IMPACT OF TIME PRESSURE AND DISRUPTONS ON SUPPLY CHAIN PERFORMANCE: EFFECT ON SUPPLY CHAIN RELATIONSHIPS

by

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Abstract

Changes in technological advances, along with rapid changes in products and innovations, mandate that organizations are able to quickly adjust and respond in order to maintain competitive advantage. An essential part of organizations are the supplier relationships within supply chains. The impositions of time pressure and supply chain disruptions that occur are problematic when suppliers actually need responsive supply chains. Proactive responses to time pressure impositions and disruptions are essential to successful supply chains. The purpose of this study was to quantitatively investigate if a correlation exists following the occurrences of both time pressure impositions and supply chain disruptions, the impact these factors have on supply chain efficiency, productivity, economic transaction costs, and the effect impacted supply chain efficiency, productivity, and economic transaction cost have on supplier relationships. This study consists of a quantitative, nonexperimental, correlational research design. This research has multiple units of analysis, supplier relationships, disruptions and time pressure impositions, and economic transaction costs. The data were analyzed by the application of multiple linear regression analysis. The results revealed after testing the hypotheses, that there was a strong positive and predictive relationship between supply chain disruption, time pressure and supply chain efficiency, productivity, and economic transaction costs. The hypothesis tests also showed that supply chain efficiency, productivity, and economic transaction costs influence supplier relationships. The relationships identified were consistent with existing research on the negative impact of supply chain disruptions and supplier relationships.

Dedication

First and foremost, I give thanks to the divine unity of the Father, Word, and Holy Spirit. I am thankful to my heavenly Father, Yahweh, for standing in me so that I was able to persevere throughout what has been an incredible journey. This dissertation is dedicated to my husband, Anthony R. Starks. The heavenly father blessed me with you as he knew that I would need you. I am thankful daily for this blessing and for your unconditional love and unwavering support. I always cherish the memories of finding a hot cup of coffee and a meal waiting when I came out of the office to take a break. I love you more each day. I dedicate this work to my wonderful sons, Donnelle, Leandre, and Brandon, thanks for always having an encouraging word and for being in my corner. Brandon, being the youngest and living the closest, you suffered Mom the most. I love you for being my late night "Tech Guy." I could not have done this without you. More importantly, guys, thanks for understanding when I no longer baked you favorites when you came home to visit, nor could not stay awake long enough to play with my beautiful grandchildren.

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I am equally blessed and fortunate to have come from a very strong and supportive family that includes some phenomenal women. To my grandmother, Mrs.

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CHAPTER 1. INTRODUCTION

Introduction to the Problem

In the global business environment today, changes in technological advances, along with rapid changes in products and innovations, mandate that organizations are able to quickly adjust and respond in order to maintain competitive advantage. An essential part of organizations are the supplier relationships within supply chains. The vast majority of organizations are dependent upon relationships forged with suppliers in multiple and various aspects of the organization's day-to-day operations, capabilities, and resources. Effective supplier relationships are crucial to organization goal achievement and work processes. Effective collaborations within the supply chain constitute an organization's intrafirm relationships. External communication with other supply chain members or individuals outside the organization is characteristic of interfirm relationships (Beyerlein, Freedman, McGee, & Moran, 2003). Beyerlein et al. (2003) asserted high-impact supply chains must commit to changes in business or organizational processes for long-term business and interfirm relationships. The commitment to change on the part of the supply chain also creates a culture of continuous improvement.

Background of the Study

The impositions of time pressure and supply chain disruptions that occur are problematic when suppliers actually need responsive supply chains. Competitive

advantage, an objective of successful supply chains, is acquired and maintained largely through proactive responses to time pressure impositions and disruptions. Contradictory divergences, deviations from normal operating or decision-making practices, result from breakdowns within or from failed internal and external supplier relationships that are used to make supply chains responsive. Researchers noted time pressure impositions have the potential to severely impact relational exchanges primarily because of response to time pressure impositions and the effects of decisions made relative to time pressure impositions (Caballer, Gracia, & Peiró, 2005; Chang & Lin, 2008; Durham, Locke, Poon, & McLeod, 2000; Li, Xu, & Ye, 2011; Maule, Hockey, & Bdzola, 2000; Ordonez & Benson, 1997; Thomas, 2008; Thomas, Esper, & Stank, 2010).

Statement of the Problem

Supply chain disruptions are problematic to supply chain relationships and disruptions are indicators of weaknesses. According to Hendricks and Singhal (2008), these weaknesses relevant to information flows, the sharing of knowledge, relationship values, and relationship loyalty are needed for optimal sustainability (Hendricks & Singhal, 2005, 2008). Researchers Hendricks and Singhal asserted productivity, efficiency, and transaction costs are encompassed within relationship values. Significant research exists in supply chain disciplines on interfirm relationships and collaboration (Anderson & Narus, 1990; Dwyer, Schurr, & Oh, 1987; Golicic & Mentzer, 2005; Porterfield, Macdonald, & Griffis, 2012; Sivadas & Dwyer, 2000; Srivastava, Shervani,

& Fahey, 1999). Prior research qualitatively explored time pressure impositions (Thomas, 2008).

Notably, a research gap exists in the investigation of the effects time pressure impositions and disruptions have on the supplier relationships where both time pressure and disruptions have occurred amid global supply chains. This search sought to address a gap within interfirm relationship literature in which relationships in an environment with an intense pressure to focus on time has not been addressed. Research existed on the detrimental effects of time pressure in other business contexts, yet is still lacking in the interfirm relationship literature. This research began to address this gap in the literature (Thomas, 2008).

A quantitative examination on the adverse effects the occurrences of both time pressure impositions and supply chain disruptions have on the interfirm relationships of global supply chains is needed. There is also a need for the quantitative examination of the adverse effects the occurrences of both time pressure impositions and supply chain disruptions have on global supply chain productivity, efficiency, and economic transaction costs. Thomas et al. (2010) suggested directing future research towards a quantitative examination of time pressure impositions and supply chain disruptions in order to provide insights on the effects these issues have on interfirm supply chain relationships. The researcher sought to provide global organizations some insights to improve or maintain supplier relationships following the occurrences of time pressure impositions and disruptions.

Purpose of the Study

The purpose of this study was to quantitatively investigate if a correlation exists following the occurrences of both time pressure impositions and supply chain disruptions. This study was to explored the impact these factors have on supply chain efficiency, productivity, and economic transaction costs**,** and the effect impacted supply chain efficiency, productivity, economic transaction cost have on supplier relationships.

Rationale

In this study, the researcher sought to address the existing gaps in the literature by examining the effects of time pressure impositions and disruptions on interfirm supply chain relationships and supply chain practices on supply chain efficiency. In addition, this researcher sought to explicitly examine how time pressure and disruption occurrences within global supply chain affect productivity, efficiency, and economic transaction costs. The results of this research were intended to contribute to supply chain literature by highlighting the benefit and influence of interdependence of supplier and supply chain knowledge and supply chain processes. In professional practice, supplier-partner insights gained are beneficial in helping to improve collaboration outcomes and organizational performance. Well-sustained supplier interfirm relationships contribute to an organization's competitive advantage.

Research Questions and Hypotheses

The research study was guided by one management question and four research questions.

Management Question

Do time pressure impositions and supply chain disruptions contribute to an organization's ability to sustain efficient global supplier relationships given that time pressure impositions and disruptions contribute to negatively impacting supply chain efficiency, productivity, and transaction costs?

Research Question 1

Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and supply chain efficiency and production? Research Question 1 sought to explore a relationship between two predictor variables, the number of supply chain disruptions and time pressure impositions, and two criterion variables, supply chain efficiency and production.

Research Question 2

Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and economic transaction costs? Research Question 2 sought to explore a relationship between two predictor variables, the number of supply chain disruptions, and time pressure impositions, and a criterion variable, economic costs.

Research Question 3

Is there a predictive relationship between supply chain efficiency and production, and supplier relationships? Research Question 3 sought to explore a relationship between

two predictor variables, supply chain efficiency and production, and one continuous criterion variable, supplier relationships.

Research Question 4

Is there a predictive relationship between economic transaction costs and supplier relationships? Research Question 4 sought to explore a relationship between the predictor variable, economic transaction costs and a continuous criterion variable, supplier relationships.

Hypotheses

There were eight hypotheses, including four null and four alternate:

$H1_0$: The number of supply chain disruptions and time pressure impositions do not predict supply chain efficiency and production.

$H1_a$: The number of supply chain disruptions and time pressure impositions predict supply chain efficiency and production.

$H2_0$: The number of supply chain disruptions and time pressure impositions do not predict economic costs.

$H2_a$: The number of supply chain disruptions and time pressure impositions predict economic costs.

$H3_0$: Supply chain efficiency and production do not predict supplier relationships.

$H3_a$: Supply chain efficiency and production predict supplier relationships.

$H4_0$: Economic Transaction Costs do not predict supplier relationships.

$H4_a$: Economic Transaction Costs predict supplier relationships.

Significance of the Study

There was a need for a quantitative examination of the negative impact that occurrences of both time pressure impositions and supply chain disruptions have on supply chain productivity, efficiency, and economic transaction costs. The intent of this analysis was to explore the potential moderating influences impacted productivity, efficiency, and transactions costs may have on interfirm supply chain relationships. The results of this research may contribute to supply chain literature by highlighting the benefit and influence of the interdependence of supplier and supply chain knowledge and supply chain processes. In professional practice, supplier relationship insights gained are beneficial in helping to improve collaboration outcomes and organizational performance. Well-sustained supplier interfirm relationships may contribute to an organization's competitive advantage.

Definition of Terms

Economic transaction costs. *Economic transaction costs*, as defined by Grover and Mahotra (2003), were adaptive to this study. Grover and Mahotra denoted transaction costs as being generally characterized as a combination of coordination costs and transactions risk. Transaction costs may consist of the costs to exchange design changes rapidly with the supplier, costs of exchanging information on products, price, availability, and product demand (Grover & Mahotra, 2003).

Social exchange theory (SET)**.** The *social exchange theory* (SET) is acknowledged as being significant in the study of interfirm and supplier relationships

(Anderson & Narus, 1990; Hingley, 2005; Jarratt & Morrison, 2003; Kwon & Suh, 2004; Walter, 1999). Williamson (1991) initially emphasized the current general assumptions of the SET that relational benefits are contingent on the expectation of future benefits (Cheng-Min, Cheng-Tao, Bor-Wen, & Pen-Chen, 2013; Shiau & Luo, 2012). The expectations of the SET are future rewards and relational benefits on behalf of the firm or organization and are unaffected by cost of interactions or penalties. A purpose of the SET is to promote research understandings of supplier relationships characterized by long-term commitment or dependency (Anderson & Narus, 1990; Hingley, 2005; Jarratt & Morrison, 2003; Walter, 1999).

Supply chain disruptions. *Supply chain disruptions* are operational breakdowns, which render firms within a supply chain vulnerable to operational and financial risks. Previous research has shown supply chain disruptions as being defined as unforeseen and unanticipated events that disrupt the normal flow of goods and materials within a supply chain (Hendricks & Singhal, 2005; Kleindorfer & Saad, 2005; Svensson, 2000). In the context of this research, Habermann (2009) related the normal accident theory as an appropriate theoretical framework for supply chain disruption research. Notably, seminal works reported by Qrunfleh (2010) supported the contingency theory as a sound theory in the study of supply chain disruptions.

Supply chain efficiency. *Supply chain efficiency*, as defined by Desai (2012), is a level or quantity of actual performance or production against what can be achieved with

the identical consumption of time, money, or other like resources. Supply chain efficiency was presented by Desai as an important element in measuring productivity.

Supply chain productivity. *Supply chain productivity* in the terms of quantity and quality is the measure of how stated resources are managed to achieve timely objectives. Javier-James (2012) cited the Bridgefield Group's (2006) definition of productivity is relative to supply chain literature as the total assessed measure of an output quantity generated by a given quantity of input. Within this intended research, productivity is based on inventory produced from month to month.

Supplier relationships. *Supplier relationships,* collaborative in nature, are relationships in which demand information is shared, forecasting of inventory, and product information are conducted jointly, where trust and commitment are essential to relationship success. According to Pilling and Zhang (1992), long-term supplier relationships are noted for being more beneficial to exchange partners than are traditional competition-based arrangements.

Time pressure impositions. *Time pressure impositions* are perceived as insufficient time to complete a task and an awareness of the potential negative consequences of missing a deadline that induces feelings of stress and a need to cope with the limited time constraint (Ordonez & Benson, 1997). Research documented that time pressure to influence real-world decisions (Ordonez & Benson, 1997). Prior research described time pressure as a factor that impacted decision making and small-

group interactions as the construct relates to the intended research individual behavior (Maule et al., 2000; Thomas et al., 2011).

Transaction costs theory. The transaction cost theory was presented by Williamson (1991) as the principles of transactions or units of exchange are the focal point of the transaction cost theory. Williamson argued the transaction cost theory centers on the economic aspects of relationships and is beneficial in explaining the formation and purpose of interfirm relationships (Williamson, 1991). Williamson believed that transaction cost amounts are influenced by uncertainty, frequency, and asset specificity in the firm's environment and relational commitment is correlated to the firm's relational efficiency.

Assumptions and Limitations

Assumptions

The SET and the transactions cost theory are fundamentally present in this study's theoretical framework. It was assumed that supplier relationships decisions are influenced by factors, such as commitment and trust; but risk, and uncertainty associated with disruptions and time pressure (Cousins & Lawson, 2007). Prior research on time pressure impositions focused on the negative effect that coping with time pressure has on decision processes and management practices. Previous research on supply chain disruptions also focused on decision processes and management practices. This study included the assumption that time pressure impositions and supply chain disruptions have adverse effects and will concentrate on the negative effects time pressure has on supply

chain efficiency, productivity, economic costs, and supplier relationships (Kocher & Sutler, 2006; Maule et al., 2000; Pennington & Turtle, 2007; Seshadri & Shapira, 2001; Thomas et al., 2010). It was assumed that the supply chain relationship structures and systems in the data samples are representative of the desired industries.

Limitations

This research study may be subjected to several limitations. The quantitative correlational methodology and nonexperimental research design allowed for the determination of positive or negative directions in relationships. Determining a direction in relationships provides perspectives that narrow the scope for future research. A nonexperimental research design may lack the strength of an experimental design. Multiple variables may be tested and examined for relationships without any manipulation of variables or random assignment (Johnson, 2001). The research design chosen was noninvasive and cost effective. Notably, the research design does not allow for determination of cause and effect. The use of archival data does not entail interactions with human participants. Public information found in government databases, previous research studies, and published survey results limits issues of breached confidentiality from within the sample population. The archival data may be used to validate the survey results across studied industries that were measured by multi-item scales. This study was limited to supply chains within specific industries. There was the possibility that the sample characteristics would make this study generalizable to those supply chains sampled. The small sample size could limit generalizability. The research

findings could imply the results are more applicable and beneficial to supply chains in the product and manufacturing industries than supply chains that are service oriented.

Nature of the Study

In the effort to test the hypotheses, an exploratory research methodology was to be utilized. Secondary data from a minimum of one or more industry sectors were collected from commercial databases, previous supply chain studies, and government databases, including the U.S. Census Bureau. In a study of supply chain efficiency, Modi and Mabert (2010) used secondary data to investigate a potential relationship between supply chain management efficiency and reduced innovation outputs. As promoted in additional earlier studies, a sound conceptual framework of the variables and relationships to be explored supported the use of the secondary data intended for use in this study.

This study consisted of a quantitative nonexperimental, correlational research design. The researcher in this study sought to identify, according to Creswell (2003), the "relationships between given variables," a quantitative approach (p. 303). A multiple regression analysis was planned to test convergent validity of the research findings. Internal consistency is to be measured by the use of the Cronbach's coefficient alpha. Previously modified multi-item scale measures of the independent variables were to be assessed by variance inflation factors (VIFs).

Theoretical Conceptual Framework

Industry functions have only recently begun to emerge through supply **c**hain management. In many instances, traditional, adversarial relationships have been replaced by closer, more collaborative relationships. There are advantages for all supply through close interfirm relationship. Conceptualized in the supply chain literature as relationship magnitude and is measured by the amount of trust, commitment, and dependence that exists between firms in a relationship, interfirm relationships are typically categorized along a continuum ranging from minimal transactions to virtual integration.

Cousins and Lawson (2007) presented prior research, which included findings that socialization mechanisms, relative to the SET, and performance measures can be effective in managing supplier relationships, though research examining their impact within a product development context has been limited. Socialization mechanisms, such as supplier conferences and on-site visits, help establish communication and information-sharing routines necessary to achieve supplier integration in the product development process. Using performance measures to evaluate a supplier helps focus managerial attention on areas, such as supplier performance, but not significantly, associated with the use of communication measures. In turn, increased levels of supplier integration led to improvements in both collaboration outcomes and business performance. Socialization mechanisms and supplier performance measures are two important variables for improving the level of supplier integration and helping to achieve these benefits (Cousins & Lawson, 2007).

Young-Ybarra and Wiersema (1999) suggested that in addition to SET, the transaction cost economic theory was linked to the concept of trust. The findings presented by Young-Ybarra and Wiersema support the premise of trust and shared values positively reacting in partner relationships. The results demonstrated relative to SET, that trust was found to be positively related to relationship flexibility while resource dependence demonstrated a negative correlation (Young-Ybarra & Wiersema, 1999).

Organization of the Remainder of the Study

The remnant portions of this study are presented in four sections. A review of relevant literature concerning supply chain disruptions, time pressure impositions, supply chain production, efficiency, transaction costs, supplier relationships, and the relevant theories is presented in Chapter 2. In Chapter 3, the methodology utilized for this research study and the subsequent analysis is presented. The analysis of archival data used in this study is presented in Chapter 4, and Chapter 5 presents the research results and findings, implications, and recommendations for future research study.

CHAPTER 2. LITERATURE REVIEW

Introduction to Review of Relevant Literature

Many organizations operate on a global scale and have global supply chains operating on behalf of the firm or organization. Supply chain disruptions are known to negatively have some type of impact on supply chain performance. In order to remain viable within the supply chain and the global environment, suppliers rely on a growing body of literature in a consistent effort to minimize the negative impact of disruptions and for insights into improving organizational performance. This effort includes maximizing the benefits of supply chain relationships.

The competitive capacity of firms depends significantly on how well suppliers are able to maintain satisfaction within their relationships. Time pressure imposed by supply partners has relational implications. Maintaining a proper balance between the capabilities of firm suppliers and the ensuing supply chain relationships has a role in the goal of competitive advantage. Firms are tasked with attaining an acceptable level of responsiveness whether it relates to risk events as imposed by disruptions, optimal performance outcomes as partner or customer relational satisfaction. Extant literature has aimed to help firms discover how to best mitigate this situational constraint as time pressure is suggested to be of great significance in organizational relationships with suppliers and within supply chains (Wagner & Johnson, 2004).

The relationships suppliers have in the global market are fundamental to the beneficial success or failure relative to the parties within the relationship. Supplier relationships are considered a strategic asset. Based on the supply chain perspective, commitment and trust are essential factors in successful supplier relationships. Supply chain management research has largely included discussions of how commitment and trust factor into the supplier relationships. There was little research exploring how the components of supply chain disruptions and impositions of time pressure affect trust and commitment levels and the resulting relationship continuity.

In this chapter, a review of the literature relative to this study is provided. First, supply chain disruption, and time pressure impositions are examined. Supplier relationships are then defined in the management and organization research context. Supplier relationships, in terms of trust and commitment are reviewed as they pertain to the supply chain context. Efficiency, production and transaction costs are examined as they pertain to the supply chain context. The remainder of the chapter includes a discussion of the SET, resource dependency, and transactions cost economics theories are examined from the supply chain research perspective.

Disruptions

Disruptions within a supply chain may be attributed to a wide variety of sources, whether from external sources or within the supply chain network, according to Zsidisin and Wagner (2010). In order to properly evaluate the phenomena of supply chain disruptions, researchers suggested first categorizing and classifying the disruptions by

source (Christopher & Peck, 2004; Hallikas, Karvonen, Pulkkinen, Virolainen, & Tuominen, 2005; Spekman & Davis, 2004; Svensson, 2000). Within the context of this research study, supply chain disruptions are aligned within a qualitative and quantitative category Svensson (2000), delineated as a supply or demand disruption Jüttner (2005), and presented as a disruptive delay, including delays in inventory (Chopra & Sodhi, 2004).

