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Towards a Theory of Services Supply Chain Management

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TOWARDS A THEORY OF SERVICES SUPPLY CHAIN MANAGEMENT

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Abstract

Much research has been performed to develop the supply chain management construct for manufacturing / goods producing firms. However, the service sector continues to grow its dominance in the percentage of GDP in high, middle and low income countries, and with it, a corresponding growth in the percentage of purchasing spend across the globe. While research continues in the manufacturing supply chain arena, much work is yet to be done to understand the differences for services.

The objectives of this research project were threefold: 1) to analyze the services supply chain management construct in order to determine how it differs from the more rigorously analyzed manufacturing supply chain management construct. The outcome is expected to be a fully developed and validated parsimonious measurement instrument for services supply chain management practices, 2) to validate a proposed framework relating the nature of the service, services supply chain management practices, information technology, operational performance and business performance. This framework, as developed, was built upon the relational view of the network and the resource based view of the firm, and 3) to propose a new topology for the services supply chain management construct.

A survey instrument to capture the operational measures for the service's supply chain management construct was developed based upon an extensive literature review of current supply chain management research, previously proposed service frameworks and service operations management research relevant to this topic. A rigorous instrument

development process was conducted to ensure the final instrument meets all requirements to satisfy the criteria for unidimensionality, convergent, discriminant, and predictive validity. A cross-sectional mail survey focused towards service industry sourcing leaders within firms in the United States was completed. Structural Equation Modeling was utilized for developing the model, determining the strength of the hypotheses, and evaluating the research model proposed. The results identify critical differences in the supply chain management construct when applied to services as the factors of capacity management, supplier management and customer involvement showed to be critical indicators of success. Additional analysis showed the impact of information technology on the services supply chain management's effect on performance.

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CHAPTER I

INTRODUCTION

The following quote comes from an article by Tinnila and Vepsalainen (1995), yet it appears to be more relevant now than ever:

> *"Service industries – and service operations of manufacturing companies – are restructuring their delivery systems. Self-services are replacing many of the traditional channels dominated by corporate sales and service personnel. New types of channels for delivering financial, logistics and other services are being created at an ever faster pace. This restructuring is forcing companies to re-evaluate their current customer service strategies. Automation is the way to cut costs and to provide quick response for the large self-service markets while specialization allows organizations to focus on the needs of small custom-service segments. Few companies can achieve both economies of scale and scope in a competitive way. The application of new information technology has created opportunities to re-engineer the service processes in innovative ways."*

Evidence continues to show that as economies grow richer, business-to-business services represent an increasing share of total economic activity. Today, they represent 27 percent of all U.S. service sector employment, almost as much as consumer services. These activities include: professional services, such as law, accountancy, and consulting; technical services such as IT and software support; wholesale trade services: and employment services like headhunters and temp agencies. The recent rapid growth in business services in developed economies is an outcome of specialization. As companies

focus increasingly on their core competencies, they buy more non-core services from third parties (Baily et al., 2006).

In further analysis, studies from the Coalition of Service Industries (CSI) (2007) illustrated the enormous impact the service sector makes in the U.S. economy. They found that the service sector represents the largest portion of U.S. employment and economic output – accounting for 93 million jobs and nearly 80 percent of U.S. private sector GDP – approximately $8.5 trillion. The CSI study also found that the majority of the workforce in every Congressional district is employed in services. In 398 Congressional districts, 70 percent or more of the workforce is employed in the service sector, and every state in the nation is an exporter of services. Meanwhile the Bureau of Economic Analysis, part of the U.S. Department of Commerce, recently released a report on key components of the United State's economy (Figure 1.1). In this report they illustrated stark difference in foreign trade between services and goods that can only be appreciated when viewed graphically. These facts cannot be ignored. Services have been and will remain a driver of U.S. non-governmental activity. As Bill Toppeta, President, International, MetLife, stated on the US Trade Representatives web site, "The service sector is the engine that is driving our economy, providing 80 percent of American private sector jobs and nearly 80 percent of our GDP."

This trend is not just a U.S. based phenomenon. Studies by the Office of the United States Trade Representatives have tracked the make-up of a country's GDP over time. As shown on Figure 1.2, the percentage of GDP made up of the services sector has increased steadily since 1970 regardless of a country's income level. While the numbers are more pronounced in high income countries, the trends are still relevant in middle- and

low-income countries as well. With this type of impact, it is important we take the time to understand the nature of services more clearly.

Through research of the many service typologies proposed over the past forty years, it is obvious that there are a multitude ways to look at the service industry. Each has its advantages and disadvantages. Some are more effective at describing the customer interaction, others focus more on service delivery, and some provide insight only into individual service industries. To date, none of the proposed service typologies have been applied to the services supply chain network. This web of dyadic relationships between a buyer and its suppliers is a complex web of governance protocols, communication mechanisms, and ever adapting relationships. For all that has been uncovered of the supply chain management construct over the past 10 – 15 years, little of this research has uncovered any of the nuances from the service industry.

Similarly, much has been written about the use of information technology and its impact on an organization. This is no where more evident than in many services. Technology has revolutionized the way that companies perform service, enabling the development of long-term individualized relationships with customers. Advancements in computing have allowed companies to improve both profits and financial accountability by providing high quality, personalized service more easily and affordably than ever before. Information Technology has been shown to not only lower the cost of service, but create avenues to enhance service revenues. Gone are the days of standardization, mass production, and mass marketing of services (Rust, Miu, 2006). The new order is bringing services off shoring, advancements through information technology, goods-to-services transformation, and innovation (Bitner and Brown, 2006). Yet with all of this research

on information technology's influence on services, much is still to be learned of its impact in supply chain networks.

1.1 SUPPLY CHAIN MANAGEMENT (SCM)

As competition in the 1990s intensified and markets became global, so did the challenges associated with getting a product and service to the right place at the right time at the lowest cost. Organizations began to realize that it is not enough to improve efficiencies within an organization, but their whole supply chain has to be made competitive. They now realize that understanding and implementing effective supply chain management (SCM) practices is an essential prerequisite to profitably competing in a global marketplace (Power et al., 2001; Li et al., 2005).

The Council of Logistics Management (2000) defines supply chain management as the systemic, strategic coordination of the traditional business functions and tactics across these businesses functions within a particular organization and across businesses within the supply chain for the purposes of improving the long-term performance of the individual organizations and the supply chain as a whole. As such, SCM recognizes the strategic nature of coordination between trading partners in a dyadic relationship. The result is a dual purpose of SCM: 1) to improve the performance of an individual organization, and 2) to improve the performance of the supply chain as a whole. It does this by integrating both information and material flows seamlessly across the supply chain as an effective competitive weapon (Li et al., 2005).

Stated another way in Chen and Paulraj, 2004a, SCM is a novel management philosophy that recognizes that individual businesses no longer compete as solely autonomous units, but rather as supply chains. Therefore, it is an integrated approach to

the planning and control of materials, services and information flows that adds value for customers through collaborative relationships among supply chain members.

Over the past two decades, considerable work has been initiated to try to define the Supply Chain Management (SCM) construct (See Figure 1.2). Each organization with an interest in leading the effort has defined the concept in its own way. Based upon these definitions, researchers have attempted to analyze this construct. However, the ambiguity caused by multiple definitions has caused the inclusion of several very different concepts (Table 1.1).

Tan (1998) started out with a simple construct made up of only three factors (purchasing, quality and customer relations). Since then, the studies have grown to include the concepts of waste elimination and inter-organizational systems (Alvarado and Kotzab, 2001); supply chain integration and JIT capability (Tan, 2001); common vision and goals, risk and reward sharing, and agreed on supply chain leadership (Min and Mentzer, 2004); information quality, and postponement (Li, et al., 2005, 2006); inter-organizational relationships and logistics (Burgess, et al., 2006); and supplier selection, certification, and trust (Chen and Paulraj, 2004).

Though most of these construct definitions were theoretically driven; not all of them have been empirically tested. The most thoroughly researched construct was developed by Chen and Paulraj (2004). They reviewed over 400 articles to understand the prior research on this topic. Then basing their proposed SCM construct on relational view theory, they empirically validated their model. Their framework encompassed not only the SCM construct, but the driving forces behind the implementation of SCM concepts and a view of performance from both the buyer's and supplier's perspective.

Yet even with all of this research, lack of consensus continues even on the definition of the term. In a recent 3 year study of 6 supply chains and 72 companies in Europe, the authors reveal that supply management is, at best, still emergent in terms of both theory and practice. They contend that few practitioners were able, or even seriously aspired, to extend their reach across the supply chain in the manner prescribed in much modern theory (Storey et al., 2006). This should not be surprising to many as research has shown this field to remain "relatively new", with several disciplines claiming ownership of the field. To date, these frameworks have been dominated by transaction cost economics and competitive advantage theory, depending upon the objectives of the researchers. Additionally, the contextual focus remains in the manufacturing industry and maintains a predominantly process-driven conceptual frame. In fact, many of the factors behind the theory (such as postponement and excess inventory) are exclusive to a manufacturing environment. They ignore many of the factors that are unique to services and thus cannot hope to capture the nuances of these industries (Burgess et al., 2006). Even these researchers identify the need 'add service-oriented constructs' in order to draw out the differences related to services (Chen and Paulraj, 2004a). This brings out a need to turn our attention to service industries.

1.2 SERVICE SUPPLY CHAIN MANAGEMENT

1.2.1 Service features

One may argue that supply chain management should be conducted in the same manner in both manufacturing and service organizations. It is true, is it not, that both industries are attempting to procure inputs that can be utilized to provide value to the end

customer. Reviewing Lee and Billington's 1992 article on manufacturing Supply Chain Management pitfalls and opportunities, nearly all fourteen pitfalls could also be conferred to the service industry.

While much work has been done to analyze the supply chain management construct in a manufacturing (goods-producing) environment, the same cannot be said in the services arena. As explained throughout this document, the service industries are unique with their own set of defining factors, characteristics and measurements. This is highlighted by studies that point out significant differences in sourcing services. In a 2003 CAPS Research study a majority of respondents indicated that buying services is more or much more difficult than buying goods (CAPS Research, 2003; Ellram et al., 2004, 2007; Field and Meile, 2008). Research by Field and Meile (2008) identified that cooperative relationships among supply partners may help service supply chain partners overcome the ambiguities of the service environment. They also posited that the relationship between supply chain relationships and supply chain performance that has been validated in manufacturing may not be generalizable to services.

This brings one to consider how a "services" supply chain management construct might differ from what has been developed for manufacturing-based firms. To answer that question, we must revisit the characteristics of the service. Generally, this has come to focus on the following five characteristics: intangibility, heterogeneity, simultaneity (inseparability), perishability, and customer participation (Ahlstrom and Nordin, 2006; Sampson and Froehle, 2006).

Intangibility - "Intangibility" refers to something, especially an asset, which cannot be perceived by the senses. Service processes are capable of being perceived, and

service outcomes are often as tangible, or more tangible, than manufacturing outputs. For example, anyone who has experienced a dental root canal procedure understands how their sense of touch is heightened by the service (Sampson 2001). Authors like Lovelock (1983) have proposed several categories for classifying tangible versus intangible services based upon who / what the service acted. Table 1.2 illustrates these categories.

Heterogeneity - Heterogeneity is the observation that individual units of service production tend to be unique, especially when compared with non-service processes such as mass production (Nie and Kellogg 1999). Accommodating that variability is one of the biggest challenges for service operations.

Simultaneity - Simultaneity, also called inseparability, refers to the observation that services are generally produced and consumed at the same time (as compared with non-services' tradition of producing well in advance of demand and consumption). With service processes, significant portions of production cannot begin until after customer inputs have been presented by the customer, which corresponds with demand (Sampson 2001). Because the customer is involved, some aspects of consumption may begin during the production process. Some call this concept "inadvertent JIT" (Just-in-Time), implying that JIT production in services is a necessity, not a choice (Karmarkar 1996; Sampson 2001).

Perishability - Related to perishability is the mistaken belief that service processes are unable to produce inventory. We understand inventory to be items of production that are available before needed. Inventory is the result of a mismatch between production and demand. With service processes, we cannot produce before demand due to the reliance on customer inputs. However, there can still be delays in the

system if customer inputs arrive in excess of available capacity. In such cases, the customer inputs are in "inventory" either until sufficient server capacity becomes available or until the customer decides to withdraw his or her inputs from the process. This "customer inventory" is commonly called a "queue" or a "waiting line," and it experiences a "holding cost" much more time sensitive than traditional manufacturing inventories. Manufacturing inventory holding costs are calculated over weeks or months, whereas service customer inventory holding costs are typically measured in minutes or hours (Sampson 2001).

Customer participation - This is a limited view of 'customer inputs' in which the customer provides himself as a labor input. Customers can also participate in production by providing property and/or information. It has been stated that when a customer provides inputs to production (through the provision of any inputs) that it is a service process. This has also been called co-production where both the service provider and the customer produce the service at the same time (Bitner and Brown, 2006; Roth and Menor, 2003; Sampson and Froehle, 2006). Examples of this include, receiving a personal haircut and watching a movie.

Simultaneous production and consumption, perishability and heterogeneity are generally outcomes of the service's intangibility that make managing it different from managing goods (Zeithaml & Bitner, 2000). Because services cannot be stored they must be produced when the customer demands them. Some services are immediately completed, like purchasing music on-line, while others may take many months to complete, like receiving scores from the ACT, SAT, LCAT or other standardized testing centers. Because services cannot be stored, the service provider focuses much attention

upon capacity and demand management (Sasser, 1976). The heterogeneity of a service results because the service is co-produced by employees and customers, many times meeting for the first time. Because each customer subjectively evaluates the outcome of the service system, even if the outcome is consistent based upon objective measurements, they will perceive different levels of performance. This affects the way a service organization assesses performance and organizes its workforce (Bowen and Ford, 2002). Many services must be delivered close to their customers. This prevents centralization and makes service delivery structures more complex. The net result of these differences requires an organization to impact the way a service organization defines its strategy, organization and processes (Bowen and Ford, 2002).

1.2.2 Research in Services Supply Chain Management

In regards to sourcing, the intangible nature of services makes the specification of services less definable and resultant evaluation of vendors more difficult. This same characteristic also clouds the correlation between a service's price and value which affects sourcing negotiations and influences the governance mechanisms required. There are many issues that result from these basic characteristic differences. Ahlstrom, P., Nordin, F., (2006) highlighted a few of them in their 2006 study (shown in Table 1.3).

The concept of SCM has received increasing attention in the service world from researchers (Schmenner 1986 and 2004, Ellram, et al., 2004, and Sengupta et al., 2006,) and practitioners. Trade magazines are recognizing the attention SCM draws from their customers and service industries are realizing the competitive advantages that are available by creating superior networks of suppliers. Yet, even with this increased attention there has not been much effort put into determining what is unique about the

service supply chain management practices or the relationships involved in sourcing services over goods.

Much of the difficulty comes from the service sector itself. The service industry has always been considered extremely fragmented (Prajogo, 2000). Researchers have struggled to develop theories that expand beyond narrow industry boundaries. We see this in many research articles published today. There is plenty of beneficial work done on the subject, but most of it is narrowly focused. That is why we see articles specific to blood centers (Pagell et al., 2004), fast food (Stank et al., 1999), healthcare (Ross et al., 2009; Sinha et al., 2009), insurance (Doran and Thomas 2005), public services (Karwan et al., 2006; Verma et al., 2006), goods retail (Sheu et al., 2006), retail banking (Soteriou and Zenios 1999; Metters and Vargas 2000), security services (Vandaele and Gemmel 2007), telecommunications (Talluri et al., 2004), trading (Lai et al., 2008), and turbine after-sales support (Johansson et al., 2006) to name only a few.

