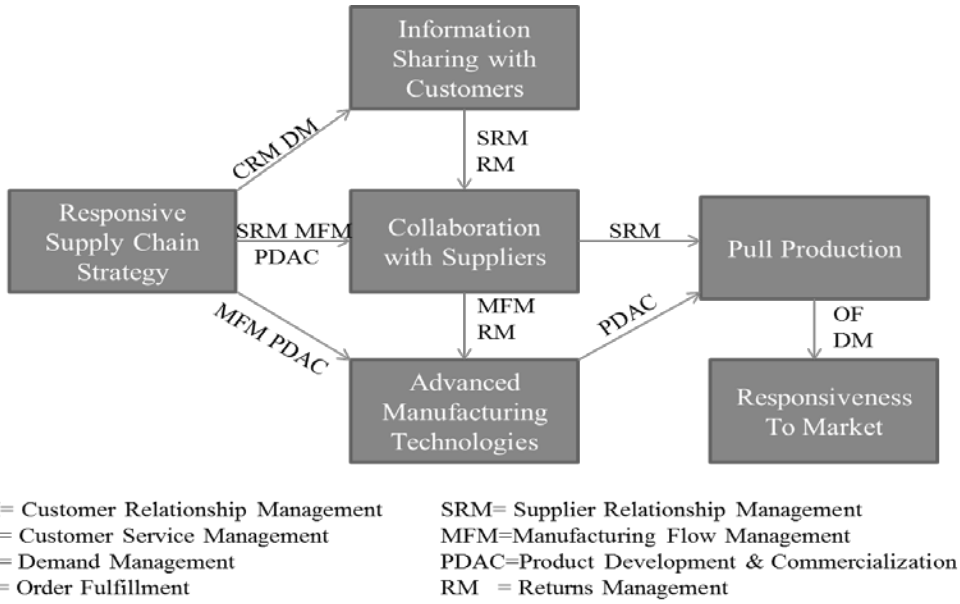

Figure 8. The strong relationships needed for a responsive supply chain and the supply chain processes involved in those relationships.
Adapted from "Implementation of a Responsive Supply Chain Strategy in Global Complexity: The Case of Manufacturing Firms," by J. Roh, P. Hong and H. Min, 2014, *International Journal of Production Economics, 147,* p. 206. Copyright 2013 by Elsevier B. V.

Literature Review Summary

The review of the literature demonstrated that in the last 15 years, supply chain management has evolved into an organizational function closely linked to the strategic direction of the firm. In the late 1990s, the Council of Logistics Management acknowledged that logistics management as a sub-part of supply chain management. At the same time, the Global Supply Chain Forum defined supply chain management as the integration of business process internal and external to the focal firm from the customer back to the original material /services provider that add value to the client (Lambert et al., 1998). The Global Supply Chain Forum also identified supply chain management as having eight key business processes that needed integration. Four processes addressed the buyer: customer relationship management, customer service management, demand management, and order fulfillment. The last four addressed the firms: supplier relationship management, manufacturing flow management, product development and commercialization, and returns management.

The current research was focused on Supplier Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization business processes to narrow the scope of this study and understand what academia has presented regarding their relationship in creating competitive advantage.

The importance of Supplier Relationship Management to competition depends on the role the vendor has in the value chain. In addition, Transaction Cost Economics allows the focal firm to identify the profitability of doing the work inside the firm or by a supplier. This research study highlighted that focal firms need to strengthen the

relationship, through partnership agreements, with outsourced critical value chain suppliers (Rose-Anderssen et al., 2008).

In doing market assessment and internal resources and capability assessment, management identifies the supplier that can provide the added features to the product for increasing the market share. The added resources, through a supplier or internally, need to increase value, the speed to market, or flexibility in handling diverse requirements to stay competitive. Porter (2008) acknowledged that competition is no longer between firms but between supply chains in bringing a better value product faster to market.

Manufacturing flow management process increases the value of the product through better reliability, quality, and maintainability. Additionally, manufacturing flow management provides the product faster and at lower cost through lean activity implementation (Goldsby & Garcia-Dastugue, 2003). Manufacturing flow management business process needs internal and external integration to ensure Just in Time capability from the supply chain. Davis and Jolekar (2013) emphasized the importance of product development process for the manufacturing flow by designing the product modular. A modular assembly allows for flexibility in meeting customer requirements. The modularity of the product allows options for the supply chain. Suppliers manufacture different modules while the focal firm customizes the assembly and delivery process of the product. Furthermore, manufacturing flow management can increase competitiveness through increased value, speed to market, and flexibility to customer requirements.

Product development and commercialization business processes provides competitiveness to the focal firm. In isolation, product development and

commercialization can make the product too expensive to produce and a detriment to the competitiveness of the company. The literature advises integrating the product development and commercialization business process with marketing, finance, manufacturing, and logistics functions within the supply chain. The integration ensures maximum utilization of resources in achieving customer's requirements in value, schedule, and performance. Acur et al. (2012) advocated the integration of the business functions to stay competitive and achieve the leading role in the market. If the business functions in the supply chain remain in silos and do not improve value and schedule for the product, they may address the wrong market area and misapply critical resources. product development and commercialization can guide the proper allocation of resources by integrating inputs from customer relationship management, demand management, supplier relationship management, manufacturing flow management, and returns management.

This literature review identified the following three supply chain business processes: supplier relationship management, manufacturing flow management, and product development and commercialization. These processes have a role in providing the supply chain competitive advantage according to Porter's (2008) Competitive Forces Theory. This review documented possible relationships of each of the three supply chain management business process with competitive advantage. Furthermore, the review identified if a business process has a stronger relationship with competitive advantage than the other processes in United States manufacturing firms. The next chapter will

provide details on the research design and data collection methods used for this research study.

CHAPTER 3. METHODOLOGY

The purpose of this quantitative, non-experimental, explanatory, cross-sectional research study was to assess the relationship between Competitive Advantage and supply chain management processes. The Global Supply Chain Forum in 1998 identified the following three supply chain management processes selected by this research study: Supplier Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization. The research assessed the relationship between these factors and Competitive Advantage, while controlling for (a) Experience Level of management, as measured by years in supply chain management roles; (b) firm size, as measured by Number of Employees; and (c) sales, measured by Gross Annual Sales.

The research identified Competitive Advantage Index of the firm as the dependent variable. The independent variables were the supply chain management constructs of Supplier Relationship Management Index, Manufacturing Flow Management Index, and Product Development and Commercialization Index Additionally, the research included the three control variables of Level of Experience of management, firm size through Number of Employees, and Gross Annual Sales.

Research Design, Methodology and Assumptions

Research Design

The research utilized a quantitative, non-experimental, explanatory, cross-sectional, survey research design. The research was based on a post-positivist worldview

quantitative research design. This research study design aligned with objective evidence through a form of questioning and survey panel identification. The sampling size was consistent with linear regression methodology, data collection, and analysis. The data analysis included hierarchical multiple linear regression with validation of the results and measurement of the reliability of the results.

Methodology

The research involved hierarchical multiple linear regression to answer the research question. The use of hierarchical multiple regression demonstrated the relative, unique contribution of each independent variable towards the Competitive Advantage process of the firm. The research methodology followed the Global Supply Chain Forum on the processes that makeup supply chain management process (Lambert et al., 1998; Roh et al., 2014). The research concentrated on three supply chain management processes and identified how much of the variation in Competitive Advantage can be explained by the predictor variables. The research analyzed the relative contribution of each predictor to the explanation of variance during the selection of the hierarchical regression methodology.

Population, Sampling Frame, and Sampling Plan

Population

The population consisted of managers from United States manufacturing firms who satisfy the following inclusion criteria:

1. At least a 4-year college degree.

2. A minimum of 2 years of experience in the following supply chain fields: finance, engineering, manufacturing, procurement, logistics, fabrication, transportation, information technology, business development, sales, or marketing (Croxton et al., 2001; Gunasekaran et al., 2008; Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006).

Sampling Frame

The sampling frame consisted of members of the Qualtrics audience that were managers from United States manufacturing firms and met the inclusion criteria. The potential participants were 2,700 managers (Croxton et al., 2001; Gunasekaran, Lai, & Cheng, 2008; Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006).

Minimum Sample Size

The minimum sample size was calculated using G*Power 3.1.9.2 (Mayer, Erdfelder, Buchner, & Faul, 2007; Faul, Erdfelder, Buchner, & Lang, 2009). Fault et al. (2009) suggested the use of a medium effect size. The greater the effect size, the greater is the difference in relationship between the dependent and independent variables. The values from Table 1 are medium effect size of .15, error probability $\alpha = .05$, moderate power of .85 (β = .15), and six predictor variables. A minimum sample size was calculated of 109 surveyed managers needed for this study (Table 1 and Figure 9). The input parameter of α = .05 means that the probability of incorrectly rejecting a true null hypothesis (making a Type I error) was five percent of all possible samples. The input parameter β = .15 addresses the probability of incorrectly accepting a false null hypothesis (Type II error) was 15% of all possible samples. The Power of the test (.85 [1-

β]) is the probability of rejecting a false null hypothesis, that would occur in 85 percent of all the possible samples.

Table 1
Minimum Sample Size

Tests: Linear multiple regression: Fixed model, R^2 deviation from zero		
Analysis: A priori: Compute required sample size		
Input	Effect size f^2	0.15
	α err prob	0.05
	Power (1-β err prob)	0.85
	Number of predictors	6
Output	Noncentrality parameter λ	16.3500000
	Critical F	2.1777608
	Denominator df	6
	Numerator df	102
	Total sample size	109
	Actual power	0.8533706

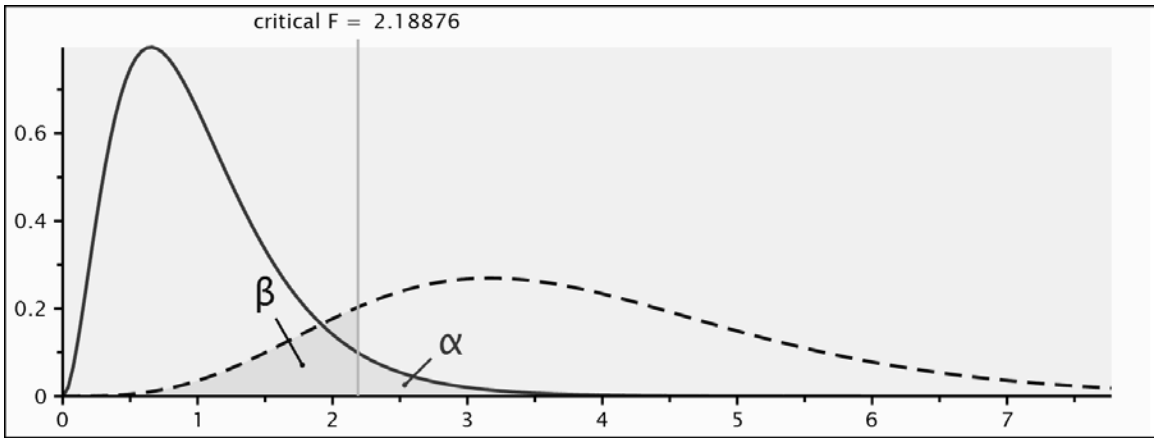

Figure 9. Plot of central and non-central distributions from G*power 3.1 based on the parameters of this study.

Sampling Plan

Qualtrics' staff selected panelists fitting the inclusion criteria, as defined in the population section, using simple random sampling. Qualtrics distributed questionnaires which collected data from the sample population with the intent to generalize to the larger

population. In this study, the larger population referred to United States manufacturing firms' supply chain management managers.

The use of panels for the identification of participants is common within the body of literature on this subject (Simon, Kinias, O'Brien, Major, & Bivolaru, 2013). The Qualtrics staff drew on a simple random sample from the sample frame. The selected participants received an e-mail inviting them to participate in the survey. The consent form was approved by the Institutional Review Board; this form was included electronically as the first item in the survey.

Instrumentation/Measures

This research study used a previously-validated survey instrument developed by the United States Air Force Institute of Technology on the eight supply chain management processes defined by the Global Supply Chain Forum. The Competitive Advantage and firm performance constructs tested by Li et al. (2006) were included in the AFIT survey (Salazar, 2012; White, 2012). The survey asked the participants to respond to 69 questions using a five-point Likert scale to identify relationships between supply chain management processes and Competitive Advantage. The survey addressed the following constructs: (a) Supplier Relationship Management – 14 questions, (b) Manufacturing Flow Management – 18 questions, (c) Product Development and Commercialization – 18 questions, (d) Competitive Advantage – 14 questions. The survey also addressed the following control variables: (a) participant profile – 1 question, and (b) company profile – 2 questions.

Through the analysis of the participants' responses, the research sought to answer the question, "What are the relationships between Competitive Advantage Index, as perceived by manufacturing managers, and Supplier Relationship Management Index, Manufacturing Flow Management Index, Product Development and Commercialization Index. additionally, the relationships of Level of Experience of management measured by years in supply chain management roles, the firms' size as measured by Numbers of Employees and sales measured by Gross Annual Sales, with Competitive Advantage Index and supply chain management processes of United States manufacturing firm?"

Measures

The Air Force Institute of Technology instrument used a five-point Likert scale for the questions. For the independent variable Supplier Relationship Management Index, the respondents were asked 14 questions adopted from Lambert's (2008) assessment tool. A portion of the questions were on the corporate level dealing with strategy, cross-functional groups, and Supplier Relationship Management metrics linked to financials, supplier contribution to company profits, and the impact of the firm's business on supplier performance. The second part of the Supplier Relationship Management questions included negative aspects of Supplier Relationship Management inclusion by the firm, such as lack of performance goals for suppliers, lack of criteria for segmenting suppliers, sharing conflicting functional objectives with suppliers, and not sharing benefits from process improvements with suppliers. In addition, at the functional level, employees understand how their decision affects Supplier Relationship Management, supplier's staff understands how they can affect Supplier Relationship Management, and

the customer understands how their decisions affect Supplier Relationship Management Index. These 14 questions addressed Supplier Relationship Management at the strategic level, functional level, and ambivalent level.