Empirical research studies examined how supply chain partner activities and characteristics potentially mitigate the impact of supply chain disruptions. How the supply partner functions has direct and indirect impacts on the supply chain's capacity to perform or respond to uncertainty and risk (Walter, Müller, & Helfert, 2003). Adapting and diversifying supply chain strategies, to include strategically storing inventory, was theorized by Tang (2005) as being able to potentially influence disruption vulnerability. Research included suggestions that performance outcomes are affected by varying levels of disruptions characterized by frequency and duration. Survey results were used by Braunscheidel and Suresh (2009) to study whether organizational integration practices and culture are related to the firm's responsiveness to disruptions within the supply chain.

Looking to address the crucial need for supply chain disruption research, Blackhurst, Craighead, Elkins, and Handfield (2005) conducted a significant empirical study that was multi-industry and multimethodology, signifying the methodology had multiple characteristics, on supply chain disruptions. The intent was to explore the external, internal, disruption factors, decision making and partner responses. According

to Blackhurst et al., the multifaceted nature of the research sought to identify insights that address global sourcing and supply chain disruptions concerns. Notably, Radjou (2002) attested the use of a global sourcing model increased the probable occurrence of supply chain disruptions. Taking advantage of close interactions with industry, Blackhurst et al. identified several areas and issues of common concern and presented an analysis to assist in mitigating supply chain resiliency.

The intent of Schimdt and Raman (2012) was to contribute to supply chain literature as an analysis was conducted to determine if a relationship existed between external and internal disruption factors, causes, and improved operational efficiency. Schimdt and Raman also investigated whether supply chain disruptions influenced firm value and concluded disruption impact on firm value is greatly influenced by firm control and responses. Papadakis (2006) used an event study to demonstrate disruptions within the supply chain negatively impact financial performance and transaction costs. Disruption impact varies greatly to include impacting a firm's operations and supply chain costs. Notably, Hendricks, Singhal, and Zhang (2009) quantitatively found that in instances where sales ratios and transaction costs were already low, the disruptions impact was less. This was an extension to previous research of Hendricks and Singhal (2005, 2008) in which the researchers reported negative stock market reactions to disruption announcements, with the magnitude of the decline in market capitalization being as large as 10%. A leading buyer in the manufacturing industry attributed $400 billion in lost revenue to a failed shipment when the supplier partner suffered a disruption

in its supply chain. Chen and Xiao (2009) reported the estimated costs of disruptive events are significant in terms of revenue and its impact on performance outcomes. Rice and Caniato (2003) projected $50 to $100 million in daily losses within the supply chain due to disruptions.

Riddalls and Bennett 2002) presented research that attested to the negative impact to transaction costs correlated to delays from supply chain disruptions. Costs were shown to increase; sales decreased and stock prices were cut. In turn, Radjou's (2002) research study listed several examples of supply chain disruptions in which the negative impact to financial performance was measurably significant. The supply chain partners and suppliers were from the automotive, manufacturing, and aerospace industries. Using a survey methodology, Rice and Caniato (2003) similarly presented research findings in which the daily impact to costs within the supply chain was estimated at $50 to $100 million.

Bode, Wagner, Persen, and Ellram (2011) provided essential theoretical contributions to the literature on organizational responses to adverse events and to the literature of research findings on supply chain disruptions. The study purposed to explain by which reasons and under conditions firms react to supply chain disruptions. The study examined the impact of supply chain disruptions and how supply chain disruption affects the firm's dependence on its exchange partner. Additionally, Bode et al. examined the probability of moderation of direct relationships by two important parameters of supplier

relationships: firsthand experiences with supply chain disruptions and previously developed trust in the exchange partner involved in a disruption.

Several research studies (Craighead, Blackhurst, Rungtusanatham, & Handfield, 2007; Hendricks & Singhal, 2005; Sheffi & Rice, 2005) attesting to the problematic nature of supply chain disruptions were reported by Kuo-Ting, Young, and Tangpong (2009). Significant economic and financial negative implications caused by supply chain disruptions were identified in relevant literature (Hendricks & Singhal, 2005). The assertion of Kuo-Ting et al. was that the key to successful and timely supply chain response and recovery from disruptions is attributed to supportive, committed, trust-based relational ties with supply chain partners. Earlier work suggested firms struggle to recover from disruptions when partners are perceived as being untrustworthy and unreliable (Chopra & Sodhi, 2004).

Time Pressure

Recognizing that competition consistently increases prompts the need for optimal efficiency among time-pressured supply chains (Stalk & Hout, 1990). Impositions of time pressure were classified by Osborn and Nault (2012) as problems, which have a negative impact on supply chain firm partners within the supply chain. The findings were concluded from a review of peer-reviewed research studies and relevant literature. The intent of this research was to provide a resource for firms and organizations to improve responsiveness, performance, sales, inventory management, and integration practices. Supply chain processes are time based in order to promote the timely flow of

goods and information (Stalk, 1988; Stalk & Hout, 1990). These researchers argued that effective productivity processes and knowledge sharing allows the supply chain to sustain competitive advantage. Time pressure prompts supply chain partners to maintain high levels of responsiveness and to have the ability to adapt quickly to changes within the supply chain (Barney, Wright & Ketchen, 2001).

Arguably, decision making in supplier relationships and supply chain performance are adversely effected by time pressure (Dhar & Nowlis, 1999; Durham et al., 2000; Maule et al., 2000; McDaniel, 1990; Ordonez & Benson, 1997; Stuhlmacher & Champagne, 2000). Time pressure coping mechanisms were found to negatively impact decision making and supplier relationships. According to Saorín-Iborra (2008), time pressure, when perceived, is reliant upon several aspects, including the supply chain or business environment.

It is impossible to identify differing perceptions of time pressure impositions when there is a difference in the scenarios; despite a consistent availability of time. Saorín-Iborra (2008) asserted that whether perceived through internal or external conditions, time pressure affects the decision making preparation and end processes (Commons, 1985; Hunt, 1990; Jemison & Sitkin, 1986; Saorín-Iborra, 2008; Sebenius, 1998). Long-time relational experience has the more significant impact on decision practices under time pressure posits Saorín-Iborra (2008). More experienced supplier members tend to place more emphasis on decision and negotiation issues crucial to the benefit of the firm and its supply chain and how to address and resolve such issues.

Thomas (2008) sought to address existing gaps in literature on time pressure in supply chain relationships. Time pressure, and not the coping mechanisms related to time pressure, was found to affect the supplier relationship magnitude aspects of trust and commitment (Thomas, 2008). Comparatively, there was documentation in the research findings of Thomas, Fugate, and Koukova (2011) where grounded theory methodology was employed to discern time pressure coping strategies taxonomy that is driven by preconditions, such as the frequency, magnitude, and attribution of time pressure. The resulting research model provided information about the potential costs of leveraging interfirm relationships in order to achieve supply chain responsiveness (Thomas et al., 2011).

Exploration of time pressure impositions is essential to supply management theory and practice. Specifically, the effects of time pressure were noted to diminish trust and communication. Knowledge sharing between buyers and suppliers may be hindered as a result of diminished trust (Thomas et al. (2011). Utilizing a qualitative scenario-based methodology, Thomas (2008) explored the aspects of time pressure in supply chain relationships. Thomas postulated time is frequently a prevailing aspect of supply chain performance to include measurement of transaction cycle times. In addition, time was presented as a key element in achieving or maintaining a competitive advantage. Similarly, the seminal work of Stalk and Hout (1990) presented time pressure as an essential element in time-based performance aspects of supply chains and supply chain relationships.

Supplier Relationships

Walter et al. (2003) identified supplier relationships as the unit of analysis as these researchers examined moderating effect of alternate suppliers as in a supply chain. Commitment and trust were presented as essential elements in this empirical research. Walter et al. described commitment as the intent to build and sustain a long-lasting relationship and interaction among partners. Commitment was acknowledged as an integral part of long-term business relationships on any level.

Drawing on the conceptual approaches of previous scholarly research, trust was presented as the benevolence shown towards a relationship partner, the reliance on a partner's honesty and the belief that the part will act to the mutual benefit of the relationship to both parties (Walter et al., 2003). Supplier relationship complexities were examined in an effort to comprehend process adaptation. Most notably, Hrebiniak (1974) investigated the role of trust and commitment on supplier relationships. Hrebiniak indicated in the findings that great value is placed on trust between parties to the extent partners seek to commit long-term to the relationships.

Anecdotal evidence included indications that the significance of considering supplier–supplier relationships when investigating the dynamics of multiple supplier partnership implications (Asanuma, 1985; Dyer, 1996a, 1996b). Research findings revealed relational operating differences amid multiple suppliers and buyers. The competitive nature of these types of relationships makes it difficult to build or sustain long-term partnerships (Dyer, 1996a, 1996b; Monczka, Petersen, Handfield, & Ragatz,

1998). Additionally, Wu and Choi (2005) asserted supplier relationship dynamics have supply chain performance implications.

Although commitment has many aspects, previous researchers have explored the relationship commitment in terms of willingness to pursue or continue ongoing partnerships within a supply chain. As part of such research, Mukjerhi and Francis (2003) sought to address the questions of "how commitment between two firms come about" and what factors "create commitment" and "what follows commitment?" (p. C1). Commitment was found to have a mediating effect on trust and trust on adaptation to or with supplier relationships. Varga et al. (2009) presented a long-term commitment within supplier relationships and supply chains are an investment of tangible and intangible resources. The developmental aspects to the supplier relationship are an indicator of improvement within the supplier relationship and the performance of the supply chain. Morgan and Hunt (1994) declared that when a supply partner decides to end or sever a supplier relationship in lieu of another there is the potential to incur additional transaction costs. Trust among supply partners impact firm commitment to the supplier relationship (Morgan & Hunt, 1994).

In an effort to fill research gaps between theoretical argument and empirical testing, survey results identified a strong relationship between the levels of commitment and the levels of trust. Contributing to supplier relationship and supply chain management literatures were Olsen and Ellram's (1997) suggestions that trust characteristics and performance are linked. Magnitude in the supplier relationships were

indicated as assets with trust acting as the crucial factor in fostering commitment among supply chain partners (Chu & Fang, 2006; Sahay, 2003; Suh-Yueh & Wen-Chang, 2006). Lyles, Flynn, and Frohlich (2008) found trust to be a vital element in supply chain relationships. This trust is relative to high expectations that a supply partner will not disrespect the boundaries of the supplier relationship nor will a supply partner engage in any form of opportunistic behavior. Shared values promote good-faith efforts to remain committed to the supply chain relationship.

Sahay (2003) built upon the premise of Olsen and Ellram (1997) that trust in supplier relationships relies upon the perspective of the supply partners. Initial trust is needed to establish the relationship and long-term trust relationships are essential for the survival of the supply chain and any long-term benefits the relationship may yield. Arising from the evaluation and interpretation of one another's motives, Sahay (2003) posited trust in supply chain relationships is the crucial element used in predicting the supply partner's behavior. Doney, Cannon, and Mullen (1997) asserted the results of previous partnership transactions are the groundwork for future interactions among the suppliers. The empirical research of Anderson and Weitz (1989) revealed that a supply partner's trust in a manufacturer increases as the relationship progresses towards a longer stage of commitment.

More experienced supply partners demonstrate high levels of trust during turbulent times at the firm levels, which are an indication of the value placed in the long-term relationship (Sahay, 2003). Trust, from the transaction cost economics perspective,

is seen as an alternate to costly control and coordination mechanisms (Bromiley & Cummings, 1995). Trust levels may be assumed to be unaffected by new activities and stable when comparatively examined against long-term relationships.

Substantial evidence supported trust within interorganizational relationships as an important predictor of positive performance. Evidence of this extends across multiple disciplines of organization research. The economic and social benefits associated with trust-based relationships are said to far outweigh potentially elevated risk factors (Bove & Johnson, 2001; Currall & Inkpen, 2002; García-Canal, Duarte, Criado, & Llaneza, 2002; Koka & Prescott, 2002; Parkhe, 1993; Volery & Mensik, 1998). Trust associated with long-term commitments entail a reciprocal understanding by partners to abide by a specified agreement. Ireland and Webb (2007) also found trust within supplier relationships generally creates an environment in which firms freely exceed the minimal requirements of a relationship to maximize the success potential for all supply partners.

However, several researchers pointed to the ultimate success or failure of a supply chain partnership as being greatly dependent on the level of commitment, trust and collaboration among supply partners (Dyer & Chu, 2003; Monczka et al., 1998; Ragatz, Handfield, & Petersen, 2002; Walter et al., 2003). Comparatively, other researchers view the supplier relationship from a business perspective where the supply relationship is instrumental in new development processes, problem solving, and new team management (Harland, Brenchley, & Walker, 2003; McCutcheon & Stuart, 2000; Stanley & Wisner, 2001; Sukati, Hamid, Baharun, Yusoff, & Anuar, 2012; Wynstra & Pierick, 2000).

Reinartz, Thomas, and Kumar (2005) submitted relationship magnitude, trust, and commitment are essential indicators of success in terms of maximized sales profit and performance. Mitręga and Zolkiewski (2012) argued the depth of the relationship may be problematic when exiting a relationship plagued by risks, such as those risks posed by disruptions and time constraints. In contrast to this premise, Sheffi and Rice (2005) contended that long-term relationships are crucial to minimizing the effect on supply chain uncertainty and supply chain disruptions.

In supplier relationship research, a multitude of diverse factors had been shown to contribute to the success of supply chain relationships (Asanuma, 1985; Dyer, 1996a, 1996b; Fawcett, Fawcett, Watson, & Magmum, 2012; Krause & Ellram, 1997; Monczka et al., 1998; Sahay, 2003; Suh-Yueh & Wen-Chang, 2006). Adding to this premise is the suggestion of Lyles et al. (2008) that, in addition to having relational impacts, supply chain disruptions have severe technical implications as well that affect the supplier relationship in addition to the performance of the supply chain. Additionally, Lyles et al. asserted conflict among the supply partners and perceptions of untrustworthiness and a lack of confidence in the exchange partners are the cause of poor supply chain performance.

Successful supply chain performance is measurably improved in the presence of trust in supply relationships relative to the short-term nature of challenges and goal achievement brought on by long-term partner commitment (Angle & Perry, 1981). Major industries have benefitted from high-performing supply chains, which resulted from long-

term supplier relationships. The benefits of such long-time sustainability among supplier partners in terms of profits, performance, risk management, and serviceability have been supported in research (Baucells & Rata, 2006; Dyer, 1996a, 1996b; Dyer & Ouchi, 2003; Stank, Kellar, & Daugherty, 2001).

Comparative research defined relationship commitment as a psychological state prompting an organization toward maintaining the relationship over the long term and a consistent desire to maintain a relationship of value exchange (Moorman, Deshpandcoq, & Zaltman 1993; Park, Lee, Lee, & Truex 2012). A research premise included a suggestion that trust and common reliance within supplier relationships define the long-term alignment in the supply partner relationship.

Long-term strategic alignment is a noted organization goal and a measure by which to gage performance (Ganesan, 1994). This premise considered that there are varying degrees and multiple characteristics of trustworthiness in supplier-buyer relationships (Barney & Hansen, 1994; Henry, Suh, & Kwon, 2010). Correspondingly, researchers asserted trust and relationship commitment are representative of the strongest degree of unity among participating relationship partners. Commitment is the extent to which relationships are maintained over a long period and integral to involvement of organizations in transactional exchange relationships (Park et al., 2012).

Scott and Westbrook (1991) attested the ability to develop and maintain large degrees of trust is a key factor in successful relationships as those between supply chain partners. Research arguments included declarations that firms are able to meet

obligations and demonstrate effective levels of performance in lieu of potential threats when partners in supplier relationships agree to remain committed. The degree and level of commitment is generally hypothesized to be mutually beneficial to supply partners, but most often those partners are within a dyad relationship (Henry et al., 2010; Schelling, 1960).

Performance enhancement is a foundation for the building of trust in supplier relationships (Goffin, Lemke, & Szwejczewski, 2006). Trust indices are not always straightforward as Johnston, McCutcheon, Stuart, and Kerwood (2004) attested to the complexities of trust measurement. Survey analyses of multi-item scales are most commonly used and adopted to capture the explorative nature of trust with the diverse contexts of supplier relationships. Trust is the supposed building block of strategically aligned partnership.

Closely linked coordination and cooperation principles are preconditions for successful supplier relationships. Facilitated by trust, which is deemed as an essential relational tool, coordination and cooperation practices have long-term relevance in supply chain literature (Doney & Cannon, 1997; Gulati, 1995; Morgan & Hunt, 1994; Skandrani, Triki, & Baratli, 2011). Trust is essentially perceived as an element crucial to long-lasting social exchange and supplier relationships (Chow, 2008; Geyskens, Steenkamp, & Kumar, 1998; Malhotra & Murnighan, 2002; Skandrani et al., 2011). Notably, Johnston et al. (2004) declared tests at that point were insufficient in determining any actual influences trust has on potential interorganizational trust. More importantly, Johnston et

al. asserted there was a limited amount of research that simultaneously examined both supplier and buyer perspectives of trust issues.

Earlier research had documented contentions that evaluative information obtained from buyers and suppliers is needed to validate any potential impact that trust concepts may have on performance from an organizational standpoint (Smith & Barclay, 1997). Empirical evidence later supported that trust may potentially impact interorganizational practices, activities and overall performance despite a lack of meaningful insights on trust-related and trust-dependent behaviors (Johnston et al., 2004). The magnitude of the supplier relationship and interactions between supply chain partners is dependent upon on what the supplier partners know or are able to learn about each other's uncertainties, such as those caused by disruptions, poor efficiency, and performance levels (Zacharia, Nix, & Lusch, 2009). Successful supplier relationships improve performance, and operational outcomes, which lead to improved relational outcomes. There is a greater degree of trust when supply partners' operational outcomes are optimal and when the partner is deemed credible and reliable (Zacharia et al., 2009).

By first identifying trust as a crucial factor in successful strategic partnerships, Shen, Yen, Rajkumar, and Tomochko (2011) explored the indices of trust and commitment levels in supplier relationships. Citing Morgan and Hunt (1994) who postulated in earlier research that trust and commitment are key components to successful supplier relationships, Shen et al. (2011) purposed to explore the factors that influence both trust and commitment. The researchers subsequently investigated the role of

information sharing, quality, and availability in the development of trust and commitment in supply chain relationships as the groundwork for the research study. The research findings demonstrated through the sharing of high-quality information, solid levels of trust are established that lead to strong ties of commitment among the supply chain partner relationship. The establishing and nurturing of trust were affirmed as critical elements in achieving supply chain effectiveness organizational boundaries, particularly for relationships, such as alliances between buyers and suppliers in a supply chain (Johnston et al., 2004; Sehn et al., 2011).

Similarly, Nyaga, Whipple, and Lynch (2010) found that certain collaborative activities, including information sharing and joint relationship effort, also promote trust and commitment in supplier relationships. The research was conducted at the process level within the supply chain and Nyaga et al. (2010) postulated this led to a more effective relationship analysis of the supplier partners. The research findings presented improve performance, efficiency, and satisfaction between supplier partners. The research addressed the gap in literature for more process-level research in supply chain management (Field & Melle, 2008; Nyaga et al., 2010).

Field and Melle (2008) conducted process-level research dissimilar to most empirical supply chain studies, which generally use data from manufacturers at the strategic business unit or firm level. Field and Melle utilized service industry data to test possible relationships between supply partnerships and satisfaction. Field and Melle presented the distinctive differences among service versus manufacturing industries that

were crucial to effective data analysis. The assertion of Lambert and Knemeyer (2004) was that optimal supply chain performance is not dependent upon satisfaction and successful supply chain partnerships and resources are best used in other areas than investing in key personnel to manage supplier relationships. Contrarily, Liker and Choi (2004) hypothesized strong partnerships are critical to the supply chain success and high performance levels. Liker and Choi suggested the crucial element is close supervision of the supplier relationship.

In contrast to several current studies in which long-time supplier relationships are presented as greatly beneficial to all partners (Nyaga et al., 2010; Park et al., 2012; Ronchi, 2012; Shen et al., 2011). Mitręga and Zolkiewski (2012), looking to address gaps in literature, explored the negative aspects and possible consequences of long-term relationships. The researchers highlighted the negative impact to transaction costs, sales and purchasing. Due to the long-term nature of such relationships, supplier partners encountered exit barriers to leaving a burdensome relationships and limited opportunities to embark on a potentially more successful partner relationship. The research findings of Heide and Stump (1995) argued that although long-term relationships have enhanced performance indicators, in contrast, the increased time dimension of the relationship is also a limiting factor. Lengthy relationships negatively impact performance when specific assets and uncertainty are lacking.