This is probably not surprising given the dearth of research that is actually focused upon service operations. Machuca et al (2007) found that only 7.5% of Operations Management (OM) articles published in the top OM outlets were service-related. And there was no indication of any trend towards an increase in this value. This is a good indication of the value being given to service operations research in the OM field. Researchers Nie and Kellogg forecast this in 1999 when they stated that most manufacturing-oriented academics were more likely to believe that extensions and adaptations of existing theories are sufficient to deal with Service Operations management (SOM) research problems. Meanwhile, Robert Chase said at the 2004 Annual Meeting of the Decision Sciences Institute in Boston, "80% of the United States'

economy is in services, but 80% of the core or required courses in operations management are still focused heavily, if not entirely, on manufacturing." Even still, Sampson (1997) projected that 90 percent of business school graduates will work in service-related settings.

Yet, even with this backdrop, there are some who are pushing hard for a more unified service operations focus within the research and academic communities. Bitner and Brown (2006) believe there is already a strong services science foundation to build upon, with many robust ideas, strategies, tools, and theories that could be widely applied to immediately benefit organizations. Chesbrough and Spohrer (2006) argue for a services science discipline that integrates across academic silos in order to advance service innovation more rapidly. Meanwhile, Heineke and Davis (2007) went so far as to propose modifications to course requirements 'perhaps even to the point where every business school has service operations management as a required course and the traditional manufacturing course in operations is offered as an elective.'

Sasser et al. first coined the term "service concept" in their 1978 textbook "Management of Service Operations." The term referred to the total bundle of goods and services "sold to the customer and the relative importance of each component to the customer." Originally, the total service package consisted of three elements, 1) facilitating goods, 2) the explicit services; and 3) implicit services. The concept has since been expanded by various authors (Fitzsimmons and Fitzsimmons, 2004; Goldstein et al., 2002; Roth and van der Velde, 1991; Heskett et al., 1990) to include both core and peripheral service elements as shown in the Table 1.4 (Roth and Menor, 2003). With

such a wide variety of elements represented by the service construct, it can be difficult to define a service supply chain management construct.

1.2.3 Defining Services Supply Chain Management

Few would argue that we are living in a 'post agricultural' and 'post manufacturing' world. While we can acknowledge the importance of both agriculture and manufacturing, we can accept that neither of these sectors drives our economies. The services exchange has been described as qualitatively different from the agricultural and manufacturing epochs that have passed. Yet the very nature of the services activity is broad (comprised of government, health care, education, finance, transportation, communication, business, and others). It involves a negotiated exchange between a provider and an adopter (supplier and customer) for the provision of (predominately) intangible assets. This frequent lack of a central artifact raises an important and interesting corollary: Each party in the exchange needs the other's information in negotiating the exchange (Chesbrough et al., 2006).

In Ellram et al., 2004, they point out a 2003 CAPS Research study that illustrates many types of service purchases where the purchasing function has limited involvement. These areas include real estate, information systems, professional services, facilities, temporary labor and marketing, among others. These are often very large portions of a firm's overall spend. The problem with the lack of participation by the purchasing function is that it limits the firm's ability to control the process through formal controls and processes.

In this same article, Ellram et al. defined supply chain management as the management of information, processes, goods and funds from the earliest supplier to the

ultimate customer, including disposal. This study focused upon the professional services supply chain and the purchase of professional services. Yet they utilized existing product-based supply chain management frameworks to apply toward professional services to gain understanding. However, the problem with utilizing traditional supply chain management frameworks is that they all focus on the physical flow of goods among members of a supply chain. Though the number of supplier levels (and thus the inherent complexity) may vary by supply chain, manufacturing is still principally ordered around tracking the physical movements that take place among channel members.

Yet this common link is missing in services supply chains. In services, there is no overarching focus because the output is different depending upon the services delivered. As illustrated in Table 1.4, services focus upon many different deliverables. For example in the professional services, it is the transfer of the service firm's capacity to the customer that is most important. While in maintenance and repair services, the focus is upon a physical change to the equipment brought in for servicing. Yet even in these cases, differences will apply depending upon the final customer's needs and requirements.

Following the original definition acknowledged in the Global Supply Chain Forum (Lambert, Cooper and Pagh, 1998), Baltacioglu et al., 2007 proposed a definition of Service supply chain management as "the management of information, processes, resources and service performances from the earliest supplier to the ultimate customer." In addition to this definition, the authors provided a sound explanation of the difference between 'core services' and 'supporting services'. Core services are the products that are actually delivered to the customer for their benefit. While supporting services are additional services that may be provided to the customer in addition to the core service,

they become part of the deliverable that makes up the total service experience. Supporting services may be produced by the service provider organization or by one of its suppliers (Baltacioglu et al., 2007). However, these services should still be managed by the principle service provider. This is substantiated by research that has shown how customer satisfaction is affected by supporting services even if sold separately by the external supplier (Vandaele and Gemmel, 2007).

With services it is important to focus on the "service performance" (i.e. providing to the customer what they believe they contracted the service firm to deliver). Thus services are more of a transfer of capacity than a transfer of goods. Some authors equate capacity (in services) to inventory or goods (in manufacturing) (Ellram et al., 2004). In services, capacity choices are constantly made to balance supply and demand. This includes finding the optimal mix of permanent versus temporary, seasonal or subcontracted labor, developing strategies for managing demand and controlling supply, and managing the degree of outsourcing and franchising, among others. These capacity choices are especially important in high-customer-contact services because of the inherent characteristics of services and the variation caused by customers in the process (Roth and Menor, 2003).

In a services supply chain, human labor usually forms a significant component of the value delivered to the end customer. While many procedures and controls can be standardized and even centralized in the manufacturing environment, this is not entirely possible in services where many decisions must be made locally by the staff on hand. Because of the human involvement in services, the variability and uncertainties in outputs are higher. In studying service industry trends, it is apparent that organizations are

making attempts to reduce the variability in their service delivery process wherever they can. While it is evident in many lines of services, it is most obvious in services that have direct customer contact (i.e. consumer-based services over business services). This effort was predicted by Chase (1978) and Chase and Tansik (1983). In fact, their work is the centerpiece of several research efforts to explain how services work to split into a front-office and back-office processes. In these cases, the front-office is customer facing which requires a high degree of excess capacity and flexibility while the back-office is efficiency-based, focusing upon more repetitive work content. Thus, moving work from the front-office to the back-office improves efficiencies and reduces variability.

Separate research has identified the differences in outsourcing manufactured goods versus services (Table 1.5) (Ellram et al., 2004). The following is a list of behaviors that can result in a buying firm spending more for purchased services than market value. These are tactics that may be utilized by service firms to gain advantage and should be considered by the buying firm when sourcing services.

1. Usurping procurement leverage from the buying firm
2. Adding hidden cost adders
3. Impacting the cost of money
4. Billing and calculation errors
5. Substitution of lower-skilled staff or inputs after the sale
6. Providing levels of service below commitments to reduce costs
7. Bundling of services with other services or goods to charge higher fees
8. Using summary invoicing (not detailed line items) to charge higher fees

Assuming a supply chain management model that does not attempt to take these differences into account would minimize the applicability to the service providers. This may be one reason why services supply chain management concepts have taken so long to adopt in many service industries (HFMA Magazine, February 4, 2009, Cooling, L., 2008).

It was Wacker (2004) who highlighted the need for well defined conceptual definitions due to their ability to increase construct validity. Understanding the conceptual limits of the construct helps in the development of theory-building for the item. This will improve the results of the statistical testing utilized in the empirical research. To this end, one of this research project's objectives is to develop and validate a parsimonious measurement instrument for service supply chain management practices. This brings out the need to define the services supply chain management concept's domain and to identify how it differs from traditional supply chain management.

First, a clarification is needed to identify if services supply chain management relates to the sourcing of any service by a firm or only certain types of services. To determine this, we must consider if there is a difference between the sourcing of services necessary for providing a firm's product(s) or service(s) and the procurement of all other services. Recalling the definitions of traditional supply chain management (Figure 1.2), we notice that they focus upon activities related to meeting the customer's needs. One may conjecture that this would either exclude purchased items that are not required to meet the customer's needs (ex. Office supplies, janitorial services, etc.) or would already include these items but assume they are not consequential to the definition. Based upon this, a similar tact will be utilized in mapping out the services supply chain management

domain. With this in mind, the following definition of services supply chain management is proposed that focuses upon only purchased services that impact the buying firm's service performance. It reads as follows:

> *Services Supply Chain Management encompasses the planning and management of all activities involved in sourcing and integrating services across functional and organizational boundaries necessary for meeting the needs of the end customer.*

Unpacking this conceptual definition further, we see that services supply chain management applies equally to service providing and goods producing organizations who source services in order to serve their end customers. These services could be tangible (like logistics services) or intangible (such as information processing services).

1.3 THEORY DEVELOPMENT

As the supply chain management construct for the manufacturing (goods-producing) environment has evolved, much work has been put into understanding the construct measurement itself (Chen and Paulraj, 2004b). As Venkatraman stated in his landmark 1989 paper when analyzing the strategic orientation of business enterprises, the development of a construct measurement device is a critical part of the theory building exercise. The process of construct conceptualization and measurement development is at least as important as the examination of substantive relationships. It is within that line of thought that this research aims to follow. This research is focused initially on the development of the services supply chain management construct that will be validated through an empirical study in order to define the operational measures. Utilizing proper analytical concepts, the measures will be validated to confirm they satisfy the criteria for unidimensionality, convergent, discriminant, and predictive validity, among others. The

result is intended to be a construct that is battle tested to be used by others for further research in this arena.

It should be mentioned that due to the fragmentation of businesses within the 'services' sector, no single construct will be able to capture all factors that affect the performance of all service's supply chains. One can refer to the myriad of scales used to define the general manufacturing supply chain management construct for proof. There will always be examples of businesses that do not utilize all of the factors employed in any construct that is developed. Instead, the power of the statistical tools used is to draw out those factors that have statistical significance when considered in a model representing the services sector as a whole. Any differences due to service industry characteristics will need to be drawn out in future studies in this area.

1.4 RESEARCH SCOPE:

The purpose of this research is threefold in design. First, this study will analyze the Service Supply Chain Management (SSCM) construct in order to determine how it differs from the more rigorously analyzed manufacturing Supply Chain Management construct. The objective is to develop and validate a parsimonious measurement instrument for Service Supply Chain Management (SSCM) practices. SSCM practices are the set of activities undertaken by an organization to promote effective management of its service supply chain.

Second, a framework is proposed, built upon the resource based view and relational view, using previous research in the areas of supply chain management and service operations management. This framework identifies the relationships between the nature of the service, SSCM practices, information technology, operational performance

and business performance based upon theoretical assumptions in the extant literature on these concepts. SSCM practice is proposed as a multi-dimensional concept that encompasses the relationship between a service buyer and its suppliers. However, this research project will only consider the view from the perspective of the buyer initially. Operational measures for the constructs are to be developed and the model will be tested empirically using data collected from survey respondents.

Finally, a new topology will be proposed for the services supply chain management construct built upon the theories under consideration and confirmed from the results of this research. As detailed elsewhere in this proposal, the service operations management topic has identified many topologies for defining segments within the service industry. Yet very few empirical studies have taken place to validate their concepts. This research project will permit the development and validation of a topology for understanding services supply chain management segments and the concepts that provide influence.

1.5 RESEARCH SIGNIFICANCE

Due to the sheer size of the services industry, one would think that the services supply chain management field would be well researched and understood. After all, in 2005 services industries accounted for 68 percent of U.S. GDP and 79 percent of real GDP growth. However, this has been proven to not be the case in academic research. In fact, services are grossly understudied compared to manufacturing industries, representing only 7.5% of all articles published in the top OM journals over a six year period (Machuca et al., 2007).

Likewise, the services supply chain management topic has only been suggested in a few studies. Therefore, this research study will help to extend the concepts around these areas, offering a validated instrument to measure SSCM. In addition, it will offer useful guidance for analyzing services supply chain management practices. This in turn will provide a platform for further research in this area. The results will also provide an initial means for comparison of the supply chain management construct as it relates to manufacturing and service environments.

While different service concepts and markets require different approaches to the design and management of services (Chase et al., 1998; Schmenner, 1986), they do not necessarily require different approaches to supply chain management. This study will validate that supposition, thus providing the basis for further study to extend the learning in services management.

1.6 DISSERTATION OUTLINE

This dissertation proposal is designed to cover the critical content necessary to explore the Services Supply Chain Management concept. It is organized as follows: Chapter 1 presents an introduction and definition to the services supply chain management construct that is based upon both the supply chain management and service operations management research. Chapter 2 synthesizes the extant literature that has been developed in these areas and clarifies why these concepts relate to the constructs utilized in this research project. Utilizing research from a wide base of disciplines, this chapter pulls together the factors that affect the management of services supply chains. Chapter 3 identifies the theoretical concepts of service supply chain management coupled

with the hypotheses that relate between them. Information on the research design, instruments and methods used to analyze this research are also presented.

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

While supply chain management for goods manufacturing has received much attention over the past twenty years, the same cannot be stated for the services industry. Even though 2007 statistics from the Office of the United States Trade Representative identified that service industries accounted for 68 percent of U.S. GDP and 79 percent of real GDP growth in 2005, the services remain an under-researched area. Due to the shear size of the services industry, and the total spend applied toward the purchase of services, it is critical that research is undertaken to analyze the supply chain management concept.

2.2 THEORETICAL FOUNDATION

A study of research in the supply chain management literature identified that the transaction cost and competitive advantage theories dominate the landscape. From this, some acknowledge that the current pre-occupation with a few existing theories (in their singular form) may not be sufficient to describe the field completely given its complex nature (Burgess et al., 2006). The work by Chen and Paulraj (2004a) has been considered the most comprehensive and conclusive study on this subject. This work illustrated how

the relational view was most effective at explaining the relationships effects going on in the dyadic buyer-supplier networks.

When extending the research of supply chain management into the service industry, one key new factor comes forward and needs to be considered in this network relationship. This factor is the characteristic of customer interaction in the service delivery system. While the degree of customer interaction is dependent upon the service under review, no one can argue that the customer and their perceptions do not have a significant impact on the delivery of all services. Adding this characteristic to the supply chain management concept does not change the theoretical foundation requirements. In fact, they strengthen them as the relational effects should be even more significant for suppliers in a service network.

The second key factor to consider is the heavy use of information technology in today's supply chains. Due to most service's reliance on the movement of information to create value, any services framework must incorporate information technology's impact.

Based upon these key factors, this study bases its constructs and model upon both the resource based view of the firm and the relational view, when applied to a supply network. These strategic management theories are the most applicable foundations for which to interpret the interactions inherent in a services supply chain. These will be discussed in more detail next.