For the independent variable Manufacturing Flow Management Index, the respondents addressed 18 questions adapted from Lambert's (2008) assessment tool. The respondents answered these questions using give-point Likert scale (ranging from *strongly disagree* to *strongly agree*). A set of questions addressed the corporate level on strategy guiding the Manufacturing Flow Management process, setting a process to evaluate the expertise needed to address future technologies, the make/buy decision based on long-term focus, and the Manufacturing Flow Management metrics that are linked to financial performance. Other questions were geared toward firms not applying Manufacturing Flow Management process, such as lack of planning for capacity growth, not having manufacturing flexibility, conflicting functional objectives within the firm and supplier, and limited understanding of the Manufacturing Flow Management process. The other set of Manufacturing Flow Management questions were directed at the functional level of firm and supplier in implementing Manufacturing Flow Management through strong communication of manufacturing capability with supplier, firm, and customer; also, communicating the postponement opportunity of manufacturing among supplier, customer, and firm. These questions tested how a firm strategically and functionally implemented the Manufacturing Flow Management process.

A third set of questions addressed how manufacturing firms employed the independent variable of the Product Development and Commercialization Index process.

The current research used the Product Development and Commercialization process to determine the extent to which a firm develops and applies new ideas, addresses the time to market, and involves suppliers and customers in the development and commercialization of new products. This measure was adapted by Lambert's (2008) assessment tool for the Product Development and Commercialization process. This measure was assessed through 18 questions quantified through a five-point Likert-type scale. The 18 Product Development and Commercialization questions focused on corporate strategy influencing product development, extensive cross-functional understanding of the supply chain capabilities in the development process, formal overall guidelines on time to market expectations, profitability expectations, and well-communicated performance goals. A portion of the 18 questions dealt with lack of Product Development and Commercialization process activities, such as not considering customer feedback, not having a methodology for developing new products, and no formal procedures for new product roll-out.

The fourth set of questions concentrated on the dependent variable of the Competitive Advantage process. This measure evaluated, through 14 questions, how a firm could achieve an offensive position in the market (Porter, 1985). The instrument adopted this Competitive Advantage measure from Li et al. (2006). This measure evaluated if the manufacturing firm used price, reliability, quality, dependability, loyalty, customization, and being the first to market strategies in order to achieve Competitive Advantage.

Validity and Reliability

The validity issue of most concern in this study was construct validity. The constructs that require reliability include Competitive Advantage, Supplier Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization. The original reliability of this instrument showed a 0.81 Cronbach's Alpha for Supplier Relationship Management, .91 for Manufacturing Flow Management, .74 for PDCA, and .82 for Competitive Advantage. Cronbach's alpha above .7 deems the survey questions reliable for the constructs they represented (Vogt, 2007). The research used Laerd Statistics (Lund & Lund, 2013) and the IBM SPSS version 23 software to calculate the Cronbach's alpha of the current study's variables (Table 2). The research also tested the data for missing data. No adjustment was required due to missing data.

Table 2
Cronbach's Alphas for the Survey Instrument Subscales

Subscales	*A*
Competitive Advantage	*.71*
Product Development and Commercialization	*.90*
Manufacturing Flow Management	*.84*
Supplier Relationship Management	*.76*

Justification of Chosen Instrument

The data collection instrument for this research study was a public domain survey from the Air Force Institute of Technology (AFIT) on Leading Edge Supply Chain dissertation (Salazar, 2012). The Competitive Advantage construct was tested by Li et al. (2006) and included in the tested Air Force Institute of Technology survey (Salazar, 2012; White, 2012). This survey addressed the Global Supply Chain Forum processes

that make up the framework of the supply chain. The survey used in the two dissertations addressed all eight-supply chain processes; three processes in Salazar's dissertation and five in White's dissertation. Since the Air Force Institute Technology researchers were only able to reach eight surveyed participants, from a list of over 800 population sample, a void in the scholar databases developed. Furthermore, the increased importance of supply chain management in the last few years has increased the need to address this void of knowledge in supply chain management. To verify the strategic role of supply chain management, the research sought to verify a possible relationship between the three supply chain management processes and Competitive Advantage. To promote success, the research processes included a solid data collection system.

Permission for Instrument's Use

The instrument is in the public domain.

Data Collection

The proposed validated survey instrument elaborated the criteria actually used in the simple random sample from the sampling frame that Qualtrics® had available. Recruiting was conducted by Qualtrics® via their survey panels. Qualtrics® conducted the sample identification by using a simple random sample from the sample frame. The selected participants received an email inviting them to participate in the survey by selecting the link that allowed the participant access to the survey. The first section of the survey included the consent form approved by the Institutional Review Board. If the participant accepted the conditions of the consent form, the survey proceeded to the second section. Using the online electronic services by Qualtrics® diminished paper usage

and the time used in processing the responses in a format compatible with IBM Statistical Package for Social Science (SPSS) software.

The respondents included 118 participants, which were more than the minimum required sample size of 109. The participants had a mean of 15 years' experience in fields related to supply chain management, and all had a 4-year college degree. The manufacturing firms' respondents had a mean of 16,000 employees with mean gross annual sales of $10 billion USD.

Multiple Linear Regression Assumptions

The study tested the following multiple linear regression assumptions with the use of SPSS software:

1. Data was collected through random sampling. A random sample ensured that each member of the population had an equal chance of being selected. Random sampling does eliminate bias, but the sampling error was not eliminated. Using a panel from Qualtrics® ensured that the panel meeting the selection criteria was selected randomly.
2. The continuous dependent variable that is continuous was interval or ratio scale.
3. Independent variables consisted of a minimum of two variables: categorical (nominal or ordinal measurement scale) and continuous (interval or ratio measurement scale).
4. Independence of errors (residuals). The study performed a Durbin-Watson test to test for a lack of independence. The Durbin-Watson statistic, *d*, result can

range from 0 to 4; a value of approximately 2 shows that correlation between residuals does not exist (Lund & Lund, 2013). The research used the Durbin-Watson critical value tables table from SPSS to calculate *d*.

5. The linear relationship between the predictor variables (and composite) and the dependent variable has two assumptions. These assumptions state that the independent variables collectively have a linear relationship to the dependent variable, and that each pair of independent variable with dependent variable has linear relationship (pairwise). The current research tested these two linearity assumptions through scatter plots of the studentized residuals against the unstandardized predicted values for the first assumption. For the second linearity assumption, the research analyzed the partial regression plots between each independent variable with the dependent variable and through Pearson's correlation coefficients for each pair of independent with the dependent variable (Lund & Lund, 2013). The tests of linearity assumptions through the scatter plots and partial regression plots do not test statistical inference but provide a subjective evaluation of the plotted results. The null hypothesis of linearity would be supported if the results of the plot form a horizontal band. Conversely, a partial regression plot and Pearson's correlation coefficients do provide statistical inference. The null hypothesis for H_0: $|\rho x| = 0$ is supported for $p > \alpha$ and H_0: $|\rho x| = 0$ is not supported for $p < \alpha$ where $\alpha = .05$.

6. Homoscedasticity of residuals (equal error variances) - was investigated by scatter plotting z*predicted* versus *zresiduals*. Plotting the *z*-scores of the predicted and standardized residuals tested the alternative hypothesis of no systematic association between the residuals and the errors predicted by the model. The residuals Y value compute versus the Y value observed are equal for all values of the predicted dependent variable (Lund & Lund, 2013).
7. No collective multicollinearity between independent variables. This test assesses if two or more independent variables are highly correlated. In the event of high correlation between independent variables, the findings of the research could not identify which independent variable causes the effect on the dependent variable. Pearson Correlation and tolerance / Variance Inflation Factors values tested multicollinearity (VIF). Pearson's correlation coefficients tested multicollinearity between each pair of independent variables. Variance Inflation Factor is the reciprocal of tolerance. If tolerance is less than .1 or Variance Inflation Factor greater than 10, then collinearity would be problem. Moreover, the study would have collinearity problems with Pearson's correlation coefficients greater than .7 and tolerance values less than .1 (Lund & Lund, 2013).
8. No significant outliers or influential points. The Casewise Diagnostics table highlighted any case where the standardized residual is greater than ± 3 standard deviations. When identified, the process would involve the removal of outliers. Cook's distance values test for influential points for each case;

from the SPSS statistics of this study, any Cook's distance value greater than one should be investigated (Lund & Lund, 2013).

9. That errors (residuals) were normally distributed. In order to determine statistical significance among the independent variables, the errors / residuals need to be normally distributed. The distribution can be analyzed by superimposing a normal bell shaped histogram over the residuals and a Normal P-P plot of regression standardized residual with dependent variable of Competitive Advantage. For the histogram, the standard deviation should be very close to one and the mean close to zero in order to be normally distributed. In addition, a Normal P-P plot with points aligned along a diagonal line depicts the expected values of Competitive Advantage against the observed values. To be normally distributed, the points should be on the regression line. In the event of violation, perform a transformation on the dependent variable and/or independent variables to try to coax the error residuals to normality. This hypothesis assumption that state error terms are normally distributed was tested via four statistical analysis: (a) a histogram of the regression standardized residual with a superimposed normal distribution curve, (b) Normal P-P plot of the regression standardized residual, (c) Kolmogorov-Smirnov goodness-of-fit test, and (d) the Shapiro-Wilk tests of normality. The assumption of normality is violated if the test is significant at the $\alpha = .05$ significance level, and the null hypothesis is rejected if the residuals are not normally distributed (Lund & Lund, 2013).

In the event of assumption violations, the research involved appropriate steps to address the violations (e.g., in the event of lack of normality for the dependent variable, the research analyzed a log or square root transformation). In the event of correlation between independent variable, the model dropped one of the variables.

Testing the Hypotheses

The research used hierarchical multiple linear regression to analyze the research hypothesis. The research involved one analysis with four models to test the hypothesis related to the research question.

Model Fit

The study entered the research data into four linear regression models. The first model included the Competitive Advantage Index regressed by manager years of Experience, Number of Employees in the firm, and Gross Annual Sales. The second model included the manager years of Experience, Number of Employees, and Gross Annual Sales as well as the regressed Product Development and Commercialization. Index. The third model included the manager years of Experience, Number of Employees, Gross Annual Sales, and Product Development and Commercialization Index, while regressing the Manufacturing Flow Management Index. The fourth model controlled manager years of Experience, Number of Employees, Gross Annual Sales, Product Development and Commercialization Index, and Manufacturing Flow Management Index, while regressing the Supplier Relationship Management Index.. The regression included Pearson correlations for each model to understand the correlation of the independent variables to the dependent variable and the control variables with the

dependent variable. The ANOVA analysis determined the significance of each model to the Competitive Advantage of the firm; the model was statistically significant when $p <$ ($\alpha = .05$). Through this analysis, the findings identified which model provided a greater percent of influence on Competitive Advantage identified by R^2. The linear regression model for the population in this research study was expressed using the following statistical notation (Lund & Lund, 2013)

$$Yi = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \varepsilon i$$

where

1. $i = 1, 2, \ldots, n$, where n is the size of the population sample
2. Y_i is the i^{th} value of the dependent variable *Competitive Advantage Index*
3. β_0 is the population regression coefficient for the y intercept
4. β_1 is the population regression coefficient for the control variable *Manager Years of Experience* (X_1)
5. β_2 is the population regression coefficient for the control variable *Number of Employees* (X_2)
6. β_3 is the population regression coefficient for the control variable *Gross Annual Sales* (X_3)
7. β_4 is the population regression coefficient for the independent variable *Product Development and Commercialization Index* (X_4)
8. β_5 is the population regression coefficient for the independent variable *Manufacturing Flow Management Index* (X_5)

9. β_6 is the population regression coefficient for the independent variable *Supplier Relationship Management Index* (X_6)

10. ε_i is the i^{th} value of the error term

Testing the Hypotheses

Hierarchical multiple linear regression was used to analyze the collected data. One analysis was conducted through four models each to test the hypothesis to the research question. Each model forced a new independent variable in the regression. The first model for the research question included the dependent variable *Competitive Advantage Index* and the control variables *Manager Years of Experience, Number of Employees,* and *Gross Annual Sales*. The second model included the dependent variable *Competitive Advantage Index*, the control variables *Manager Years of Experience, Number of Employees,* and *Gross Annual Sales* and regressed the independent variable *Product Development and Commercialization Index*. The third model maintained the dependent variable *Competitive Advantage Index*, the control variables *Manager Years of Experience, Number of Employees,* and *Gross Annual Sales* the independent variable *Product Development and Commercialization* and regressed the independent variable *Manufacturing Flow Management Index.* The fourth model maintained the dependent variable *Competitive Advantage Index*, the control variables *Manager Years of Experience, Number of Employees,* and *Gross Annual Sales*, the independent variable *Product Development and Commercialization, Manufacturing Flow Management Index* and regressed the independent variable *Supplier Relationship Management Index*.

Hypothesis for RQ

The study tested the overall predictive validity of the multiple linear regression models for RQ for statistical significance ($\alpha = .05$) using the following null and alternate hypothesis:

H_0: $\rho^2 = 0$

H_A: $\rho^2 > 0$

In these hypotheses, ρ^2 was the population coefficient of determination. Testing the overall predictive validity of the multiple linear regression models allowed for the determination of statistical significant of each model. In determining the predictive validity of each multiple regression model, model fit, the SPSS software provided the information needed for analyzing the results. These results identified the linear relationship between the dependent and independent variable via the *R*, R^2, and adjusted R^2 values through SPSS. The values R^2 measured the proportion variability in the outcome variable explained by the predictor variable.

Ethical Considerations

The general principles of ethical research assert that the participants should be protected from harm, have their privacy protected, have their data kept confidential, that the participants should be informed regarding the purpose and use of this research study, and that the researcher does not have personal gains from the outcome of the study (Patten, 2012). The current study included the following measures to address the ethical considerations:

1. Using a third-party online survey that provided anonymity of participants,

2. Using a third party for collection of data and participants in order to disassociate the researcher from the gathered data,
3. Maintaining the raw data within the survey tool and SPSS by anonymous ID number,
4. Obtaining consent from participants.

CHAPTER 4. RESULTS

The purpose of this explanatory study was to understand a possible relationship between three supply chain management processes and the Competitive Advantage of a manufacturing firm. Moreover, the study analyzed the effects of the firm and employee characteristics on the relationship between supply chain management and Competitive Advantage. Qualtrics collected the research data by administering the four-part survey to their panel that represented the sample frame. The study's data analysis involved a quantitative approach with hierarchical multiple linear regression to understand the effect each supply chain management process had on Competitive Advantage. This chapter will describe the adoption of the collected data to address the null and alternative hypotheses of the following research question:

RQ: What are the relationships between Competitive Advantage Index (DV), as perceived by manufacturing managers, and Supplier Relationship Management Index (IV), Manufacturing Flow Management Index (IV), Product Development and Commercialization Index (IV) while controlling for the firms' size, as measured by Numbers of Employees (CV), sales, as measured by Gross Annual Sales (CV), and Experience Level of management, as measured by years in supply chain management roles (CV)?