The automobile industry has been documented as taking advantage of long-term relationship orientation with its exchange partners. Supply partners postulated long-term

relationships with this industry and were used to manipulate short-term benefits that favored one-relationship partners, the automobile industry, and not the relational partnership as a whole (Terpend, Krause, & Dooley, 2011). Rossetti and Choi (2005) highlighted a key disadvantage to long-term supplier relationships was from the aerospace industry perspective, which is the negative restraint it places on a firm's ability to attain competitive advantage.

Supply Chain Efficiency and Productivity

Researchers Zelbst, Green, Sower, and Reyes (2009) suggested the foundation of such effectiveness is dependent upon the ability of the supply chain partners to develop long-term, strategic relationships. Zelbst et al. associated supplier relationship satisfaction to supply chain performance and low costs. In contrast, Field and Meile (2008) hypothesized that supplier relationship satisfaction is relative primarily to supply chain efficiency and responsiveness.

Supply chain effectiveness and performance is measurable by low total transaction costs, service quality, and supplier satisfaction within the supply chain and supply chain effectiveness leads to value maximization. Researchers Chandrashekar and Schary (1999) and Christopher (2000) persisted firms struggle to survive long term and are at risk for higher rates of failure without the support and benefit of well-developed supply chain relationships. The primary aim of the supply chain partnership is promoting high levels of productivity and efficiency contributing to the necessity of the supply chain relationships (Krause & Ellram, 1997; Monczka et al., 1998). Unstable supply chains

and waivering profit margins have fueled the increase of former long-term supply partners emerging as new market competitors. Despite this disadvantage, Rossetti and Choi (2005) concluded the greatest benefit to the firm extends from a longer committed relationship. According to these researchers, it is within long-term serial exchange relationships where there exists a willingness of suppliers working with buyers to reduce cycle times and to improve transactional efficiencies.

An earlier assertion of Heizer and Render (2006) similarly presented that the effectiveness and success of the supply chain is significantly linked to the relationship in which the organization participates as a partner. McCarthy and Golicic (2002) found improvements in supply chain performance, to include optimized efficiency, increased levels of productivity, optimized transaction costs, and increased sales were attributed collaborative efforts of supply chain partners. The relationships stemmed from long-term commitment and trust factors. The research purposed to use a case study methodology to explore supply partnership collaboration processes.

A more recent study correspondingly sought to expand supply chain literature by also analyzing supplier specific role as a construct. The supplier relationship supply chain practices and the resulting level of organizational performance were examined by Cook, Heiser, and Sengupta (2011). Here, the researchers looked to see if the industry-specific supplier role moderated the overall supplier relationship, and the supply chain performance level. The research findings indicated a connection between supplier role, as in manufacturer; retailer; and the type of relationship that existed within the supply

chain, and improved performance (Cook et al., 2011). Thomas et al. (2010) drew upon this premise having declared collaborative relationships are mutually beneficially options for suppliers seeking to improve supply chain efficiency and sustain competitive advantage (Thomas et al., 2010). Linkages between supplier relationships and satisfaction were examined through process-level analysis. Process-level analysis was deemed a more beneficial contributor to supply chain literature by researchers as it examines the multifacets, processes, and related supply chains within firms (Field & Meile, 2008; Nyaga et al., 2010).

Johnson and Templar (2011) presented that productivity may be measured through generated sales, then sought to quantitatively identify the impact supply chain efficacy has on the performance of the organization. Secondary financial were used in the exploration of the relationship between supply chain and firm performance. Prior research included a suggestion that a distinct correlation between superior organizational performance and well-managed supply chains and supply chain business relationships (Christopher, 2005; D'Avanzo, Lewinski, & Van Wassenhove, 2004; Zsidisin, Ellram, Carter & Cavinato, 2004). The findings of Johnson and Templar indicated improving supply chain management practices has a positive impact upon improved firm performance as the supply chain promotes the improvements. Corresponding to previous research findings, which posited the impact of effect supply chain, management extends beyond the reduction of costs (Ellram & Liu, 2002; Farris & Hutchison, 2002; Lambert & Cooper, 2000).

The Johnson and Templar's (2011) development of a unified proxy to describe the relationships between an organization's financial performance and its supply chain while considering the multiple constraints of profitability, liquidity, and productivity was noted. Möller, Windolph, and Isbruch (2011) referenced the findings of Johnson and Templar (2011) while examining the effective management of supply chain partnerships and their impact on competitive advantage. Moller et al. hypothesized that the relational factors trust and commitment influence supply chain financial management practices. The analysis of data obtained from an automotive manufacturing industry sample supported the initial premise. Supplier's commitment promoted effective cost practices and the buyer's commitment to the supply chain relationship is essential in promoting interorganizational cost practices.

Similarly, Chang and Chiu (2010) and Chen, Liang, and Yang (2006) measured various types of supply chain relative efficiency. A key distinction between the two research studies lies in the analysis of cost functions. The cost function in the research of Chen et al. was based upon the relation of inputs and outputs whereas the latter research of Chang and Chiu was based the analysis of function costs on profit maximization relative to minimized costs. Chang and Chiu applied the substantiated data envelope analysis model previously used to measure supply chain member relative efficiency (Banker, 1999; Dong & Zhi-Pang, 2006; Easton, Murphy, & Pearson, 2002; Liang, Yang, Cook, & Zhu, 2006; Reiner & Hofmann, 2006; Weber & Desai, 1996; and Zhu, 2003).

Economic Transaction Costs

According to Williamson (1991), economic transaction costs are those expenses produced through economic exchanges, such as sales, negotiation expenses, or costs related to specifying fair market values or prices. The transaction is the unit of analysis (Williamson, 1991). Reporting from the economics literature of an organization, which included multiple aspects of supplier relationship management (Hoetker, 2005), Moeen, Somaya, and Mahoney (2013) acknowledged analysis of economic transaction costs is potentially limited by governance choices towards recent transactions or prior commitments of a firm to other transactions relationships. In contrast, recognition of the potential effect of the economic transaction costs on future transactions may justify previously unfavorable strategic choices where the transaction was also the unit of analysis (Kang, Mahoney, & Tan, 2009; Mayer 2006).

Primo, Dooley, and Rungtusanatham (2007) suggested manufacturers tend to be unresponsive towards potential increases in transaction costs relative to supply chain disruptions and overly responsive to perceptions of supply chain disruption risk. Additionally, supply partners from the manufacturing industry generally are increasingly dissatisfied with any amassed disruption impact. Howick and Eden (2001) posited the more generally methods used to restore or sustain production in response to supply chain disruptions may unintentionally increase the negative effect of the disruption to include supply chain transaction costs. Wang, Plante, and Tang (2013) found supply chain disruptions to be costly in terms of transaction costs and increased levels of supply chain disruptions are linked to a total increase in costs. Optimal recovery capabilities

essentially improve partner satisfaction and are an indication of long-term commitment on behalf of the supplier (Primo et al., 2007).

Ketchen and Hult (2007) asserted value-centered supply chain partners place great emphasis on establishing mutually beneficial long-term relationships based on trust. Relatively, Noh (2009) asserted trust building requires long-term commitment and the absence of mutual trust are potentially overcome through role empowerment during decision making. Traditionally, supply chains view the risk of opportunism and potential exclusion within the supply chain as acceptable as its efforts are focused on keeping the supply chain transaction costs at a minimum.

DeVita, Tekava, and Wang (2010) added to the premise of Ketchen and Hult (2007) attesting to the negative effects of buyer opportunism. According to DeVita et al., suppliers are forced to make cuts in terms of operational services and performance measures in order to minimize relationship costs. In contrast, supply chains whose focus remains on total transaction costs are deemed more trustworthy and reliable. This presents supply chain managers with the opportunity to internalize processes when possible in order to maintain the balance between cost effectiveness and trustworthy relationships (Ketchen & Hult, 2007).

Suppliers are generally known to substantially value relationships that result in lower transaction costs. Having presented this premise, Dyer and Chu (2003) investigated the relationship between supplier trust in the buyer and transaction costs and information sharing in a sample of 344 supplier exchange relationships across the United

States, Korea, and Japan from the automotive industry. The research findings indicated supplier perceptions of trustworthiness leads to reductions in transaction costs and are associated with increases of shared information in supplier-buyer relationships. These researchers announced their study provided empirical evidence that trustworthiness lowers transaction costs and lower costs are potentially an essential factor of competitive advantage. Noh (2009) found mutually beneficial supplier and buyer outcomes stemmed from trust-embedded transactions. Improved financial performance is built on trust efforts while competitive advantage is increased through the process. Trust reduces perceptions of risk amid supply chain partners.

Dyer and Chu (2003) strongly advocated that in addition to lowering costs, trust creates value in supplier relationships that lead to long-term commitments (Dyer & Chu, 2003). This assertion aligns with the results of Canon and Homburg (2001) and Butler et al. (1997). Cannon and Homburg's model indicated supply partners' firms benefit by working to keep costs at a minimum, which creates value in the process. Butler et al. (1997) predicted suppliers who are able to minimize transaction costs expected to recognize efficiency advantages in the suppliers' respective business environment.

Comparatively, Gadde and Snehota (2000) asserted performance is impacted greatly relative to the level of the supplier relationship. Gadde and Snehota then argued the continuity of the relationship greatly influences economic transactions of the supplier. Remaining committed to a supplier relationship is not always beneficial. These research authors then presented commitment to a relationship is viable only in instances where the

benefits from commitment to the relationship far outweigh economic costs. These researchers concluded best practice is to limit suppliers or supply chain members in an effort to maximize benefits (Gadde & Snehota, 2000).

Following Gadde and Snehota (2009), research authors Cannon and Homburg (2001) developed a model that sought to clarify supplier behaviors and how the management of suppliers affected various aspects of the supplier relationship to include economic transaction costs. Notably, the model proposed that these costs facilitate the relationship between buyer-supplier relationship behaviors and the customer firm's intentions to expand future transactions with the supplier (Cannon & Homburg, 2001).

Having removed the governance mechanisms of social exchange and transaction cost economics, Bierly and Gallagher (2007) explained the role of relational trust and asserted the impact of time pressure and too much firm level trust is problematic to the supplier alliance. The researchers contrastingly operationalized time pressure as the level of expediency in the partner selection process. The results of Bierly and Gallagher's study supported an initial research hypothesis where optimal partner selection was said to be more beneficial to the overall relationship when not influenced by internal or, more importantly, external pressures of time (Bierly & Gallagher, 2007).

Theoretical Framework

Research presented the SET was developed originally for use in human behavior analysis (Homans, 1958) and progressed to analysis applications derived to examine organizational behavior (Bleau, 1964; Emerson, 1962; Shiau & Luo, 2012). The SET

includes an embracement of the fundamental concepts of modern economics as a foundation for analyzing human behavior and relationships to determine social structure complexity. Based on psychology dating back to the 1950s, emphasis was placed on the significance of norms in order to further develop the SET to the organizational context specific to interorganizational exchange behavior as in supplier relationships (Salam, Rao, & Pegels, 1998).

Bleau (1964) postulated the SET is concerned with the study of social exchanges amid parties. Adapting from Bleau's premise, Hald, Cordón, and Vollmann (2009) presented social exchange is defined as those actions of individuals characterized as being voluntary in nature and motivated by expected returns from others. The SET includes benefits are provided by parties as to invoke commitment from the other party to reciprocate like benefits in return. Additionally, based upon the SET, social exchange processes are expected to create and produce trust from ongoing, consistent, and reliable relationships (Bleau, 1964). The perspectives of relationship value, trust, and power dependence may be synthesized using the SET considering the premise that emergent and successful exchanges within the social context rely upon reward and reciprocity processes among parties (Anderson & Narus, 1990; Hingley, 2005; Jarratt & Morrison, 2003; Walter et al., 2003).

The perspective of researchers Markosky, Skvoretz, Willer, Lovaglia, and Erger (1993) presented the development of the SET stemmed from the desire to predict distribution outcomes and resource allocations within interfirm and intrafirm networks of

individuals, work groups, and supply chains. Willer (1999) asserted the exchange theory seeks to directly examine structural conditions that produce behavioral changes having identified beforehand efficacy within the structure. Supply chain activities depict the activities produced from the exchange theory examination of structures. The resulting vertical structures seek efficiency while the resulting horizontal structures look to obtain effectiveness (Walters & Rainbird, 2003; Zelbst et al., 2009).

Bock and Kim (2002) argued knowledge sharing practices are chiefly determined by reciprocal relationships and reward expectations. These researchers adopted SET in order to comprehend the task-oriented knowledge sharing. The social exchange model presented by Salam et al. (1998) attested that organizations, as well as individuals tend to relate in order to maximize benefits and minimize costs. This premise corresponds to Bleau's 1964 approach, which asserted cost-benefit relationships and interactions stem from mutually beneficial exchanges.

In contrast, prior researchers extensively studied the effects of interfirm dependency on a variety of relationship outcomes to include performance (Lewis & Lambert, 1991), trust (Laaksonen, Pajunen, & Kulmala 2008), and loyalty (Scheer, Miao, & Garrett, 2010). Several of these studies embrace the perspective that dependency is associated with the use of strategies associated with adversarial relationship climates and adverse performance outcomes (Coleman & Mayo, 2007; Duffy, Fearne, & Hornibrook., 2003; Lai, 2009).

Theorized by Pfeffer and Salancik (1978), the resource dependence theory has a primary focus on how firms are able to manage relationships dependent upon the input goods and materials. Environmental uncertainty is reduced for a great many of these firms where this disproportionate interdependence exists within these interfirm relationships (Ketchen & Hult, 2007). The resource dependence theory is highly valued in context to traditional supply chains (Ketchen & Hult, 2007) as supply chain members seek to avoid any overdependent reliance on a partner member to minimize the risk of exploitation by such member.

Drawing on Pfeffer and Salancik's theory of resource dependence, Hofer, Jin, Swanson, Waller, and Williams (2012) sought to explain the power-seeking comportment of firms in a retail supply chain. Postulating that firms' dependence on the business environment relative their supply chain operations is key to firm success and survival. This same success and survival was said to be explicitly dependent upon the level of commitment to the supplier relationship.

According to Bode et al. (2011), the resource dependence theory is centered on a firm's relationships with its exchange partners and business operating environment. Supporting the work of Pfeffer (1981), Bode et al. stated the two foremost principles of resource dependence theory are that "(1) a firm's need for scarce external resources creates a dependence on its exchange partners and, hence, a potential source of adversity for the firm, and (2) firms strive to minimize this dependence, which is tantamount to maximizing power" (p. 836). As the resource dependence theory highlights firm

vulnerability, power, and control, the theory is a necessity in supply chain literature to elucidate the responsiveness of firms affected by supply chain disruptions (Bode et al., 2011).

In addition to the resource dependence theory, the transaction cost economics theory (TCET) is an organizational perspective, which has maintained an essential role in supply chain disruption research studies. Relative to the definition of economic transaction costs presented by Williamson (1991), it is important to note the role of trust. Researchers posit that based on the TCET, suppliers, managers, or key decision makers are tasked with ensuring that transaction costs remain at a minimum by streamlining the decision process whether the role is that of a supply chain producer or buyer (Ketchen & Hult, 2007).

Historically, the organizational theories, transaction cost economics, and resource dependence have been used to study the effects of market scarcity, supply uncertainty, supply base complexity, technological dynamism, product customization, product importance, and inventory buffering strategies on supply chain risk (Choi & Krause 2006; Ellis, Henry, & Shockley 2010; Ellis, Shockley, & Henry, 2011; Khan, Christopher, & Burnes, 2008; Kull & Closs, 2008; Wagner & Bode, 2006). The rationale of the TCET provides a supportive conceptual link between the supply disruption risk, and uncertainty and asset specificity, while resource dependency theory comparatively submits that supply disruption risk is a function of dependence. Following this perspective, the TCET has been broadly used when examining vertical integration.

Emery and Marques (2011) applied the TCET principles to promote an understanding of the benefit of managing raw materials to keep transaction costs at minimal levels. Vulnerability, stemming from risks, such as disruptions and effect transaction costs. Logistics and sales force teams were used to reinforce TCET assertions of vertical integration relative to making distribution and forward integration decisions (Anderson, 1985; Anderson & Schmittlein, 1984, Klein, Frazier, & Roth, 1990; Maltz, 1993). In contrast, Lieberman (1991) and researchers Walker and Weber (1987) studied backward integration pathways to supply. Walker and Weber concluded production costs were of more significance than transaction costs.

The prior research of Golicic and Mentzer (2006) presented a corresponding relationship between the TCET and SET. Golicic and Menzter declared their research validated the principles of transaction cost economics and SET. The SET maintains exchange relationships are to provide social value. Commitment to the relationship is a result of relationships costs that are outweighed by relational benefits. Evidence obtained from in-depth interviews demonstrated relationship value perceptions were based upon the results of costs and benefits (Golicic & Mentzer, 2006). Correspondingly, Argyres and Liebeskind (1999) posited the TCET supports, in addition to its assets, an additional key component of a firm are its long-term supplier relationships. In addition, uncertainty, as the uncertainty caused by supply chain disruptions, is also a factor (Argyres & Liebeskind, 1999).

According to Williamson (1991), transaction costs consists in part of the maladaptation costs, which are a result of remaining committed to a relationship following changes in operating conditions. Williamson theorized transaction costs are unlike costs associated with production as transactions costs effect exchanges among partner relationships. Williamson also claimed transaction costs are generally higher for specialized products where there is a benefit of lower transaction costs for more general products. Transactions costs may fluctuate based upon the practices of supplier exchanges but notably are minimized from supplier relationships as those in supply chains or market exchanges. Crook, Combs, Ketchen, and Aguinis (2012) conducted a meta-analysis and presented findings in support of Williamson's TCET that there exists a relationship among transaction costs and decisions. Crook et al. asserted uncertainty prompts commitment towards partnerships as those found in supply chain relationships.

Utilizing an empirical research methodology, confirmatory factor analysis, and a structural equation model; Wu,Weng, and Huang (2012) explored trust and commitment in hi-tech supply chains. Notably, in contrast to the more common SET, RDT, and TCET, Wu et al. based the theoretical principles of the intended research upon the commitment trust theory. Presented were findings in which the supply chain disruptions and like uncertainties were said to be reduced by marketing for the most beneficial supplier relationships. Trust, as generally seen in previous research, was said to be a key factor that influences the supplier relationship (Ambrose, Marshall, & Lynch, 2010; Morgan & Hunt, 1994; Wu et al., 2012).

Conclusion

Negatively impacting supply chains are the problematic disruptions that occur. The impact of supply chain disruptions varies by degrees and levels. Supply chain disruptions influence the performance of the supply chain relative to production levels, efficiency, and economic transaction costs. Also, time pressure impositions have been known to impact the performance of the supply chain. Supply chains are expected to be optimally responsive to disruptions and time pressure as both affect the competitive advantage of the firm. Most notably is the impact that supply chain disruptions and time pressure have on the relationships within the supply chain.

Trust and commitment are crucial components of the supply chain relationship. Trust and commitment relative to a long-term supply chain relationship are influenced by a supply partner's decision making, responsiveness, and behaviors in terms of supply chain disruptions and time pressure. Long-term supply chain relationships are generally mutually beneficial to all supply chain partners. The body of literature included a reflection that long-term relationships are trust based and are significant in improving the overall performance of the supply chain. Optimal performance outcomes manifest within the supply chain in the form of increases in levels of productivity and efficiency, improved sales and minimized economic transactions costs, as well as relationship continuity decisions.

CHAPTER 3. METHODOLOGY

Introduction

The research method used in testing the hypotheses presented in Chapter 1 is outlined in this chapter. The purpose of this study was to quantitatively investigate if a correlation exists following the occurrences of time pressure impositions and supply chain disruptions; the impact these factors have on supply chain efficiency, productivity, and economic transaction costs; and the effect impacted supply chain efficiency, productivity, economic transaction cost have on supplier relationships. The purpose of Research Question 1 was to explore a relationship between two predictor variables, the number of supply chain disruptions and time pressure impositions, and two criterion variables, supply chain efficiency and production. Research Question 2 had a focus to explore a relationship between two predictor variables, the number of supply chain disruptions and time pressure impositions and a criterion variable, economic costs. The focus of Research Question 3 was to explore a relationship between two predictor variables, supply chain efficiency and production, and one continuous criterion variable, supplier relationships. Research Question 4 had a focus to explore a relationship between the predictor variable, economic transaction costs, and a continuous criterion variable, supplier relationships.

This chapter includes these subsequent sections. The nine sections follow: (a) the research design, (b) research questions and hypotheses, (c) population and sample,

(d) units of analysis, (e) instrument design and development, (f) survey administration, (g) data analysis, (h) validity and reliability, and (i) ethical considerations.