2.2.1 Resource Based View (RBV) – influence on Information Technology

The resource based theory asserts that a firm's resources explain how firms can achieve sustainable competitive advantage through the acquisition of and control over resources. Here a resource is meant anything which could be thought of as a strength or

weakness of a given firm. For this to occur, the resource must also be imperfectly mobile, inimitable and nonsubstitutable. Such resources and capabilities are linked to competitive advantage when they are a source of abnormal profits (Peteraf, 1993). *These resources can include both tangible (e.g. equipment) and intangible (e.g.. information or process knowledge) assets* that enable the production and delivery of goods and services (Wernerfelt, 1984; Amit and Schoemaker, 1993). Amit and Schoemaker (1993) further explain how a firm's capabilities (i.e. a firm's capacity to deploy resources using organizational processes) can positively affect their performance. These information-based tangible and intangible processes (like industry knowledge and learning capability) are usually developed over time. Resource based theory places considerable attention on firm specific intangible assets that have the potential to generate more significant profits than purchasable resources (Barratt and Oke, 2007).

The resource based view has been used to support many research concepts of strategic resources within the supply chain arena such as: organizational learning capacity (made up of the four first order factors team-, systems-, learning-, and memory orientations) (Hult et al., 2001), strategic IT alignment (i.e. combining business and information technology knowledge in order to support business objectives) from Kearns and Lederer (2003), entrepreneurial capability (the processes, practices, and decision-making activities that lead to the development and delivery of new and innovative services that can differentiate an organization from others in its market) in Jambulingam, et al., (2005), firm knowledge and its fit within the firm's strategy (Hult et al., 2006), information visibility (the extent to which actors within a supply chain have access to or share information which they consider as key or useful to their operations and which they

consider will be of mutual benefit) in Barratt and Oke (2007), and strategic outsourcing implementation decisions by Holcomb and Hitt (2007). In addition, the resource based view has been posited to support the creation of supply chain linkages by Rungtusanatham et al., (2003). In their study, supply chain linkages are considered those explicit and/or implicit connections between a firm and its supply chain partners. Linkages are used to manage the flow and quality of inputs (ex. information) with suppliers and customers. These links are considered resources that provide operational performance benefits to the firm, and provide the capability to acquire additional resources yielding benefits to the firm's internal operations.

In line with the use of the resource based theory's focus upon intangible assets, the resource based view has also been used to support the concept of Information Technology as an organizational capability. Wernerfelt (1984) originally proposed this idea when he illustrated how a technological advantage would lead the firm to higher returns. He believed this would enable the firm to retain better people because it would provide a more stimulating environment. If this were true, these firms would continue leading with new technology by motivating these individuals (Wernerfelt 1984).

Bharadwaj (2000) postulated the concept of 'firm-specific IT resources' as the sum product of the IT infrastructure, the Human IT resources and IT-enabled intangibles. These resources, when performing well (i.e. capable, effective, and aligned) serve as the tool for improving the way the business runs. When applied to the services supply chain, firm-specific IT resources take on the role of improving collaboration within the firm and with external sources, increasing communication level and effectiveness, improving information sharing, and supporting cross-functional activities between firms.

These factors permit the supply chain to be more tightly coupled, allowing the buying firm to focus on a smaller number of vendors and thus developing longer-term relationships with their partners. In today's world, firms that support this type of relationship will develop a series of integration points that permit the supply chain partners to share critical information that permits each of them to perform their businesses more effectively. By supplying more timely demand information, the supplier can match capacity more accurately and ensure tighter completion times and hold to higher service reliability. Likewise, the buying firm will expect this to translate into more accurate service deliveries and improved reliability. The net result is an improved operational performance for the buying firm which will translate into superior firm performance.

And yet some have claimed that investments in IT and firm profitability are uncorrelated, or even negatively correlated. This may be to the fact that despite high investments in IT, not all firms are successful in creating an effective IT capability Bharadwaj (2000). So it can be seen that while many firms may invest in IT capability, only a small subset of the sample is likely to have the right IT "resources" in place for achieving competitive advantage. This makes the argument that IT capability is not so much a specific set of sophisticated technological functionalities as it is an enterprise-wide capability to leverage technology to differentiate from competition (Henderson and Venkatraman 1993).

2.2.2 Relational View (RV) – Influence on SCM

Meanwhile, the relational view of the firm was postulated by Dyer and Singh. In their 1998 paper on the subject, the relational view was unveiled as an alternative to the

current views on organizational strategy. They contrasted the relational view to the existing norms presented by the "industry structure view" in Porter 1980 and the "resource based view" (RBV) of the firm from Wernerfelt, 1984 (Table 2.1). Whereas the industry structure view suggests that supernormal returns are primarily a function of a firm's membership in an industry with favorable structural characteristics (e.g., relative bargaining power, barriers to entry, and so on), the resource based view argues that differential firm performance is fundamentally due to firm heterogeneity rather than industry structure (Barney, 1991; Wernerfelt, 1984). Firms that are able to accumulate resources and capabilities that are rare, valuable, nonsubstitutable, and difficult to imitate will achieve a competitive advantage over competing firms (Barney, 1991; Dierickx & Cool, 1989). Thus, extant resource based view theory sees the firm as the primary unit of analysis (Dyer and Singh, 1998).

In contrast, the relational view looks at where a firm's critical resources reside. From this perspective, the firm's critical resources may extend beyond its physical boundaries to a network of organizations working together (i.e. the supply chain). A firm's products and services are made up of the resources available to it across disparate locales, capabilities and relationships. Thus the firm is said to focus on the dyad or network relationships and processes (Chen, Paulraj, 2004).

Using this perspective, researchers have identified several different resources that provide competitive advantage to the firm due to the development of relational competencies. Examples of these competencies are strategic purchasing achievements through strategic collaboration (Dyer and Singh, 1998), including the impact an affective supply chain architecture has on collaboration (Sheu et al., 2006), production information

integration (Devaraj et al., 2007), and inter-organizational communication (Paulraj, et al., 2008). The relational view has also been the basis for the development of a framework for buyer – supplier relationships (Chen, Paulraj, 2004) that was built upon supply base reduction, long-term relationships, communication, cross-functional teams, and supplier involvement.

Applying these competencies to the dyadic relationship of the supply network permits improved relationships among supply chain partners. When these concepts are applied to the service industry, particularly for critical services to the buying firm, it strengthens the argument. A firm's most critical sourced services require a relationship that is capable of serving the needs of all partners while protecting the ultimate customer experience. For example, a healthcare provider's sourcing of laboratory services; a banking firm's supplier of web servicing tools, an airline's provider of baggage handling services and a manufacturer's sourcing of temporary resources from a staffing agency all must provide a competitive advantage to the buying firm. Each of these services is critical to the delivery of the core product or service, and is enhanced by the competencies of the partnerships that exist.

2.3 SERVICES

2.3.1 The Service Classification

The modern definition of the classification of services arose out of the 1930s U.S. Department of Commerce's Standard Industrial Classification (SIC) codes. At that time, there were three major economic sectors: agriculture, manufacturing and services. Services were still considered a residual category for activities that did not fit into either of the other two classifications.

With the growth in the services sector today, the services category is stretched beyond its initial meaning. Today there are separate Divisions for transportation, wholesale and retail trade, and finance; along with a broader Division for general services which includes repair services, entertainment, health, education, and professional services to name a few (Table 2.2).

2.3.2 Service Taxonomies

Typologies play an important role in theory development because valid typologies provide a general set of principles for scientifically classifying things or events (Blau & Scott 1962; Margulies, 1980). The goal of a typology is to permit the researcher to combine different variables into a single construct in order to comprehend complex ideas (Collier, Meyer, 2000). However, while they are intended to provide analytical simplicity, they are not without limits. As illustrated in Carper and Snizek's 1980 study on organizational typologies, they found that "there are virtually as many different ways to classify organizations as there are people who want to classify them. Consequently, it is fairly easy to find a single dimension on which a typology can be based and which will, at least on the surface, support any given philosophical orientation" Carper and Snizek (1980).

Likewise, "empirical classifications are termed 'taxonomies'… (due to an) empirical existence of internally consistent configurations, but it is important to recognize that their development is sensitive to the choice of underlying dimensions as well as the analytical method used to extract the taxonomies" (Venkatraman, 1989).

Many researchers have tried to develop classification schemes or positioning matrices for services. Yet to date, none of these schemes has been found to represent a

broad spectrum of service classifications due to flaws in definition, measurement, interpretation or complexity (Collier, Meyer, 2000). For this reason, the typologies developed to date tend to find use in specific applications. Lovelock's two-by-two matrices serve as service classification schemes; while Schmenner's 1984 matrix of service processes will facilitate the analysis of process choice. The work of Silvestro et al. (1992), Tinnila and Vepsalainen (1995), Kellogg and Nie (1995) and Collier and Meyer (1998) are positioning matrices. And Chase (198`1) and Chase, Tansik (1983) is a theory postulated for defining service efficiency. Table 2.3 (Service Classifications) illustrates a summary of the prominent service typologies that have been proposed to date. It contains identification of the key classification features as well as notes on key criticisms that have been raised with each.

2.3.3 Service Frameworks

The following is a summary of the key frameworks that have developed in the service operations management arena. Each has been cited a number of times by other researchers and appeared in on-going research work. Based upon this they have extended our understanding of services and service operations management concepts.

The pioneering textbook Management of Service Operations (Sasser et al., 1978) introduced the term "service concept," defined as the total bundle of goods and services "sold to the customer and the relative importance of each component to the customer" (Johnston 1999). The service concept dictates, and is defined by, the service delivery system (performance characteristics of materials, atmosphere and image of facilities, attitudes of employees). Both of these are used to create service levels communicated to the consumer to determine "consumer perceived service levels."

In 1979, Hayes & Wheelwright introduced the *Product-Process Matrix*. Though this is a framework developed for manufacturing, it is highlighted here because of its explanatory strength and impact on several service frameworks. Their premise was that product mix (volume, number of products, degree of standardization) determines the manufacturing process choice. Here, the direction of causation is clearly from the product to the process. The general hypothesis is that if an organization stays on the diagonal of the matrix, the product and process characteristics are well matched, and therefore, organizational performance is enhanced. While the causal direction does not apply to all service businesses and their processes, this concept does have some key features that make it attractive. It has been modified to support several other concepts like Silvestro et al., 1992, and Kellogg and Nie, 1995, and Collier & Meyer, 1998.

Chase (1978) and Chase, Tansik (1983) offered a different classification scheme based upon a theory of customer contact. Using the degree of customer contact as the anchor, their scheme defined three broad service categories: pure service (high contact), mixed service (medium contact), and quasi-manufacturing (low contact). Their theory postulated that the less direct contact the customer has with the service system, the greater is the potential of the system to operate at peak efficiency. Conversely, where direct customer contact is high, the potential to achieve high levels of efficiency is reduced. However, others point out the contact time by itself does not capture the managerial challenges of the service sector (Schmenner, 1986).

Using this theory, in low (or passive) customer contact environments, service processes may be designed with manufacturing-like principles in mind. The process may take advantage of standardization and automation to enhance the efficiency and

effectiveness of operations. This concept spawned researchers to investigate the movement of front office work into back office activities in order to realize improved efficiencies in the service delivery. This has been a concept employed by service industries ever since.

Mills and Margulies (1980) created a typology of three types of service organizations: *maintenance-interactive*, *task-interactive*, and *personal-interactive*. The *maintenance-interactive* firm maintains a cosmetic, continuous interaction between employee and customer/client based upon building trust in order to sustain the relationship for the long term (e.g. banks and insurance agencies). *Task-interactive* service firm are problem solvers (e.g. engineering, and advertising firms). The relationship is focused upon defining a solution to meet the customer's needs. *Personal-interactive* service firms focus on the improvement of the client/customer's personal well-being (e.g., legal, medical, and counseling organizations). It is what occurs in the interaction between the employee decision unit and the client/customer that categorizes these types. This classification scheme attempts to provide information not only for categorizing service organizations but also for structuring and operating the entities within each type. It is criticized for containing classifications that are not entirely mutually exclusive.

In 1983, Christopher H. Lovelock proposed five different two by two schemes to classify services into market segments outside of their traditional industry category. His work led to new understand on the complexity of service delivery concepts and have lead to improved strategies for marketing and operating in various services. However, these

classifications fail to provide clear direction of influence between matrix axes, such as the direction of influence shown in Hayes & Wheelwright's (1979) product-process matrix.

In 1986, Schmenner developed his *Service Process Matrix* based upon the dimensions of degree of interaction with and customization for the consumer (x-axis) and the degree of labor intensity (y-axis). It was used to facilitate the analysis of process choice and is considered by some to be the primary service classification scheme (similar to Hayes and Wheelwright's (1984) Product-Process Matrix for manufacturing operations). One can appreciate its evolution built upon Lovelock's views of the service act and an expansion of Chase's customer contact approach (through contact customization).

Based upon this matrix and its modified form in 2004, four positions were defined for the service factory, the service shop, mass services and professional services. Schmenner argued that many of the moves that had been made in the service sector involved moves toward and up a diagonal approaching the service factory.

A few researchers attempted to utilize this topology with limited results. Wright and Mechling (2002) empirically tested which operations management problems were the most important to small service organizations. From their study, they concluded that *Schmenner's service typology* did not provide an explanatory basis for the variations in the factor results. In a separate study by Prajogo (2006) there was no significant difference between Schmenner's four service types with respect to the key issues addressed in their study (service characteristics, operations management activities, operational and strategic performance, management challenges).

Among the early classification schemes that were developed, Silvestro et al. (1992) is notable. They derived a service taxonomy based on the volume of daily service activity and six classification dimensions—length of customer contact time, degree of customization, level of employee discretion, value added, product/process focus, and labor intensity. Depending upon a firm's daily service activity and its ranking on the six dimensions, it would be classified as a professional service, service shop, or a mass service.

While intriguing, this taxonomy has come under attack for several reasons. For one, the horizontal axis is defined as the number of customers processed by a typical service unit per day, but it does not help to explain the nature of the service. Knowing the volume/service unit/day about a service does not give the service provider enough information to make decisions on the six dimensions of the vertical axis. In addition, six dimensions on the vertical axis may be overly complex given that they are likely correlated (Collier & Meyer, 1998). Six dimensions also makes it tough to for users to operationalize.

Kellogg and Nie (1995) introduced the *Service Process Design Matrix*. This two-dimensional classification matrix is based on the service process structure & service package structure (connected the characteristics of service-products w/ service-processes). Here the x-axis represents the service process dimension (also called customer influence) while the y-axis defines the service package dimension (defined by the degree of customization). This matrix is similar to Schmenner's SPM matrix but with more focus toward linking operational issues with marketing concepts. It addresses the strategic issues faced by service firms. A service offering is actually a package of goods,

facilities, implicit and explicit services. Process for producing a service is determined less by the level / sophistication of the equipment used as by the degree to which the customer influences the service process. The greatest challenge raised to this taxonomy is due to the interpretation challenge due to the customer's influence in both dimensions.

Collier and Meyer introduced a new *Service Matrix in 1998*. On their x-axis is the Customer's Service Encounter Activity sequence. It holds positions from unique and not repeatable to highly repeatable. On the y-axis is a measure for the number of pre-determined pathways built into the service system design. On the diagonal are the following matrix positions:

(1) **Customer routed services** - Those that offer the customer broad freedom to select from many possible routes through the service delivery system (ex. Nike Town, Internet, Club Med, parks, museums and health clubs);
(2) **Co-routed services** - Offers customers a moderate number of routes through the service delivery system (ex. consulting, investment portfolio, and legal and medical services);
(3) **Provider routed services** – Which constrain customers to follow a small number of pathways through a highly repeatable service system (ex. newspaper dispenser, ATMs, McDonalds, network TV programming, and credit cards).