Exploratory Data Analysis

This research study first calculated the descriptive statistics of the population. The research addressed the assumptions of the linear regression model to ensure that the results could be inferred to the larger population that meets the inclusion criteria. This section will present results of the model as well as concluding remarks that answer the research question, summarize the chapter, and introduce the final chapter.

Description of the Sample Manufactures and Surveyed Population

Table 4 provides the background of the managers responding to the survey. The manufacturing filed had the highest percentage of 29% participation. Engineering and Information Technology managers followed the manufacturing managers closely. About 10% of the survey participants were managers in fields of business and sales. Finally, five percent represented managers in logistics, supply chain, procurement, transportation, marketing, business development, and production fields. These results could indicate the reason why Supplier Relationship Management was significant but with very low effect on Competitive Advantage, since the managerial fields dealing with suppliers directly had low participation in the survey. Furthermore, the managerial manufacturing managers should have had greater influence on Manufacturing Flow Management, but the results indicated a slight effect on Competitive Advantage. Product Development and Commercialization construct demonstrated to have the greatest effect on Competitive Advantage and the fields of engineering, Information Technology, manufacturing, sales contributed to a direct involvement in Product Development and Commercialization. These results suggested that a relationship between the percentage of respondents in a

particular management field and the outcome of a particular construct on Competitive Advantage is possible.

Table 3
Descriptive Statistics

	Mean	*Std. Deviation*	*N*
Competitive Advantage	*3.73*	*.82*	*118*
Years in current position	*15*	*10.22*	*118*
Full time employees	*16,360*	*42,630*	*118*
Gross Annual volume of Sales measured in millions	*$10,430*	*$45,420*	*118*
Product Development and Commercialization	*3.71*	*.82*	*118*
Manufacturing Flow Management	*3.46*	*.59*	*118*
Supplier Relationship Management	*3.31*	*.65*	*118*

Table 4
Managers' Experience in the Supply Chain Field for at Least 2 Years

Answer	Response	%
Business	10	8%
Finance	8	7%
Purchasing	4	3%
Engineering	17	14%
Manufacturing	35	29%
Production	3	3%
Supplier Management	1	1%
Transportation	2	2%
Logistics	5	4%
Information Technology	22	18%
Marketing	3	3%
Sales	8	7%
Business Development	2	2%
Other	0	0%
Not a Manager	0	0%
Total	120	100%

The sample for this study was part of the Qualtrics® audience made up of 120 managers in the supply chain management fields of United States manufacturing firms that met the inclusion criteria. Qualtrics® reached a response of 120 surveys in less than 3 days, with an average completion time of 6 minutes per participant. Since two surveys respondents had a data point missing, the SPSS software did not include the data of these participants in the analysis; therefore, the actual number of valid survey responses was 118 (Table 3).

By not limiting the research to a certain firm size, the data reflected large deviations in the annual sales and firm population. The data exhibited large variations in company size, from companies with 50 employees to those with up to 250,000. The same was evident for gross annual sales, which ranged from a few million dollars to over $200 billion USD. The fact that such large differences were evident could explain why this data did not have outliers and did not have cases that had strong influences in skewing the results

Testing Statistical Model Assumptions

Multiple linear regression models have assumptions that must be met in order to be able to infer the results to the target population. This study highlighted these assumptions in Chapter 3 of this research. Testing of the following Multiple Linear Regression assumptions with the SPSS Statistics 23 software allowed for analyzing the validity of the data from the study participants.

Data Collected Via Random Sample

The current research tested the assumption that data collected for this study was accomplished through random sampling by reviewing the sampling plan of Qualtrics® the firm that conducted the survey. The firm used random sampling in selecting the audience from their database. Qualtrics® confirmed the use of random sampling for this research**.**

Continuous Dependent Variable

An assumption of the research was that the values of the dependent variable Competitive Advantage Index are based on a continuous scale (interval or ratio). The measurement of this dependent variable is continuous, since it was the arithmetic mean value of responses to questions graded on a five-point Likert scale. The arithmetic mean is a real number on a continuous scale. In summary, the dependent variable supports the assumption for being continuous.

Continuous or Categorical Independent Variables

The sub-assumption of each independent variable (predictor) was based on a continuous scale (either ratio or interval). The research tested each assumption by addressing the measurements of each independent variable. The three independent variables were measured by the arithmetic mean of the responses to questions graded on a five point Likert scale. The arithmetic mean is a real number measured on a continuous scale for each predictor. The three control variables were based on ratio level of measurement, they were based on equal interval such as years, number of people, and number of dollars (Vogt, 2007) In summary the independent and control variables were continuous and supported the assumption.

Independence of Errors (Residuals)

A Durbin-Watson test using SPSS Statistics software tested for the first order serial correlation between the residuals for the data for the dependent variable. The Durbin-Watson test for the dependent variable for the research question resulted in d = 1.7, from the SPSS Statistics software (Table 5). From Chapter 3, a value of 2 depicts no correlation between residuals, and 1.7 is very close to two. The research assessed the independence of residuals through a Durbin-Watson statistic of 1.7 (Lund & Lund, 2013). In summary, the assumption of independence of errors was supported.

Linearity Between Dependent and Independent Variables

The research study addressed the assumption of the multilinear regression linearity by two sub-assumptions: (a) that the dependent and independent variables have a linear relationship, and that (b) pairs of each independent with the dependent variable have a linear relationship. The research tested the first sub-assumption by plotting the standardized residuals against the predicted values looking for a linear relationship (Lund & Lund, 2013; Figures 11-13).

Scatter plots. The research tested the first sub-assumption (the dependent and independent variables have a linear relationship) via a scatter plot of studentized residuals versus unstandardized predicted values. The hypotheses for this first linear assumption were H_0: $|\rho| = 0$; and H_a: $|\rho| > 0$. The absolute value $|\rho|$ is the cumulative linear correlation of the independent and dependent variables (Figure 10).

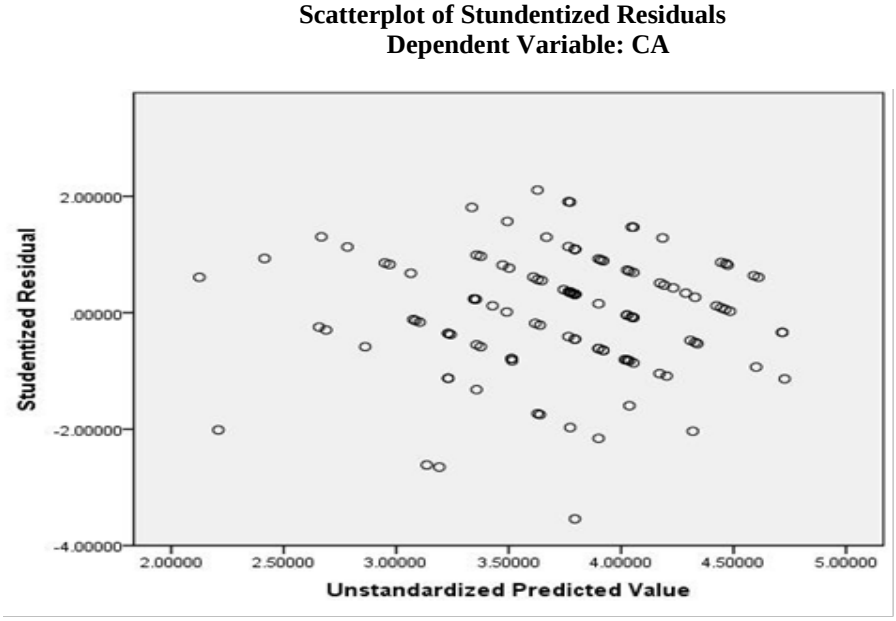

Figure 10. Standardized residuals against the predicted values plot for linearity.

Table 5
Collinearity Statistics and Durbin-Watson

	Collinearity Statistics		
Model	Tolerance	VIF	Durbin - Watson
1			1.7
Years of experience	.910	1.09	
full time employees	.877	1.14	
GAS in millions.	.956	1.04	
2			
Years of Experience	.909	1.10	
full time employees	.876	1.14	
GAS in millions	.954	1.05	
PDAC	.994	1.01	
3			
Years of experience	.898	1.11	
full time employees	.876	1.14	
GAS in millions	.948	1.05	
PDCA	.889	1.12	
MFM	.877	1.14	
4			
Years of experience	.891	1.12	
full time employees	.875	1.14	
GAS in millions	.945	1.05	
PDAC	.797	1.25	
MFM	.872	1.14	
SRM	.856	1.16	

The analysis of the first sub-assumption scatter plot failed to support the null hypothesis H_0: $|\rho| = 0$, since the points in the scatter plot above form a horizontal swat that is not curvilinear or any other nonlinear relationship.

The research tested the second sub assumption of linearity of each pair of dependent and independent variable using regression plots between Competitive Advantage Index (dependent variable) versus each independent variables (Supplier Relationship Management Index, Manufacturing Flow Management index, and Product Development and Commercialization Index; Figures 11-13). The research also calculated Pearson's correlation coefficients for each pair of independent and dependent variables (Table 6).

Partial regression plots. The partial regression plots between Competitive Advantage Index and each independent variable of Supplier Relationship Index, Manufacturing Flow Management Index, and Product Development and Commercialization Index all showed a straight line. The points in the scatter plots of Figures 11, 12, and 13 fail to support the null hypothesis H_0: $|\rho| = 0$, since the points in the scatter plots form around a horizontal line, therefore the relationship between the dependent variable with each predictor is linear. The figures do not appear to show a curvilinear or other linear relationship.

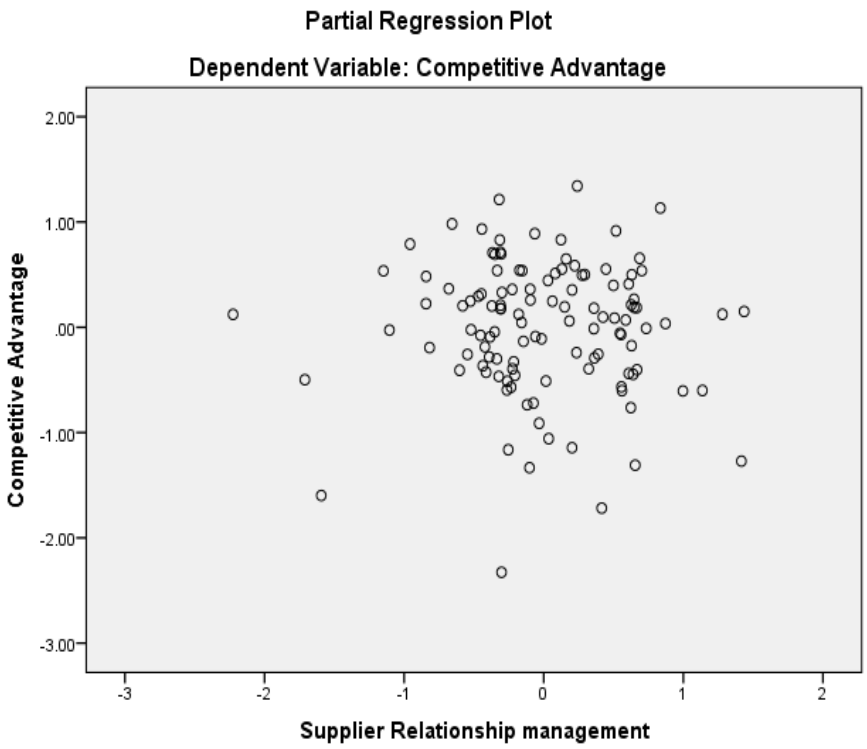

Figure 11. Scatter plot of Supplier Relationship Management Index across Competitive Advantage Index.

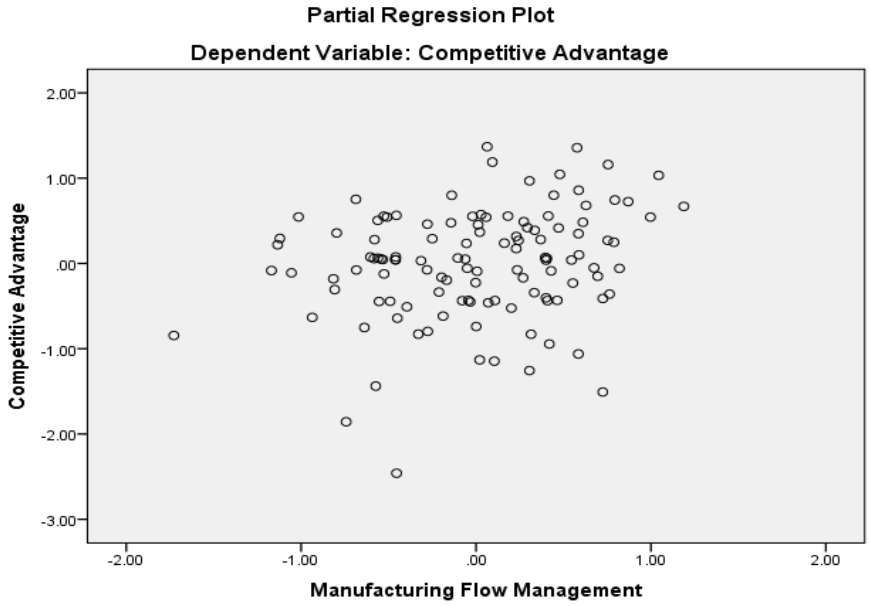

Figure 12. Scatter plot of Manufacturing Flow Management Index across Competitive Advantage Index.