Research Design

This study had a quantitative nonexperimental correlational research design. Affirming the research of Creswell (2003), this study sought to identify the "relationships between given variables" (p. 303), and a quantitative approach was utilized. The recommended approach was a nonexperimental approach intended to examine whether or not time pressure impositions and supply chain disruptions affect supply chain productivity, efficiency, economic transaction costs, and supplier relationships. The hypothesized relationship among variables in presented in Figure 1. This research did not entail manipulation of variables or random assignment justifying a nonexperimental design (Johnson, 2001).

Tables and figures are intended to illustrate findings of the quantitative analysis of variables. The primary purpose of correlation research, according to Bryman and Bell (2007), is to establish the possible relationship between two or more variables. This is crucial in the determination of positive or negative direction of the variables relationships (Johnson, 2001).

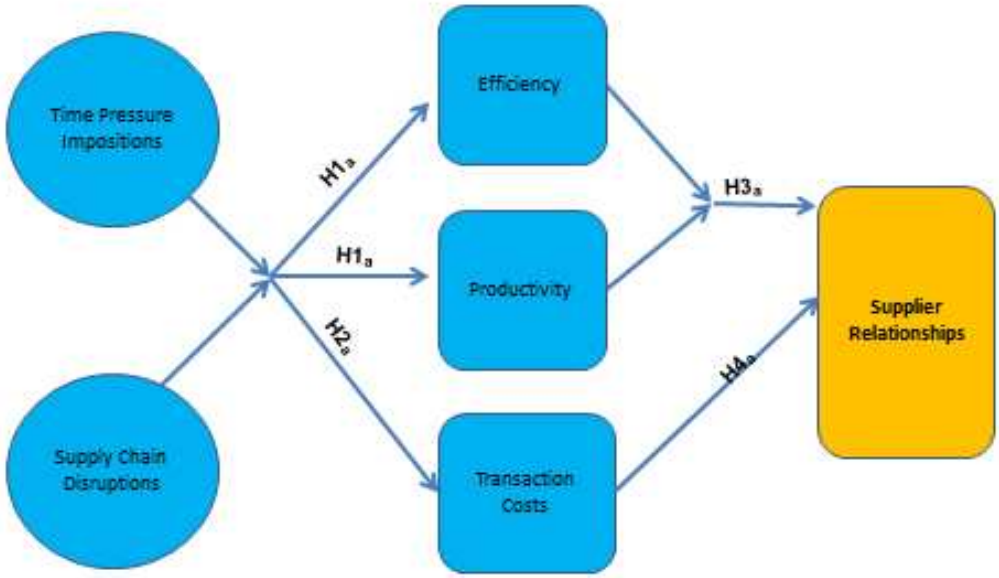

Figure 1. Relationship model among variables.

Research Questions and Hypotheses

Research Questions

Management question. Do time pressure impositions and supply chain disruptions contribute to an organization's ability to sustain efficient global supplier relationships given that time pressure impositions and disruptions contribute to negatively impacting supply chain efficiency, productivity, and transaction costs?

The four research questions follow:

1. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and supply chain efficiency and production?

2. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and economic transaction costs?

3. Is there a predictive relationship between supply chain efficiency and production, and supplier relationships?

4. Is there a predictive relationship between economic transaction costs and supplier relationships?

Hypotheses

The specific and alternate hypotheses are presented as follows:

$H1_0$: The number of supply chain disruptions and time pressure impositions do not predict supply chain efficiency and production.

$H1_a$: The number of supply chain disruptions and time pressure impositions predict supply chain efficiency and production.

$H2_0$: The number of supply chain disruptions and time pressure impositions do not predict economic costs.

$H2_a$: The number of supply chain disruptions and time pressure impositions predict economic costs.

$H3_0$: Supply chain efficiency and production do not predict supplier relationships.

$H3_a$: Supply chain efficiency and production predict supplier relationships.

$H4_0$: Economic transaction costs do not predict supplier relationships.

$H4_a$: Economic transaction costs predict supplier relationships.

Population and Sample

The population was defined as service and manufacturing supply chains in which the following condition held: the supply chain must have operations located in, at a

minimum, two different countries. The major purpose of the condition was to ensure that supply chain members participated in a global supply chain network or system where maintaining effective supplier relationships is crucial to the organizational competitive advantage. The sample was identified through archival data. The sample population shared the following general characteristics.

The supply chains are international and representative of three global regions: Asia, North and South America, and Europe. In a wide range of supply chain industries, company sizes are varied but consistently represented. A source of the secondary, archival data utilized in this research was the U.S. Census Manufacturers' Shipments, Inventories, and Orders (M3) survey. The M3 survey purposed to provide generally monthly statistical data on current economic conditions and indications of future production commitments in the manufacturing and service sectors (U.S. Census Bureau, 2011). The M3 survey sampled individual supplier firms within a host of manufacturing and service industries. The responses in this particular survey are aggregated to the industry level (U.S. Census Bureau, 2011).

So as not to limit the scope of the research purpose, the sample included data obtained from previous studies where a large range of manufacturing industries were randomly sampled. These industries included, but were not limited to, industrial machinery, electronics, medical instruments, automotive, chemicals, plastics, pharmaceuticals, health care, engineering, construction, aerospace, and telecommunications.

Multiple regression analysis correlation was the quantitative model recommended for use in this research study. The effects of individual variables were measured and isolated by multiple regression techniques. Independent effects of each variable under analysis may have been gauged as the effects of the remaining variable were controlled (King, 2003). Multiple regression correlation connects complexities between structural equation modeling and multilevel modeling. Prior research of the multiple regression or correlation analysis presented the multiple regression or correlation analysis as a flexible method of analyzing data highly general in nature. Cohen, Cohen, West, and Aiken (2003) noted under multiple regression correlation, the relationship between the dependent variables and independent variables was unconstrained and presented as a simple relationship among variable or a relationship that is more highly complex. Simple relationships among variables are visually depicted in linear form and complex relationships as curvilinear, general or conditional, or a mixture of simple and complex possibilities (Cohen & Cohen, 1983).

Units of Analysis

Bode et al. (2011) declared supply chain disruptions as interorganizational phenomena involving at least two firms engaged in a supply chain relationship. The unit of analysis of Bode et al. was "a supply chain disruption affecting a dyadic relationship between a focal buying firm and one of its suppliers" (p. 836). This research had multiple units of analysis. One relevant unit of analysis focused on global firms while examining disruptions and time pressure impositions that posed a significant threat or

impacted the everyday course of business operations relative to the firm's production process and level of efficiency (Bode et al., 2011). The additional unit of analysis was in regard to transaction costs. In this case, the basic unit of analysis was the transaction itself, according to Richey, Adams, and Delala (2012) and costs of transactions in the buyer-supplier dyad (Grover & Mahotra, 2003).

Instrumentation and Measures

The process of operationalization translates a broad research aim or purpose into explicit, tangible questions, which may be effectively researched and answered. Multiple measures of dependent variables were included within a quantitative research study. In this study, the provision of operationalized definitions of all identified variables was intended to escalate the quality of the research results while improving the robustness of the research design (Shuttleworth, 2008). The independent and dependent variable measures are shown in Table 1.

Time pressure imposition was operationalized as the length of production time loss relative to on-time delivery (Bode et al., 2011; Thomas, 2008). Disruptions were operationalized and measured the number of disruptions within a period. Using the adapted scale measures, the respondents indicated if loyalty to the supply partner changed, if the level of trust in the supply partner changed, and if the commitment to continue the relationship with the supply partner changed.

Table 1. *Types of Data*

Hypothesis	Dependent variable	Level of measurement	Independent variable	Level of measurement
1	Efficiency	Interval	Time pressure	Interval
1	Productivity	Interval	Time pressure	Interval
1	Efficiency	Interval	Disruptions	Interval
1	Productivity	Interval	Disruptions	Interval
2	Economic transaction costs	Ratio	Time pressure	Interval
2	Economic transaction costs	Ratio	Disruptions	Interval
3	Supplier relationships	Ordinal	Efficiency	Interval
3	Supplier relationships	Ordinal	Productivity	Interval
4	Supplier relationships	Ordinal	Economic transaction costs	Ratio

Supplier relationships were operationalized by changes in the trust levels, relationship loyalty or strength, and commitment, and were measured by change in the supplier relationship (Golicic, Foggin, & Mentzer, 2003; Golicic & Mentzer, 2006; Thomas, 2008). The variables obtained from secondary data were previously measured on 7-point Likert-type scales ranging from the lowest possible value of 1 (*strongly disagree*) to the highest possible answer value of 7 (*strongly agree*). Based on these

indices, a single compounded variable identified as SUP_REL was made up from the transformation of these three variables and used here afterwards as the dependent variable in the multiple linear regression analysis. The number of changes that occurred in the relationship was recorded.

Because supplier relationships are based on the elements of the SET, it was accepted that the greater the degree and levels of trust between the organizations, the stronger the relationship and the less likely changes in the relationship would occur. Efficiency was operationalized as the percent change in inventory produced on a monthly basis. Productivity was operationalized as the level of productivity within a month, and economic transaction costs are the cost of sales differences within a given month (Stank, Esper, Cook, & Autry, 2012; Thomas, 2008; Thomas et al., 2011).

The independent and dependent variables were measured using multi-item scales. Notably, multi-item scales are extremely beneficial when examining constructs that must endure rigorous statistical evaluation to assure meaningful measurement characteristics. Previous researchers support the use of summated items to achieve more valid and reliable responses which more appropriately represent the entire domain of a latent construct (Keller, Savitskie, Stank, Lynch & Ellinger, 2002; Sengupta, Heiser, & Cook, 2006).

Data Collection

The secondary research procedures follow:

1. Reviewed sample frame (based on firm and industry sectors).

2. Identified relevant sources from 2006 to present time.
3. Reviewed previous research studies for archival survey responses related to research questions.
4. Searched commercial and government databases for data related to research questions.
5. Made data decisions based on data form and content.
6. Verified integrity of data following best practices.
7. Entered, cleaned and grouped data by variable names.
8. Conducted multiple regression analysis to test each hypothesis.
9. Reviewed and present research findings.

Data Analysis

Multiple linear regressions were an appropriate analysis when the goal of research is to assess the extent of a relationship among a set of continuous or interval-ratio predictor variables on an interval-ratio criterion variable or a continuous criterion variable (Tabachnick & Fidell, 2006). There were two predictor variables in the analysis: number of supply chain disruptions and levels of time pressure impositions. There were multiple criterion variables and a multiple regression analysis was conducted for each of them:

1. To assess $H1_0$ and $H1_a$: two multiple regressions were conducted to determine if number of supply chain disruptions and time pressure impositions predict supply chain efficiency and production.

2. To assess $H2_0$ and $H2_a$: one multiple regression was conducted to determine if number of supply chain disruptions and time pressure impositions predict economic costs.

3. To assess $H3_0$ and $H3_a$: one multiple regression was conducted to determine if supply chain efficiency and productivity predict supplier relationships.

4. To assess $H4_0$ and $H4_a$: one multiple regression was conducted to determine if economic transaction costs predict supplier relationships.

Validity and Reliability

The primary objective of multiple regression analysis was to examine the context by which multiple variables related and how the multiple variables may be utilized to predict a dependent variable. Validity attests to the degree to which theoretical foundations and empirical evidence support the adequacy and appropriateness of explanations and action (Bagozzi, Yi, & Phillips, 1991). Reliability is supported when variables are established and when indicative scales are used as predictor components in objective models. The validity and reliability of survey instruments are dependent upon the precision and quality of the questions and scales attests (Fowler, 2002). Evidence of reliability does not ensure evidence of validity. This study utilized archival survey data.

The M3 survey data were benchmarked in an effort to minimize sampling and nonsampling errors. The supplier relationship independent and dependent variable data were measured using previously modified multi-item scales tailored to the research context. Construct validity is generally established through the correlation of multiple measures, strongly advocating that the measures are associated with these variables in

theoretically predictable ways (Weston & Rosenthal, 2003). The construct validity of this study was achieved with the use of multiple sources of evidence through secondary sources. Internal validity was concerned with reducing and restricting instances of confounding variables to show causality within an acceptable degree of confidence. Cronbach's alpha was used to determine internal consistency and reliability (Vogt, 2007).

Ethical Considerations

This research study included the use of archival data collected via random sampling. Evidence was presented in prior research, which confirmed studies based on secondary data present a minute possibility of ethical dilemmas, as the research data for is already formatted for public in some way (Aaker, Kumar, & Day, 2007; Meyer, 2000; Stanley, Sieber, & Melton, 1996). Notably, research based on data published in academic research studies, organizational and government research studies or surveys have already addressed underlying ethical issues, where needed. The use of the secondary data did not pose a conflict of interest. The data were obtained from commercial databases, government sites, and previous research studies on time pressure and supply chain disruptions.

CHAPTER 4. RESULTS

Introduction

The purpose of this study was to quantitatively investigate if a correlation exists following the occurrences of time pressure impositions and supply chain disruptions; the impact these factors have on supply chain efficiency, productivity, and economic transaction costs; and the effect impacted supply chain efficiency, productivity; and economic transaction cost have on supplier relationships. The results of this research were intended to contribute to supply chain literature by highlighting the benefit and influence of interdependence of supplier and supply chain knowledge and supply chain processes. Provided within this chapter is a description of the data analysis, the results of the data analysis, and interpretations of the data analysis to test the hypothesis upon an evaluation of the correlation coefficients so that interpretations may be drawn from the intended population.

Sample

The sample included secondary data obtained from the U.S. Census Bureau government database and previous research studies sampled from multiple industries sectors. These industries included, but were not limited to, industrial machinery, electronics, medical instruments, automotive, chemicals, plastics, pharmaceuticals, health care, engineering, construction, aerospace, and telecommunications.

Sampling Procedures

The U.S. Census Bureau declared the Office of Business Economics provides monthly estimates of changes in manufacturing as its sampling procedure in the M3 survey. The Office of Business Economics initially published only index numbers, but later published dollar aggregates by benchmarking the monthly series to statistics of income data from the Internal Revenue Service.

Sample Size

Power analysis for a multiple regression was conducted using G*Power, Version 3.1.0 to determine a sufficient sample size using an alpha of 0.05, a medium effect size (0.15), a power of 0.80, and two predictors. Based on these, the desired sample size is 68 participants. The most stringent sample size recommended must be used in analysis; therefore the minimum recommended sample size is 68. In Table 2, a portion of the sample statistics are represented.

Data Analysis

The statistical results and analysis of the research questions and corresponding hypotheses are presented in this chapter. Multiple regression analysis was employed to determine the statistical significance of the hypotheses. The results and resultant justifications to support and explain the analysis are also presented.

Table 2. *Sample Statistics (Supply Chain Disruptions Only)*

Industry	SIC No.	Frequency
Food and tobacco	2000 to 2199	15
Lumber and furniture	2400 to 2599	19
Paper and printing	2600 to 2799	7
Chemicals and petroleum	2800 to 3099	91
Stone and leather	3100 to 3299	3
Primary and fab metals	3300 to 3499	39
Industrial machinery	3500 to 3599	27
Electronics	3600 to 3699	66
Transportation equipment	3700 to 3799	30
Instruments	3800 to 3899	43
Pharmaceutical manufacturing	3900 to 3999	61
Retail and wholesale	5000 to 5999	27
Services	7000 to 8999	8

Note. $N = 436$. Adapted from *When Supply Chain Disruptions Matter* by W. Schmidt & A. Raman (2012, p. 29). Retrieved from http://www.hbs.edu/facultyPublication%20Files/13-006_cff75cd2-952d-493d-89e7-d7043385eb64.pdf

The independent and dependent variables were defined by this researcher as disruptions, time pressure, efficiency, productivity, economic costs, and supplier

relationships. The six variables are coded by the researcher: DISRUPT, TIME_PRESS, EFF_CH, PROD_CH, ECON_COSTS, and SUP_REL, respectively. In Table 3, the time pressure impositions were measured by time loss in days. Disruptions within the supply chain were measured, as well as the number of disruptions within a period. Obtained from a review of literature, supplier relationships indices were changes in trust levels, relationship loyalty or strength, and commitment; and were measured by changes in the supplier relationship. These indices were used to transform the variables of trust, relationship loyalty or strength, and commitment into a single compounded variable (identified as SUP_REL). The number of changes that occurred in the relationship was recorded. Efficiency was measured by monthly percent change in inventory produced. Productivity was measured by productivity changes within a month, and economic transaction costs are the cost of sales differences within a given month.

Exploration of the data distribution revealed significant differences in the descriptive statistical information, including the confidence interval, variance and interquartile range values. In Table 4, an initial exploration of the research variables is displayed. Appropriate measures were taken to test the following assumptions of multiple linear regressions.

Table 3. *Independent and Dependent Variable Indices*

Variable	Variable identifier	How measured
Disruption	DISRUPT	Number of disruptions
Time pressure	TIME_PRESS	Time loss in days
Efficiency	EFF_CH	Monthly change in inventory produced
Productivity	PROD_CH	Monthly change in productivity
Economic costs	ECON_COSTS	Monthly differences in cost of sales
Supplier relationships	SUP_REL	Changes in supplier relationships

Note. DISRUPT = disruption, TIME_PRESS = time pressure, EFF_CH = efficiency, PROD_CH = productivity, ECON_COSTS = economic costs, and SUP_REL = supplier relationships.

Assumptions

Accurate assumptions or predictions must be formulated in order to attest to normal distribution. Appropriate statistical tests were essential in order to test assumptions and make appropriate predictions. The different levels of measurement required different statistical techniques. Parametric techniques were used in this quantitative analysis with variables that were measured by ratios or intervals, using descriptive, associational and inferential statistics. Visual or graphical displays seen in histograms or frequency diagrams were used to illustrate normal distribution of one or

more variables. Relationships between two variables were demonstrated in scatterplots graphically assessing normality, linearity and homoscedasticity (Field, 2009).

Table 4. *Descriptive Statistics for the Independent and Dependent Study Variables (*N = *12)*

Variable	Min.	Max.	*M*	*SD*	Skewness std. error
DISRUPT	3.0	91.0	35.667	26.0501	.868
TIME_PRESS	17.0	88.9	50.083	18.9668	.144
EFF_CH	-.2	1.5	.550	.5649	.458
PROD_CH	813.7	126,186.9	34,714.767	37,912.3093	1.504
ECON_COSTS	453.5	134,377.6	31,908.000	39,018.9634	1.915
SUP_REL	0.0	3.0	2.170	1.0300	-.988

Note. *N* = 12 and standard error = .637. DISRUPT = disruptions, TIME_PRESS = time pressure, EFF_CH = efficiency, PROD_CH = productivity, ECON_COSTS = economic costs, and SUP_REL = supplier relationships.

Field (2009) asserted parametric tests are required to satisfy four assumptions: normal distribution of data, homogeneity of variance, data are free of dependence among respondents, and the data that are measured at interval level. Comparatively, Bryman and

Cramer (2001) argued that it is only suitable to use parametric tests when the data meet the following three conditions: first, the level or scale of measurement is of equal interval or ratio scaling, that is, more than ordinal; second, the distribution of the population scores is normal; and, third, the variances of both variables are equal or homogeneous.

Skewness and Kurtosis

Skewness is represented by the extent to which a graph of a distribution was symmetrical and kurtosis was measured at how flat or pointy the graph of a distribution was based on Vogt's definition of skewness and kurtosis (Vogt, 2007). Abrams (2002) noted that, statistical programs, such as SPSS, will calculate the skewness and kurtosis for each variable; an extreme value for either one would tell you that the data are not normally distributed. Skewness is a measure of how symmetrical the data are; a skewed variable is one whose mean is not in the middle of the distribution (i.e., the mean and median are quite different). According to Abrams, kurtosis has to do with how peaked the distribution is, either too peaked or too flat. Abrams noted that data are homoscedastic if the residuals plot is the same width for all values of the predicted dependent variable. The independent variable disruption, and dependent variables efficiency, productivity, economic costs, and supplier relationships were transformed using either a square root or natural log function due to the highly skewed nature of the data distribution (see Appendix A; Tabachnick & Fidell, 2012).

Normality

Normality can be determined through a graphic or visual inspection of data distributions between independent and dependent variables. The scatterplots or

histograms demonstrated if the data were clustered more or less symmetrically about a central value with values toward the extremes allowing the researcher to reasonably assume normal distribution of data (Kault, 2003).

Homoscedasticity

According to Garson (2009), homoscedasticitiy assures that residuals are dispersed randomly throughout the range of estimated dependents. The variance of residual error should be constant for all values of the independents. Garson noted that "lack of homoscedasticity may mean: (a) there is an interaction effect between a measured independent variable and an unmeasured independent variable not in the model, or (b) that some independent variables are skewed while others are not" (p. 20).