The *Unified Services Theory (UST)* (Sampson 2001) is defined by the following description: "With service processes, the customer provides significant inputs into the production process. With manufacturing processes, groups of customers may contribute ideas to the design of the product, but individual customers' only participation is to select and consume the output. All managerial themes unique to services are founded in this distinction."

This implies that, 1) service processes are distinguished from non-service processes only by the presence of customer inputs and implications thereof, 2) understanding those additional issues unique to managing services requires only understanding the implications of customer inputs, and 3) customer inputs are the root cause of the unique issues and challenges of services management.

Collectively these frameworks represent the best conceptual explanations of services proposed in the research arena. While each of these concepts holds merit, none of these are able to explain the complex nature of service relationships in a supply chain network. This research is intended to help uncover more of that veil.

2.4 SERVICE SUPPLY CHAIN MANAGEMENT THEORY

Service operations management as a separate discipline was slow developing until 1976 with the publication of Earl Sasser's article "Match supply and demand in service industries" was released in the Harvard Business Review. Two years later this was followed by the pioneering textbook Management of Service Operations (Sasser et al., 1978) containing what are now regarded as classic service cases and issues. In this book was coined the term "service concept," defined as the total bundle of goods and services "sold to the customer and the relative importance of each component to the customer". Later in 1978, Richard Chase wrote a service article for the HBR titled, "Where does the customer fit in a service operation?" Chase challenged the operations management community to consider two types of operations: the traditional back office factory and the customer-facing, customer contact front office. These researchers had the pedigrees to provide credibility and authority to the study of customer-influenced operations (Johnston, 1999). There were other sources offering service operations concepts

including “Production-line approach to service” (Levitt, 1972), “Quality control in a service business” (Hostage, 1975), “The new back office focuses on customer service” (Matteis, 1979) and “Marketing’s potential for improving productivity in service industries” (Lovelock and Young, 1979). Taken together, these works and others like it spawned a new age of service operations management research (Johnston, 1999).

Meanwhile, the origins of supply chain management are less clear or dramatic. The term was introduced by consultants in the 1980s, but much ground breaking work was completed in the 1990’s as researchers built the foundations for analyzing effective operations management processes. It is generally believed that the increase in global competitive pressures forced businesses to look harder for ways to improve their financial performance. As these firms searched for answers, they put attention to two arenas. First, they looked more closely at ways to improve their own internal operations (JIT, agile manufacturing, TQM). Second, they considered selectively outsourcing work to supply chain partners who could provide added value to their operation (lower costs, shorter lead times, higher quality). In a 2006 study of supply chain management research, Burgess et al., found that over an 18 year period from 1985 to 2003, over 75% of the supply chain management articles were published in the last 5 year period (1999 through 2003). This supports the belief that the supply chain management construct was still relatively new as of 2003.

As it relates to services, there has been good work performed in service related topics that affect SCM. Pagell and Melnyk, (2004), point out unique constraints for services that are not generally faced by manufacturers because the customer is physically waiting in the queue. Sampson (2000) explained how with service organizations, one of

the primary suppliers of process inputs is customers themselves, who provide their bodies, minds, belongings, or information as inputs to the service processes. They refer to this concept of customers being suppliers as "customer-supplier duality." Narasimhan and Jayaram (1998) offered a process model for successfully planning and implementing business process reengineering efforts in services. They identified four unique features of service delivery systems that affect project planning: customer involvement, need for customer preparation, concurrency of document, financial and information flows and process customization. Stanley and Wisner (2001) provide strong support for strengthening relationships between purchasing, the firm's external suppliers, and purchasing's internal suppliers and customers.

Similarly, there has also been research on several facets within service supply chain management. Wynstra et al (2006) proposed a classification of business services based on how the buying company applies the service with respect to its own business processes. Ellram, et al (2004) applied manufacturing frameworks to the services supply chain for both buyers and suppliers. Vandaele and Gemmel (2007) showed how services purchased from an external supplier by a business service provider influence downstream supply chain members satisfaction with the business service provider. This was found to exist even when the external service was sold separately. Recently, Lindberg and Nordin (2008) examined the process of buying complex services and how some firms have attempted to objectify the services, reducing them to the status of simple objects, during different stages of the procurement process. This manufacturing-dominant approach is being performed in an effort to make them more tangible in nature (by materializing, standardizing, specifying or packaging them for procurement). This is in contrast to the

more service-dominant concept that presumes customized solutions developed in close buyer– supplier interaction.

On the topic of sourcing agreements, Ahlstrom and Nordin (2006) identified key areas which may cause problems when establishing service supply relationships. Among those areas identified were writing legal agreements for service exchanges, clearly specifying service processes to be transferred to suppliers, handing over service delivery to suppliers, and losing control over the relationship with the customer. Along those lines, Ellram et al., (2004) discovered more granular differences in service agreements. Specifically:

- Expectations are more vague in service level agreements than product specifications,
- Quality is a subjective measure based upon user-defined scales,
- Demand is less predictable,
- Cost variability is more volatile, and
- Contract completion is more subjective with less tangible evidence of completion (Refer back to Table 1.5).

2.5 FACTORS AFFECTING SERVICES SUPPLY CHAIN MANAGEMENT

2.5.1 Nature of the Service

The service industry has been characterized as fragmented with many different types of service concepts. Toward unpacking these concepts, there have been several key characteristics that have been postulated to distinguish the nature of services offered. Some of the more highly regarded ideas identified in the service framework literature include:

- the degree of service labor intensity (Schmenner 1984);
- the degree of customer interaction (Schmenner 1984);
- the degree of customization for the consumer (Schmenner 1984);
- the volume of the output (Silvestro, 1999);
- variety and flexibility of services offered (Armistead, 1990)**;** and
- the length of customer contact time (Chase, 1981 and Chase, Tansik, 1983)

As described in the section on Service Typologies, there has been no end to the number of service typologies proposed to call to attention a unique facet within one or many services. With the rapid acceleration in E-business technologies, this growth is bound to continue on this pace. Yet to date there have been very few proposed service classifications that have been utilized by other researchers or better yet, tested for significance. Understanding these service characteristics is important for positioning the service firms in terms of their strategies and operations (Nie and Kellogg, 1999). With that in mind, this study will include an analysis of these characteristics. The nature of the service will be analyzed based upon three seminal pieces of work that have been held up to considerable review and discourse. These are the works by Lovelock (1983), Chase (1981), Chase, Tansik (1983) and Schmenner (1986 and 2004).

Lovelock introduced a series of classifications back in 1983 to classify service industries in order to generalize the service industries into useful market segments. His research paper identified five two-by-two classification matrices based various service concepts. These included concepts on 1) the nature of the service act (tangible vs. intangible services), 2) the nature of the service delivery (continuous or discrete transaction delivery), 3) customization (of the service delivery and the employees' ability

to exercise judgment), 4) the nature of demand to supply (based upon variation in either) and 5) the method of service delivery (based upon the availability of service locations or access). In a related article, Lovelock and Young (1979) introduced a classification for dividing services into two categories: those that do something for consumers themselves and those that do something for consumers' possessions.

Chase (1981) first proposed the Theory of Customer Contact where it was postulated that common service systems could be grouped according to decreasing contact into various categories: pure services, mixed services and quasi-manufacturing services. His seminal work was further exercised by Kellogg (1995), when together they empirically analyzed the impact of customer contact on the service delivery. Since then, many others have utilized the Customer Contact Theory to attempt to explain the service delivery concept. This has resulted in research into retail bank marketing (Julian et al., 1994); the de-coupling of front and back office delivery systems (Metters et al., 2000; Safizadeh et al., 2003; Zomerdijk et al., 2007); evaluating perceptions of the technology-mediated customer service experience (Froehle and Roth, 2004); studying customer contact employees (Schwepker et al., 2005), linking the customer contact model to the SERVQUAL measure (Soteriou and Chase, 1998); and acting as a moderator in service strategy formation (Roth and van der Velde, 1991).

The degree of labor intensity (high intensity vs. low intensity) and the degree of interaction and customization was introduced by Schmenner in his 1986 and 2004 articles. Based upon his matrices, four positions were defined identifying the service factory, the service shop, mass services and professional services. Several authors have felt his concept was the most accurate method for determining service process (Mersha,

1990) while others have made attempts to disprove his theories (Prajogo, 2006; Verma, 2000; Wright and Mechling, 2002).

2.5.2 Services Supply Chain Management

2.5.2.1 Trust

There are multiple similar definitions of trust that have been used in research. For example, trust has been defined as one party in a relationship being confident that the other party will not exploit its vulnerabilities (Dyer and Chu 2000). Trust is also frequently defined as a willingness to take risk (Mayer et al., 1995) and the decision to rely on a partner with the expectation that the partner will act according to a common agreement (Currall and Inkpen, 2002).

When looking at trust in the context of supply chain management, we need to focus upon the trust between supply partners. Ireland and Webb (2007) have reviewed the differences between trust in a partner and trust in a situation. They state, "Trust between organizations as partners creates an atmosphere in which firms willingly exceed the minimal requirements of a relationship to increase the likelihood of success for all partners. Trust in a situation results in an arrangement in which firms contribute the minimum amount of resources and time to an inter-organizational relationship to achieve efficiency."

Trustworthiness is considered an important factor in selecting a supplier, along with integrity, commitment, and characteristics that imply 'fair dealing' (Anderson and Narus 1990). Trust is a predictor of positive performance within inter-organizational relationships (Currall and Inkpen, 2002); a determinant to the level of supplier responsiveness (Handfield et al., 2002); a predictor of partnership success (Mohr and

Spekman 1994); and a predictor of cooperation (Morgan and Hunt 1994; McCutcheon and Stuart 2000) and commitment (Kwon and Suh, 2005) in buyer-seller relationships. This agrees with research that proposes trust is an antecedent to a firm's strategic partnering orientation (Mentzer et al., 2000). As stated in La Londe (2002) "Issues of trust and risk can be significantly more important in supply chain relationships, because supply chain relationships often involve a higher degree of interdependency between companies." Such a requirement (releasing and sharing information) is a challenging task, which requires a high degree of trust among and between the supply chain partners (Handfield, 2002).

This is essential to developing relationship-based partnerships where trust is used over controls (McCutcheon and Stuart 2000). In these cases, trust appears to have a reciprocal relationship with external cooperation. Trust is found to act as both a pre-condition and an outcome of the buyer-seller relationship. A limited level of trust may allow initial external cooperation, which when successful creates trust, which in turn enhances external cooperation (Fredendall et al., 2005; Fawcett et al., 2009). As a result, once trust is established, firms learn that joint efforts will lead to outcomes that exceed what the firm would achieve had it acted solely in its own best interests (Anderson and Narus 1990). At any level of trust, a certain amount of relational risk is present as a partner may not act according to the agreement (Currall and Inkpen, 2002). Firms accept elevated levels of risk to gain access to the social and economic benefits that are associated with trust-based relationships. A balance of trust and power within the supply chain offsets uncertainty and risks associated with the behaviors underlying cultural competitiveness (Ireland and Webb, 2007).

Meanwhile , Monczka et al. (1998) define commitment as the willingness of the buyer or seller to 'exert effort on behalf of the relationship'. In the supply chain, this effort comes out in the form of resources applied to develop and maintain the relationships involved in the network. When suppliers act as committed partners in a relationship, they become involved in their customer's needs and apply effort to help them obtain their mission. This leads them to act responsibly toward their customer. Likewise, when a buyer is committed to their supply partners, they work to maintain a strong relationship, treat their partners fairly and follow through on promises made. This leads them to openly share information about their needs, competitive forces and future plans.

2.5.2.2 Effective Communication

Previous research has illustrated the critical role that two-way communication has on a successful supplier relationship (Hahn et al., 1990; Krause, 1999; Lascelles and Dale, 1989; Newman and Rhee, 1990). In the manufacturing literature, this usually is illustrated in relation to material selection, product design and problem resolution. In the service industry, similar communication requirements are needed to improve service delivery. This is particularly true when the customer is part of the delivery system. Buyers and suppliers in the service arena must constantly assess their customer's requirements and how the service meets their needs (Sampson, 2000). Using the relational view as the backdrop, inter-organizational communication is a relational competency within a dyadic buyer-supplier relationship and was found to foster relationship-specific assets that generate sustainable competitive advantage for both the buyer and supplier firms (Paulraj et al., 2008).

Separately, insufficient communication has also been identified as one of the key relationship issues likely to jeopardize supplier relationships (Fredendall et al., 2005). When communication does not meet levels expected by one of the parties in the dyad, it can lead to mistrust and misunderstanding (Kelly et al., 2002). It also is the critical element necessary to avoid or elevate conflicts between partners (Mentzer et al., 2000; Mohr and Spekman 1994). Not surprisingly, Newman and Rhee (1990) found in their case study of the NUMMI automotive production plant that many supplier product problems were due to poor communication.

Based upon this, communication finds itself as a core factor making up the supply chain management construct in several research projects (Chen and Paulraj 2004a; Fredendall et al., 2005). Within the literature, we find that relationship quality with suppliers is positively influenced by communications frequency (Sriram and Stump 2004) and that communication within the dyad should be timely, accurate, adequate, complete and credible (Fredendall et al., 2005) in order to effective. Communication between buyers and supplier was also found to have a positive effect on customer responsiveness (Chen et al., 2004).

2.5.2.3 Information Sharing

Information sharing is a related, but unique construct. It refers to one party's willingness or propensity to provide critical and proprietary information to other parties. When provided to supply chain members in a partnership relationship, it is linked with trust. Shared information can vary from strategic to tactical in nature and from information about logistics activities to general market and customer information (Mentzer et al., 2000). By taking the available data and sharing it with other parties

within a network, information can be used as a source of competitive advantage (Jones, 1998). Information sharing has been linked to other benefits as well. When teams share accurate information openly they build trust and increase their influence on other team's strategies (Fawcett et al., 2009). Sharing of accurate, timely information with suppliers facilitates reliability even in a rapidly changing competitive environment (Power et al., 2001). Subramani (2004) contends that the association suppliers develop with buyers is directly constrained by communication within the firm. In effect, internal communication serves to mediate buyer–supplier collaboration.

In the professional services, Ellram et al., (2004) identify information, through monitoring and controls, as one of the four key strategies for minimizing risk in outsourcing services. They also illustrate how the perishable nature of services increases the effect of demand uncertainty. This increases the importance of information flows (like information sharing and feedback). Sampson (2000) pointed out the importance of information as an input to the service process, along with the customer themselves. Meanwhile, Mohr and Spekman (1994) found information sharing to be a predictor of partnership success.

Dyer and Singh (1998) suggest that firms can create the potential for achieving competitive advantage by moving away from an arm's-length relationship through tangible investments in relation-specific assets, substantial information exchange, complementary resources and capabilities, and effective governance. Kwon and Suh (2005) found that information sharing will lower the degree of behavioral uncertainty and potential opportunism and indirectly improve the level of trust among supply chain

partners. Information sharing has also been singled out as the most important factor for a successful supply chain alliance (Bowersox et al., 1999; Handfield et al., 2000, 2002).