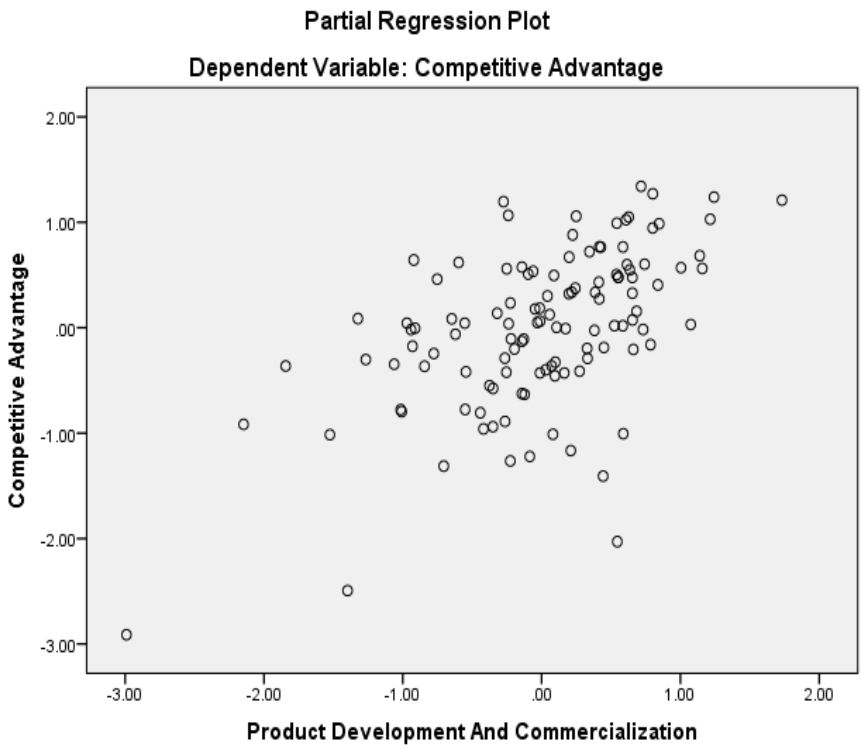

Figure 13. Scatter plot of Product Development and Commercialization Index across Competitive Advantage Index.

Pearson's linear correlation coefficient test. The second test of the pairwise linearity assumption included the Pearson's correlation coefficient (Table 6). The results supported the null hypothesis H_0: $|\rho| = 0$ for the Competitive Advantage Index and control variable manager's experience because [($p = .43$) > ($\alpha = .05$)]. The results supported the null hypothesis for Competitive Advantage Index and the control variable of Gross Annual Sales because [($p = .26$) > ($\alpha = .05$)]. The results also supported the null hypothesis for the Competitive Advantage Index and control variable Number of Employees because [($p = .11$) > ($\alpha = .05$)]. The results supported the alternate hypothesis for the Competitive Advantage Index and independent variable Supplier Relationship Management Index [($p = .01$) < ($\alpha = .05$)]. The results supported the alternate hypothesis

for the Competitive Advantage Index and the independent variable Manufacturing Flow Management Index [(p = .0001) < (α = .05)]. The alternate hypothesis is supported for Competitive Advantage Index and the independent variable Product Development and Commercialization Index [(p = .0001) < (α = .05)]. Therefore, the pairwise linearity assumption was satisfied for the variable pairs involving the independent variables, but was not satisfied for variable pairs involving the control variables. Also, the test shows that the Pearson's correlation coefficient of r = .61 has a very strong linear relationship between Competitive Advantage and Product Development and Commercialization. The correlation is not higher than .7, which Chapter 3 highlighted as the highest allowable for being able to distinguish between Competitive Advantage and Product Development and Commercialization; therefore, the results did not demonstrate collinearity problems.

Table 6
Pearson Linear Correlation Factors

Tests	*Variable*	*CA*	*MGR years of experience*	*Full time employees in firm*	*Gross annual sales in millions*	*PDAC*	*MFM*	*SRM*
Pearson Correlation	Competitive Advantage	*1.00*	*-.01*	*-.11*	*.06*	*.61*	*.37*	*.21*
	MGR years of Experience	*-.01*	*1.00*	*.28*	*-.03*	*.04*	*-.09*	*-.07*
	Full time employees in organization	*-.11*	*.28*	*1.00*	*.19*	*.06*	*.01*	*.025*
	Firm's Gross Annual Sales measured in millions	*.06*	*-.03*	*.19*	*1.00*	*.045*	*.09*	*.081*
	PDAC	*.61*	*.05*	*.06*	*.04*	*1.00*	*.32*	*.35*
	MFM	*.37*	*-.10*	*.01*	*.09*	*.32*	*1.0*	*.19*
	SRM	*.20*	*-.07*	*.02*	*.08*	*.35*	*.19*	*1.00*
Significance (1-tailed)	Competitive Advantage	*.00*	*.43*		*.26*	*.00*	*.00*	*.01*
	MGR years of Experience	*.44*	*.00*		*.38*	*.31*	*.15*	*.22*
	Full time employees in Firm	*.11*	*.00*	*.00*	*.11*	*.26*	*.46*	*.39*
	Organization's Gross Annual Sales measured in millions	*.26*	*.38*	*.02*	*.00*	*.31*	*.15*	*.19*
	PDAC	*.00*	*.31*	*.26*	*.31*	*.00*	*.00*	*.00*
	MFM	*.00*	*.14*	*.46*	*.15*	*.00*	*.00*	*.01*
	SRM	*.01*	*.22*	*.39*	*.19*	*.00*	*.01*	*.00*

Linearity assumption summary. In summary, the graphical linearity through scatter plots demonstrated a linear relationship between Competitive Advantage Index and all the predictors. There was a linear relationship between Competitive Advantage Index and each independent variable. Through the Pearson's linear coefficient factors, there is not a linear relationship between Competitive Advantage Index and each control

variable, but there is linearity between Competitive Advantage Index and each of the three independent variables

Homoscedasticity of Error Variances

The homoscedasticity assumption test uses the scatter plots of studentized residuals versus unstandardized predicted values. The homoscedasticity assumption is satisfied if the scatter of the residuals did not increase or decrease moving across the predicted values. The visual inspection of Figure 14 points to a scatter plot that does not increase or decrease across the domain of predicted values. The pattern does not show a funnel type of scatter or a fan type; therefore, the assumption of homoscedasticity of the error variances was met.

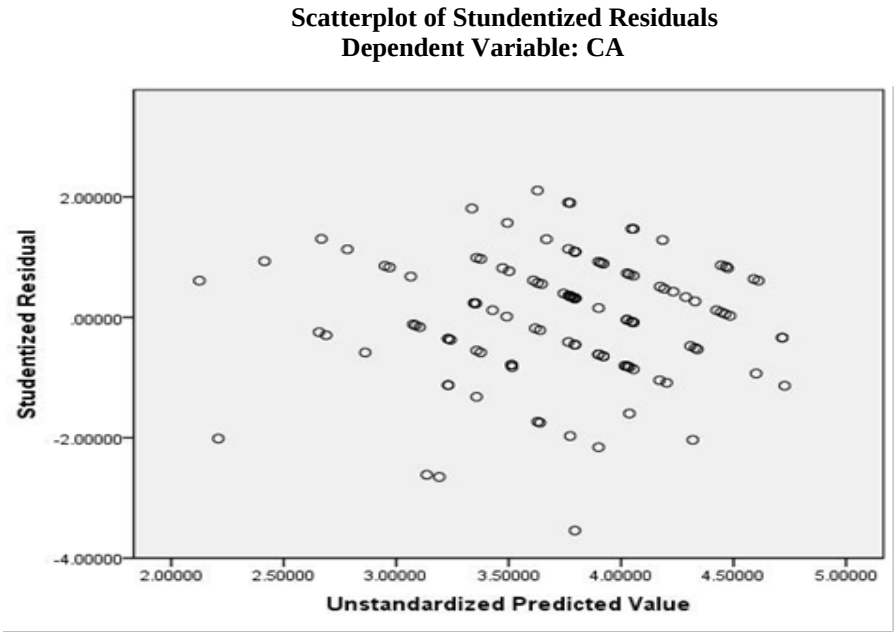

Figure 14. Standardized residuals against the predicted values plot for linearity.

Absence of Multicollinearity

No multicollinearity between independent variables, when two predictor variables are collinear the test would have difficulty in identifying which predictor created the effect on the dependent variable. The absence of multicollinearity was tested through two different methods: (1) through Pearson's linear correlation and (2) by inspecting Tolerance/VIF (Variance Inflation Factor) values.

Pearson's correlation. Table 6 depicts the Pearson's linear correlation coefficient for each independent variable. The results supported the null hypothesis H_0: $|\rho| = 0$ is supported for all the control variables, since $p > (\alpha = .05)$. For all the independent variables, the results did not support the null hypothesis H_0: $|\rho| = 0$ (Lund & Lund, 2013). For the independent variable, there is a linear correlation factor of .61, which is close to the .7 limit, where above .7 there would be a strong correlation that would be hard to differentiate which variable was causing the effect (Lund & Lund, 2013).

Tolerance/VIF. The Tolerance/VIF values for this research are listed in Table 5. As discussed in Chapter 3, when the tolerance values are less than 0.1 or VIF greater than 10, a collinearity problem exists (Lund & Lund, 2013). In addition, VIF values are reciprocal of tolerance values; consequently, only tolerance values less than .1 need to be identified from Table 5. The table does not have tolerances less than .7; therefore, there is no evidence of multicollinearity among the indirect variables (Lund & Lund, 2013).

Summary of multicollinearity. The assumption of the absence of multicollinearity was evident in the Pearson's correlation coefficients that were below .7, the number above which there would be collinearity. The only independent variable that

was close to .7 was Product Development and Commercialization Index with .61. By using the tolerance/VIF values through SPSS (Table 5), the tolerance values were greater than the recommended level of 0.1, and the tolerance values were not less than .8 for the pairs of dependent variable with each of the control and independent variables.

Absence of Outliers

Outliers are points fall away from the predicted value. SPSS software produced a casewise diagnostic table where any cases in the responses of the survey had a point ± 3 standard deviations away from the mean. The casewise diagnostic revealed a point, case 4, ±3 standard deviations away from the mean. To identify if this point was influential in the analysis, the SPSS provided the Cook's Distance in Table 8 (Lund & Lund, 2013). Cook's Distance values greater than 1 should be investigated further. Table 8 did not show a Cook's Distance greater than 1; therefore this analysis did not have any one influential point, even though casewise diagnostics (Table 7) showed one point greater than ±3 standard deviation.

Summary of outliers and influential points. Cook's distance values demonstrated the point did not have any influence on the results. The fourth survey taker points were left in the data analysis.

Table 7
Casewise Diagnostics

Case number	*Std. residual*	*Competitive Advantage*	*Predicted value*	*Residual*
4	*-3.62*	*1.50*	*3.83*	*-2.33*

Table 8
Residuals Statistics

	Minimum	*Maximum*	*Mean*	*Std. Deviation*	*N*
Predicted Value	*2.20*	*4.78*	*3.73*	*.54*	*118*
Std. Predicted Value	*-2.84*	*1.93*	*.00*	*1.00*	*118*
Standard Error of Predicted Value	*.07*	*.59*	*.14*	*.06*	*118*
Adjusted Predicted Value	*2.15*	*4.80*	*3.73*	*.53*	*118*
Residual	*-2.33*	*1.35*	*.00*	*.63*	*118*
Std. Residual	*-3.62*	*2.10*	*.00*	*.97*	*118*
Stud. Residual	*-3.67*	*2.11*	*.00*	*1.00*	*118*
Deleted Residual	*-2.39*	*1.36*	*.00*	*.66*	*118*
Stud. Deleted Residual	*-3.89*	*2.14*	*-.00*	*1.01*	*118*
Mahal Distance	*.393*	*98.90*	*5.95*	*10.11*	*118*
Cook's Distance	*.00*	*.12*	*.008*	*.020*	*118*
Centered Leverage Value	*.00*	*.84*	*.05*	*.086*	*118*

Residuals Are Normally Distributed

The errors (residuals) should be normally distributed in order for the study to make inference to a larger population using multiple linear regression results (Lund & Lund, 2013). The following assumption of normality were tested using: (1) Histogram with super imposed normal curve, (2) Normal P-P Plot of the studentized residual, (3) Kolmogrov-Smirnov test, and (4) Shapiro-Wilk test.

Histograms. The histogram showed in Figure 15 demonstrates the standardized residuals are approximately not normally distributed. Lund and Lund (2013) point out that visually the histogram is deceptive because the appearance is dependent to the column width.

Normal P-P plots. The Normal P-P plots of the regression standardized residual are approximately normally distributed, and the point plot would have aligned directly on the regression line of the Normal P-P plot (Figure 16). Lund and Lund (2013) stated that the residuals need only be approximately normally distributed. The Histogram and the

Normal P-P plots show the same approximation to normal distribution. Laerd Statistics (2013) does point out that the visual graphical check provides approximations, the other way of checking the normality of the data is through the Kolmogorov-Smirnov test that Chapter 3 discussed.