Multicollinearity and Residuals

Multicollinearity refers to excessive correlation of the predictor variables (time pressure, disruptions) and was tested using tolerances and VIF tests (Garson, 2009). Residuals, according to Garson (2009), are the differences between the observed values and those predicted by the regression equation. Generally, in statistical procedures, residuals signify error and are primarily used to point out heteroscedasticity, an example being increased error resulting from increases in observed Y values; to pinpoint significant cases with outliers; and to identify additional patterns of error as the error related to a particular range of X variables (Garson, 2009). Standardized residuals are ones that have been constrained to a mean of zero and a standard deviation of 1. A rule of thumb is that outliers are points whose standardized residual is greater than 3.300 (corresponding to the .001 alpha level; Garson, 2009). Cooper and Schindler (2011)

stated standardized residuals should fall between 2 and -2, are randomly distributed about zero, and show no discernible pattern.

Part 1. Predictor Variables Time Pressure, Disruption: Dependent Variables Efficiency and Production

Research Questions

The four research questions follow:

1. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and supply chain efficiency and production?

2. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and economic transaction costs?

3. Is there a predictive relationship between supply chain efficiency and production, and supplier relationships?

4. Is there a predictive relationship between economic transaction costs and supplier relationships?

Hypotheses

The corresponding hypotheses relative to the research questions follow:

$H1_0$. The number of supply chain disruptions and time pressure impositions do not predict supply chain efficiency and production.

$H1_a$. The number of supply chain disruptions and time pressure impositions predict supply chain efficiency and production.

$H2_0$. The number of supply chain disruptions and time pressure impositions do not predict economic costs.

$H2_a$. The number of supply chain disruptions and time pressure impositions predict economic costs.

$H3_0$. Supply chain efficiency and production do not predict supplier relationships.

$H3_a$. Supply chain efficiency and production predict supplier relationships.

$H4_0$. Economic transaction costs do not predict supplier relationships.

$H4_a$. Economic transaction costs predict supplier relationships.

The first linear regression model summary relative to Research Question 1 is shown in Table 5. The regression utilized time pressure and disruptions as predictors and the probability of a linear relationship was not significant as a predictor of changes in efficiency ($F(2, 9) = .120$, ($p = .888$. $R^2 = .026$).

Table 5. *Research Question 1 Regression Model Summary*[b]
Dependent Variable, EFF_CH

Category	Statistic
Model	1.0000
R	.1610[a]
R square	.0260
Adjusted *R* square	-.1900
Std. error of estimate	.3676

Note. EFF_CH = efficiency.
[a.] Predictors: (Constant), TIME_PRESS = time pressure and DISRUPT = disruptions.
[b.] Dependent Variable: EFF_CH = efficiency.

Significance is indicated when $p < .050$. Time pressure and disruptions accounted for only 2.600% of the variance in time pressure and disruptions influencing percent changes in levels of efficiency. In Model 1, the adjusted R^2 is negative, which indicated the mean data value was able to provide a better indication of fit to predicting outcomes in the analysis of time pressure and disruptions predicting change in efficiency. The mean data value supported lack of good fit. The standard error of the estimate (SEE) is also larger than the R^2 indicating greater estimation error. Ideally, increases in R^2 will decrease SEE demonstrating a better fit with less estimation error (Field, 2009).

The ANOVA summary shown in Table 6 presents the sums of squares and the degrees of freedom associated with each. The regression sum of squares indicated that .033 deviations about the mean are explained. The residual sum of squares indicated that a larger 1.216 deviation about the mean was unexplained by the predictors. The regression degrees of freedom represented the number of predictors, whereas the residual degrees of freedom was the number of parameters n - k - 1. The *F* ratio was of greatest importance is the ANOVA summary. A small *F* ratio indicated the null hypothesis may be accepted, rejecting the alternative hypothesis. The result of a large *F* ratio indicates the null hypothesis may be rejected and the alternative hypothesis accepted. Significance levels are shown when $p < .050$. The ANOVA calculations shown in Table 6 demonstrated the model has no significant predictive value, there is a small *F* ratio of .126. Time pressure and disruptions do not predict changes in efficiency. The overall

significance value of $F(2, 9) = .120$, $p = .888$, which is greater than an acceptable predictive value of $p < .050$.

Table 6. *Research Question 1 ANOVA*[a] *Analysis Summary for Dependent Variable, EFF_CH*

Model		Sum of squares	*df*	*M* square	*F*	Sig.
1	Regression	0.033	2	.016	.126	.888[b]
	Residual	1.216	9	.135		
	Total	1.249	11			

Note. DISRUPT = disruptions, TIME_PRESS = time pressure, and EFF_CH = efficiency.
[a.] Predictors: (Constant), TIME_PRESS, DISRUPT.
[b.] Dependent variable: EFF_CH.

In the coefficients of regression summary presented in Table 7, the standardized coefficients Beta (β) value is the key element to interpret. There are two independent variables: DISRUPT and TIME_PRESS. The β value shows that each time supply chains disruptions increase by one, efficiency will decrease by .036, keeping in mind that time pressure impositions are held constant. The same may be said for time pressure impositions. As time pressure changes by one, efficiency will change, increasing by a small value of .157 while disruptions are held constant.

Table 7. *Research Question 1 Coefficients of Regression Summary of Dependent Variable, EFF_CH*

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta (β)	*t*	Sig.
1	(Constant)	.753	.414		1.819	.102
	DISRUPT	-.005	.049	-.036	-.108	.916
	TIME_PRESS	.003	.006	.157	.478	.644

Note. Collinearity statistics: Tolerance = 1.000. DISRUPT = disruptions and TIME_PRESS = time pressure.

The coefficient linear regression summary shown in Table 8 presents no increase in the variance of the regression coefficient, which would indicate multicollinearity, a correlation in the predictor variables to other predictors in the model (Cooper & Schindler, 2011). The VIF has a value of 1 indicating that the predictor variables are not linearly related to each other, a good sign in multiple regression (Fields, 2009).

The histogram of standardized residuals is graphically presented in Figure 2. The transformed variables present a normal distribution of data with most ranging from -1.5 to + 1.5, respectively.

Table 8. *Research Question 1 Variance Inflation Analysis Summary With Dependent Variable, EFF_CH*

Model	Coefficients[a]	Collinearity statistics VIF
1	(Constant)	
	DISRUPT	1.000
	TIME_PRESS	1.000

Note. VIF = variance inflation factor, DISRUPT = disruptions, TIME_PRESS = time pressure, and EFF_CH = efficiency.

[a.] Dependent variable: EFF_CH.

In Figure 4, the assumptions of linearity and homoscedasticity were assessed by an examination of the scatterplot of the predicted values of the dependent variable, efficiency change, against the residuals. According to Kahane (2001), the correlation coefficient is instrumental in evaluating dependent variable and to depict the positioning of data points on the scatterplot. A random pattern is depicted in the scatterplot indicating the fulfillment of linearity and homoscedasticity.

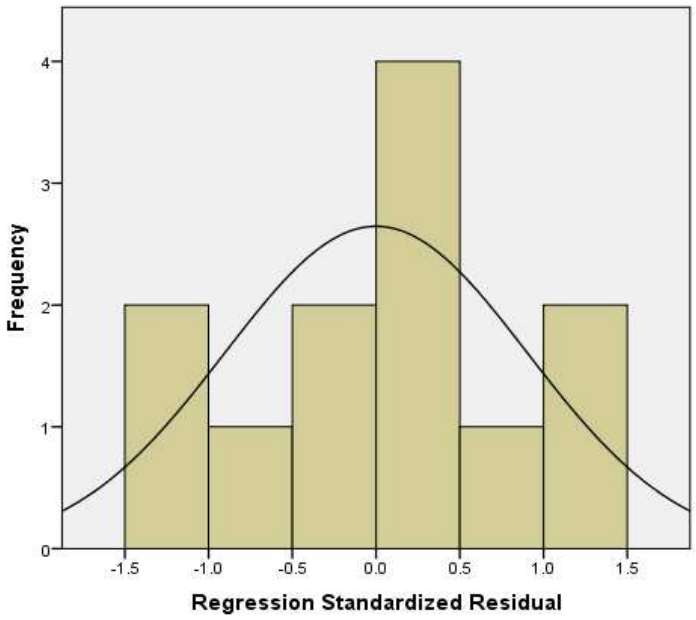

Figure 2. Research Question 1 histogram of dependent variable, DV:EFF_CH. EFF_CH = efficiency. M = 8.33E-17, SD = 0.905, N = 12.

A second linear regression was performed relative to Research Question 1. The regression model summary is shown Table 9. The regression utilized time pressure and disruptions as predictors of a probable linear relationship with changes in supply chain productivity. The probability indicator was significant for time pressure and disruptions as predictors of changes in productivity ($F(2, 9) = .120$, ($p = .051$. $R^2 = .483$).

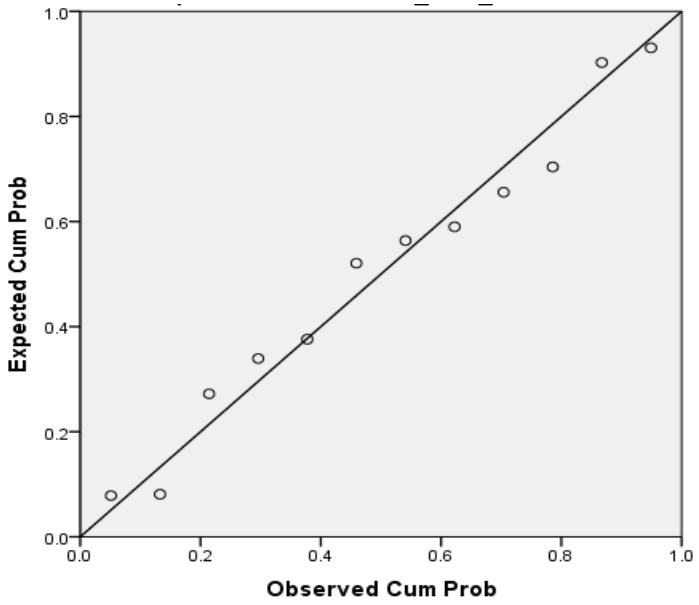

Figure 3. Research Question 1 Normal P-P plot of regression standardized residual for dependent variable, EFF_CH. and EFF_CH = efficiency.

Time pressure and disruptions accounted for 48.300% of the variance in time pressure and disruptions influencing percent changes in levels of productivity. In contrast to the first regression where the adjusted R^2 is negative, the R^2 in Model 2 is positive. The increase in the adjusted R^2 inversely decreased the SEE, thereby presenting a better fit of the model (Field, 2009).

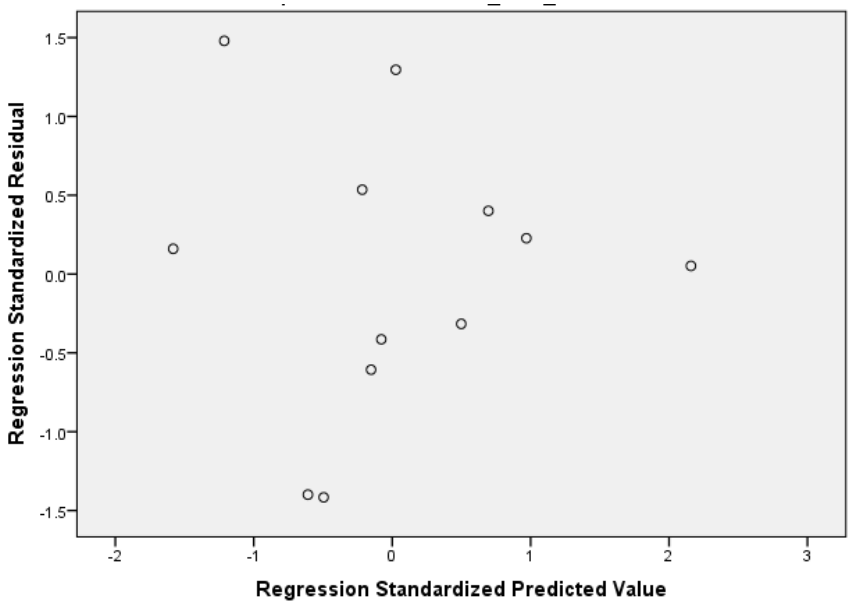

Figure 4. Scatterplot of dependent variable, EFF_CH. EFF_CH = efficiency.

The regression sum of squares value presented in Table 10 included an explanation offer of 11.33 deviations about the mean. Noteworthy here is the difference between the regression sum of squares for the predictors in Model 1, time pressure and disruptions; and efficiency, .33 and the sum of squares for the predictors in Model 2, time pressure and disruption, linked to productivity change 11.33. The predictive nature of time pressure and disruptions correlating to changes in productivity is stronger.

Table 9. *Research Question 1 Regression Model Summary*[b] *of Dependent Variable, PROD_CH*

Category	Statistic
Model	1.0000
R	.6950[a]
R square	.4830
Adjusted *R* square	.3680
Std. error of estimate	1.1611

Note. PROD_CH = productivity, EFF_CH = efficiency, TIME_PRESS = time pressure and DISRUPT = disruptions.
[a.] Predictors: (Constant), TIME_PRESS and DISRUPT.
[b.] Dependent variable: EFF_CH.

The ANOVA calculations shown in Table 10 demonstrate the model has a significant predictive value; the *F* ratio is large at 4.20. Based upon an interpretation of the ANOVA summary, the conclusion is that time pressure and disruptions are moderately viable predictors to changes in productivity. The overall significance value of $F(2, 9)$ has an acceptable predictive value of ($p = .051$) that just meets the acceptable value.

Table 10. *ANOVA*[a] *Analysis Summary for Dependent Variable, PROD_CH*

Model	Sum of squares	*df*	*M* square	*F*	Sig.
1					
Regression	11.325	2	5.663	4.200	.051[b]
Residual	12.133	9	1.348		
All	23.459	11			

Note. DISRUPT = disruptions, TIME_PRESS = time pressure, and PROD_CH = productivity.
[a.] Dependent variable: PROD_CH.
[b.] Predictors: (Constant), TIME_PRESS, DISRUPT.

The β values for the two independent variables, DISRUPT and TIME_PRESS, are displayed in Table 11 demonstrate that each time supply chains disruptions increase by 1, productivity changes will increase by .61, keeping in mind that time pressure impositions are held constant. Comparatively, a time pressure change of 1 will change productivity by a value of .34, while disruptions are held constant.

In Table 12, the VIF again has a value of 1, as did the first linear regression in Model 1. This signifies the predictor variables are not linearly multicollinear, related to each other.

Table 11. *Coefficients of Regression Model for Dependent Variable, PROD_CH*

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta (β)	*t*	Sig.
1	(Constant)	6.262	1.308		4.787	.001
	DISRUPT	.392	.1549	.609	2.540	.032
	TIME_PRESS	.026	.018	.338	1.408	.193

Note. Collinearity statistics: Tolerance = 1.000. PROD_CH = productivity, DISRUPT = disruptions, and TIME_PRESS = time pressure.

The transformed variables in Figure 5 depict a graph that is skewed to the right, but the level of skewness remains below the acceptable level of 3. Multivariate normality is fulfilled as shown in Figure 6 as the data points are clustered towards the diagonal line.

Table 12. *Research Question 1 Variance Inflation Summary for Dependent Variable, PROD_CH*

Model	Coefficients[a]	Collinearity statistics VIF
1	(Constant)	
	DISRUPT	1.000
	TIME_PRESS	1.000

Note. VIF = variance inflation factor, PROD_CH = productivity, TIME_PRESS = time pressure, and DISRUPT = disruptions.
[a.] Dependent variable: PROD_CH.

Presented in Figure 7 are the assumptions of linearity and homoscedasticity which were assessed by an examination of the scatterplot of the predicted values of the dependent variable, productivity change, against the residuals. Throughout the length of plot, the data points were not evenly dispersed.

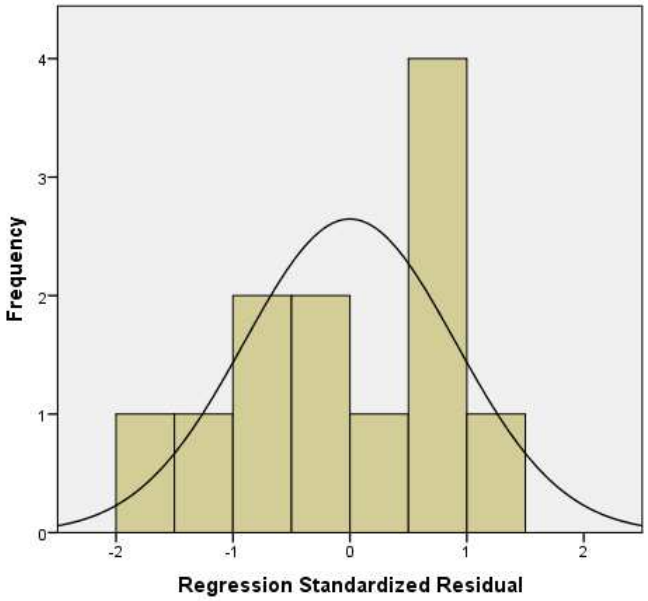

Figure 5. Research Question 1 histogram for dependent variable, PROD_CH. PROD_CH = productivity. M = 2.503E-16, SD = 0.905, and N = 12.

The data points did in fact form a distinctive funnel shape pattern indicating a violation of the assumption of homoscedasticity. The visual depiction of data indicates some heteroscedasticity exists. Transforming variables will generally address heteroscedasticity. Because the variables were already transformed, this slight

heteroscedasticity, according to Tabachnick and Fidell (2012), will likely have little impact on the significance.

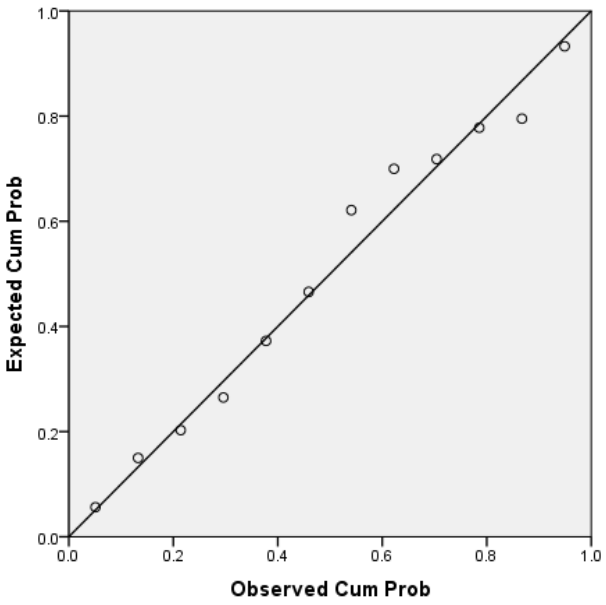

Figure 6. Normal P-P plot of regression standardized residual for dependent variable = PROD_CH. PROD_CH = productivity.

Part 2. Predictor Variables Time Pressure, Disruption: Dependent Variable Economic Transaction Costs

Research Questions

The four research questions follow:

1. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and supply chain efficiency and production?

2. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and economic transaction costs?

3. Is there a predictive relationship between supply chain efficiency and production, and supplier relationships?

4. Is there a predictive relationship between economic transaction costs and supplier relationships?

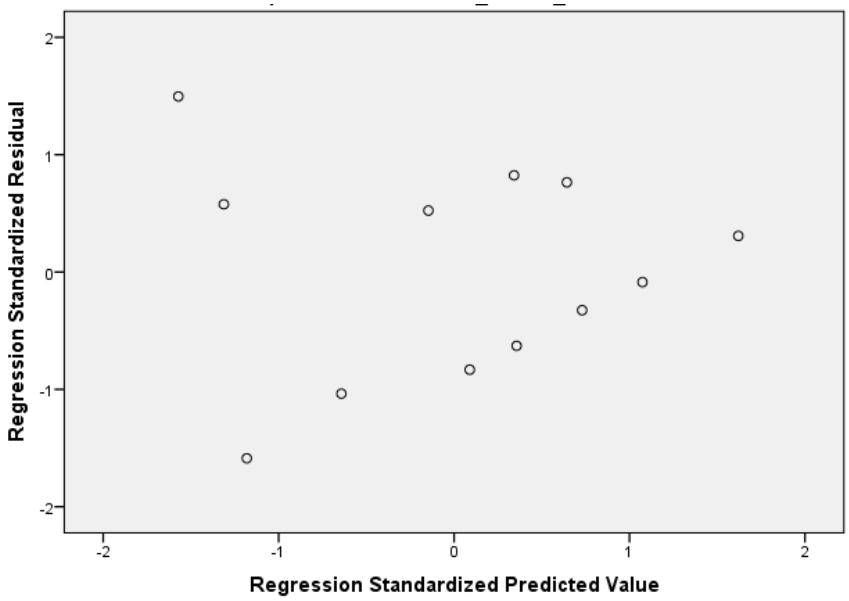

Figure 7. Scatterplot for dependent variable, PROD_CH.
PROD_CH = productivity.