Many researchers have emphasized the importance of information sharing in defining the supply chain management construct. Min and Mentzer (2004) cite the value of mutually sharing information for planning and control processes. Lalonde (1998) considers sharing of information as one of five building blocks that characterize a solid supply chain relationship. Li et al., 2005 and 2006 identify information sharing and information quality as two of their six key factors making up the supply chain management construct.

2.5.2.4 Long-term Relations

In a related topic, long-term relations is a factor related to advanced purchasing practices for manufacturing firms. But its influence on the service industry is projected to be no less significant. Research states that when a buying firm employs advanced supply chain management practices, there are several items that generally fall out of the practice, the development of long-term relationships with suppliers is one of those items.

Carr and Pearson (1999) identified that firms which conduct long-term planning and consider purchasing to be strategic are more likely to build long-term cooperation relationships with their key suppliers. Long-term sourcing policies have been shown to have a positive affect on inter-organizational communication (Paulraj et al., 2008), to be a major contributor to improved supply chain performance (Shin et al., 2000), a positive impact to advanced buyer – supplier practices (De Toni and Nassimbeni 1999); a key to improved customer responsiveness (Chen et al., 2004a); an impact on the entire supply chain's competitiveness (Choi and Hartley, 1996); positively related to the buying firm's

involvement in supplier development (Krause, 1999) mutually beneficial to buyer and supplier (Burt and Soukup, 1985) and tied to higher levels of integration between partners (Sheu, C., Yen, H., Chae, B., 2006). In addition, researchers Ellram and Krause (1994) claim that buyer-supplier relationships tend to last longer for non-manufacturing than manufacturing firms while non-manufacturers believe that it would be more difficult to replace their supplier partner. These findings lead to the assumption that service relationships require more effort to develop (Field and Meile, 2008).

These findings can be supported on theoretical grounds as well. When partners in a dyadic relationship commit to a relationship, they expend energy and resources to ensure it works effectively for both parties. Relational investments by one party, be they time or money, show the other party the willingness to make the relationship work. Once these investments are observed, they create relational trust between partners. Long-term, this safeguards the partners against opportunistic behavior, reducing the transaction costs between each partner (Dyer 1997).

While the concept of long-term relationships have not been defined in terms of years, it is implied that there is an intention to maintain the relationship into the future. For the parties involved, long-term relationships relates more to the intention that the arrangement is not going to be temporary (Chen et al., 2004b). Some researchers have identified the importance of long-term relationships in their supply chain management constructs. Li et al., 2005 and 2006 identify strategic supplier partnership as a key factor in supply chain management. They defined strategic supplier partnership as a long-term relationship between an organization and its suppliers. Min and Mentzer (2004) cite the performance value of a long-term orientation for the supply chain and its individual

members. Meanwhile, Chen and Paulraj (2004b) tie 'partnerships' and 'partnership sourcing' arrangements to closer, longer relationships with suppliers.

2.5.2.5 Supply Base Reduction

By developing a long-term orientation with a supply base, it is natural for the total supply base to shrink in size. Developing long term partners reduces the turnover affect of competitive bidding inherent in more adversarial buyer – supplier relationships, which often emphasizes purchased prices over the performance of the purchased item (Mohr and Spekman 1994). By focusing attention on fewer, more strategically aligned firms, the sourcing department is able to reduce the number of suppliers in its portfolio. This is a key step toward future development of the chosen suppliers (Handfield 1993).

The very concept of multiple suppliers for every sourced material or component is based upon transaction cost theory (Williamson 1985). This derives from the premise that (1) competition is the basis of the economic system, (2) purchasing must not become source dependent and (3) multiple sourcing is a risk-reducing technique (Shin et al. 2000). This concept believes that the administrative or transaction costs associated with managing a large number of vendors will not outweigh the benefits (Dyer 2000). Yet research has shown otherwise.

Chen and Paulraj (2004b) identify eleven (11) benefits supply base reduction has over the traditional multi-source methods. Among some of the most significant advantages cited in their literature that stand out for the service industry are volume consolidation and quantity discounts, an improved buyer–supplier product design relationship (De Toni and Nassimbeni, 1999), improved trust due to communication (Newman 1988), improved performance (Shin et al., 2000), and better customer service

and market penetration (St. John and Heriot, 1993). Additional research has identified improvements in quality (Handfield et al., 1993), trust, dependability and cooperation (Dyer and Singh, 1998; Chen et al., 2004). There are also benefits realized by the supplier in these arrangements due to increased information sharing as well as potential future volumes and prices guarantees (Handfield et al., 1999).

2.5.2.6 Supplier Involvement

Webster's Dictionary defines collaboration as the act of working together, especially in a joint intellectual effort. Collaboration is played out in the supply chain arena in the areas of teamwork, cooperation, partnerships, and alliances. While each area applies a different level of collaboration, they all require investments from both sides (buyer and supplier). It is the involvement related to the supplier that is specifically under study in this construct.

Collaboration has been cited as a differentiator for companies involved in supply chain management best practice (Bovel and Martha 2000). When considering collaboration, it has been found that both internal and external collaboration are required to ensure supply chain performance (Stank et al., 2001). They found external collaboration to directly influence internal collaboration, which in turn increased logistic performance. Similarly, in a study on the impact of information technology on supply chain strategy, the authors defined supply chain integration as a construct made up of supplier partnering, closer customer relationships and cross-functional teams (Vickery et al., 2003).

However for this research project, we focus upon external supplier involvement due to the significant impact suppliers have on the quality, delivery and performance of

sourced goods and services. When the supply base is the recipient of affective communication and information sharing, a level of trust will develop. While this is important to building strong relationships, the benefit is realized when these actions are accompanied by strong supplier involvement through collaboration. The importance of the supply base's impact on a firm's performance is growing. This puts maintaining supplier relationships of greater importance. Experience has shown how long-term, collaborative relationships mutually benefit both a buyer and supplier. When both parties have a vested interest in the success of the relationship, they must work to make it a success (Burt and Soukup 1985).

Among manufacturing firms, attention has been focused upon the new product development arena (Burt and Soukup 1985). However, it has also been found that a key determinant of the ability of manufacturing to make rapid changes is the selection, development and integration of suppliers with appropriate capabilities (Narasimhan and Das 2000; Power et al., 2001). Supplier involvement has been identified as a major contributor to improving supply chain performance (Shin et al., 2000). Similarly, firms identified in research on 'agile manufacturing' see the involvement of suppliers as critical to developing products, improving processes and quality initiatives and receiving high customer satisfaction levels (Power et al., 2001). Within Toyota's strategic supply chain network it has also been suggested that extensive knowledge sharing, facilitated by boundary sharing teams of suppliers, has generated its competitive advantage (Dyer and Nobeoka 2000).

In this study, it is conjectured that supplier involvement is equally important to the service supply chain management construct. This is supported by Sheu et al., (2006)

who identified that supplier – retailer collaboration had a positive affect on supplier - retailer performance. Similarly, Stanley and Wisner (2001) investigated the link between external suppliers, internal customers and the quality delivered to external customers. They found that external purchased supplies have an impact on the satisfaction of external customers, through internal service quality. While the deliverable may differ between service and manufacturing industry, the objectives remain similar. Supplier involvement is deemed to be an important factor in helping to reach these common objectives.

The value of supplier involvement has been used in several studies to define the supply chain management construct. Tan et al., (2001) suggested an integrated supply chain (one that may involve overhauling its current purchasing process and integrate a supplier's engineering teams and product designers directly into its own decision-making process). Li et al., 2005 and 2006 identify strategic supplier partnership as one of six key factors making up the supply chain management construct. Here they identify that strategic supplier partnerships are designed to *'leverage the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits.'* In a related manner, Burgess et al., (2006) considered a factor called "process improvement orientation", which they defined as having established processing arrangements that support interactions within and between organizations, with a view toward continually improving them. Chen and Paulraj (2004a; 2004b) identify supplier involvement in their theoretical construct. Its inclusion is based on the involvement of suppliers in crucial project and planning processes.

2.5.2.7 Capacity Management

One commonality found between manufacturing and services is the high degree of uncertainty in supply chains. However, because services cannot be inventoried, they require added attention toward capacity and demand management. As Ellram et al. stated in 2004, the focus of efficiencies in service supply chains is not on inventory management but on the management of capacity, flexibility of resources, information flows, service performance and cash flow management. Sasser espoused the topic of capacity management back in 1976 when he illustrated how services typically involve simultaneous production and consumption. He explained how services are unable to match capacity and demand with the use of inventories or to smooth capacity utilization by producing for inventory. Typical examples given to illustrate this are the unsold bus or plane seat that cannot be used once the trip begins. Similar arguments can be made in many service industries from academia to healthcare to financial service arenas, where unused capacity carries no value (Bowen and Ford, 2002).

The importance of this issue for services cannot be overlooked. Researchers espouse that variability is a greater factor in services than manufacturing due to the influences of demand and service delivery. Service demand is generally less predictable and more variable than that for manufactured goods (Lovelock, 1984; Hope and Muhlemann, 1997). Meanwhile, customer interaction impacts the delivery of a service due to the variability in processing time (Chase 1981, Chase and Tansik, 1983, Murdick et al., 1990). When considered in conjunction with the features of inseparability and perishability, these factors accentuate the need to manage service delivery differently than goods manufacturing.

To account for this phenomenon, services often utilize a combination of demand and capacity management schemes. In demand chain management, firms employ methods to link their customers and suppliers together into tightly integrated networks. As with goods suppliers, these tactics come at a high cost if unsuccessful (Sasser, 1976). Examples of this strategy includes offering discounts, lowering prices, increasing advertising, diversifying to less fluctuating market segments, offering different services, and accepting reservations, to name a few (Ng et al., 1999). Successful demand change management has shown strong success in driving above average performance in manufacturing firms, though the same has not been found in service organizations (Frohlich and Westbrook, 2002). This difference is generally considered to be caused by the higher variability in demand for services than for the producers of goods and the inability to impact the variation as significantly.

On the capacity management side, services employ schemes to give themselves more flexible capacity to meet customer demand fluctuations. Capacity can be managed in several ways, but for labor-intensive services the most typical methods involve the use of part-time or seasonal employees, flexible work schedules and supply chains (Lovelock and Wright, 1999). By employing capacity management schemes, capacity acts as a replacement for inventory. This permits a supplier to modify its production level in order to respond to customer demands. This is similar to how a goods-producing supplier would increase safety stock to offset demand fluctuations. Both offer buffering effects which increase responsiveness and flexibility to meet customer demand needs. Yet both come at a high price if customer demand does not warrant the levels maintained (Ellram et al., 2004). However, the cost is often less than the cost of losing customers to long

waiting lines. In addition, many service firms approach excess capacity as a leveragable resource. This is accomplished by utilizing excess capacity to market the service through schemes such as differentiation strategies, capacity pledging, entry deterrence and other means (Ng et al., 1999).

There are several research projects that focused upon capacity management in service industries. Whether the research project focused upon the hospital market (Renner and Palmer, 1999), knowledge-based industries (Shah, 2007) or a broader service industry survey (though mostly professional in nature) (Ng et al., 1999), they all considerable capacity management as a significant consideration for improving the service performance. A service firm's ability to employ these schemes successfully by utilizing their supply chains should have a positive affect on the firm's performance.

2.5.2.8 Supplier Management

Supplier management is related to the governance methods employed in managing a firm's supply network. This is a key function of the purchasing group in a manufacturing environment. But research has shown that there are unique features to services supplier management that must not be overlooked. The first area of interest is the contract. Here, decisions are required on how to define the service, the type of agreement to use, the negotiating decision criteria to use, and the completion or sign-off evaluation, among others (Ellram et al., 2004; Ahlstrom and Nordin, 2006). Decisions must also be made to determine the quality controls and supplier evaluation methods to employ (Ellram et al., 2004). Additionally, service organizations must determine who can write and authorize service agreements (i.e. individual departments vs. a central purchasing group) (Cooling, 2008) and any controls utilized to reduce opportunism

(Grover and Malhotra, 2003). As an organization determines what type of contracts to utilize (formal legal contracts, service level agreements, statements of work, etc.), they must consider the impact these agreements have on the development of trust between the channel partners. While, contracts can lay the groundwork for trust, its evolution is often tied to tangible commitments between partners and satisfactory performance over time (Handfield et al., 2002).

Another important factor in managing service suppliers is to manage demand. The focus of demand management for goods producers is forecasting customer requirements while attempting to match capacity. For manufacturers, this is accomplished through production control, inventory buffers, outsourcing, and flexible systems (Davis 1993). However, the services sector has less flexibility to deal with uncertain demand due to the inability to inventory services. As a result, demand management in many of the service sectors focuses on how to meet, or even generate, customer demand. Thus, demand management is a focus on managing demand variation in order to minimize its impact.

2.5.2.9 Customer Involvement (i.e. customer interaction)

Firms in many industries are identifying pressures to contain costs in order to protect margins. These pressures are causing them to look outside of their walls for opportunities to save costs. This is resulting in new requirements to consider. In some industries, customers now demand access to real-time data and expect this access to be available at any time, any place, and via any means the customer may choose. For example, in the financial services industry transactions are now being executed on customer terms, not industry or individual company terms (Mulligan and Gordon, 2002).

As customer expectations are evolving, suppliers are identifying the need to react to their customers more quickly. When coupled with the direct involvement customers have on the service delivery system, it results in the need to develop a client relationship component in the service supply chain management construct. Several previous researchers have included elements of the customer in their supply chain management constructs. Customer relationship (associated with all practices employed to manage customer complaints, build long-term relationships with customers, and improve customer satisfaction) is a factor making up the construct of Li et al. (2005, 2006). Tan (2001) employs a similar construct called customer service management. Chen and Paulraj (2004b) identify 'customer focus', based upon satisfying needs and providing timely service, as one of three key external driving forces instrumental to the development of their notion of supply chain management. Meanwhile, according to Mentzer et al. (2001), supply chain management requires a customer focus to create unique and individualized sources of customer value, leading to customer satisfaction.

In the philosophy of a supply chain management network, the customer is a core component of the supply chain. A company's offerings are directly related to the capabilities of the supply chain, enhanced by a firm's relationships with its suppliers and customers (Min and Mentzer, 2004). In an integrated service supply chain, the responsibility to communicate is shared between the service provider and the customer. Because service providers must inform customers of their process features, they must know their supply partners capabilities and limitations as well (Sampson, 2000).

Customer relationship management (CRM) is a term often associated with managing customer relationships. CRM is a broad term that covers concepts used by

companies to manage their relationships with customers, including the capture, storage and analysis of customer, vendor, partner, and internal process information. Employing CRM requires not only understanding a customer's needs, but focusing efforts to meet those needs (Bitner 1995).

Sampson (2000) explained how in service organizations information is one of the key inputs to the service process, along with the customer themselves, that makes services unique. The inclusion of the customer into the service delivery process is one of the unique features of services as customers can provide property and/or information. It is this co-production concept that is unique to service providers and must be accounted for in any service supply chain management construct (Bitner and Brown, 2006; Roth and Menor, 2003; and Sampson and Froehle 2006).