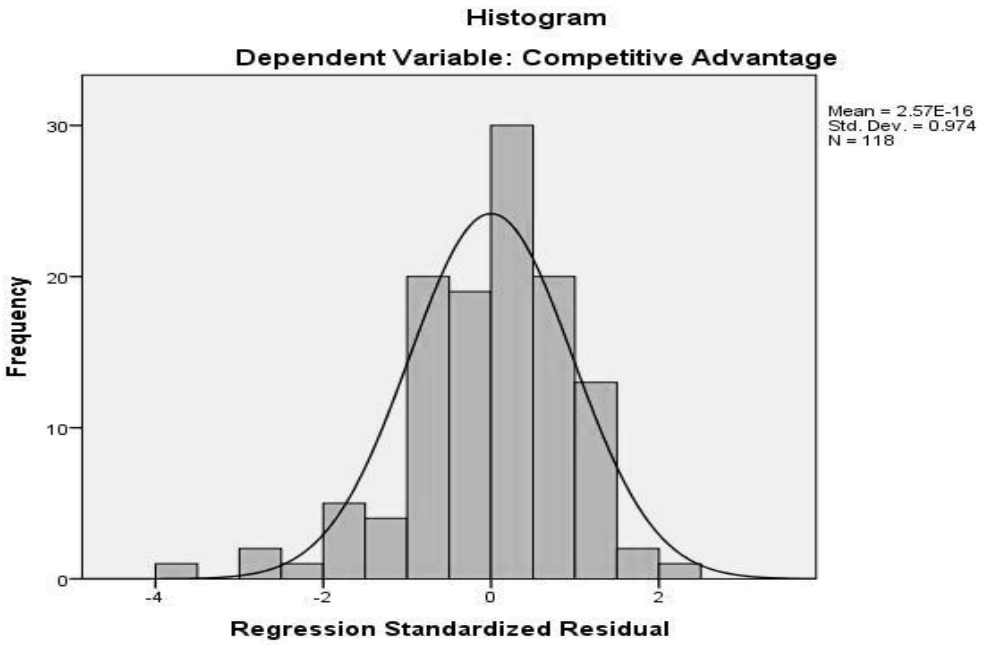

Figure 15. Histogram of the standardized residual for Competitive Advantage Index

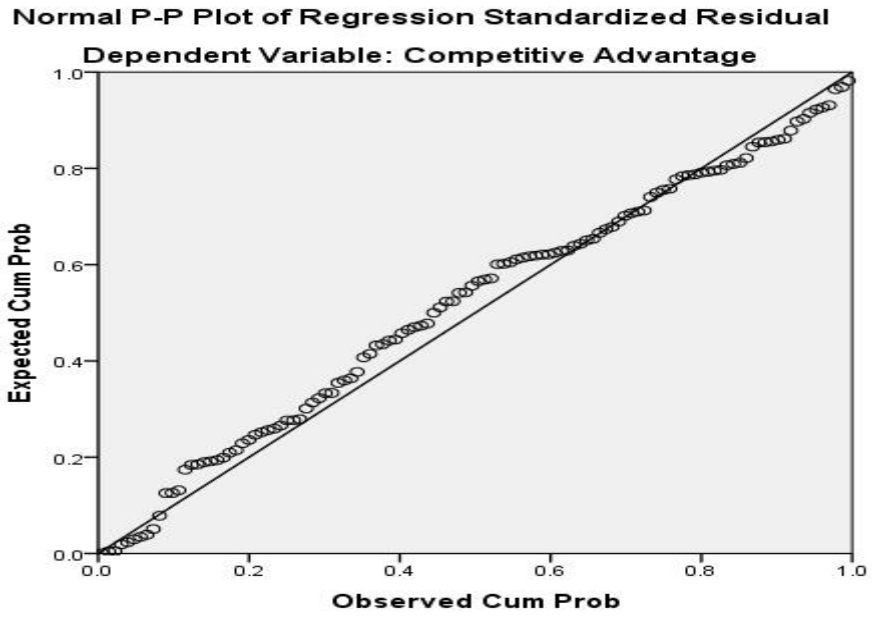

Figure 16. P-P plot.

Kolmogorov-Smirnov test. The results of Kolmogorov-Smirnov appear in Table 9. The findings supported the null hypothesis H_0: $F(\varepsilon_i) = N(\mu, \sigma^2)$ that the residuals for Competitive Advantage are [($p = .053$) > ($\alpha = .05$)]. The results of the Kolmogorov-Smirnov test indicate that the probability distribution for Competitive Advantage was barely normal.

Shapiro-Wilk test. The results of the Shapiro-Wilk test are in Table 9. For the dependent variable of Competitive Advantage, the findings supported the null hypothesis H_0: $F(\varepsilon_i) = N(\mu, \sigma^2)$ that the residuals for the dependent variable are normally distributed [($p = .238$) > ($\alpha = .05$)]. The results of Shapiro-Wilk test was that the probability distribution of the dependent variable Competitive Advantage Index was normal.

Summary of normality test. All the tests for Normal distribution indicated that the probability distribution of residuals for Competitive Advantage was normal, although the K-S test had a significance of .053 very close to minimum of $\alpha = .05$. The graphical

tests showed very close to normal distribution, and the statistical tests agreed with those results.

Table 9
Test of Normality

	Kolmogorov-Smirnov[b]			*Shapiro-Wilk*		
	Statistic	*Df*	*Sig.*	*Statistic*	*Df*	*Significance*
Competitive Advantage	*.345*	*5*	*.053*	*.863*	*5*	*.238*

Note. a =Supplier Relationship Management = 4.00, Manufacturing Flow Management = 3.00, Product Development and Commercialization = 4.00; *b* = Lilliefors Significance Correction; *Df* = Degree of freedom

Model Assumption Summary

All assumptions of multiple linear regression were satisfied. The residuals were supported by the Durbin-Watson statistics by each of the four models. The findings confirmed linearity and homoscedasticity utilizing scatter plots. and the Pearson's linear coefficient factors The study assured multicollinearity utilizing tolerance /VIF values and the Pearson's correlation. coefficients. The research tested outliers and high influential points through casewise diagnostics and Cook's distance. Lastly, the research tested the normality of the distribution of the residuals through histogram, Normal P-P plots, the Kolmogorov-Smirnov Test and the Shapiro-Wilk test..

Data Analysis

Testing the Multiple Linear Regression Hypothesis for RQ

The hierarchical multiple linear regressions consisted of four models. The dependent variable for all four models was Competitive Advantage Index. Model 1 tested the control variables Manager Experience Level, Number of Employees, and Gross Annual Sales. Model 2 controlled Manager Experience Level, Number of Employees,

and Gross Annual Sales, and inserted the first predictor Product Development and Commercialization index. Model 3 controlled Manager Experience Level, Number of Employees, Gross Annual Sales, and Product Development and Commercialization, while inserting the second predictor of Manufacturing Flow Management. Model 4 controlled Manager Experience Level, Number of Employees, Gross Annual Sales, Product Development and Commercialization, and Manufacturing Flow Management, while inserting the third predictor variable of Supplier Relationship Management. Through the data analyses presented in this section, the research addressed the study research question through the null and alternate hypothesis.

H_0: $\rho^2 = 0$

H_A: $\rho^2 > 0$

Testing Model 1: Fit Hypothesis

Model fit addresses the model's ability to predict the outcome (dependent) variable. The research evaluated the Model 1 fit by testing the following hypotheses using a level of significance of $\alpha = .05$, where ρ^2 reflects the population coefficient of determination.

H_0: $\rho^2 = 0$

H_A: $\rho^2 > 0$

The research analyzed model summary and ANOVA tables (Tables 10 and 11) to address the control variables influence on Competitive Advantage through the null and alternate hypothesis. The *p*-value for Model 1 from Table 11 was .51. The findings supported the null hypothesis H_0: $\rho^2 = 0$ since [($p = .51$) > ($\alpha = .05$)], which means that

the control variables in Model 1 would not be good predictors for Competitive Advantage.

Examining model fit for Model 1 in Table 10, R^2 = .02 and adjusted R^2 = - 01. The value R^2 indicates the effect Model 1 has in influencing Competitive Advantage. In fact, 2% of the variability in Competitive Advantage Index was related to the three control variables.

Testing model 1 regression coefficients. Despite the fact that Model 1 supported the null hypothesis, the research tested the hypothesis for the regression coefficients for Model 1.

For Model 1, the research evaluated the regression coefficients by testing the following null and alternate hypotheses using a level of significance $\alpha = .05$:

$H_0 i: \beta_i = 0$

$H_A i: \beta_i \neq 0$

for i = 0, 1, 2, 3 and where (a) β_0 is the population regression coefficient for y-intercept and (b) β_1 is the population regression coefficient for the control variables Manager Experience Level (X_1), (c) β_2 is the Number of Employees (X_2), and (d) β_3 Gross Annual Sales ($X_{,3}$).

The SPSS results relating to the regression coefficients were .000. The results did not support the null hypothesis $H_0 = 0$ because [($p < .0005$) < ($\alpha/2 = .025$)], which means the *y*-intercept for Model 1 is a statistically significant predictor of the dependent variable. Since the *y*-intercept is simply an arithmetic mean of the dependent variable, the *y*-intercept is meaningless in interpreting the multiple linear regression results.

The *p*-values for the null hypothesis for β_1 for Model 1 is in Table 12 as .781. The results supported this null hypothesis because [(p = .781) > ($\alpha/2$ = .025)], which means that the regression coefficient for Manager Experience Level is not a statistically significant predictor for Competitive Advantage.

The *p*-value for β_2 regression coefficient for control variable number of employees X_2 was .171. The statistics supported the null hypothesis H_0: $\beta_2 = 0$ because [(p = .171) > ($\alpha/2$ = .025)], which means that the regression coefficient for number of employees in Model 1 is not a statistically significant predictor for Competitive Advantage.

The *p*-value for the null hypothesis for β_3 regression coefficient for control variable Gross Annual Sales X_3 was .368. The findings supported the null hypothesis H_0: $\beta_3 = 0$ because [(p = .368) > ($\alpha/2$ = .025)], which means that the regression coefficient for gross annual sales in Model 1 is not statistically significant for Competitive Advantage. This result is also consistent with the previous result that supported the null hypothesis for model fit H_0: $\rho^2 = 0$.

Model 1 regression equation.

$$y_i = b_0 + b_1x_{1i} + b_2 x_{2i} + b_3 x_{3i} + e_i$$

$$y_i = 3.72 + (.003 * x_{1i}) + (-2.65E\text{-}6 * x_{2i}) + (1.5E\text{-}12 * x_{3i}) + e_i$$

$$y_i = 3.72 + e_i$$

Testing Model 2: Fit Hypothesis

Model fit addresses the model's ability to predict the dependent variable Competitive Advantage Index value. The research evaluated Model 2 by testing the

following hypotheses using a level of significance of $\alpha = .05$, where ρ^2 reflects the population coefficient of determination.

H_0: $\rho^2 = 0$

H_a: $\rho^2 > 0$

The research used model summary and ANOVA tables (Tables 10 and 11) to address the control variables' and independent variables' influence on Competitive Advantage through the null and alternate hypotheses. The *p*-value for Model 2 from Table 13 was .000. The results did not support the null hypothesis H_0: $\rho^2 = 0$ since [(p <.0005) < ($\alpha/2 = .025$)], which means that the independent variable Product Development and Commercialization Index is a good predictor of Competitive Advantage Index.

Examining model fit for Model 2 in Table 13, $R^2 = .39$ and adjusted $R^2 = .37$. The value R^2 indicates the effect Model 2 has in influencing Competitive Advantage Index. In fact, 37% of the variability on Competitive Advantage is explained by Model 2.

Model 2 regression analysis. For Model 2, the research evaluated the regression coefficients by testing the following null and alternate hypotheses using a level of significance of $\alpha/2 = .025$:

H_0i: $\beta_i = 0$

H_Ai: $\beta_i \neq 0$

For i = 0, 1, 2, 3, 4 and where (a) β_0 is the y-intercept, (b) β_1 is the population regression coefficient for the control variable of manager experience Level (X_1), (b) β_2 is the population regression coefficient for control variable number of employees (X_2), (c) β_3 is the population regression coefficient for control variable gross annual sales (X_3), (d) β_4 is

the population regression coefficient for independent variable Product Development and Commercialization Index (X_4).

The *p*-value for the null hypothesis for β_0 for Model 2 from Table 12 is .000. The findings did not support the null hypothesis H_0: $\beta_0 = 0$ because [($p < .0005$) < ($\alpha/2 = .025$)], which, as in Model 1, the *y*-intercept is statistically significant but the *y*-intercept is simply the arithmetic mean of the dependent variable.

The statistics supported the null hypothesis H_0: $\beta_1 = 0$ because [($p = .940$) > ($\alpha/2 = .025$)], which means the regression coefficient for manager experience level in Model 2 is not a statistically significant predictor for the dependent variable. This result is consistent with the previous null hypothesis for model fit H_0: $\rho^2 = 0$.

The statistics supported the null hypothesis H_0: $\beta_2 = 0$ because [($p = .041$) > ($\alpha/2 = .025$)], which means the regression coefficient for number of employees in Model 2 is close, but not a statistically significant predictor for the dependent variable. This result is consistent with the previous null hypothesis for model fit H_0: $\rho^2 = 0$.

The findings supported the null hypothesis H_0: $\beta_3 = 0$ because [($p = .409$) > ($\alpha/2 = .025$)], which means the regression coefficient for gross annual sales control variable in Model 2 is not statistically significant predictor for the dependent variable. This result is consistent with the previous null hypothesis for model fit H_0: $\rho^2 = 0$.

The results did not support the null hypothesis H_0: $\beta_4 = 0$ because [($p < .0005$) < ($\alpha/2 = .025$)], which means the regression coefficient for Product Development and Commercialization Index independent variable in Model 2 is a statistically significant predictor for the dependent variable.

Model 2 regression equation.

$y_i = b_0 + b_1x_{1i} + b_2 x_{2i} + b_3 x_{3i} + b_4 x_{4i} + e_i$

$y_i = 1.46 + (.000 * x_{1i}) + (-3.14E\text{-}6 * x_{2i}) + (1.1E\text{-}12 * x_{3i}) + (.61 * x_{4i}) + e_i$

$y_i = 1.46 + (.61 * x_{4i}) + e_i$

Testing Model 3: Fit Hypothesis

Model fit addresses the model's ability to predict the dependent variable Competitive Advantage Index value. This research evaluated Model 3 by testing the following hypotheses using a level of significance of $\alpha/2 = .025$ where ρ^2 reflects the population coefficient of determination.

H_0: $\rho^2 = 0$

H_A: $\rho^2 > 0$

The research used model summary and ANOVA tables (Tables 10 and 11) to address the control variables and independent variables influence on Competitive Advantage through the null and alternate hypothesis. The *p*-value for Model 3 from Table 13 was .000. The statistics did not support the null hypothesis H_0: $\rho^2 = 0$, since [($p < .0005$) < ($\alpha/2 = .025$)], which means that Manufacturing Flow Management Index is a good predictor of Competitive Advantage Index.

Examining model fit for Model 3 in Table 13, $R^2 = .42$ and adjusted $R^2 = .40$. The value R^2 indicates the effect Model 3 has in influencing Competitive Advantage. Index. In fact, 42% of the variability in Competitive Advantage Index was explained by Model 3.

Model 3 regression analysis. For Model 3, the research evaluated the regression coefficients testing the following null and alternate hypotheses using a level of significance of $\alpha/2 = .025$:

H_0i: $\beta_i = 0$

H_Ai: $\beta_i \neq 0$

For i = 0,1,2,3,4,5 and where (a) β_0 is the y-intercept, (b) β_1 is the population regression coefficient for control variable manager experience level (X_1), (c) β_2 is the population regression coefficient for control variable number of employees(X_2), (d) β_3 is the population regression coefficient for control variable gross annual sales (X_3), (e) β_4 is the population regression coefficient for the independent variable Product Development and Commercialization Index (X_4), and (f) β_5 is the population regression coefficient for the independent variable Manufacturing Flow Management Index (X_5).

The *p*-value for the null hypothesis for β_0 for Model 3 from Table 12 is .061. The findings supported the null hypothesis H_0: $\beta_0 = 0$ because [($p = .061$) > ($\alpha/2 = .025$)], in which the *y*-intercept is not statistically significant, but it is simply the arithmetic mean of the dependent variable.