Hypotheses

The corresponding hypotheses relative the research questions are as follows:

$H1_0$. The number of supply chain disruptions and time pressure impositions do not predict supply chain efficiency and production.

$H1_a$. The number of supply chain disruptions and time pressure impositions predict supply chain efficiency and production.

$H2_0$. The number of supply chain disruptions and time pressure impositions do not predict economic costs.

$H2_a$. The number of supply chain disruptions and time pressure impositions predict economic costs.

$H3_0$. Supply chain efficiency and production do not predict supplier relationships.

$H3_a$. Supply chain efficiency and production predict supplier relationships.

$H4_0$. Economic transaction costs do not predict supplier relationships.

$H4_a$. Economic transaction costs predict supplier relationships.

One linear regression was performed relative to research question 2. In the regression model summary shown below in Table 13 time pressure and disruptions are used as predictors of a probable linear relationship of changes in economic transaction costs. Here ($F(2, 9) = .12$, ($p = .132$. $R^2 = .363$). Time pressure and disruptions accounted for 36.3% of the variance in time pressure and disruptions influencing changes in economic costs.

The regression sum of squares present in the ANOVA summary shown in Table 14 indicated that 9.67 deviations about the mean are explained. The residual sum of squares indicated consistently that 17 deviations about the mean are unexplained by the predictors. The ANOVA calculations demonstrated the model had a marginally significant predictive value, there is *F* ratio of 2.56.

Table 13. *Research Question 2 Regression Model Summary for Dependent Variable, ECON_COSTS*

Category	Statistic
Model	1.0000
R	.6020[a]
R square	.3630
Adjusted *R* square	.2210
Std. error of estimate	1.3748

Note. ECON_COSTS = efficiency, TIME_PRESS = time pressure, and DISRUPT = disruptions.
[a.] Predictors: (Constant), TIME_PRESS and DISRUPT.
[b.] Dependent variable: ECON_COSTS.

The ANOVA, coefficients of regression, and coefficient linear regression summaries were examined and are presented in Tables 14, 15, and 16, respectively. The essential *F* ratio is sizable enough to make the determination to reject the null hypothesis in acceptance of the alternative. The ANOVA calculations shown in Table 14 demonstrate the model has significant predictive value. Interpretation of the key β value in Table 15 shows that each time supply chains disruptions and time pressure impositions increase by 1, economic transaction costs will decrease by .556 and .234, anticipating that supply chain disruptions and time pressure impositions are held constant. The VIF in

Table 16 has a value of 1, indicating that the predictor variables are not linearly related to each other, no multicollinearity, is present.

Table 14. *Research Question 2 ANOVA*[a] *Analysis Summary for Dependent Variable, ECON_COSTS*

Model		Sum of squares	*df*	*M* square	*F*	Sig.
1	Regression	9.676	2	4.838	2.560	.132[b]
	Residual	17.010	9	1.890		
	All	26.686	11			

Note. ECON_COSTS = efficiency, TIME_PRESS = time pressure, and DISRUPT = disruptions.
[a.] Dependent variable: ECON_COSTS.
[b.] Predictors: (Constant), TIME_PRESS, DISRUPT.

In the histogram of standardized residuals shown in Figure 8, the data appear to be very slightly skewed to the left, negatively skewed. The level of skewness is below the acceptable level of 3. The points on the *p* plot in Figure 9 are clustered rather snugly along the diagonal line thereby meeting the assumption of multivariate normality. The scatterplot of standardized residuals shown in Figure 10 is not in a random pattern demonstrating homoscedasticity was again violated. Heteroscedasticity persists although the variables, obtained from nonrandomized data collection, were transformed. This may be attributed to the nonrandomly selected data.

Table 15. *Research Question 2 Coefficients*[a] *of Regression Model for Dependent Variable, ECON_COSTS*

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta (β)	*t*	Sig.
1	(Constant)	6.480	1.549		4.184	.002
	DISRUPT	.382	.183	.556	2.089	.066
	TIME_PRESS	.019	.022	.234	.879	.402

Note. Collinearity statistics: Tolerance = 1.000. ECON_COSTS = efficiency, DISRUPT = disruptions, and TIME_PRESS = pressure.
[a.] Coefficients.

Part 3. Predictor Variables Efficiency, Production: Dependent Variable Supplier Relationships

Research Questions

The four research questions follow:

1. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and supply chain efficiency and production?

2. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and economic transaction costs?

3. Is there a predictive relationship between supply chain efficiency and production, and supplier relationships?

4. Is there a predictive relationship between economic transaction costs and supplier relationships?

Table 16. *Research Question 2 Variance Inflation Summary for Dependent Variable, ECON_COSTS*

Model	Coefficients[a]	Collinearity statistics VIF
1	(Constant)	
	DISRUPT	1.000
	TIME_PRESS	1.000

Note. VIF = variance inflation factor, ECON_COSTS = economic costs, DISRUPT = time pressure, and DISRUPT = disruptions.
[a.] Dependent variable: ECON_COSTS.

Hypotheses

The corresponding hypotheses relative the research questions are as follows:

$H1_0$: The number of supply chain disruptions and time pressure impositions do not predict supply chain efficiency and production.

$H1_a$: The number of supply chain disruptions and time pressure impositions predict supply chain efficiency and production.

$H2_0$: The number of supply chain disruptions and time pressure impositions do not predict economic costs.

$H2_a$: The number of supply chain disruptions and time pressure impositions predict economic costs.

$H3_0$: Supply chain efficiency and production do not predict supplier relationships.

$H3_a$: Supply chain efficiency and production predict supplier relationships.

$H4_0$: Economic transaction costs do not predict supplier relationships.

$H4_a$: Economic transaction costs predict supplier relationships.

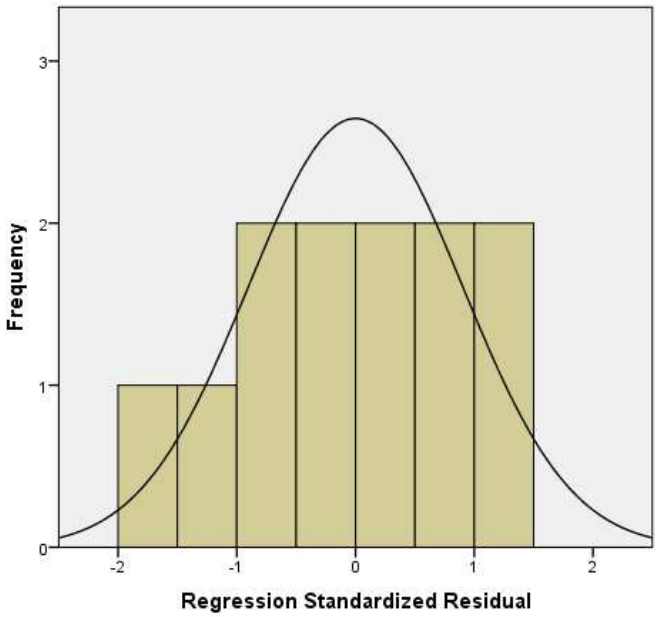

Figure 8. Histogram of dependent variable, ECON_COSTS. ECON_COSTS = economic costs differences monthly. M = 2.91-16, SD = 0.905, N = 12.

A single linear regression was conducted relative to Research Question 3 (see Table 17). This regression utilized productivity change and efficiency change as predictors of a probable effect on supplier relationships. Significantly, productivity change and efficiency change predicted changes in supplier relationships, ($F(2, 9) = .120$, $p = .045$. $R^2 = .396$). Significance again is indicated as $p < .050$. The SEE is not meaningfully larger than the R, the difference is .060, indicating the estimation error was minimized.

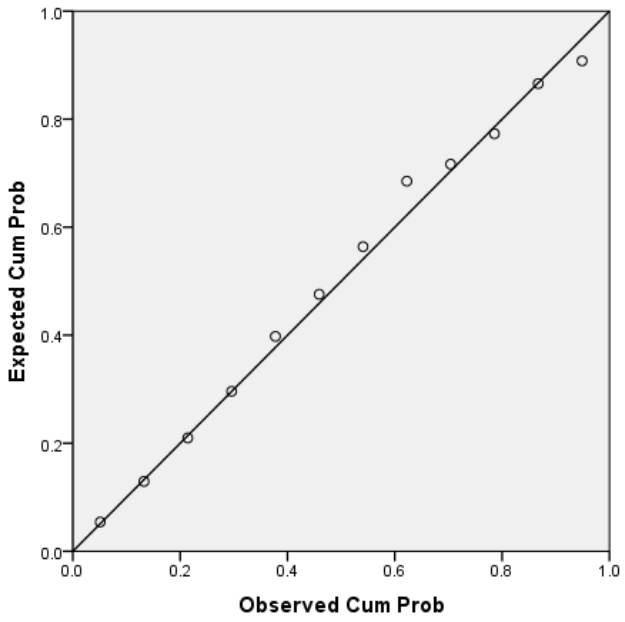

Figure 9. Normal P-P plot of regression standardized residual for dependent variable, ECON_COSTS. ECON_COSTS = economic costs.

In stark contrast to the regression sum of squares presented in connection to research question 2, the regression sum of squares present in the ANOVA summary (see Table 18) indicates a very small value of where 1.23 deviations about the mean are explained with a residual sum of squares indicator of 1.87 unexplained deviations about the mean. The ANOVA values for Research Question 2, where there was a marginal significance, had regression and residual values of 9.76 and 17.00. The ANOVA calculations demonstrate the model has a significant predictive value.

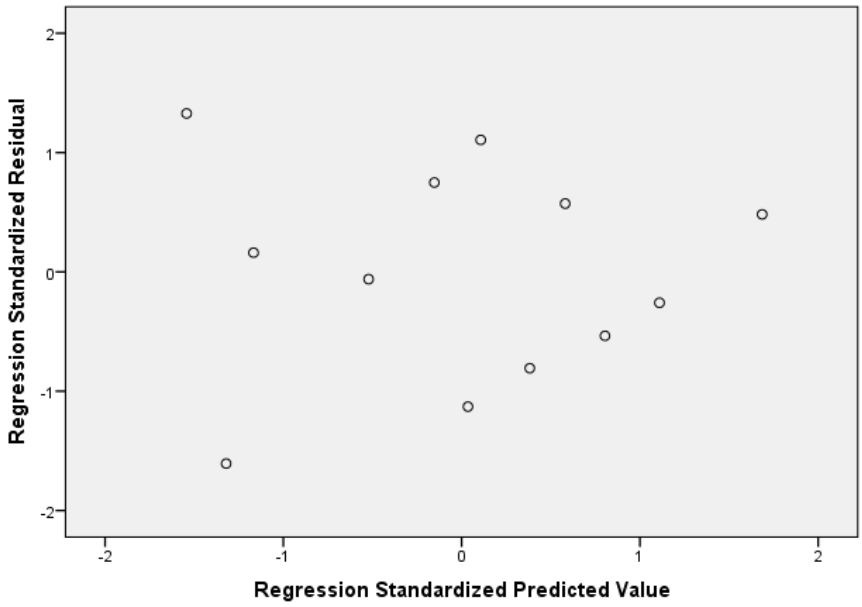

Figure 10. Scatterplot for dependent variable, ECON_COSTS.
ECON_COSTS = economic costs.

It was noted in the ANOVA summary that productivity change predicted changes in supplier relationships whereas efficiency change did not predict changes in supplier relationships. Nonetheless, the essential *F* ratio for the multivariate analysis is ample enough to make the determination to reject the null hypothesis and accept the alternative hypothesis. The ANOVA calculations (see Table 18) demonstrate the model has significant predictive value. Interpretation of the displayed β value in Table 19 illustrates a constant significance where $\beta = .610$ and $p = .045$.

Table 17. *Research Question 3 Regression Model*[b] *Summary for Dependent Variable, SUP_REL*

Category	Statistic
Model	1.0000
R	.6300[a]
R square	.3960
Adjusted *R* square	.2620
Std. error of estimate	.4563

Note. PROD_CH = productivity, SUP_REL = supplier relationships, and EFF_CH = efficiency.
[a.] Predictors: (Constant), PROD_CH, EFF_CH.
[b.] Dependent variable: SUP_REL.

Assumptions of multicollinearity are met. This is indicated by the VIF value of 1 shown in Table 20.

Table 18. *Research Question 3 ANOVA[a] Analysis Summary for Dependent Variable: SUP_REL*

	Model	Sum of squares	*df*	*M* square	*F*	Sig.
1	Regression	1.231	2	.615	2.956	.103[b]
	Residual	1.874	9	.208		
	Total	3.105	11			

Note. EFF_CH = efficiency, PROD_CH = productivity, and SUP_REL = supplier relationships.
[a.] Dependent variable: SUP_REL.
[b.] Predictors: (Constant), PROD_CH and EFF_CH.

The histogram shown in Figure 11 is slightly skewed to the left, but well below the acceptable level of 3. The multivariate normality assumption and the assumption of homoscedasticity were met as indicated by the points clustered along the diagonal line in Figure 12 and the random pattern depicted in Figure 13.

Part 4. Predictor Variable Economic Transaction Costs: Dependent Variable Supplier Relationships

Research Questions

The four research questions follow:

1. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and supply chain efficiency and production?

2. Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and economic transaction costs?

3. Is there a predictive relationship between supply chain efficiency and production, and supplier relationships?

4. Is there a predictive relationship between economic transaction costs and supplier relationships?

Table 19. *Research Question 3 Coefficients*[a] *of Regression Model for Dependent Variable, SUP_REL*

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta (β)	*t*	Sig.
1	(Constant)	-.550	1.026		-.536	.605
	EFF_CH	.368	.410	.234	.899	.392
	PROD_CH	.221	.095	.607	2.332	.045

Note. Collinearity statistics: Tolerance = 0.992. SUP_REL = supplier relationships, EFF_CH = efficiency, and PROD_CH = productivity change.

Hypotheses

The corresponding hypotheses relative the research questions are as follows:

$H1_0$. The number of supply chain disruptions and time pressure impositions do not predict supply chain efficiency and production.

$H1_a$. The number of supply chain disruptions and time pressure impositions predict supply chain efficiency and production.

$H2_0$. The number of supply chain disruptions and time pressure impositions do not predict economic costs.

$H2_a$. The number of supply chain disruptions and time pressure impositions predict economic costs.

$H3_0$. Supply chain efficiency and production do not predict supplier relationships.

$H3_a$. Supply chain efficiency and production predict supplier relationships.

$H4_0$. Economic transaction costs do not predict supplier relationships.

$H4_a$. Economic transaction costs predict supplier relationships.

Table 20. *Research Question 3 Variance Inflation Summary for Dependent Variable: SUP_REL*

Model	Coefficients[a]	Collinearity statistics VIF
1	(Constant)	
	EFF_CH	1.000
	PROD_CH	1.000

Note. VIF = variance inflation factor, EFF_CH = efficiency, PROD_CH = productivity, and SUP_REL = supplier relationships.
[a.] Dependent variable: SUP_REL.

The final linear regression model summary relative to Research Question 4 is shown in Table 21. Economic transaction costs were used as the predictor in this linear regression. The probability of a linear relationship was significant as a predictor of changes in supplier relationships, ($F(2, 9) = .120$, ($p = .006$. $R^2 = .549$).

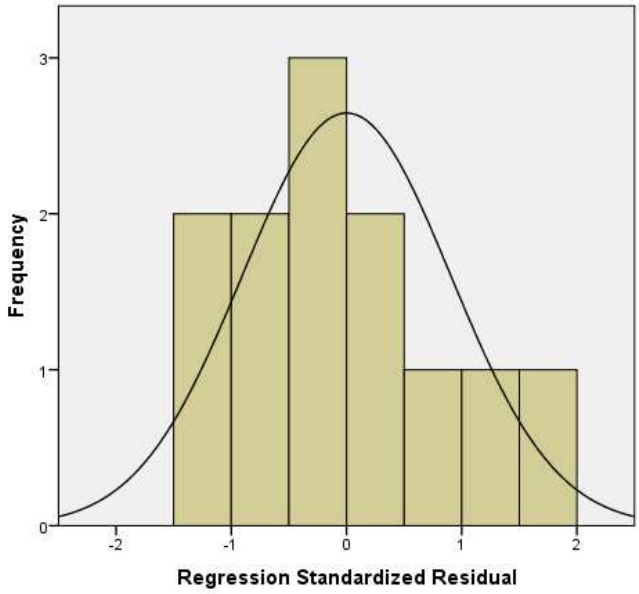

Figure 11. Histogram for dependent variable, which is SUP_REL. SUPP_REL = supplier relationships. M = 6.73E-16, SD = 0.905, and N = 12.

Significance is strongly indicated as $p < .050$. Economic transaction costs accounted for 54.900% of the variance of economic transaction costs influencing percent changes in supplier relationships. The mean data value supports good fit of the model. The SEE is not as large as the $R,^2$ which would indicate a great deal of estimation error (Field, 2009).

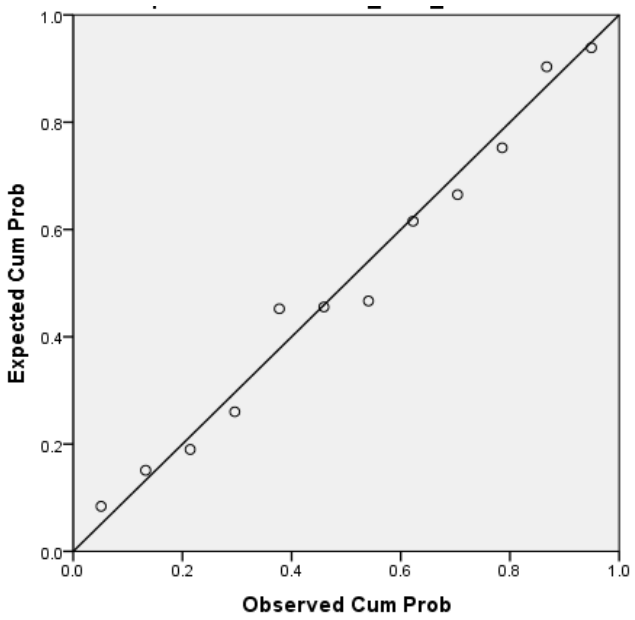

Figure 12. Normal P-P plot of regression standardized residual for dependent variable, SUP_REL. SUP_REL = supplier relationships.

The ANOVA summary in Table 22 presents a regression sum of squares that explains 1.7 01 deviations about the mean. Comparatively, the residual sum of squares indicates that 1.401 deviations about the mean are unexplained by the predictor. The values are the regression sum of squares and the residual sum of squares are approximate to each other due the 1 degree of freedom. The regression degrees of freedom represent the number of predictors, whereas the residual degrees of freedom is the number of parameters n - k - 1. The decisive and large *F* ratio of 12.163 indicates the null hypothesis may be rejected and the alternative hypothesis accepted.

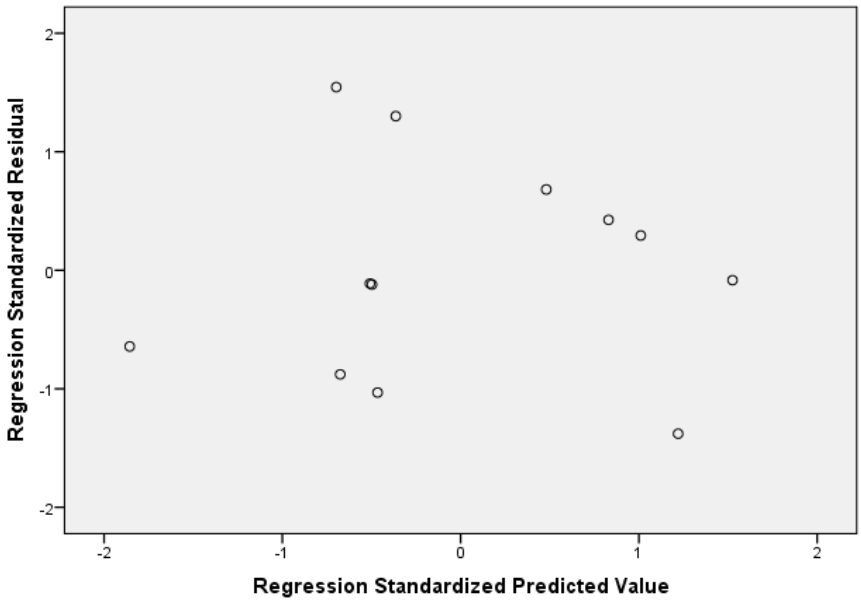

Figure 13. Scatterplot for dependent variable, SUP_REL. SUP_REL = supplier relationships.