Sasser et al., in their landmark 1976 article probably define the role best when they stated the following: "A primary reason for defining the service product in terms of a total service concept is the role the process plays in creating the product. In purchasing a service, the consumer interacts with the workforce, equipment, and physical environment that create the service. The process itself is, therefore, one dimension of the product. In contrast, the manufacturing process is isolated from the consumer and has an impact on the consumer only through what effect it has on the product. The elements of the manufacturing process are designed for the effective production of the physical good that is its output. The labor, equipment, and facilities are functionally designed with the cost and quality of the product being the primary criteria for evaluating how effectively these resources are utilized. In contrast, the service delivery system must be designed with the presence of the consumer in mind."

The existence of reciprocal relationships confirms the findings of a recent study by Sampson (2000) on what he terms 'customer-supplier duality' – the concept that a customer can also be a supplier – in service organizations. Customers perform this role by providing their bodies, minds, belongings, or information as inputs to the service processes. A connection to the customer has been found to be a significant factor in many related research studies. Lovelock (1983), for one, addressed how customers can become more productive "inputs" into the service delivery process by means of actions such as timing-changes, co-production and third-party involvement (Wynstra et al., 2006). Customer influence has a significant impact on four key operations management decision areas (location, product/process development, quality, and work force issues (Nie and Kellogg 1999). Linking supply chain management to CRM and supplier relationship management has been shown to improve firm performance in terms of improving communication, trust and supply chain responsiveness (Wisner 2003). Meanwhile, "Agile" firms have been found to be more customer-focused and are able to apply a combination of management techniques and new technology to meet changing customer requirements (Power et al., 2001). Consequently, a service supply chain network must engage, extract and distribute information regarding the customer's needs in order to be successful.

2.5.3 Information Technology Impact

Information technology has been found to be an important factor in several of the previously developed supply chain management constructs discussed already. Donlon (1996) included information technology sharing; Alvarado and Kotzab (2001) added the use of inter-organizational systems (ex. EDI as an instrument to allow interaction

between partner firms); Chen and Paulraj, (2004) extended the application of inter-organizational systems' to generate collaborative planning; Min and Mentzer (2004) focused upon information sharing and considered EDI as a key component to drive this; and Burgess et al. (2006) included information systems (covering aspects of communication both within and between organizations). All of these studies focus upon information technology's ability to increase the transfer of information and ideas between supply chain partners in order to improve effectiveness. When viewed from a product or goods supply perspective (as each of these studies were), the use of information technology is generally geared toward impacting inventory management as it relates to procurement, replenishment, tracking, or product design.

However, some would argue that service encounters are more socially interactive and information dependent than those that occur in manufacturing settings (de Burca et al., 2006). They believe that information technology is critical to many practices within the service operations management spectrum. Other researchers contend that IT related practices have been central to the service revolution that has occurred (Rust and Miu, 2006). They maintain that computer technology has revolutionized the way that companies perform their services by enabling the development of long-term individualized relationships with customers. This has been done by facilitating the communication, storage, and processing of information. Figure 2.1 takes a look at some examples of the information technology-based service solutions offered by service firms today.

To understand what makes up information technology we turn to previous research. Some see information technology as the acquisition, processing, storage and

dissemination of vocal, pictorial, textual and numeric information by a microelectronics-based combination of computing and telecommunication. Information technology comes in a wide range of applications within services management. It includes everything from personal productivity tools (spreadsheets, word processing and simple customer databases) to more sophisticated decision support systems and everything in between (Fletcher 1991). It includes all hardware, software, communications, telephone and facsimile facilities (Weill, 1992), including the Internet. E-commerce, as it is known, is the process of doing business online, typically via the Web. Although in most cases e-commerce and e-business are synonymous, e-commerce implies that goods and services can be purchased online, whereas e-business might be used as an umbrella term for a total presence on the Web, which would include the e-commerce shopping component.

When considering the impact of information technology on supply chains, one must consider the architecture making up the supply chain itself. Supply chain architecture refers to the gathering of technical components and inter-organizational protocols that enable buyers and suppliers to collaborate effectively. From a study of retailers by Sheu et al (2006), supply chain architecture was determined to be made up of four variables: information sharing (communication), inventory systems, IT capabilities, and supply chain coordination structure. It was also found to have a significant impact on buyer-supplier collaboration which in turn affected buyer-supplier performance.

This finding is in line with other research showing that the use of information technology has improved business communications both internally and with customers. Internal departments are able to share information electronically in real-time, while customer-facing departments can contact their customers via email at any time of day or

night around the world. Information technology also helps firms collect and analyze customer information regarding their entire purchase and contact histories (Rust and Miu, 2006). This leads to the assertion that the information technology construct within the services supply chain management arena must capture elements across three areas of competence in order to create effectiveness. Those three areas include communication links (connecting with both customers and suppliers), processing effectiveness to drive service delivery efficiencies, and information technology capability (a.k.a. IT sophistication). A firm proficient in these areas can answer each of these questions in the affirmative:

- Are you connected electronically to your suppliers and customer?
- Are you collaborating with suppliers to improve components of the supply chain and/or service delivery?
- Do you have the technical wherewithal to do this affectively?

2.5.3.1 Information Technology Sophistication (i.e. Skills and Capabilities)

To successfully utilize Information technology one would assume that the department skills and infrastructure capabilities must provide value. The resource based view of the firm would posit that only by having immobile, inimitable and non-substitutable IT skills and capabilities will a firm be able to sustain a competitive advantage over its competition. This implies that a firm first has developed or acquired such skills and capabilities to leverage. Previous research on the topic by Weill and Broadbent (1998) found that base-level IT components were converted into useful IT infrastructure capabilities and business applications with the skills of the IT department. These skills allow the department to form a shared IT infrastructure capability. They also

found evidence that higher skilled IT department were associated with IT infrastructures with more capabilities and services, and ultimately, more valuable business applications. Others have identified that IT departments with high technical skills led to better IT infrastructure flexibility (Byrd and Turner, 2000). Still others have found direct and positive affects of the quality of the IT department's technical skills on information technology's impact on the supply chain (Byrd and Davidson, 2003).

The topic of skill and capability has been studied from several dimensions. One line of research headed by de Burca et al., (2006), labeled this concept IT sophistication. They defined "IT Sophistication" as the degree to which an organization's processes, equipment and personnel compares favorably or unfavorably with its competitors. They found that the level of a firm's IT sophistication moderated the relationship between service practice and service performance within the firm.

In another line of research, IT-based supply chain management systems (termed SCMS) have also been analyzed for their impact. They have drawn considerable attention due to their ability to affect performance across an entire network of suppliers through automated routing and real-time process monitoring capability. Extending firms' visibility into the network has spawned new levels of supply chain integration (Benjamin and Wigand, 1995; Gunasekaran et al., 2004; Dehning et al., 2007). The implementation and use of SCMS' has also been shown to impact service quality and customer satisfaction (Zhu et al., 2002), increase firm performance (Dehning et al., 2007; Byrd and Davidson (2003) and Vickery et al. (2003), and lead to closer buyer-supplier relationships (Subramani, 2004, Bakos and Brynjolfsson, 1993). And their deployments increase the

importance of more subjective relationship affects such as quality, responsiveness and innovation.

2.5.3.2 Electronic Communication Links (i.e. Connectivity & Integration)

The concept of connectivity has been analyzed many times under the guise of the 'information technology' construct. But it relates to more than just the mere fact that partners have electronic links with each other. The passing of data can be accomplished in many different ways. However, by passing information electronically it can be done efficiently (transmitting billions of information bits in an instant), effectively (with significantly higher data quality), and intelligently (where needed, when needed and based upon pre-defined business rules). These connections are also referred by some as 'supply chain linkages'. They refer to the connections that a firm creates with supply chain partners (both suppliers and customers) to manage the flow and quality of information. Using the resource based view as a theoretical foundation, these linkages have been posited to be critical resources that provide advantages to the firms that develop them. Knowing this will justify a firm's decision to enhance their linkages throughout their supply chain (Rungtusanatham et al., 2003).

One of the most often discussed means to pass information electronically is through electronic data interchange (EDI). Some also refer to this as E-commerce, in which one company's computer system transacts with another company's computer system. In the sourcing arena, one firm's computer system may query their inventory and transmits purchase orders to another company's computer in an automated, real time mode (www.answers.com). Sharing information with supply chain partners through EDI is a critical component of supply chain management in the 21st Century. EDI is not only

a method for electronic ordering, it can integrate business functions to create a more proactive and effective style of business management and customer responsiveness. By providing a direct transfer of information between business partners, firms can improve logistics efficiency and increase customer service levels. It may also improve cycle reliability and help to decrease cycle time (Tan, 2001).

In fact, technology use within the supply chain is often seen as an 'enabler,' because it can substantially reduce paperwork, improve communication, and reduce supply chain cycle times if properly implemented (Handfield et al., 2002). But information technology should not be constrained to only its influence on the supply base. It can also have a significant impact on customer interaction. Directing the service delivery medium, improving the service delivery effectiveness, increasing customer connectivity, enhancing information flow, increasing service quality, and improving customer satisfaction are a few of the areas of influence (Bitner and Brown, 2006; Heineke and Davis, 2007).

In the research arena, IT connectivity as been shown to affect communication (Chen and Paulraj, 2004b; Sriram and Stump, 2004; Paulraj et al., 2008), increase information sharing within and between organizations (Chen and Paulraj, 2004b; Fawcett et al., 2007; Cooling, 2008; Zhou and Benton, 2007; Paulraj et al., 2008), facilitate supply chain integration (Frohlich and Westbrook, 2001; Mulligan and Gordon, 2002; Vickery et al., 2003; Rai et al., 2006; Devaraj et al., 2007), and improve the efficiencies of cross-functional teams (Chen and Paulraj, 2004b). It should not be surprising that research has also shown that supplier relationship quality and communication frequency is positively influenced by IT investments in purchasing-specific technology applications and vendor

interface applications (through EDI and other means of electronic communication) (Sriram et al., 2004).

2.5.3.3 Information Processing Effectiveness

It has been suggested that information powers the supply chain. Yet as noted in Collier and Meyer (1998), information technology is capable of changing the very economics of business (both the economies of scale and scope) and redefining the possibilities in service system design. Examples can be found everywhere showing how IT increases or decreases the number of service encounter activity sequences available to customers and the number of pathways built into the service system. In a similar manner, Chase (1981) and Chase and Tansik's (1983) work on customer contact theory spawned an entire research vein on the concept of splitting service processes into front-office and back-office compartments. From this work, efforts are now focused on introducing technology to facilitate these process splits (between front-office and back-office) as well as increasing the overall service delivery available (Safizadeh et al., 2003; Zomerdijk et al., 2007). This is what drove Schmenner, in his 1986 & 2004 articles, to propose his Service Process Matrix typology that specifically focused upon a service organization's degree of interaction with and customization for the consumer and the degree of labor intensity in the service process. His work facilitated the analysis of process choice and is considered by some to be the primary service classification scheme. Real world examples illustrate the need to provide the customization that customers clamor. But this often requires the creation of new service features. In today's world, these service features are generally developed through technology advances and extensions versus more traditional methods.

In other ways, information technology has shown to enhance productivity (e.g., by automating routine tasks like order and payment processing, vendor evaluation and communication links) and to enable quality programs and other initiatives that rely on the generation, manipulation, and dissemination of vast amounts of real-time information. This has supported the information dependent requirements of business process re-engineering (BPR), Total Quality Management (TQM), Just-in-Time (JIT), knowledge management programs and supply chain management initiatives (Sriram et al., 2004). Others have cited IT's ability to enhance strategic partnerships through time-based strategies (Bowersox and Daugherty, 1995) and to moderate supply chain collaboration (Sheu et al., 2006). Meanwhile, information technology utilization has been found to promote a firm's ability to become 'agile' (Power et al., 2001); and logistics coordination effectiveness has been found to be facilitated by excellent information technology processes (Li et al., 2005). IT was also shown to affects purchasing process improvements through improved relationship quality (Sriram et al., 2004).

Another decision related to the use of technology in supplier management relates to the degree of information flow (Davis 1993; Lee and Billington 1995). In new supply chains, buying firms are purchasing not only their suppliers' products or services, but also their suppliers' systems and capabilities, which in turn require high levels of coordination. Buying firms in these relationships provide more than just financial compensation to their suppliers. Buyers not only share information with their suppliers, but also provide suppliers with guarantees of future volumes, prices, resources, and creativity. This can spur suppliers onto additional cost reduction and quality improvements (Handfield and Krause, 1999).

Information sharing in the retail service environment has proven to reduce supply chain inventories by as much as 40%. Through a combination of advance shipping notices with point of sales (POS) customer information, connected across a supply chain network via electronic data interchange connections, has provided vendors with the ability to coordinate shipments more timely and accurately with retailer demand (Kahn and Mentzer, 1996). With the advent of the Internet, this type of information coordination should increase, especially in the area of collaborative forecasting, planning and replenishment (CPFR) (Mentzer et al., 2000). These benefits should not be restricted to inventory based services like retailing and distribution.

In research studies, information technology has been shown to increase collaboration between supply chain partners (Sriram and Stump, 2004; Sanders and Premus, 2005; Sanders and Nada, 2007; Sheu et al., 2006); enhance the supply base's relationship orientation (Sheu et al., 2006), increase processing options while decreasing the affect of client customization (Collier and Meyer, 1998), promote higher levels of organizational integration (Vickery et al., 2003), and lead to closer buyer-supplier relationships (Mulligan and Gordon, 2002; Subramani, 2004). In fact, information technology affects the very architecture of the supply chain (Sheu et al., 2006). Separately, strategic IT alignment, when authored correctly, has the added affect of yielding competitive advantages for the firm (Kearns and Lederer., 2003).

Meanwhile, much has been written about the productivity paradox (originally introduced by Robert Solow (1987)) based upon studies in the 1980s that found no correlation between information technology investments and U.S. economic productivity. Since then there has been much debate on whether investments in information technology

were generating higher productivity. Meanwhile, a decade's worth of studies at the firm and country level have consistently shown that there is a significant positive impact on labor productivity and economic growth as a result of information technology investment. Some of these studies showed that the economic boom and surge in productivity of the late 1990s was significantly influenced by heavy investment in IT and the growth of the Internet.

Perhaps the most thorough review of this research has been done by Dedrick et al., (2003) who critically reviewed more than 50 articles on computers and productivity. Their review found evidence to effectively refute the productivity paradox. When looking at the firm level, they found that the performance variability from information technology investments between different organizations is associated with complementary investments in organizational capital. These investments can be associated with investments in decentralized decision-making systems, job training, or business process redesign. They point out that information technology is not just a means to automate existing processes, but more importantly, an enabler of organizational change that ultimately leads to productivity improvements.

In the supply chain management arena, several researchers have found positive relationships between information technology and firm performance. Sanders et al., (2005) related IT capability to firm performance, mediated by internal and external collaboration, key tenets of supply chain management. Dehning et al., (2007) found that a firm's investment in IT-based SCMS had a direct affect on input and output processes, which in turn affected firm performance.

2.5.4 Performance

Much has been written about performance and how it is to be measured. To date, no coordinated decision has been reached on the topic. Yet to analyze operational constructs and their impact on organizational effectiveness, most all believe that performance must be measured. What is generally agreed upon is that measuring both operational (non-financial) and firm (financial) performance leads to a better indication of results. Gunasekaran et al., (2001) provide a summary of the performance measurements and metrics utilized in supply chain literature (Table 2.4).