The statistics supported the null hypothesis H_0: $\beta_1 = 0$ because [($p = .722$) > ($\alpha/2 = .025$)], which means the regression coefficient for manager experience level in Model 3 is not a statistically significant predictor for the dependent variable. This result is consistent with the previous null hypothesis for model fit H_0: $\rho^2 = 0$.

The statistics supported the null hypothesis H_0: $\beta_2 = 0$ because [($p = .036$) > ($\alpha/2 = .025$)], which means the regression coefficient for number of employees in Model 3 is

close but still not a statistically significant predictor for the dependent variable. This result is consistent with the previous null hypothesis for model fit H_0: $\rho^2 = 0$.

The statistics supported the null hypothesis H_0: $\beta_3 = 0$ because [($p = .522$) > ($\alpha/2 = .025$)], which means the regression coefficient for gross annual sales control variable in Model 3 is not a statistically significant predictor for the dependent variable. This result is consistent with the previous null hypothesis for model fit H_0: $\rho^2 = 0$.

The findings did not support the null hypothesis H_0: $\beta_4 = 0$ because [($p < .0005$) < ($\alpha/2 = .025$)], which means the regression coefficient for Product Development and Commercialization Index independent variable in Model 2 is a statistically significant predictor for the dependent variable.

The results did not support the null hypothesis H_0: $\beta_5 = 0$ because [($p = .014$) < ($\alpha/2 = .025$)], which means the regression coefficient for Manufacturing Flow Management Index independent variable in Model 3 is a statistically significant predictor for the dependent variable.

Model 3 regression equation.

$$y_i = b_0 + b_1x_{1i} + b_2 x_{2i} + b_3 x_{3i} + b_4 x_{4i} + b_5 x_{5i} + e_i$$

$$y_i = .763 + (.00*x_{1i}) + (-3.16E\text{-}6*x_{2i}) + (8.6E\text{-}13*x_{3i}) + (.556*x_{4i}) + (.264*x_{5i}) + e_i$$

$$y_i = .763 + (.556 * X_{4i}) + (.264 * X_{5i}) + e_i$$

Testing Model 4: Fit Hypothesis

Model fit addresses the model's ability to predict the dependent variable Competitive Advantage Index value. The research evaluated Model 4 by testing the

following hypotheses using a level of significance of $\alpha = .05$, where ρ^2 reflects the population coefficient of determination:

H_0: $\rho^2 = 0$

H_a: $\rho^2 > 0$

The research used model summary and ANOVA tables (Tables 10 and 11), to address the control variables and independent variables influence on Competitive Advantage Index through the null and alternate hypothesis. The *p*-value for Model 4 was .0001. The results did not support the null hypothesis H_0: $\rho^2 = 0$ since $[(p < .0005) < (\alpha/2 = .025)]$, which means that Supplier Relationship Management Index is a good predictor of Competitive Advantage.

Table 11 illustrates the model fit for Model 4 ($R^2 = .42$ and adjusted $R^2 = .39$). The value R^2 indicates the effect Model 4 has in influencing Competitive Advantage Index. In fact, 61% of the variability was not explained by Model 4. Model 4 shows that the Supplier Relationship Management Index is significant for the Competition Advantage Index, but Supplier Relationship Management does not affect any changes to the dependent variable.

Model 4 regression analysis. For Model 4, the research evaluated the regression coefficients by testing the following null and alternate hypotheses using a level of significance of $\alpha = .05$:

H_0i: $\beta_i = 0$

H_Ai: $\beta_i \neq 0$

For i = 0, 1, 2, 3, 4, 5, 6 and where (a) β_0 is the y-intercept, (b) β_1 is the population regression coefficient for the control variable of manager experience level (X_1), (b) β_2 is the population regression coefficient for the control variable of number of employees (X_2), (c) β_3 is the population regression coefficient for the control variable of gross annual Sales (X_3), (d) β_4 is the population regression coefficient for the independent variable Product Development and Commercialization Index (X_4), (e) β_5 is the population regression coefficient for the independent variable Manufacturing Flow Management Index (X_5), and (f) $\beta 6$ is the population regression coefficient for the independent variable Supplier Relationship Management Index (X_6).

The *p*-value for the null hypothesis for β_0 for Model 4 from Table 12 is .067. The statistics supported the null hypothesis H_0: $\beta_0 = 0$ because [($p = .067$) > ($\alpha/2 = .025$)], which as in Model 1, the *y*-intercept is not statistically significant but it is simply the arithmetic mean of the dependent variable.

The results supported the null hypothesis H_0: $\beta_1 = 0$ because [($p = .749$) > ($\alpha/2 = .025$)], which means the regression coefficient for Manager Experience Level in Model 4 was not a statistically significant predictor for dependent variable. This result is consistent with the null hypothesis for model fit H_0: $\rho^2 = 0$.

The findings supported the null hypothesis H_0: $\beta_2 = 0$ because [($p = .037$) > ($\alpha/2 = .025$)], which means the regression coefficient for the Number of Employees in Model 4 is close but still not statistically significant predictor for the dependent variable. This result is consistent with the previous null hypothesis for model fit H_0: $\rho^2 = 0$.

The statistics supported the null hypothesis H_0: $\beta_3 = 0$ because [(p = .510) > ($\alpha/2$ = .025)], which means the regression coefficient for gross annual sales control variable in Model 4 is not statistically significant predictor for the dependent variable. This result is consistent with the previous null hypothesis for model fit H_0: $\rho^2 = 0$.

The results did not support the null hypothesis *H_0:* $\beta_4 = 0$ because [(p <.0005) < ($\alpha/2$ = .025)], which means the regression coefficient for Product Development and Commercialization Index independent variable in Model 4 is a statistically significant predictor for the dependent variable.

The statistics did not support the null hypothesis *H_0*: $\beta_5 = 0$ because [(p = .014) < ($\alpha/2$ = .025)], which means the regression coefficient for Manufacturing Flow Management Index independent variable in Model 4, was statistically significant predictor for the dependent variable.

The results supported the null hypothesis H_0: $\beta_6 = 0$ because [(p = .703) ($\alpha/2$ = .025)], which means the regression coefficient for Supplier Relationship Management Index independent variable in Model 4 is not statistically significant predictor for the dependent variable.

Model 4 regression equation.

$$y_i = b_0 + b_1 x_{1i} + b_2 x_{2i} + b_3 x_{3i} + b_4 x_{4i} + b_5 x_{5i} + b_6 x_{6i} + e_i$$

$$y_i = .843 + (.00 * x_{1i}) + (-3.15E\text{-}6 * x_{2i}) + (8.92E\text{-}13 * x_{3i}) + (.566 * x_{4i}) + (.267 * x_{5i}) + (-.038 * x_{6i}) + e_i$$

$$y_i = .843 + (.566 * x_{4i}) + (.267 * x_{5i}) + (-.038 * x_{6i}) + e_i$$

Table 10
Model Summary Output from SPSS

Model	*Statistics*				*Change Statistics*				
	R	R^2	*Adjusted* R^2	*Std. Error of the Estimate*	R^2 *Change*	*F Change*	*df1*	*df2*	*Sig. F Change*
1	*.14*	*.02*	*-.01*	*.83*	*.02*	*.77*	*3*	*114*	*.51*
2	*.63*	*.39*	*.37*	*.66*	*.37*	*69.33*	*1*	*113*	*.00*
3	*.65*	*.42*	*.40*	*.64*	*.03*	*6.16*	*1*	*112*	*.01*
4	*.65*	*.42*	*.39*	*.64*	*.00*	*.14*	*1*	*111*	*.70*

Note. *R* = Simply correlation coefficient; R^2 = coefficient of determination; *F* = test; *df* = degree of freedom

Model Fit

Taking into account the correction achieved, R^2 - adjusted R^2, the largest effect on Competitive Advantage Index with all the control variables and independent variables was 39%.

Table 11
ANOVA Table Output from SPSS

Model		Sum of Squares	Df	Mean Square	*F*	Significance
1	Regression	*1.60*	*3*	*.53*	*.77*	*.51*
	Residual	*78.74*	*114*	*.69*		
	Total	*80.34*	*117*			
2	Regression	*31.54*	*4*	*7.88*	*18.26*	*.000*
	Residual	*48.79*	*113*	*.43*		
	Total	*80.34*	*117*			
3	Regression	*34.09*	*5*	*6.82*	*16.51*	*.000*
	Residual	*46.25*	*112*	*.41*		
	Total	*80.34*	*117*			
4	Regression	*34.15*	*6*	*5.69*	*13.67*	*.000*
	Residual	*46.19*	*111*	*.41*		
	Total	*80.34*	*117*			

Table 12
Coefficients of Regression Model

		Unstandardized Coefficients		*Std. Coefficients*			*95.0% Confidence Interval for B*		*Correlations*			*Collinearity Statistics*	
	Model	*B*	*Std. Error*	*Beta*	*T*	*Sig.*	*Lower Bound*	*Upper Bound*	*Zero-order*	*Partial*	*Part*	*Tolerance*	*VIF*
1	(Constant)	*3.727*	*.138*		*27.09*	*.000*	*3.455*	*4.000*					
	years of experience	*.002*	*.008*	*.027*	*.279*	*.781*	*-.013*	*.018*	*-.014*	*.026*	*.02*	*.910*	*1.09*
	full time employees	*-2.65E-6*	*.000*	*-.136*	*-1.37*	*.171*	*.000*	*.000*	*-.112*	*-.128*	*-.12*	*.877*	*1.14*
	GAS in millions.	*1.5E-12*	*.000*	*.086*	*.903*	*.368*	*.000*	*.000*	*.059*	*.084*	*.08*	*.956*	*1.04*
2	(Constant)	*1.469*	*.292*		*5.030*	*.000*	*.891*	*2.048*					
	years of experience	*.000*	*.006*	*.006*	*.076*	*.940*	*-.012*	*.013*	*-.014*	*.007*	*.00*	*.909*	*1.10*
	full time employees	*-3.14E-6*	*.000*	*-.162*	*-2.06*	*.041*	*.000*	*.000*	*-.112*	*-.191*	*-.15*	*.876*	*1.14*
	GAS in millions	*1.1E-12*	*.000*	*.062*	*.828*	*.409*	*.000*	*.000*	*.059*	*.078*	*.06*	*.954*	*1.05*
	PDAC	*.619*	*.074*	*.612*	*8.327*	*.000*	*.471*	*.766*	*.606*	*.617*	*.61*	*.994*	*1.01*
3	(Constant)	*.763*	*.403*		*1.893*	*.061*	*-.036*	*1.562*					
	years of experience	*.002*	*.006*	*.027*	*.356*	*.722*	*-.010*	*.014*	*-.014*	*.034*	*.02*	*.898*	*1.11*
	full time employees	*-3.16E-6*	*.000*	*-.163*	*-2.12*	*.036*	*.000*	*.000*	*-.112*	*-.197*	*-.15*	*.876*	*1.14*
	GAS in millions	*8.6E-13*	*.000*	*.047*	*.643*	*.522*	*.000*	*.000*	*.059*	*.061*	*.04*	*.948*	*1.05*
	PDCA	*.556*	*.077*	*.551*	*7.241*	*.000*	*.404*	*.709*	*.606*	*.565*	*.51*	*.889*	*1.12*
	MFM	*.264*	*.106*	*.190*	*2.483*	*.014*	*.053*	*.475*	*.369*	*.228*	*.17*	*.877*	*1.14*
4	(Constant)	*.843*	*.456*		*1.851*	*.067*	*-.060*	*1.746*					
	years of experience	*.002*	*.006*	*.024*	*.321*	*.749*	*-.010*	*.014*	*-.014*	*.030*	*.02*	*.891*	*1.12*
	full time employees	*-3.15E-6*	*.000*	*-.162*	*-2.10*	*.037*	*.000*	*.000*	*-.112*	*-.196*	*-.15*	*.875*	*1.14*
	GAS in millions	*8.92E-13*	*.000*	*.049*	*.661*	*.510*	*.000*	*.000*	*.059*	*.063*	*.04*	*.945*	*1.05*
	PDAC	*.566*	*.081*	*.561*	*6.954*	*.000*	*.405*	*.728*	*.606*	*.551*	*.50*	*.797*	*1.25*
	MFM	*.267*	*.107*	*.192*	*2.496*	*.014*	*.055*	*.480*	*.369*	*.231*	*.18*	*.872*	*1.14*
	SRM	*-.038*	*.099*	*-.030*	*-.383*	*.703*	*-.234*	*.159*	*.206*	*-.036*	*-.02*	*.856*	*1.16*

Note. *VIF* = Variance Inflation Factor

Summary of Results

This research study met all the multiple linear regression assumptions by collecting the data using random sampling. The dependent variable was continuous and the independent variables were continuous. The results proved the independence of residuals through Durbin-Watson statistics. Linearity relationships between dependent and independent variables assessed by partial regression plots and a plot of studentized residuals against the predicted values. The research met the independence of residuals since the Durbin-Watson statistic of 1.7 was very close to 2. The study verified the homoscedasticity assumption by visual inspection of a plot of studentized residuals versus unstandardized predicted values. In addition, the data showed no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. The research data had one studentized residual greater than ±3 standard deviations. The analysis did not remove this particular residual, since the residual did not have a large leverage value and/or influence on the results. The data did not have leverage values less than 0.2, and values for Cook's distance above 1. The study met the assumption of normality through the assessment of the P-P Plot, and verified through (K – S) and (S – W). The value of K – S Sig. .053 and S – W Sig. .238, the assumption for normality had not been violated.

Results demonstrated no relationship between the control variables of years of experience, control variable firm's gross annual sales and the dependent variable of Competitive Advantage Index; the results demonstrated a slight relationship between the number of employees and the Competitive Advantage Index. The strongest relationship was between the Product Development and Commercialization Index, followed by a

lesser relationship between Manufacturing Flow Management Index and Competitive Advantage Index, and the least of independent variable relationships between Supplier Relationship Management Index with Competitive Advantage Index.

Table 13 summarizes that the control variables provided a 2% effect on Competitive Advantage; Product Development and Commercialization provided a 37% effect on Competitive Advantage; Manufacturing Flow Management provided a 3% effect on Competitive Advantage; and Supplier Relationship Management provide less than 1% effect on competitive advantage.