The ANOVA calculations shown in Table 22 demonstrate the model has a strong significant predictive value. Economic transaction costs may essentially predict changes in supplier relationships.

Interpretation of the critical β value presented in Table 23 demonstrates that each time economic costs change or increase by 1, supplier relationships will change by a probability of .741. The VIF (see Table 24) has a consistent value of 1, a good sign in multiple regression (Fields, 2009).

Table 21. *Research Question 4 Regression Model Summary*[b] *for Dependent Variable: SUP_REL*

Category	Statistic
Model	1.0000
R	.7410[a]
R square	.5490
Adjusted *R* square	.5040
Std. error of estimate	.3743

Note. ECON_COSTS = economic costs and SUP_REL = supplier relationships.
[a.] Predictors: (Constant), ECON_COSTS.
[b.] Dependent variable: SUP_REL.

Consistently, as in the previous regression analyses involving the transformed variable utilized in the previous regression analyses, the histogram of standardized residuals (see Figure 14) present a relatively normal distribution of data with most again ranging from -1.5 to +1.5 respectively. The clustered data points along the diagonal line in Figure 15 indicate normality was met and an examination of the random scatterplot pattern of residuals presented in Figure 16 indicates linearity and homoscedasticity assumptions are met.

Table 22. *Research Question 4 ANOVA*[a] *Analysis Summary for Dependent Variable, SUP_REL*

	Model	Sum of squares	*df*	*M* square	*F*	Sig.
1	Regression	1.704	1	1.704	12.163	.006[b]
	Residual	1.401	10	.140		
	Total	3.105	11			

Note. SUP_REL = supplier relationships and ECON_COSTS = economic costs.
[a.] Dependent variable: SUP_REL.
[b.] Predictors: (Constant), ECON_COSTS.

Data Analysis Summary

In Table 25, the number of annual supply chain disruptions in 2011 ranged from three to 91. The mean number of disruptions in 2011 was 36 (*SD* = 26). The number of time pressure impositions (as measured by time loss in days) in 2010 ranged from 17 to 89; the mean was 50 (*SD* = 19). Change in annual efficiency (averaged across the years 2011 and 2012) ranged from -.20 to 1.50; the mean change in efficiency was .55 (*SD* = .56). Change in annual productivity (averaged across the years 2011 and 2012) ranged from $814 million to $126,187 million; the mean change in annual productivity was $34,714 million (*SD* = $37,912 million). Change in economic costs (averaged across the years 2011 and 2012) ranged from $453 million to $134,378 million; the mean change in economic costs was $31,908 million (*SD* = $39,019). The number of changes in supplier relationships in 2011 ranged from 0 to 3; the mean was 2 (*SD* = 1.03).

Table 23. *Research Question 4 Coefficients*[a] *of Regression Model for Dependent Variable, SUP_REL*

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta (β)	*t*	Sig.
1	(Constant)	-.499	.701		-.711	.493
	ECON_COSTS	.253	.072	.741	3.487	.006

Note. ECON_COSTS = economic costs, and SUP_REL = supplier relationships.

In Appendix A, all, but the time pressure variable, were highly skewed. Therefore, the variables were transformed using either a square root or natural log function (Tabachnick & Fidell, 2012). The transformed variables were less skewed; skewness indices were all below the acceptable level of three (Kline, 2005). Thus, the transformed variables were used in subsequent regression procedures.

Table 24. *Research Question 4 Variance Inflation Summary for Dependent Variable, SUP_REL*

Model		Collinearity statistics	
		Tolerance	VIF
1	(Constant) ECON_COSTS	1.000	1.000

Note. VIF = variance inflation factor, ECON_COSTS = economic costs, and SUP_REL = supplier relationships.
[a.] Dependent variable: SUP_REL.

Predictors of Change in Efficiency and Productivity (Research Question 1)

The intent of the first research question was to determine whether the number of disruptions and time pressure impositions (as operationalized by time loss in days) would significantly predict a change in efficiency and productivity. Two linear regression procedures were conducted to answer the first research question. In the first procedure, the change in efficiency was regressed on number of disruptions and time pressure impositions. In the second procedure, change in productivity was regressed on the number of disruptions and time pressure impositions. The assumption of multivariate normality was assessed via a normal probability plot.

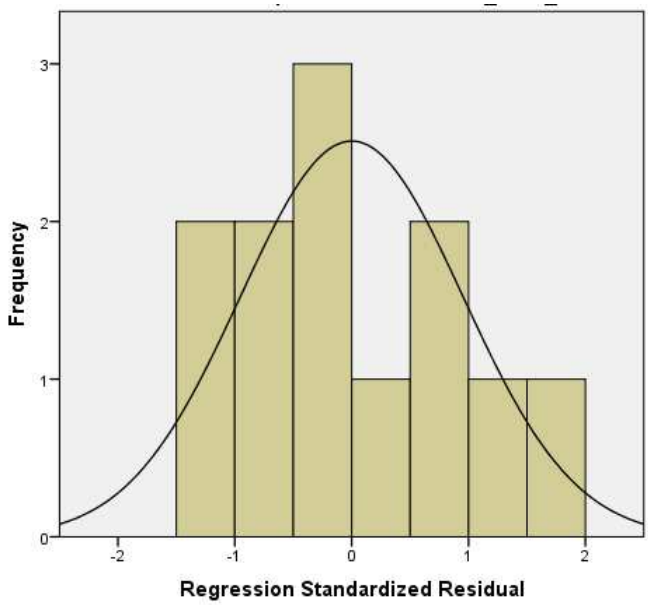

Figure 14. Histogram for dependent variable, SUP_REL. SUP_REL = supplemental relationships. *M*= 6.25E-17, *SD* = 0.953, and *N* = 12.

Field (2009) asserted this assumption is met when the points cluster towards the diagonal line. The assumptions of linearity and homoscedasticity were ascertained via a scatterplot of the standardized residuals by the standardized predicted values. Field stated that linearity and homoscedasticity are met when the scatterplot yields a random scatter. In the change of efficiency regression model, multivariate normality was fulfilled as the points were clustered towards the diagonal line. The scatterplot of residuals also yielded a random scatter; thus, linearity and homoscedasticity were also fulfilled.

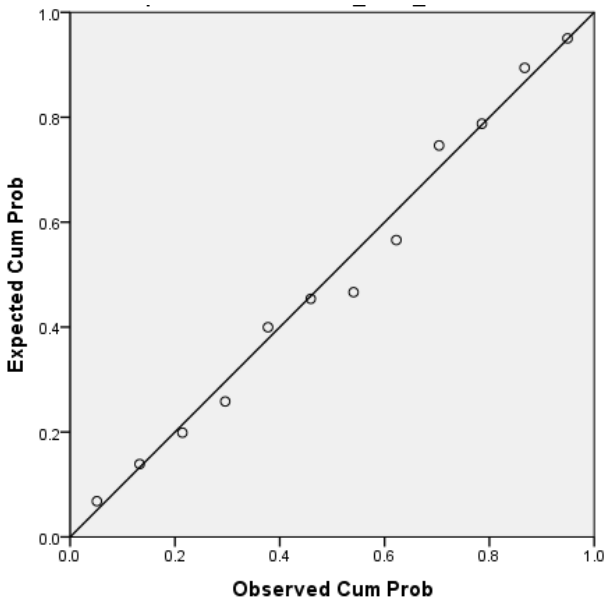

Figure 15. Normal P-P plot of regression standardized residual for dependent variable, SUP_REL. SUP_REL = supplemental relationships.

The findings in Table 26 revealed that number of disruptions and time pressure impositions did not significantly predict change in efficiency. In the change of productivity regression model, multivariate normality was fulfilled as the points were clustered towards the diagonal line. In Table 27, the number of disruptions significantly predicted the change in productivity, ($\beta = .61$, $p = .032$). The greater the number of disruptions, the greater was the change in productivity. Time pressure impositions did not significantly predict the change in productivity.

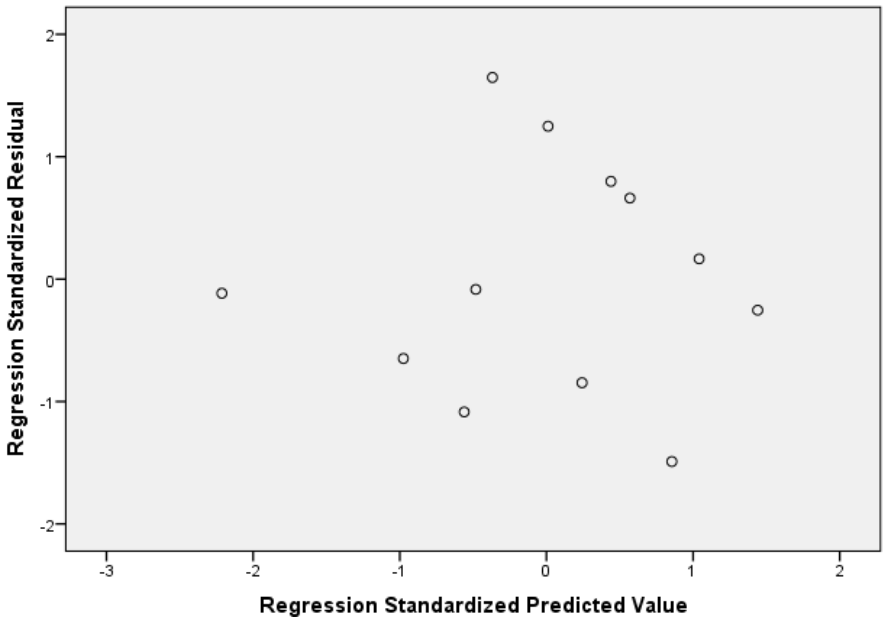

Figure 16. Scatterplot for dependent variable, SUP_REL. SUP_REL = supplemental relationships.

Predictors of Change in Economic Costs (Research Question 2)

The intent of the second research question was to determine whether number of disruptions and time pressure impositions (as operationalized by time loss in days) would significantly predict change in economic costs. One linear regression procedure was conducted to answer the second research question. Multivariate normality was fulfilled as the points were clustered towards the diagonal line. The scatterplot of residuals did not yield a random scatter. Heteroscedasticity was not corrected.

Table 25. *Descriptive Statistics for the Independent and Dependent Study Variables (*N = *12)*

Variables	*M*	*SD*	Skewness	Kurtosis
Number of disruptions in 2011	35.67	26.05	.87	.32
Time pressure loss in days in 2010	50.08	18.97	.14	.78
Change in efficiency in 2011 and 2012	.55	.56	.46	-.43
Change in productivity in 2011 and 2012	34,714.77	37,912.31	1.50	1.95
Economic costs in 2011 and 2012	31,908.00	39,018.96	1.92	3.86
Supplier relationships in 2011	2.17	1.03	-.99	-.02

Note. *SE* for skewness statistic = .64 and *SE* for kurtosis statistic = 1.23.

In Table 28, the number of disruptions marginally predicted the change in economic costs, ($\beta = .56$, $p = .066$) are displayed. The greater the number of disruptions, the greater was the change in economic costs. Time pressure impositions did not significantly predict the changed in economic costs.

Table 26. *Multiple Linear Regression Results for Efficiency change Model (*N = *12)*

Variables	B	SE	β	Sig.	TOL
Number of disruptions	-.01	.05	-.04	.916	1.00
Time pressure impositions	.00	.01	.16	.644	1.00
(Constant)	.75	.41		.102	

Note. TOL = tolerance. Overall model $F(2, 9) = .12$, $p = .888$. $R^2 = .026$.

Predictors of Change in Supplier Relationships (Research Question 3)

The intent of the third research question was to determine whether change in efficiency and productivity would significantly predict change in supplier relationships. One linear regression procedure was conducted to answer the third research question. Multivariate normality was fulfilled as the points were clustered towards the diagonal line. The scatterplot of residuals yielded a random scatter, thus indicating that the assumptions of linearity and homoscedasticity were met.

In Table 29, the change in productivity significantly predicted the change in supplier relationships, $\beta = .61$, $p = .045$. The greater the change in productivity, the greater was the change in supplier relationships. Change in efficiency did not significantly predict change in supplier relationships.

Table 27. *Multiple Linear Regression Results for the Change in Productivity Model (*N = *12)*

Variables	B	SE	β	Sig.	TOL
Number of disruptions	.39	.15	.61	.032	1.00
Time pressure impositions	.03	.02	.34	.193	1.00
(Constant)	6.26	1.31		.001	

Note. TOL = tolerance. Overall model $F(2, 9) = 4.20$, $p = .051$. $R^2 = .483$.

Relationship Between Change in Economic Costs and Change in Supplier Relationships (Research Question 4)

The fourth research question sought to determine whether change in economic costs would significantly predict changes in supplier relationships. One linear regression procedure was conducted to answer the fourth research question. Normality was fulfilled as the points were clustered towards the diagonal line. The scatterplot of residuals yielded a random scatter, thus indicating that the assumptions of linearity and homoscedasticity were met. In Table 30, the change in economic costs significantly predicted the change in supplier relationships, $\beta = .740$, $p = .006$. The greater the change in economic costs, the greater was the change in supplier relationships.

Table 28. *Multiple Linear Regression Results for the Change in Economic Costs Model (*N = *12)*

Variables	B	SE	β	Sig.	TOL
Number of disruptions	.38	.18	.56	.066	1.00
Time pressure impositions	.02	.02	.23	.402	1.00
(Constant)	6.48	1.54		.002	

Note. TOL = tolerance. Overall model $F(2, 9) = 2.56$, $p = .132$. $R^2 = .363$.

Chapter Summary

In summary, the quantitative analysis of data results for this research study is presented in Chapter 4. A brief overview of Chapter 4 defined the independent and dependent variables, presented the variable codes, and outlined the descriptive statistics. The assumptions of multiple linear regression analysis were presented to a brief overview of skewness and kurtosis, normality, homoscedasticity, multicollinearity and residuals. The analysis of data for each research question was offered and subsequently presented after the research questions and hypotheses were restated. In addition, the justification as to the transformation of independent and dependent variables was noted. The data analysis affirmed there are statistically significant correlations amid the dependent variables utilized in this research study attesting to several noteworthy relationships.

Table 29. *Multiple Linear Regression Results for the Change in Supplier Relationships Model (*N = *12)*

Variables	B	SE	β	Sig.	TOL
Change in efficiency	.37	.41	.23	.392	.99
Change in productivity	.22	.10	.61	.045	.99
(Constant)	-.55	1.03		.605	

Note. TOL = tolerance. Overall model $F(2, 9) = 2.96$, $p = .103$. $R^2 = .396$.

The findings submitted confirmed there is no statistically significant relationship between time pressure, disruptions and changes in efficiency, the number of disruptions significantly predicted the change in productivity while time pressure impositions did not significantly predict the change in productivity. The research findings attested to a marginal statistical significance in the number of disruptions and the change in economic costs, and no statistical significance in time pressure impositions and changes in economic costs. Changes in efficiency did not predict with any statistical significance changes in supplier relationships. A statistical significance was present that predicted changes in productivity and changes in economic costs were related to changes in supplier relationships.

Table 30. *Multiple Linear Regression Results for the Change in Supplier Relationships Model (*N = *12)*

Variables	B	SE	β	Sig.	TOL
Change in economic costs	.25	.07	.74	.006	1.00
(Constant)	-.50	.70			

Note. TOL = tolerance. Overall model $F(1, 10) = 12.16$, $p = .006$. $R^2 = .549$.

CHAPTER 5. DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

The preceding chapter presented the results and findings of the data analysis. Chapter 5 includes a discussion of the data analysis and results, a discussion of the research implications, the research limitations, and the recommendations for further research. The intent of this research was to investigate the existence of correlations following the occurrences of both time pressure impositions and supply chain disruptions, the impact these factors have on supply chain efficiency, productivity, and economic transaction costs; and the impact effected supply chain efficiency, productivity; and economic transaction cost levels have on supplier relationships. Four primary research hypotheses were presented to test four research questions. All four primary null hypotheses were rejected as the four primary hypotheses yielded some significant findings. The research results implied there are statistical correlations among the independent variables; disruptions and time pressure impositions; and dependent variables, efficiency, productivity, and supplier relationships.

Summary of Results

Significant researched exists in supply chain disciplines on supplier relationships and collaboration (Anderson & Narus, 1990; Dwyer et al., 1987; Golicic & Mentzer, 2005; Hendricks & Singhal, 2008; Porterfield et al., 2012; Sivadas & Dwyer, 2000;

Srivastava et al., 1999). The problematic nature of supply chain disruptions may impact the supplier relationship within the supply chain. The disruptions may indicate weaknesses and poor responsiveness capabilities of the supply chain. According to Hendricks and Singhal (2008), these weaknesses relevant to information flows, the sharing of knowledge, relationship values, and relationship loyalty are needed for optimal sustainability (Hendricks & Singhal, 2005, 2008). Researchers argued productivity, efficiency, and transaction costs are encompassed within relationship values.

Empirical research examined the nature of supply chain disruptions, and classified disruptions so as to better evaluate risk factors and uncertainty (Christopher & Peck 2004; Chopra & Sodhi, 204; Hallikas et al., 2005; Spekman & Davis 2004; Svensson, 2000). The review of extant literature explored time pressure impositions and the potential impact time pressure has on supply chain partnerships and supply chain effectiveness (Dhar & Nowlis, 1999; Durham et al., 2000; Fugate, Thomas, & Golicic, 2012; Maule et al., 2000; McDaniel, 1990; Ordonez & Benson, 1997; Stuhlmacher & Champagne, 2000; Thomas, 2008; Thomas et al., 2011). Relevant to this research study, elements of successful supplier relationships were explored to include commitment and trust (Barney & Hansen 1994; Henry et al., 2010). The long-term benefits of supplier relationships were analyzed to promote a solid theoretical foundation for the research variables as well (Chow, 2008; Cook et al., 2011; Fugate et al., 2012; Geyskens et al., 1998; Malhotra & Murnighan, 2002; Skandrani et al., 2011). A quantitative, nonexperimental correlation examination on the adverse effects the occurrences of time

pressure impositions and supply chain disruptions have on the supplier relationships of global supply chains was conducted.

The theoretical framework of this research was developed based on the literature review of supply chain disruptions; and time pressure impositions and the effect of time pressure on performance, supply chain efficiency, productivity, economic transaction costs, and supplier relationships. The theoretical research included an exploration of theories related to supply chains, such as the SET, and the resource dependence theory. The independent variables of the study were supply chain disruptions and time pressure impositions. The dependent variables of the study were efficiency change, productivity change, and supplier relationship changes. The association between time pressure impositions and disruptions was tested for each dependent variable.

This research started with three objectives. The first was to present the established theoretical framework that demonstrates the relationships and constructs of supply chain processes and supplier relationships based on the previous literature. The second objective was to investigate the relationships between disruptions, time pressure, efficiency, productivity, economic costs, and supplier relationships and to present the empirical results. The final objective was to initiate additional research opportunities regarding the relationship between disruptions, time pressure, efficiency, productivity, economic costs, and supplier relationships. The research findings were intended to contribute to the body of supply chain management knowledge and assist in promoting an understanding of supply chain processes and supplier relationships. The discussion and

summary of statistical results presented in this chapter would be a source for understanding the importance of responsive and productive supply chains and effective supplier relationships.

Discussion of Results

In an effort to gain insights relative the relationship between the independent and dependent variables, and to discover answers to the research questions, four hypotheses were statistically tested. In general, the hypotheses confirmed associations among disruptions, efficiency, and productivity and supplier relationships. The multiple analysis of variables presented in Chapter 4 clearly presented evidence of significant linearly associations. Exceptions to the findings were on time pressure impositions and efficiency, productivity, and economic costs.