2.5.4.1 Service Performance:

When considering service quality, most researchers reflect on the SERVQUAL measure. SERVQUAL, was developed by Parasuraman et al., 1985 and 1988 to assess customer perceptions of service quality in service and retail organizations. It has since become the de facto measure utilized for analyzing service quality perceptions across a broad range of industries and applications. In services, it has been used to evaluate customer contact (Soteriou and Chase (1998), purchasing performance (Stanley and Wisner (2001 and 2002)), IT-based services (Zhu et al., (2002), and charitable organizations' performance (Bennett and Barkensjo (2005) among others.

While this construct has been utilized affectively in many applications, it has not been utilized exclusively when analyzing non-financial service performance measurements and their impact on firm performance. Instead, an alternative measure was developed for the general services practice-performance model from the "Service in Britain" study by Voss and Johnston (1995). The underlying proposition to this work was to show that best practice in service management would lead to higher service

performance and ultimately to both improved business and financial performance. From earlier work in both the services sector (Heskett et al., 1997) and the manufacturing sector (Voss et al., 1995), a connection linking general practice to performance was obtained (Glynn et al., 2003). While many of the SERVQUAL items are represented in this measure, it also includes items to identify other factors identified as relevant to a service's overall performance such as employee expertise, service customization, new service introduction speed, unit cost of service and customer retention rates. As a result, the operational service performance metrics for this dissertation analysis are based upon the Glynn et al. (2003) study, which successfully applied these metrics to a supply chain management realm. It has been adapted only slightly to include a few items from relevant supply chain management practice research (Chen, Paulraj, (2004) and Fawcett, et al (2007)) to create a more comprehensive review of service operational performance for this study.

2.5.4.2 Firm Performance:

Organizational performance refers to how well an organization achieves its market-oriented goals as well as its financial goals. The short-term objectives of SCM for goods purchasing is primarily to increase productivity and reduce inventory and cycle time, while long-term objectives are to increase market share and profits for all members of the supply chain (Li et al., 2006). Meanwhile, SCM in services are focused upon customer responsiveness, performance and reliability (modified from Glynn et al., 2003) in order to obtain the same organizational objectives.

Any organizational initiative, including supply chain management, should ultimately lead to enhanced organizational performance (Li et al., 2006). A number of

prior studies have measured organizational (or firm) performance using both financial and market criteria, including return on investment (ROI), return on equity (ROE), market share, profit margin on sales, the growth of sales, and the growth of market share Vickery et al., (2003); Byrd, Davidson (2003); Wisner (2003); Chen, Paulraj (2004b); Fawcett et al., (2007). Based upon this literature, these items will be adopted to measure organizational performance in this study.

2.5.5 Conclusion

Services supply chain management is a topic that has not received much attention, even with the significance of the services segment. To date, this is an under-studied area within the service operations management region. Given this, it is important that research is undertaken to confirm or deny any differences in the development of the supply chain management construct when looked at exclusively from the perspective of service management. By considering supply chain management in this view several different factors are drawn out, including: the intangible nature of the service, the uniqueness of the service concepts and the service delivery mechanisms, and the interaction of customer and service deliverer. Each of these has the potential to affect the method and objectives by which service organizations employ supply chain management.

The preceding chapter focused upon how these factors affect the supply chain management constructs based upon the theoretical support of both the resource based view of the firm and the relational view of the buyer-supplier network. The next chapter presents the theoretical constructs of service supply chain management and the research hypotheses relating them together.

CHAPTER III

RESEARCH METHODOLOGY

3.1 THEORY DEVELOPMENT

Wacker, 1998 impressed upon the need for formal conceptual definitions and better measurement instruments when developing theory. This came from his belief that most modern research encourages the measurement of concepts even before the concept's definition has been fully clarified. Wacker stated that concepts that are formally defined lead to better measures that lead to more consistency between results and empirical studies. He uses the phrase "formal conceptual definition" to mean a complete, concise verbal expression of a concept. Stealing from Hempel (1970), 'good' formal conceptual definitions should exhibit inclusivity, exclusivity, differentiability, clarity, communicability, consistency, and parsimony.' He reminds us that while formal conceptual definitions are used for abstraction and theory-building, non-formal definitions (or properties) are used for interpretation and theory testing.

Expressed more literally, researchers should focus upon theory development first when exploring new concepts. This explains why formal conceptual definitions are necessary before any traditional statistical empirical validity tests are performed. Without

a well defined concept based upon theory, one is not able to validate any measurement scale. Wacker goes so far as to suggest that statistical validity tests are not even meaningful if the concept is not formally defined. He also suggests that surveys are the preferred method for theory development due to their statistical rigor when a theory is postulated a priori. It also minimizes development errors by building upon the backs of current theory (Wacker, 1998). The ultimate aim of survey research is to contribute to theory development. Survey research should better explain or predict a phenomena. Since most constructs are latent or not directly observable or measurable, theory attempts to explain observed phenomena by systematically setting out interrelationships between constructs (Malhotra and Grover 1998).

3.2 THEORETICAL DOMAIN AND CONSTRUCTS

The Supply Chain Council (2002) defined the traditional supply chain as "encompass(ing) every effort involved in producing and delivering a final product, from the supplier's supplier to the customer's customer." Researchers have found this broad conceptual domain to be very extensive. It has contributed to their inability to cover the entire concept in any single study. The conceptual frameworks they have developed generally cover only major facets of the supply chain management construct. We must take a similar approach when considering the services supply chain management concept. Measurement instrument development is an ongoing process and the instrument can be strengthened only through a series of refinements and tests across different populations and settings (Hensley, 1999).

Services supply chain management covers the planning and management of all activities involved in sourcing and integrating services across functional and

organizational boundaries. Research into this concept have covered the topics of purchasing and sourcing, operations and strategic management, organizational behavior, information technology, finance, marketing and even economics. This broad spectrum of subject areas supports a wide literature domain. As a result, this research provides a new framework for considering the supply chain management concept. Grounded in the relational view of the service supply network, it looks at how the nature of the service and the relationships between supplier, service provider and customer will impact the performance of the service operation and overall business. From that, this study may be viewed as the first comprehensive vehicle to identify the theoretical domain of services supply chain management. As with research on the broad theoretical concept of supply chain management, further research will be necessary to refine the constructs and strengthen the measurement instrument identified in this study.

Theoretical Models (Refer to Figures 3.1 – 3.4)

3.2.1 The Nature of the Service

As discussed in the literature review, the service nature encompasses a broad spectrum of categories and themes argued by many different authors. For the purposes of analyzing the services supply chain management construct, this study will focus upon the following key areas: tangibility (Lovelock, 1983), degree of customer contact (Chase, 1984; Chase et al., 1998), degree of customization (Lovelock, 1983; Schmenner, 1986; Safizadeh et al., 2003), degree of customer influence (Safizadeh et al., 2003; Kellogg and Nie, 1995), degree of labor intensity (Schmenner, 1986; Safizadeh et al., 2003), degree of management design (Collier and Meyer, 2000).

3.2.2 Services Supply Chain Management

The services supply chain management construct is proposed as a new construct based upon a foundation of previous supply chain management literature. The core of this literature includes the concepts of trust, effective communication, information sharing, long-term relationships, supply base reduction and supplier involvement. By basing these constructs upon previous research, we are able to establish strong construct validity in developing these factors for this project. The services supply chain management construct begins with *Trust* because it is the backbone of any solid buyer-supplier relationship. This comes from the fact that supply chains involve a high degree of interdependency between buyer and seller (La Londe 2002). While trust is often defined as a willingness to take risk (Mayer et al., 1995), commitment is the willingness of the buyer or seller to 'exert effort on behalf of the relationship' (Monczka et al., 1998). Together, trust and commitment are conceptualized based on a long-term cooperative business relationship and a willingness not to exploit the other party (Spekman et al., 1998; Zineldin and Jonsson, 2000). The next factor, *Effective communication* is characterized by contact that is timely, accurate, adequate, complete and credible (Fredendall et al., 2005). Inter-organizational communication is a relational competency found to foster relationship-specific. Extant literature shows that two-way communication is critical to a successful supplier relationship (Hahn et al., 1990; Krause, 1999; Lascelles and Dale, 1989; Newman and Rhee, 1990). *Information sharing* refers to a party's willingness to exchange sensitive information with another party (Min and Mentzer, 2004; Li, et al., 2005 & 2006). It has also been identified as the most important factor for a successful supply chain alliance (Bowersox et al., 1999; Handfield et al.,

2000, 2002). The theoretical construct is operationalized to involve activities between buyers and suppliers to share key information that would provide benefits to either party (Chen and Paulraj, 2004a; Li, et al., 2005 & 2006; Paulraj et al., 2008). *Long-term relationships* refers to the notion that the parties involved intend to maintain the relationship to some unknown future date. Prior research has shown that a long-term relationship orientation may promote collaboration and build stronger relational bonds between supply chain partners (De Toni and Nassimbeni, 1999; Kotabe et al., 2003). The indicators of long-term relationships are adopted from prior research projects (Bowersox, 1993; Chen and Paulraj, 2004a; Paulraj et al., 2008). The *supply base reduction* concept is based upon a belief that the traditional view of pitting suppliers against each other on the basis of price is less effective than building strong alliances with suppliers capable of providing a quality product or service and able to work with the buyer to reduce overall system costs over time. Many positive benefits have been cited in the literature including improved trust due to communication (Newman 1988) and performance (Shin et al., 2000). Based upon this, the theoretical construct is operationalized based upon prior research to identify if the buying firm employs this strategy (DeToni and Nassimbeni, 1999; Glynn et al., 2003; Chen and Paulraj, 2004a; Gonzalez-Benito, 2007). Meanwhile the *supplier involvement* concept relates to the practice of including suppliers in key planning, development and implementation decisions in order to improve decisions, processes and results between the parties. This theoretical construct is conceptualized to include collaborative efforts between both parties (Chen and Paulraj, 2004; Li, et al., 2005 & 2006; Gonzalez-Benito, 2007).

To draw out the core differences that differentiate services supply chain management from the traditional concepts, constructs for capacity management, supplier management and customer involvement have been added. As detailed in the literature review, each of these concepts are driven by one of the key service characteristics. *Capacity management* refers to the planning and oversight of an organization's capacity resources in order to economically meet its demand profile. Capacity management comes from the simultaneity of service production and consumption and it is the principle method by which service providers meet service demand. While the capacity management construct has not been well developed in empirical studies it has been theoretically framed in works by Lovelock and Wright, 1999; Safizadeh et al., 2003; and Ellram et al., 2004 with an emphasis on its impact in the services arena. The *supplier management* concept defines the means by which a service organization sources and manages its service suppliers. A decent amount of research has been performed to identify the differences in overseeing service suppliers compared to goods producers. The sourcing of services contains challenges defining and managing the procurement process due to the intangible and heterogeneous nature of services. Hence, this theoretical construct is conceptualized to involve initiatives for procuring and overseeing service suppliers (Ahlstrom and Nordin, 2006; Gonzalez-Benito, 2007). Meanwhile, the *customer involvement* construct is not new to supply chain management research (Chen and Paulraj, 2004a; Min and Mentzer, 2004). It has typically been presented as an antecedent to the supply chain structure, not an element of the supply chain management concept itself. However, in the services arena customer involvement takes on a heightened priority due to the characteristics of simultaneity and customer participation

in the service delivery. Many sourcing decisions must be made with an awareness of the customer's evaluation (Vandaele et al., 2007). Therefore we conceptualize the customer involvement construct to represent the types and degree of interaction the service provider has with their customer (Glynn et al., 2003; Ellram, et al., 2004).

3.2.3 Information Technology

Based upon the research currently available on information technology, one would posit that information technology is mediated by purchasing practices. This concept would imply that the effect that information technology has on performance (either at the operational or firm level) is first mediated by the way the buyer - supplier relationship is affected from the use of IT between the two firms. In this scenario, purchasing practices are those making up the Service Supply Chain Management (SSCM) construct.

3.2.3.1 Purchasing Practices' Mediating Effect

Refer to the models in Figures 3.1 and 3.2

Byrd, Davidson, 2003 analyzed the impact information technology has on the supply chain in a review of large for-profit US firms. They identified antecedents to IT impact on the supply chain and the effect these relationships had on overall firm performance. These antecedents were comprised of IT department technical quality, IT plan utilization, and top management's support of IT. Taking these antecedents into account, the IT impact on the supply chain was found to affect firm performance.

However, even with this analysis regarding IT's impact on performance, it has usually been found to interact with a purchasing practice affect. Purchasing practice

affects can take on many forms and may include factors that affect processes, attitudes, relationships or systems. For Example, Sanders et al., (2005) related IT capability to firm performance through the prism of internal and external collaboration, key tenets of several supply chain management constructs. Dehning et al., (2007) found that a firm's investment in IT-based supply chain management systems (SCMS) had a direct affect on input and output processes, which in turn affected firm performance. However, they also noted that the affects were mediated by the way in which business processes are conducted within the firm. This is consistent with other researcher's findings as Dedrick et al., (2003) showed that IT does have a positive effect on productivity. They reviewed more than 50 articles on computers and productivity and found evidence to effectively refute the productivity paradox. One of their key findings showed that information technology is not just a means to automate existing processes, but more importantly, an enabler of organizational change that ultimately leads to productivity improvements.

Meanwhile, Sriram and Stump (2004) found no significant direct influence of IT on performance, but only an indirect one, mediated by relationship quality. This result suggests that IT's effects are fully mediated by the relationship changes that occur from the use of the information technology. Gonzalez-Benito (2007) found support for the idea that IT investments exert a positive effect on purchasing operational performance. However, the results showed that this effect arises because IT allows companies to implement certain purchasing practices and, partially, because it facilitates greater strategic integration of the purchasing function. In a study by Subramani (2004) regarding Supply Chain Management Systems (SCMS) implemented by a large retailer, the results supported the hypotheses that relationship-specific intangible investments play

a mediating role linking SCMS use to benefits. He also found evidence that patterns of information technology use are significant determinants of relationship-specific investments in business processes. This study highlighting the role of relationship-specific assets as it pertains to value creation and value retention in contexts of IT-mediated buyer-supplier interactions. These studies would confirm that Information Technology's effect is mediated by practices employed by the firm to take advantage of the new information-rich supply chain management environment existing after implementing the new technologies or capabilities.

In another related study, researchers proposed a model in which supply chain process integration *mediates* the impact of supply chain management-related IT infrastructure integration on firm performance. Their results suggest that supply chain process integration fully mediates the impact of IT infrastructure integration on firm performance. Of the integration methods, information flow integration had the largest effect on the formation of supply chain process integration capability, followed by physical flow integration, and finally financial flow integration had no significant impact (Rai et al., 2006). This study is similar to my model which postulates that a service's supply chain management practices *mediates* the impact of supply chain management-related IT "effectiveness" (or infrastructure) on service performance. While Rai and others suggest that integrated IT infrastructures enable firms to develop a higher-order capability of supply chain process integration, I propose that effectively management service supply chains enable firms to develop higher-order information technology capabilities in service networks.

This research project will systematically investigate the extent to which the service firm's capabilities of managing their supply chain mediates the impact that information technology has on operational and firm performance. Thus it will consider what drives the link between various antecedents making up an information technology construct and the outcome variables. Using the relational view as the foundational backbone, we view service supply chain management as a relational competency that affects the ability of information technology to impact performance. The degree to which this can be empirically validated will open the door for significant future development of service supply chain management research.