Table 13
Hierarchical Multiple Regression Predicting Competitive Advantage

Variable	*Model 1*		*Model 2*		*Model 3*		*Model 4*	
	B	*b*	*B*	*b*	*B*	*b*	*B*	*b*
Constant	*3.7*		*1.5*		*.76*		*.843*	*.02*
Years of Experience(CV)	*.00*	*.03*	*.00*	*.01*	*.00*	*.03*	*.00*	*.02*
# of Employees (CV)	*.00*	*-.14*	*.00*	*-.2*	*.00*	*-.2*	*.00*	*-.2*
GAS (CV)	*.00*	*.1*	*.00*	*.1*	*.00*	*-.05*	*.00*	*.05*
PDAC (IV)			*.62*	*.6*	*.56*	*.6*	*.56*	*.6*
MFM (IV)					*.26*	*.2*	*.28*	*.2*
SRM (IV)							*-.04*	*.00*
R^2	*.02*		*.4*		*.4*		*.4*	
F	*.8*		*18.26*		*16.5*		*13.6*	
ΔR^2	*.02*		*.4*		*.03*		*.00*	
ΔF	*.77*		*69.34*		*6.2*		*.15*	

Note. *B* = regression coefficients; R^2 = coefficients of determination ; *F* = test

Conclusion

This research study applied a hierarchical multiple linear regression model to determine that the alternate hypothesis proved that a statistical significant relationship was evident between the studied supply chain management processes. Although the hierarchical model was able to differentiate which supply chain management process and control variables contributed the most and which the least in influencing Competitive

Advantage, the Competitive Advantage Index, the Product Development and Commercialization Index process provided the most impact to Competitive Advantage Index, followed by Manufacturing Flow Management Index, and the least impact total number of employees in the firm, Supplier Relationship Management Index, years of experience level, and gross annual sales (Table 17).

These findings highlighted the theories affecting Product Development and Commercialization Index, Manufacturing Flow Management Index, and Competitive Advantage Index. The concluding chapter will discuss the analysis from this chapter four, and will explain how these findings affect scholars and practitioners. Additionally, chapter five will address the theoretical implications of the findings, any limitations that affected this research, and provide recommendations for further studies.

CHAPTER 5. DISCUSSION, IMPLICATIONS, RECOMMENDATIONS

This chapter will present the analysis from the statistical model of the survey results. Following the discussion will address the implications of the results and provide recommendations for future scholars and practitioners. The recommendations will take into consideration the limitations that the study encountered.

This chapter will introduce the results of the research problem. Afterword, this chapter r will address a summary of the literature review and emphasize how the study results affected the theories and definitions addressed in the literature review. The discussion of the results will include findings from the hierarchical multiple regression models. This chapter will present the implications of the results to the body of scholarly research. Afterword, this section will describe the limitations affecting this research and recommendations for further studies. Lastly, this chapter will present concluding remarks which emphasize the implications of the whole study to the strategic application of supply chain management to firm strategy.

Research Problem

The research problem, identified through a gap in the existing literature, was the lack of understanding of the possible relationships between Competitive Advantage and supply chain management processes. The current study analyzed the following three supply chain management processes: Supplier Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization. The researchers

in the body of literature have not addressed whether (a) firms' size, as measured by Numbers of Employees; (b) sales, as measured by Gross Annual Sales; (3) and Experience Level of Management, as measured by the number of years in supply chain management roles, affect the Competitive Advantage of the firm.

Significance of the Study

The findings of this research will add to the current literature on supply chain management knowledge by identifying the relationships between Competitive Advantage Index and the three supply chain management processes: Supplier Relationship Management, Manufacturing Flow Management Index, and Product Development and Commercialization Index. Furthermore, the findings measured the relationship of the firms' size, as measured by Numbers of Employees, sales measured by Gross Annual sales, and Manager's Experience Level, with the relationship between supply chain management and Competitive Advantage Index.

The results of this study will provide scholars with an understanding of the relationship of supply chain management processes to the Competitive Advantage of a U. S. manufacturing company. The research also addressed the gap in the literature of organization and management in determining the relationship between Competitive Advantage Index and the supply chain management processes. This research study aimed to close the literature gap between supply chain management and the competitiveness of a United States manufacturing firm by determining the relationship between Competitive Advantage and supply chain management processes.

The analysis highlighted the significance to practitioners by allowing them to identify the supply chain management processes that had the greatest impact on the firm's Competitive Advantage. This will allow practitioners to understand the integrative role of supply chain management and the strategic importance in the daily organizational and management fields. The research aimed to determine which supply chain management process have a stronger relationship with Competitive Advantage based on the perception of the surveyed sample of the manager population of United States manufacturing firms.

Literature Review

Supply chain management, although a relatively new field in business and scholar environment, reflects established theories (Storey et al., 2006). The integration of many processes, with their own theories, defines supply chain management (Lambert, 2001). This section will identify which theories this research affected and how.

Theory of the Firm

Coase (1937) provided the foundation of how a firm functions. The purpose of the firm is to make money. Every function of the firm has to have a cost that provides linkage to the product. The entrepreneur has to find the best places to have the functions done, internal or external to the firm, depending on the cost and importance of performing that function. Entrepreneurs often perform this assessment through Transaction Cost Theory.

Transaction cost theory. The transactional supply chain predicates on the contractual performance of the supplier with no risk sharing by the vendor and no rewards sharing with the prime contractor. The buyer builds the whole strategy around

controlling the valued resources of the supply chain. Madhok (2002) differentiated the Theory of the Firm from Transaction Cost Theory. Coase (1937) emphasized the economics of running the firm. Transaction Cost Theory addresses the market cost, or the internal functions needed to be competitive with the market to continue producing the resource internally. Transaction Cost Theory forces a firm to identify the center of excellence in producing a product and ensuring the firm maintained control of those resources whether internally, contractually or through partnerships. This study's survey addressed both of these theories by asking if the companies the managers worked in had made a buy decision on whether parts of the product would be built internally or externally. In analyzing the data, the make/buy question received an average score of 3.7, above the average score of Supplier Relationship Management Index and Manufacturing Flow Management Index, but equal to the average score of Product Development and Commercialization Index. In addition, Product Development and Commercialization Index had the strongest relationship with the Competitive Advantage Index of the firm; therefore, the make/buy decision strengthens the linkage with Transaction Cost Theory and Theory of the Firm. Additionally, the firm performing the transaction cost analysis needs must consider the Product Development and Commercialization activities that enhance their competitive edge, in the transaction cost decisions.

Resource base view theory. Resource Base View Theory describes the tangible and intangible resources involved in the strategic direction of the firm. The application of resources can help the firm capture a Competitive Advantage (Wernerfelt, 1984). In building competitive advantage, a company must identify resources, acquire them, and

use them effectively. The results of this study indicated that resources dedicated to developing new products and commercialization have a greater impact on the competitiveness of the firm than the resources aimed at Supplier Relationship Management and Manufacturing Flow Management. The resources in Manufacturing Flow Management that affect the firm's speed of delivery, high quality, maintainability, and reliability improve the product development, commercialization, and competitive advantage. The resources chosen by management also depend on the stage of the product's life cycle. In the early phase of the life cycle, resources could be applied in order to maximize innovation, speed, or flexibility. In a mature phase, management may seek better manufacturability to improve costs (Moser & Blome, 2008). Although better manufacturability may improve the costs to the firm, manufacturability would not improve competitiveness of the firm unless manufacturability is linked to the Product Development and Commercialization process instead of Manufacturing Flow Management process.

Competition Theory

Competition theory describes the five forces in a market that can affect the position of the firm in the market, as discussed by Porter (1985, 1998, 2008). The forces revolve around the bargaining power of the supplier, bargaining power of the buyers, threats of a substitute product, the threat of new entrant in the market, and the rivalry between existing competitors in the current market. According to Porter, these forces maintain the market in equilibrium, and the firm that could master those forces could influence the direction of the market. For a company to be effective within a marketing

force, the firm must gain have competitive advantage in order to be influential within that force.

Supply chain management processes address the five market forces. Supplier Relationship Management relates to the bargaining power of the supplier. Researchers have shown, however, that Supplier Relationship Management has little to no effect on Competitive Advantage for the surveyed firms. The results of the current study indicated that either the bargaining power of the suppliers is not that important to Competitive Advantage, or that the Supplier Relationship Management process is not addressing the force properly. The customer relationship management process affects the bargaining power of the buyer. Product Development and Commercialization processes can address threats of substitute products through continuous development. Product Development and Commercialization and Manufacturing Flow Management processes can aid in countering the threat of new entrants by making this threat difficult to enter the market through lean activities and new manufacturing processes that can help facilitate a price war. The result of this research study indicated that Product Development and Commercialization are the most valuable supply chain management process. All eight of the supply chain management processes can aid in maintaining a competitive edge with existing competitors.

Addressing all eight supply chain management processes at the same time would be a very expensive proposition for a firm. The results of this study suggest that given a choice, management would achieve more competitiveness by investing more resources in Product Development and Commercialization efforts rather than in Manufacturing Flow

Management and Supplier Relationship Management. Other similar studies are needed to identify which of the remaining supply chain management processes affect Competitive Advantage the most.

Scholars began discussing supply chain management as an integration of processes in early 2000 (Croxton, Garcia-Dastugue, & Lambert, 2001; Lambert & Terrance, 2001; Lummus & Vokurka, 1999). Narasimhan et al. (2013) emphasized the connection of supply chain management in a strategic operational role for the firm. Davies and Joglekar (2013) stressed that multiple connected firms provide a competitive value to the customer because together they can address the complex customer requirements. The results of this study indicate that managers of the 118 manufacturing firms rated working in an integrated manner, within and outside the firm, higher than average.

Just-in-time theory. Just-in-time theory streamlines the flow of material through the supply chain and reduced inventory costs (Madhuri, 2013; Mentzer et al., 2008; Narasimhan et al., 2013). Just-in-time theory identifies the need to manage the complexity of customer need, material producers, manufacturing cycle, transportation and customer satisfaction. Just-in-time theory has a substantial contribution to the Manufacturing Flow Management process of the supply chain. Just-in-time theory is a strong contributor in lowering the manufacturing costs, and management of the schedule. The results of this research did find a relationship between Manufacturing Flow Management and Competitive Advantage, but Manufacturing Flow Management had only a 3% effect on Competitive Advantage. If managers applied the Just-in-time theory

for the purpose of launching a new product and being first to market, this would result in a stronger contribution to Competitive Advantage through the Product Development and Commercialization process.

Supply Chain Management Processes

Supplier relationship management. Supplier Relationship Management is one of the eight supply chain management processes identified by the Global Supply Chain Forum in 1998. Monser and Blome (2008) mentioned that supplier selection is critical in building a very competitive strategy. Porter (1985) stated that in today's global market, a competitive supply chain provides a strategic advantage. This study examined Supplier Relationship Management as one of the supply chain management processes to evaluate the relationship of Supplier Relationship Management to the firm's Competitive Advantage. The study results indicate that a relationship between Supplier Relationship Management and Competitive Advantage is possible, yet Supplier Relationship Management has little influence in raising the Competitive Advantage of the firm.

Manufacturing flow management. The manufacturing process analyzes the flexibilities in the supply chain and within the firm to allow smoother and faster ability to produce a product at the lowest possible cost (Goldsby & Garcia-Dastugue, 2003; Swink et al., 2005). The process of Manufacturing Flow Management instills flexibility, planning, and integration of multiple resources with the inclusion of Total Quality Management Theory. The implementation of Total Quality Management requires constant improvements of the manufacturing flow process (Davis & Jolekar, 2013). This research study collected data on the Manufacturing Flow Management process because of

the many accolades discussed above, including Just In Time, Total Quality Management, supply chain View, flexibility, and speed to market. The findings identified that the application of Just In Time, Total Quality Management, Resource Base View, and flexibility through the Manufacturing Flow Management process would improve the firm's Competitive Advantage by 3%. If the firm implemented the above activities through a Product Development and Commercialization supply chain management process, this would affect Competitive Advantage by 37%.

Product development and commercialization. The current study analyzed the Product Development and Commercialization supply chain management process by collecting data and observing how current managers in manufacturing firms rate the linkage of Product Development and Commercialization to the firm's Competitive Advantage. The discussion in the body of literature makes a strong case for Product Development and Commercialization as a competitive asset, but only if the internal and external functions are totally integrated (Acur et al., 2012; Brettel et al., 2011; Moser & Blome, 2008; Rose-Anderssen et al., 2008). The firm must invest in resources that facilitate function integration. Marketing, business development, and sales need to continue providing customer feedback to the research and development function. Manufacturing leaders must listen to sales and marketing on the customer needs and provide research and development with manufacturing's needs. Manufacturing and sales leaders need to stay connected with logistics in order to meet schedule. this study's results substantiate the importance of Product Development and Commercialization to

Competitive Advantage. Product Development and Commercialization can affect Competitive Advantage positively by 37%.

Methodology

This research study utilized a quantitative research design that was non-experimental, explanatory, and cross-sectional approach. Qualtrics® administered a previously tested, public domain, survey instrument to their survey panels, and gathered 118 valid responses from a group of 2,700 panelists. All respondents were managers with at least a 4-year college degree and 2 years of experience in a supply chain management related field of a United States manufacturing firm. The data analysis involved hierarchical multiple linear regression using the SPSS IBM software.

Findings

The multiple linear regression assumptions of the study were satisfied. The study answered research question, reporting that the findings supported the alternative hypothesis of a statistically significant relationship between the independent variables and the outcome variable of Competitive Advantage. Not all the independent variables were significant and the control variables were not significant, but this not detract from the independent variable to be statistically significant. The independent variable of Supplier Relationship Management showed only a very small relationship with Competitive Advantage. The control variables of number of years in a supply chain management related position, total number of employees, and gross annual sales of the firm had very little effect on Competitive Advantage. The total number of employees had the most relationship with Competitive Advantage than the other two control variables.

The largest contributor to Competitive Advantage was the Product Development and Commercialization process, followed by the Manufacturing Flow Management process, at lower relationship strength with Competitive Advantage.

Discussion of the Results

Findings From the Data Preparation

The sample frame comprised of members from the Qualtrics® audience containing 2,700 managers in United States manufacturing firms in the fields of supplier management, finance, engineering, manufacturing, procurement, logistics, transportation, information technology, business development, fabrication, sales, and marketing. The surveyed respondents were required to have at least a 4-year college degree and a minimum of 2 years of experience in the above fields. Twenty-nine percent of the respondents were from manufacturing, 18% were from Information Technology, 14% were engineers, 8% were from business, 7% were from finance, and 4% were from logistics. The remaining 12% were from the fields of purchasing, production, business development, and supplier management. The minimum sample size derived from G*Power 3.1 (Mayer et al., 2007) was 109 managers; the survey received 120 responses, 118 of which were complete and able to be used in the analysis.