Multiple regression research and recent supply chain studies, which utilized a multiple linear regression model supported the conclusion best practice was to fail to accept the null hypothesis in favor of the alternate hypothesis if any of the predictors demonstrated a predictive association (Mor & Sharma, 2012; Nathans, Oswald, & Nimon, 2012; Sharmah, 2012; Singh & Sharma, 2011; Tranmer & Elliot, 2008). It was important to note in the statistical analysis of variable testing in Research Questions 1 and 2, the scatterplot of residuals did not yield a random scatter; instead, it yielded a funnel-shaped pattern, thus indicating that homoscedasticity was violated (although linearity was not violated). Because the variables (except for time pressure impositions) were already transformed, there was no other means to correct for this heteroscedasticity. This is of

considerable interest as this violation of homoscedasticity may be attributed to the secondary collection of data, which was not randomly sampled. Euser, Dekker, and Le Cessie (2008) demonstrated that accurate and meaningful indicators of reproducibility may still be determined from either square root or log-transformed variables, which can be interpreted clearly. In addition to being an easily interpretable means of approximating normality, Euser et al. asserted the more common only used practice of transforming variables by log function has a distinct advantage. Log-transformed variables are readily returned to original scale ratios.

Briefly summarizing, there is an impact to the supplier relationship as a result of disruptions, time pressure affecting changes in efficiency, productivity and economic costs. The research questions presented below were developed for this research study and subsequently evaluated for potential correlations.

Research Question 1

Research Question 1 and its related hypotheses sought to answer, Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and supply chain efficiency and production?

Null Hypothesis 1: The number of supply chain disruptions and time pressure impositions do not predict supply chain efficiency and production.

Alternate Hypothesis 1: The number of supply chain disruptions and time pressure impositions predict supply chain efficiency and production.

The null hypothesis, $H1_0$, was rejected. $H1_a$ was supported. There was statistically significant evidence ($\beta = .610$, $p = .032$) that the number of supply chain disruptions and time pressure impositions predict supply chain efficiency and production.

Supply chain disruptions appear to impact efficiency and productivity levels or changes more so than time pressure impositions. There are different levels and manifestations of a supply chain disruption. A supply chain disruptions caused by a natural disaster will have a more severe impact on the supply chain that a supply chain disruption caused by a communication on transportation disruption. It was reasonable to suggest that these findings therefore reflect supply disruptions will have a more adverse effect on the supply chain than a time pressure delay. These findings may suggest that, at best, there may be some level of expectation of the supplier that time pressure impositions will occur. This implied that supply chains have auto response mechanisms readily in place to counteract time pressure delays, such as accelerated manufacturing and processing features within one or more firms within the supply chain. Although time pressure impositions may be expected to a degree, it is doubtful that suppliers are truly tolerant and in acceptance of time pressure delays. A more thorough provoking notion suggested by these findings is the supply chains or supplier firms may have used knowledge and information sharing processes to some degree of proficiency to minimize any adverse effects of time pressure on efficient and productive functioning of the supply chain. It may then be presumed that the supply chain and its partners are willing to tolerate some degree of delay from time pressure impositions in order to focus fiscal and

knowledge resources on building and maintaining a supply chain that is optimally responsive.

Research Question 2

Research Question 2 and its related hypotheses sought to answer, Is there a predictive relationship between the number of supply chain disruptions and time pressure impositions, and economic transaction costs?

Null Hypothesis 2: The number of supply chain disruptions and time pressure impositions do not predict economic costs.

Alternate Hypothesis 2: The number of supply chain disruptions and time pressure impositions predict economic costs.

The null hypothesis, $H2_0$, was rejected. $H2_a$ was supported. Although marginal, there was evidence of a statistically predictive relationship between the number of disruptions and time pressure impositions and economic costs ($\beta = .560$, $p = .066$).

Research Question 3

Research Question 3 and its related hypotheses sought to answer, Is there a predictive relationship between supply chain efficiency and production, and supplier relationships?

Null Hypothesis 3: Supply chain efficiency and production do not predict supplier relationships.

Alternate Hypothesis 3: Supply chain efficiency and production predict supplier relationships.

The null hypothesis, $H3_{0,}$ was rejected. $H3_a$ was supported, ($\beta = .610$, $p = .045$). Changes in supply chain efficiency and productivity are able to significantly predict changes in supplier relationships.

These findings suggested that efficiency and productivity changes within supply chains negatively impact supplier relationships. Although there may be some expectation of time pressure delays, the resulting effect on efficiency and productivity does not promote supplier partners to remain committed to other supplier firms within the chain. Keeping in mind the supply chain is fundamental to the firm's competitive advantage, some consideration may be given to adverse costs relative to a supply chain's inability to effectively produce and deliver in a timely manner. It may be implied from these findings that on a long- or short-term basis, the firm's ability to remain competitive may be at risk. Research was presented that long-term relationships add value to the organization (Chow, 2008; Cook et al., 2011; Henry et al., 2010; Malhotra & Murnighan, 2002; Skandrani et al., 2011). Future supply chain risk management literature, buyer-supplier relational studies, and organizational learning may provide presumable explanations.

Research Question 4

Research Question 4 and its related hypotheses sought to answer the question, Is there a predictive relationship between economic transaction costs and supplier relationships?

Null Hypothesis 4: Economic transaction costs do not predict supplier relationships.

Alternate Hypothesis 4: Economic transaction costs predict supplier relationships.

The null hypothesis, $H4_{0,}$ was rejected. $H4_a$ was supported. Changes in economic transaction costs are able to significantly predict changes in supplier relationships as β, the correlation coefficient indicator and the level of relational significance indicator "p" are strong (β = .740, p = .006).

Research Implications

In this section, a focus is on the relationships presented by this research relative to the existing research reviewed in Chapter 2. In the expanding global business environment, it is imperative for firms to take measures to maintain competitive advantage. The role of global suppliers and the relationships these suppliers have are key factors of a successful firm. Key indicators of successful supplier relationship factors are potentially invaluable. The objective of this research has been to explore the impact supply chain disruptions and time pressure impositions have on supply chain efficiency, productivity, and economic transaction, and the resulting effect on supplier relationships. Using previously tested archival data, a multiple linear regression model demonstrated supply chain disruptions and time pressure impositions potentially impact supply chain efficiency, productivity, and economic costs. Additional consideration of supply chain efficiency, productivity, and economic costs fueled an investigation into whether changes in supply chain efficiency, productivity, and economic costs moderated the associations between the predictor variables and supplier relationships. The results of this research

study are aimed at contributing to existing supply chain literature by offering managerial implications.

Within this research study are several implications for global supplier managers. The results suggested that supply chains that are responsive towards managing disruptive events are increasingly more productive (Christopher, 2005; D'Avanzo et al., 2004; Johnson & Templar, 2011; Field & Meile, 2008; Zsidisin et al., 2004). Increases in disruptions are associated with greater fluctuations in productivity. Predictively, fewer supply chain disruptions are associated with lower economic transaction costs. The findings implied that managing economic costs and maintaining efficient levels of productivity and efficiency are beneficial to the supplier relationship and are key factors in maintaining a long-term supplier relationship. Additionally, the negative impact on supply chain disruptions and time pressure impositions have on supply chain performance processes undermines the supply chains' objective of maintaining a responsive supply chain and response measures. Responsive supply chains and successful supplier relationships are crucial elements needed to attain a competitive advantage (Dyer & Chu, 2003; Dyer & Ouchi, 2003; Hendricks et al., 2009; Lambert & Cooper, 2000; Li & Fe, 2011). This study included a suggestion that supply chains, which are responsive towards managing and minimizing disruptive events, have supplier relationships that tend to be more trustworthy and willing to commit long-term, thereby creating more long-term benefits on behalf of the firm (Kang et al., 2009; Mayer, 2006; Wang et al., 2013). Lastly, these research findings offered a suggestion that there exists a

predictive relationship between economic transaction costs and supplier relationships. The greater increases or fluctuations of transaction costs, the more the supplier relationship changed. Notably, this finding remained constant to what is stated in supplier relationship, supply chain management and transaction cost analysis literature (Dyer & Chu, 2003; Gadde & Snehota, 2000; Ketchen & Hult, 2007; Kang et al., 2009; Primo et al., 2007). Although economic transaction costs frequently appear as a vital factor for ongoing success of supplier relationships, there is a need for further research that may reveal how to consistently maintain economic transaction costs in an effort to enhance supplier relationships.

Limitations

This research study utilized archival data. The issue and limitation of archival data are how frequently the sources report data, and what was the level of importance different sources place on data that are reported. Simultaneous reporting of events may have occurred. Notably, Modi and Marbet (2010) emphasized the importance of using archival data for research in supply chain management as the data allow for triangulation of results across primary and secondary data collection studies, while simultaneously presenting distinct and multiple research opportunities. A notable example is potential research findings that may result from a longitudinal analysis, which is complex when looking to obtain data from primary sources.

Second, systematic bias may have affected the data as some disruptive events may have occurred periodically. The nonexperimental research design does not include a

determination of the cause and effect. Multiple variables were analyzed to provide direction in a predictive manner. Consideration must be given to the fact that the research design may lack the strength of other research designs when exploring relationships. Also, the results may be limited as being explicit or more appropriate for specific industries. The limitations noted contribute to the recommendations to direct further research.

Recommendations for Further Research

Derived from the outcomes of the descriptive and inferential analyses relative to the four research questions in this study, the following recommendations for further research have been developed. Archival data were obtained from multiple industries so as not to limit the scope of the research findings. It would be of interest to explore within existing supply chain literature the question of how supply chain disruptions and time pressure impositions impact the quality of products and services following disruptive events and time constraints. The scope of industries would be limited to four to five major industry sectors, such as the service industry sector, including financial and transportation services, the manufacturing, wholesale, extraction, and the retail industry sectors. The manufacturing industry sector is included as to increase the level of interest towards potential findings. It is reasonable to assume that supply chain disruptions and time pressure imposed on these sectors would assuredly affect supply chain operations. Future research should look to identify how.

An additional area of potential interest lies with the timing and duration of the effects of severed supplier relationships. It is understood that long-term supplier relationships are generally beneficial to the supply chain partners. Do firms that have experienced severed supplier relationships have long- or short-term recovery periods in terms of performance and competitive advantage? Performance levels include optimal performance of the supply chain, increased sales or profit, and reductions in uncertainty and risk. Are these firms ever able to regain a competitive advantage or financial prominence? A case study on longitudinal analysis methodology could be used. Additionally, firm age, size of the organization, and the size of the supply chain itself were not included in the multiple regression statistical analysis of the researched independent variable. These variables may be included to direct future research on the impact of supply chain disruptions and time pressure impositions have related to supply chain performance and supplier relationships. Future research may be directed at finding an acceptable balance between maintaining economic transaction costs to enhance and promoting long-term success of supplier relationships.

Conclusion

Essential to an organization's existence and longevity are its supplier relationships. Firms place great value on the supplier relationships within its supply chain in an effort to remain competitive and successful in the global business environment. A key element of a successful supplier relationship is organizational performance to include optimal levels of productivity, efficiency, and well-managed and

minimized economic transaction costs. This dissertation was a part of the supply chain research studies.

The results of this study demonstrated that it is imperative for organizations to focus on maintaining strong supplier relationships while minimizing the impact of supply chain disruptions and time pressure impositions on the supply chain's productivity, efficiency, and economic costs. The archival data for this study were compiled from a sample of over 400 firms across multiple industry sectors. The data were analyzed by the application of multiple linear regression analysis. The results revealed after testing the hypotheses, that there is a strong positive and predictive relationship between supply chain disruption, time pressure and supply chain efficiency, productivity, and economic transaction costs. The hypothesis tests also showed that supply chain efficiency, productivity, and economic transaction costs influence supplier relationships. The relationships identified are consistent with existing research on the negative impact of supply chain disruptions and supplier relationships.

Overall, factors of supply chain disruptions and imposed time pressure described throughout this study that may contribute to changes in supplier relationships are vast. Additionally, it must be noted the review of literature revealed that there are there are supplementary factors, such as culture, economic power, firm size, information sharing and technology that may also have a significant effect on supplier relationships. These elements are noteworthy as supplier relationships are representative of assets within the firm and its supply chain. The key points gained from this research study were the

collective analysis of variables demonstrated the greater the number of disruptions, the greater was the change in productivity, efficiency and economic costs. The greater the change in productivity, efficiency, and economic costs, the greater was the change in supplier relationships.

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APPENDIX A. HISTOGRAMS OF THE STUDY VARIABLES

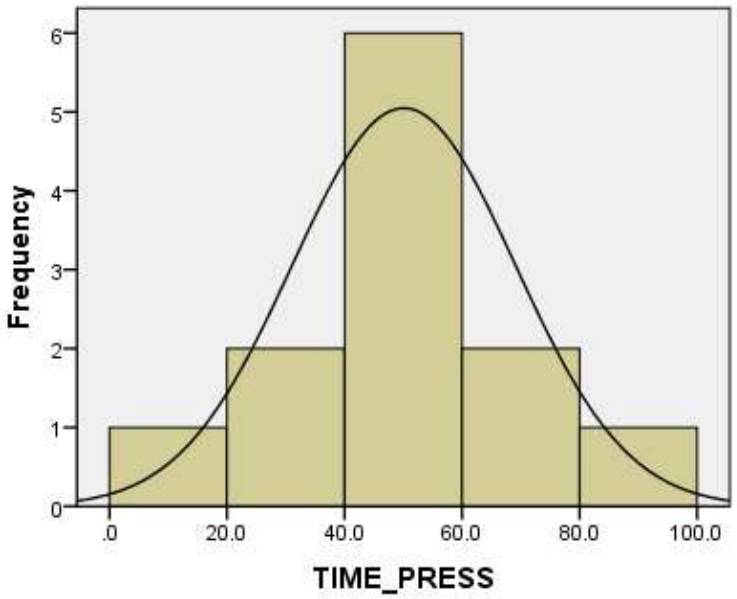


Figure A1. Histogram for independent variable, TIME_PRESS prior to variable transformation.

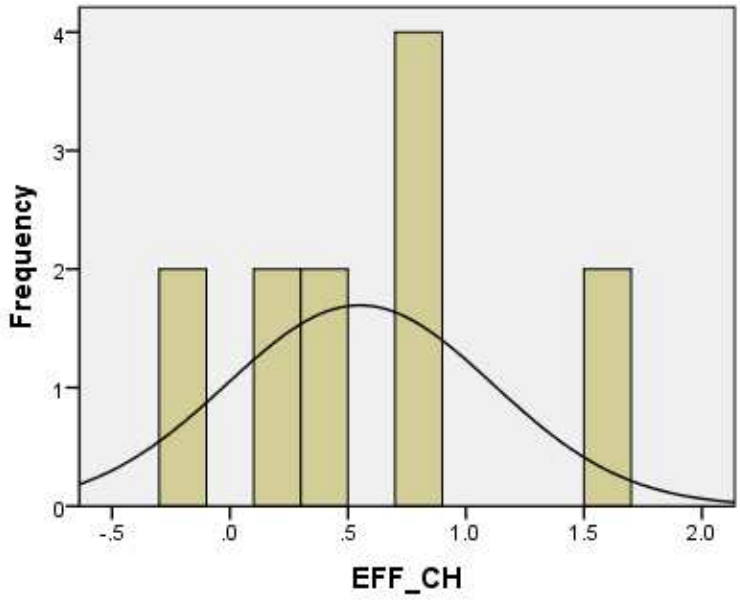


Figure A2. Histogram for dependent variable, EFF_CH prior to variable transformation.

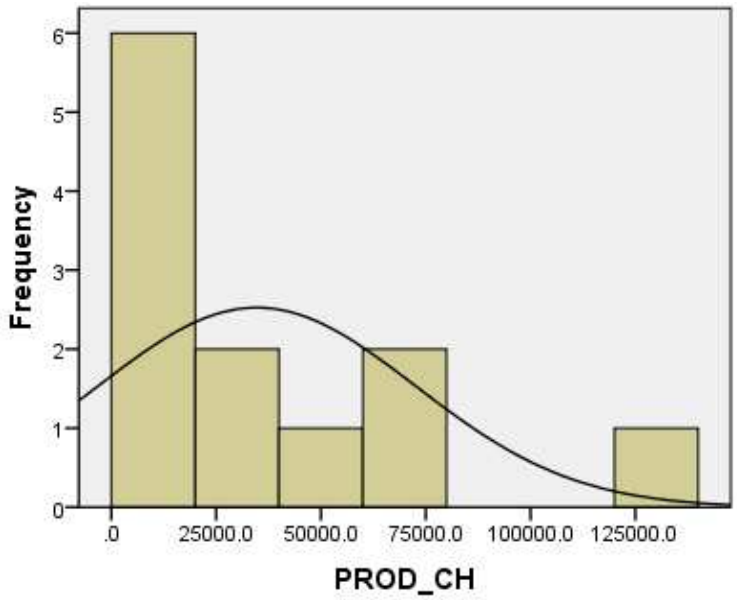


Figure A3. Histogram for dependent variable, PROD_CH prior to variable transformation.

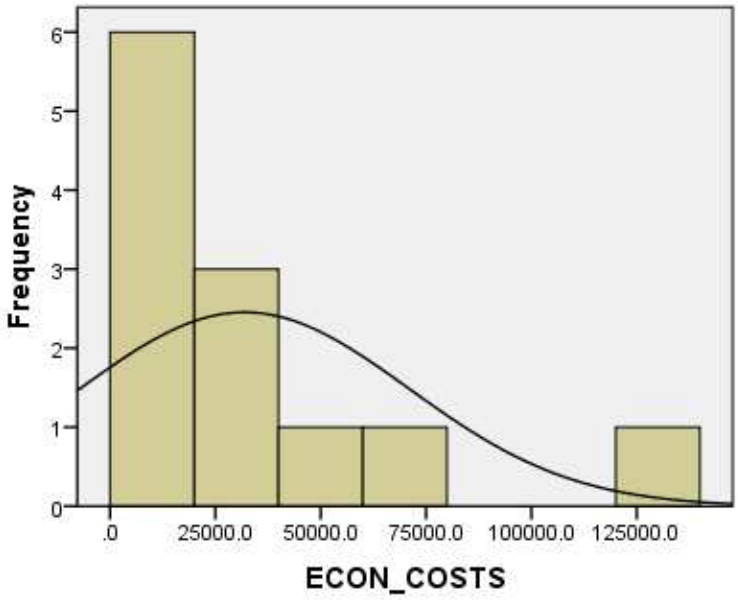


Figure A4. Histogram for dependent variable, ECON_COSTS prior to variable transformation.

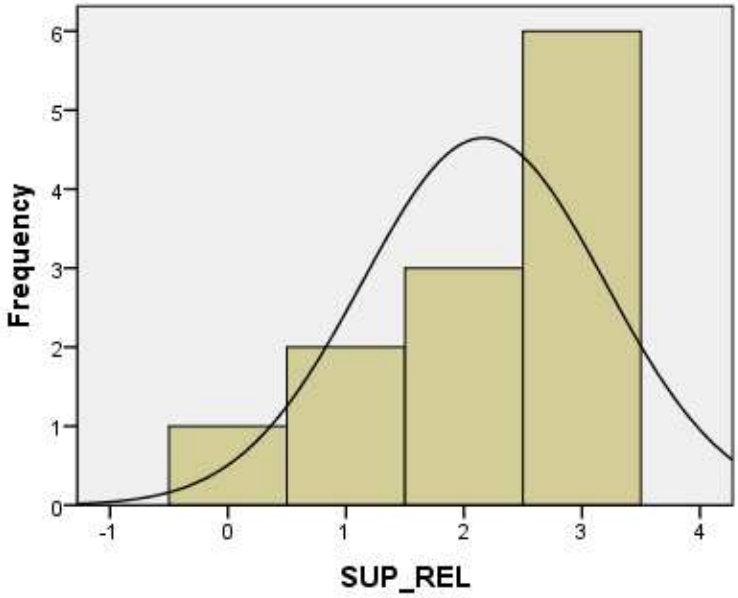


Figure A5. Histogram for dependent variable, SUP_REL prior to variable transformation.

APPENDIX B. STATEMENT OF ORIGINAL WORK

Academic Honesty Policy

Capella University's Academic Honesty Policy (3.01.01) 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 (3.03.06) 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)

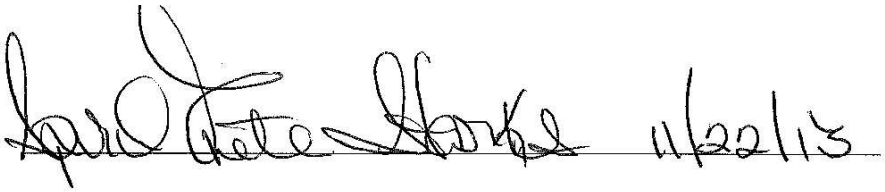
Learners failing to abide by these policies are subject to consequences, including but not limited to dismissal or revocation of the degree.

Statement of Original Work and Signature

I have read, understood, and abided by Capella University's Academic Honesty Policy (3.01.01) and Research Misconduct Policy (3.03.06), 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



Mentor name and school