The use of a five-point Likert scale allowed the calculation of the arithmetic mean of the responses to the variable. The 118 respondents had a mean of 15 years of experience in fields related to supply chain management. The respondents had substantial experience in the supply chain management field. The manufacturing firms of the respondents had a mean of 16,000 employees, of which 75% of the firms had lower

number of employees. The firms with higher number of employees had larger spreads up to 250,000 employees. The mean gross annual sales were $10 billion USD. Although a higher concentration of gross annual sales was below this value, a larger spread was evident above the mean value.

The analysis identified one outlier in Competitive Advantage with a standard deviation above the recommended three standard deviations (Lund & Lund, 2013). To verify whether to remove the outlier, the analysis assessed if the point was influential. Points are influential if their Cook's distance value is greater than one. The Cook's distance for this point did not show any values greater than 1; therefore, the findings excluded the one point that was a little more than three standard deviations away.

The nine assumptions of the linear regression model were all satisfied. The Normal P- P plot of regression standardized residual showed a close to normal distribution according to the Histogram and the Normal P-P plot. The Pearson correlations showed that the correlations were all less than .7; therefore, there was no multicollinearity between independent variables. The strongest correlation was between Product Development and Commercialization Index and Competitive Advantage Index of .61. The control variables had the lowest, insignificant correlation with the Competitive Advantage Index. The analysis assessed the homoscedasticity of the residuals by visual inspection of a plot of studentized residuals versus the unstandardized predicted values. There was a linear relationship between the predictor and the dependent variable.

The data demonstrated good levels of reliability. The Cronbach's alphas for the dependent and independent variables were greater than the recommended value of .7

(Vogt, 2007). In comparing Salazar's (2012) use of the survey with the current study reliability, the research changed the alphas for Supplier Relationship Management Index from .81 to .76; Manufacturing Flow Management Index from .91 to .84; Product Development and Commercialization Index from .74 to .90; Competitive Advantage from .82 to .71. In this study, the variable with highest reliability alpha was Product Development and Commercialization Index, the strongest predictor; the lower alpha was found with the dependent variable of Competitive Advantage Index and the non-significant predictor of Supplier Relationship Management Index.

Findings From the Models

Model 1. The first model included the three control variables: Managers' Years of Experience, firm's total Number of Employees, the organization's Gross Annual Sales, and the dependent variable of Competitive Advantage Index. The result of the analysis demonstrated that the control variables are not statistically significant in explaining change on Competitive Advantage Index; therefore, the findings supported the null hypothesis ([$p = .51$] > [$\alpha = 0.05$]).

Model 2. The second model included all the control variables with the first independent variable Product Development and Commercialization Index, and the dependent variable Competitive Advantage Index. The results of this analysis highlighted a statistical significant relationship between Independent variable of Product Development and Commercialization Index and the Competitive Advantage Index ($p < .0005$, $\alpha = .05$). The findings did not support the null hypothesis based on Model 2. The shared variance between the control and independent variables was 39.3%.

Model 3. The third model added the independent variable of Manufacturing Flow Management Index to the control variables of Product Development and Commercialization Index and the dependent variable of the Competitive Advantage Index. The result of the analysis illustrated that there is a statistical significant relationship between the control variables ($p < .0005$, $\alpha = .05$). The findings did not support the null hypothesis in Model 3. The shared variances between the control variables was 42.4%.

Model 4. The fourth model augmented the independent variables with Supplier Relationship Management and Competitive Advantage. The result of the analysis indicated that a statistical significant relationship is present between the three control variables, three independent variables, and the dependent variable of the Competitive Advantage Index ($p < .0005$, $\alpha = .050$). The findings did not support the null hypothesis in Model 4. The shared variances between the control variables, all independent variables, and the dependent variable were 42.5%. This result indicated that a negligible variance is evident due to the addition of independent variable of Supplier Relationship Management. The findings supported the alternate hypothesis H_A for Models 2, 3, and 4.

Implications of the Study Results

The implications from this research study affected both theory and management practices. Furthermore, by meeting all nine methodological assumptions, the results contribute to the knowledge or relationship between competitive advantage and supply chain management processes in the target population of United States manufacturing firms. The theoretical implications dealt with the Theory of the Firm and Competition

Theory as main theories, as well as the sub-theories of supply chain management processes, Transactional Cost Theory, Resource Base View Theory, and Partnership Theory. The lack of statistical effectiveness for Supplier Relationship Management was completely unexpected, given the coverage of Supplier Relationship Management in Blokland et al. (2012); Dyer and Singh (1998), Gonzalez et al. (2004), and Mackelprang et al. (2014). In addition, the lack of statistical significance regarding surveyed experience level, gross annual sales, and number of employees per firm was not expected. Even though Manufacturing Flow Management demonstrated statistical effectiveness, the amount of influence on Competitive Advantage was only 3%. These results indicate that firms should underemphasize Supplier Relationship Management and emphasize resources dealing with Product Development and Commercialization. Also, firms should address the manufacturing flow resources that facilitate the Product Development and Commercialization process.

Implications for Theory

Counter to most the findings of most scholars regarding supply chain management and Competitive Advantage (Gonzalez et al., 2004; Li et al., 2006; Moser & Blome, 2008; Porter, 1985), the results of the current study indicate that selection of suppliers and the choice of managing them does not significantly influence Competitive Advantage. One of Porter's five forces in competition theory is the supplier's bargaining power. To address the supplier power, firms must dedicate resources to monitoring and managing the relationship. This study's results counter the notion that Supplier Relationship Management provides much benefit to achieving a Competitive Advantage.

Total quality management directly affects the performance of the firm and indirectly provides Competitive Advantage (Kapoor & Adner, 2012; Rahani & al-Ashraf, 2012). Total quality management facilitates the Manufacturing Flow Management process of supply chain management. The result of this study imply that when Product Development and Commercialization supply chain management process designs quality into the product, then total quality management provides a bigger effect to Competitive Advantage. When Manufacturing Flow Management process manages total quality management in the organization, the effect on Competitive Advantage is 3%, according to the results of the study. When the Supplier Relationship Management process manages the supplier's quality, a negligible effect on Competitive Advantage is evident.

Practical Implications

The implication of this study's results on the managerial practice that guide this study is that the application of the Product Development and Commercialization supply chain management process practices provides a 37% positive effect on Competitive Advantage. When the Manufacturing Flow Management supply chain management process practices are applied through the firm, this could have 3% positive effect on Competitive Advantage. The application of the Supplier Relationship Management process has a negligible effect on Competitive Advantage; therefore, management should address the activities in Supplier Relationship Management and Manufacturing Flow Management that directly positively affect Product Development and Commercialization. In addressing all three supply chain management processes, supply chain management will affect positively Competitive Advantage by 37%.

Limitations

The limitations of this study involved the population selection, the population being too broad in addressing nine fields of management, the use of the survey via electronic means, and not limiting to a certain manufacturing industry, such as aerospace, construction, medical, and so forth.

The sampling frame was limited to managers that Qualtrics® had selected from a pool of self-selected individuals. The use of survey panelists represents a limitation of the study. The individuals that agree to be panelists for a survey company may have different attitudes, philosophies, and visions than managers that would respond to letters or interviews. Sax, Gilmartin, and Bryant (2003) stated that data collection obtained only through electronic means is a limitation. A potential for nonresponse bias was possible if people who choose to participate in a survey are different from those who choose not to participate and the difference relates in some way to variables relevant to the research topic (Rogelberg & Luong, 1998).

In addition, the current research broadly assessed many fields within the manufacturing industry. The makeup of Competitive Advantage may be different in different manufacturing sectors. Supply chain management is a new phenomenon in business and any data added to the current body of knowledge is a step forward regardless of the limitations as long as everything is properly documented. Additionally, there was a large variance in the firm population; the size of the firm was likely to impact the participants' responses.

Recommendations for Further Research

The recommendations for more research are evident from the data collected and the methodology used. The data driven recommendations will deal with the whole supply chain management framework and their theories. The method driven recommendations will deal with the statistical tool utilized.

Data-Driven Recommendations

The supply chain management framework, according to the Global Supply chain management Forum, is composed of customer relationship management, customer service management, demand management, order fulfillment, supplier relationship management, manufacturing flow management, product development and commercialization, and returns management. The current research concentrated only on Supplier Relationship Management, Manufacturing Flow Management, and Product Development and Commercialization because of the length of the survey in addressing all eight supply chain management processes. One recommendation for future research, therefore, would be to use the same panel of 2,700 manufacturing managers in order to receive more data on the remaining supply chain management processes regarding their relationships to Competitive Advantage. The data from all eight processes would help future researchers identify the effectiveness of the supply chain management processes in relation to Competitive Advantage. Moreover, researchers could determine whether the effects of each of the eight supply chain management processes add to or diminish the firm's Competitive Advantage.

Furthermore, the findings of this research study did not specify a particular manufacturing industry. Future scholars should observe if the relationship of Supplier Relationship Management to Competitive Advantage varies depending on the industry type. If a strong variation of relationship was due to industry type, researchers could assess what variable in that industry causes the change in relationship between supply chain management process and Competitive Advantage. Additionally, a need to observe if the relationship between the supply chain management processes and Competitive Advantage was affected by the life cycle of the company within a particular industry. For example, researchers could examine whether, in the automotive industry, a company like Tesla has the same supply chain management process relationship with Competitive Advantage as the Ford Company.

Additionally, there was a large variance in the sizes of the firms in the current study; they ranged from 20 employees to 250,000 employees. By separating the firms into three groups of small, medium, and large, researchers may better identify whether the size of the firm and number of employees have a stronger relationship with Competitive Advantage. Researchers could do the same with the variables of gross annual sales and control variable manager experience level.

The findings of this study identified that experience level of employees, number of employees, and gross annual sales do not significantly affect the relationship between supply chain management processes and Competitive Advantage. Future researchers could assess whether the geographic distance of the supply chain has an effect on supply chain management processes to Competitive Advantage.

Method-Driven Recommendations

The sampling frame, survey process, the population, and the statistical tool affected the findings of the study. In trying to narrow the sampling frame, future scholars need to be more specific on the occupation of the surveyed. Instead of engineer, the researchers should specifically examine manufacturing engineers, design engineers, industrial engineers, or quality engineers. They could also target a particular industry, such as automotive, aerospace, textile, furniture, housing, appliances, tools, electronics, or software.

Conclusion

This study addressed the current problem within supply chain management literature regarding identifying the possibility of a relationship between the supply chain management processes and the Competitive Advantage of the firm. This research specifically addressed the Product Development and Commercialization, Manufacturing Flow Management, Supplier Relationship Management, and supply chain management processes relationship to the Competitive Advantage of the firm. This research also investigated if the experience Manager's Experience Level, the Number of Employees in the firm, or the Gross Annual Sales of the firm affected the relationship between the supply chain management processes and Competitive Advantage Index.

The data analysis included hierarchical multiple linear regression analysis in addressing the research question and identifying the contribution of each supply chain management process to the statistical significant relationship with Competitive Advantage. Through four models of the hierarchical multiple linear regression, the study

analyzed the contribution of the three control variables to Competitive Advantage Index in the first model, followed by Product Development and Commercialization Index, Manufacturing Flow Management Index, and Commercialization, Manufacturing Flow Management, and Supplier Relationship Management in individual models to observe their statistical significance on the dependent variable Competitive Advantage. The control variables supported the null hypothesis, and all three independent variables supported the alternate hypothesis of having a statistically significant relationship with Competitive Advantage. While Product Development and Commercialization and Manufacturing Flow Management demonstrated an effect on Competitive Advantage of 37% and 3%, respectively, the effect of Supplier Relationship Management on Competitive Advantage is minimal.

The findings of this study were not expected, given the findings of numerous scholars indicating the strategic importance of suppliers in current performance assessments. These findings could guide the strategic management of the firm by financing firm activity that strengthen Product Development and Commercialization and to a lesser extent Manufacturing Flow Management. The activities in supply chain management processes, Manufacturing Flow Management, and Supplier Relationship Management that facilitate the process of Product Development and Commercialization should also receive financial support. This study indicates the value in understanding how the supply chain management processes affect Competitive Advantage.

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APPENDIX A. STATEMENT OF ORIGINAL WORK

Academic Honesty Policy

Capella University's Academic Honesty Policy 8.25.16 holds learners accountable for the integrity of work they submit, which includes but is not limited to discussion postings, assignments, comprehensive exams, and the dissertation or capstone project.

Established in the Policy are the expectations for original work, rationale for the policy, definition of terms that pertain to academic honesty and original work, and disciplinary consequences of academic dishonesty. Also stated in the Policy is the expectation that learners will follow APA rules for citing another person's ideas or works.

The following standards for original work and definition of *plagiarism* are discussed in the Policy:

> Learners are expected to be the sole authors of their work and to acknowledge the authorship of others' work through proper citation and reference. Use of another person's ideas, including another learner's, without proper reference or citation constitutes plagiarism and academic dishonesty and is prohibited conduct. (p. 1)
> Plagiarism is one example of academic dishonesty. Plagiarism is presenting someone else's ideas or work as your own. Plagiarism also includes copying verbatim or rephrasing ideas without properly acknowledging the source by author, date, and publication medium. (p. 2)

Capella University's Research Misconduct Policy 8.25.16 holds learners accountable for research integrity. What constitutes research misconduct is discussed in the Policy:
Research misconduct includes but is not limited to falsification, fabrication, plagiarism, misappropriation, or other practices that seriously deviate from those that are commonly accepted within the academic community for proposing, conducting, or reviewing research, or in reporting research results. (p. 1)

Learners failing to abide by these policies are subject to consequences, including but not limited to dismissal or revocation of the degree.

Statement of Original Work and Signature

I have read, understood, and abided by Capella University's Academic Honesty Policy 8.25.16 and Research Misconduct Policy 8.25.16 including the Policy Statements, Rationale, and Definitions.
I attest that this dissertation or capstone project is my own work. Where I have used the ideas or words of others, I have paraphrased, summarized, or used direct quotes following the guidelines set forth in the APA *Publication Manual*.

Learner name and date: Gaetano de Gioia 8.25.16