3.2.4 Service Performance

There are several different ways that researchers have analyzed operational performance in the extent literature. Within the manufacturing environment, it is not uncommon for researchers to use the four basic competitive priorities proposed by Hayes and Wheelwright (1984) for the production function: cost, quality, dependability and flexibility (Krause et al., 2001; Devaraj et al., 2007; Gonzalez-Benito, 2007). Within services, the SERVQUAL measurement is often utilized (Parasuraman et al., 1985, 1988). However, this study will utilize a service performance measure based upon Voss and Johnston's (1995) services practice-performance model due to effective application in service operations management research. It is related to work by Heskett et al., (1997) on the service profit chain and adapted for use by Glynn et al., (2003).

So that one does not attempt to reject the Glynn / Ennis measure, we confirm the similarity between these two measurements instruments in Figure 3.5. While the Parasuraman et al., (1985) measure consists of the five factors: assurance, competence,

empathy, responsiveness, and tangibles; the Glynn et al., (2003) study consists of the four factors: comprehensiveness, efficiency, performance, and responsiveness. Each of the SERVQUAL factors is represented within one of the four measures from Glynn et al., (2003) except for the Tangibles factor, which generally focuses upon the appearance of the service delivery. Therefore, the instrument used for measuring service performance in this study will include Parasuraman's Tangible factor items to determine their relevance to this subject matter. After making this adjustment, 14 of the 22 SERVQUAL items are represented in this study's instrument. This gives credence to the applicability of the measure to encompass the SERVQUAL concept, yet permit it to extend beyond the measurement of perceptions and into operational performance.

3.2.5 Firm Performance

Research on firm (or organizational) performance has typically applied either financial or non-financial criteria (Koh et al., 2007). When possible, it is generally preferred to utilize financial criteria to analyze an organization's overall performance. However, researchers have noted the challenge of using only financial indicators due to the impact of confounding factors. For the purposes of this study, firm performance will be analyzed using the indicators of return on investment (ROI) (Vickery et al., 2003; Glynn and Ennis, 2003; Min and Mentzer, 2004; Byrd and Davidson, 2003; Chen and Paulraj, 2004; Li et al., 2006), growth in market share (Glynn, Ennis, 2003; Min and Mentzer, 2004; Byrd, Davidson, 2003; Li et al., 2006; Fawcett et al., 2007; Wisner, 2007), growth in sales (Glynn, Ennis, 2003; Min and Mentzer, 2004; Li et al., 2006; Fawcett et al., 2007) and profit margin on sales (Vickery et al., 2003; Min and Mentzer, 2004; Chen and Paulraj, 2004; Li et al., 2006).

3.3 RESEARCH HYPOTHESES

Trust has been found to be both an antecedent and an outcome of buyer-seller relationships. An initial amount of trust is required to permit cooperation between buyers and sellers. Once cooperation is built, supplier involvement is enhanced. This in turn has a positive impact back on the trust between two partners (Fredendall et al., 2005; Fawcett et al., 2009). Supplier involvement will take on the form of increased information sharing, collaborative planning, and joint problem solving. Through these experiences, firms begin to see positive results to the relationship through improved operational performance. These results are often not possible without the involvement of both parties working together (Anderson and Narus 1990). As a result, trust is hypothesized to have positive impact on supplier involvement, information sharing and service performance.

H1: Trust will have a positive effect on supplier involvement

H2: Trust will have a positive effect on information sharing

H3: Trust will have a positive effect on service performance

Extant literature points to many benefits of communication in a partnership. In a buyer-supplier relationship, communication was found to be a key element needed to prevent supplier relationship problems (Fredendall et al., 2005). Strong two way communication in turn develops a successful supplier partnership; fostering increased supplier involvement (Hahn et al., 1990; Krause, 1999; Lascelles and Dale, 1989; Newman and Rhee, 1990) and facilitating supply base reduction initiatives (Ogden, 2006). The opposite affect is also true. If communication is lacking between network

partners, it leads to mistrust and misunderstanding which affects commitment (Kelly et al., 2002).

Others have found communication to have a positive effect on customer responsiveness when successfully deployed between buyers and supplier (Chen et al., 2004). Separately, communication can become a relationship-specific asset that creates sustainable competitive advantages for buyer and supplier firms (Paulraj et al., 2008). Based upon this, effective communication is hypothesized to positively impact trust, supplier and customer involvement as well as service performance.

H4: Effective communication will have a positive effect on trust

H5: Effective communication will have a positive effect on supply base reduction

H6: Effective communication will have a positive effect on supplier involvement

H7: Effective communication will have a positive effect on customer involvement

H8: Effective communication will have a positive effect on service performance

Information sharing has shown to have similar benefits. In a dyadic network relationship, information sharing has a positive impact on trust (Mentzer et al., 2000; Fawcett et al., 2009). Subramani (2004) found information sharing to even constrain the buyer – supplier relationship. This is due to its mediating effect on collaboration between parties, like suppliers, buyers and customers in a network. By moving in this direction,

buyers impact the very relationships they oversee through their supply base. Therefore, information sharing should improve supplier management (Dyer and Singh, 1998). It has also had an effect on the very competitive strength of a network. By sharing information among suppliers, the buying firm gains strength and improved performance (Jones, 1998). This leads one to the following hypotheses:

H9: Information sharing will have a positive effect on trust

H10: Information sharing will have a positive effect on supplier involvement

H11: Information sharing will have a positive effect on supplier management

H12: Information sharing will have a positive effect on service performance

Researchers indicate many effects of long-term relationships that should be accrued to the supply chain. First, inter-organizational communication is improved through long-term sourcing policies (Paulraj et al., 2008). These policies have also had positive impacts on a firm's involvement in developing its suppliers (Krause, 1999) as well as improving responsiveness with its customers (Chen et al., 2004a). Based upon these impacts it is not surprising that long-term relationships would also result in higher levels of partner integration (Sheu, C., Yen, H., Chae, B., 2006) and a tendency to practice more advanced buyer-supplier practices (De Toni and Nassimbeni 1999), including more intensive collaboration. The result of all of this is an improved level of supply chain competitiveness (Choi and Hartley, 1996), performance (Carr and Pearson, 1999; Shin et al., 2000) and satisfaction with the supplier (Field and Meile, 2008). Overall, this leads one to propose the following hypotheses:

H13: Long-term relations will have a positive effect on communication

H14: Long-term relations will have a positive effect on supplier involvement

H15: Long-term relations will have a positive effect on customer involvement

H16: Long-term relations will have a positive effect on service performance

Supply base reduction is another factor that has been discussed by several researchers for its benefits to the supply chain. The act of reducing suppliers has been shown to signal a buyer's intentions. This has resulted in improved trust, dependability and cooperation (Newman 1988; Dyer and Singh, 1998; Chen et al., 2004). In addition, by focusing more of the buyer's attention on a smaller number of more strategically aligned firms, increases are seen in supplier development which also results in increased supplier involvement (Handfield 1993). De Toni and Nassimbeni (1999) further noticed improvements in the buyer–supplier product design relationship that resulted from a reduced supply base. Additional benefits have been noticed in customer service and market penetration (St. John and Heriot, 1993) as well as ultimately improved performance (Shin et al., 2000), including specific improvements in quality (Handfield et al., 1993). Based upon this, supply chain reduction is hypothesized affect the following:

H17: Supply base reduction will have a positive effect on trust

H18: Supply base reduction will have a positive effect on communication

H19: Supply base reduction will have a positive effect on long-term relationships

H20: Supply base reduction will have a positive effect on supplier involvement

H21: Supply base reduction will have a positive effect on service performance

It should not be surprising that researchers have found supplier involvement to have a positive impact on communication through cross-functional teams (Hauptman and Hirhi, 1996). Collaboration between different entities requires investments from both sides. If only one firm is reaching out to garner input from the other 'partner', the partnership is doomed for failure. This is why some researchers see the involvement of suppliers as critical to developing products, improving processes and quality initiatives and receiving high customer satisfaction levels (Power et al., 2001). When personnel from the supplier participate with the buying firm, there are many opportunities to increase performance. Sheu et al., (2006) identified that supplier – retailer collaboration had a positive affect on supplier - retailer performance. Stanley and Wisner (2001) found that external purchased supplies have an impact on the satisfaction of external customers through internal service quality. Ogden (2006) identified that cross-functional teams established with suppliers facilitates a firm's ability to reduce their supply base. Meanwhile, others have identified how suppliers can impact a firm's ability to manage their capacity (Ng et al., 1999; Renner and Palmer, 1999; Shah, 2007).

Researchers have identified supplier involvement as a major contributor to improving supply chain performance (Shin et al., 2000; Rungtusanatham et al., 2003; Field and Meile, 2006). Likewise, Toyota's strategic supply chain network has shown extensive knowledge sharing, facilitated by boundary sharing teams of suppliers, to generate competitive advantage (Dyer and Nobeoka 2000). The result are the following hypotheses about the impact of supplier involvement

H22: Supplier involvement will have a positive effect on communication

H23: Supplier involvement will have a positive effect on information sharing

H24: Supplier involvement will have a positive effect on supply base reduction

H25: Supplier involvement will have a positive effect on capacity management

H26: Supplier involvement will have a positive effect on service performance

Capacity management has been identified as a critical element of a service firm's supply chain strategy (Ellram et al., 2004). In fact, the importance of this factor goes back as far as Sasser (1976). The impact of a successful capacity management practice has been shown to improve service performance (Lovelock and Wright, 1999). Its effect will be realized in improved customer satisfaction, impacted by improved cycle times, responsiveness and flexibility which ultimately will improve overall customer retention (Ellram et al., 2004). Other authors point out how capacity can be employed as a resource to strategic objectives that go so far as to improve the performance of the firm (Ng et al., 1999). Thus the following hypotheses:

H27: Capacity management will have a positive effect on service performance

H28: Capacity management will have a positive effect on firm performance

Service operations management researchers indicate that supplier management is different in the service arena. Due to the intangible nature of services, it is often difficult for buying firms to gauge the completion of a service offering. Because of this, many researchers suggest adding tighter controls in the contracting stage to ensure that expectations are well defined (Ellram et al., 2004). While this will reduce opportunism between supplier and buyer firms, the language must be weighed for its potential impact on the development of trust between channel partners (Handfield et al., 2002; Grover and

Malhotra, 2003). Ultimately, this requires both parties to keep communication lines open to ensure that both parties are on the same page. So supplier management can either positively or negatively impact communications depending upon their effectiveness. Supplier selection is also critical to permitting a firm to reduce its supply base as more effective suppliers permit buying firms to focus upon a smaller, more select group of partners who are committed to the relationship (Ogden 2006). This leads to these hypotheses:

H29: Supplier management will have a positive effect on trust

H30: Supplier management will have a positive effect on communication

H31: Supplier management will have a positive effect on supply base reduction

Many researchers understand the importance of customer involvement due to its impact on the supply chain. This is why several researchers have included customer interaction in their supply chain management models. Li et al. (2005, 2006) indicated the need to consider several facets of customer relationship management, from managing customer complaints and building long-term relationships to attending to customer satisfaction issues). Mentzer et al. (2001) considered the need to communicate based upon a goal of higher customer satisfaction. Sampson (2000) considered the influence of the customer on the service process. He focused upon the impact having a customer as an input to the service delivery influenced the need for higher levels of information sharing. Others have identified how customer involvement leads to improved performance. Chen and Paulraj (2004b) identify that establishing a 'customer focus' is a critical element to successful supply chain management. This implies that this focus will

impact the amount of collaboration evident in a supply chain. Mentzer et al. (2001) identifies that supply chain management requires a customer focus to create unique and individualized sources of customer value, leading to customer satisfaction. These factors combine to identify the impact that customer involvement has on the supply chain, hypothesized as follows:

H32: Customer involvement will have a positive effect on communication

H33: Customer involvement will have a positive effect on information sharing

H34: Customer involvement will have a positive effect on supplier involvement

H35: Customer involvement will have a positive effect on service performance

The development of communication links between network partners covers a myriad of different technologies itself. However, the very act of creating electronic communication links between partners has resulted in many benefits on its own. First, it is seen as an 'enabler' due to its ability to improve communications (Chen and Paulraj, 2004b; Sriram and Stump, 2004; Paulraj et al., 2008) and substantially reduce paperwork (Handfield et al., 2002). By increasing communications, it increases the sharing of information (Chen and Paulraj, 2004b; Sheu et al., 2006; Fawcett et al., 2007; Cooling, 2008; Zhou and Benton, 2007; Paulraj et al., 2008). By providing more effective sourcing methods, it supports the reduction of supply chain partners (Ogden, 2006). These efforts pay dividends by increasing supply chain integration (Frohlich and Westbrook, 2001; Mulligan and Gordon, 2002; Vickery et al., 2003; Rai et al., 2006; Devaraj et al., 2007) and the efficiencies of cross-functional teams (Chen and Paulraj, 2004b).

The benefit of developing electronic communication links is not restricted to the supply base. It also affects customer interaction through improved service delivery effectiveness, customer connectivity and information flow (Bitner and Brown, 2006; Heineke and Davis, 2007). These effects are then translated into improvements in service quality, customer satisfaction, and cycle times (Handfield et al., 2002; Heineke and Davis, 2007) to name a few. Based upon this, the following effects are hypothesized regarding the use of electronic communication links:

H36: Electronic communication links will have a positive effect on communication

H37: Electronic communication links will have a positive effect on information sharing

H38: Electronic communication links will have a positive effect on supply base reduction

H39: Electronic communication links will have a positive effect on supplier involvement

H40: Electronic communication links will have a positive effect on customer involvement

H41: Electronic communication links will have a positive effect on service performance

Researchers contend that information technology-related practices have been central to the service revolution (Rust and Miu, 2006). This research has shown the benefits information technology provides when applied toward process improvement

within the supply chain network. One example would be logistics coordination which has been found more effective when facilitated by information technology (Li et al., 2005). Information processes have been studied by several researchers who have reviewed how information technology solutions can improve the processing of information to drive performance benefits. This is evidenced in the use of technology to drive time-based strategies between business partners (Bowersox and Daugherty, 1995).

Buyers are not only purchasing products and services, but they are also purchasing solutions to provide competitive advantages. One of the most noted benefits of information technology is in improving collaborative relationships by facilitating increased coordination between parties within and between firms (Sriram and Stump, 2004; Sanders and Premus, 2005; Sanders and Nada, 2007; Sheu et al., 2006). Research has also shown that collaboration can be expanded with the implementation of collaborative forecasting, planning and replenishment systems (CPFR). Additional benefits include increased processing options and reductions in the cost to provide customization (Collier and Meyer, 1998).

Rust and Miu (2006) go on to state that computer technology has changed the very way companies perform their services. This has facilitated the development of long-term relationships with customers based around information technology solutions. All of this has lead to closer buy-supplier relationships as buyers start to rely more heavily on key supply partners (Mulligan and Gordon, 2002; Subramani, 2004). Information technology's effect is enough to influence the very architecture of the supply chain (Sheu et al., 2006). This has a downstream impact on the performance of the supply chain partners evidenced in several research studies. Kearns and Lederer (2003) found that

strategic IT alignment yields firm competitive advantages. Sanders et al. (2005) found a relationship between IT capability's affect on firm performance to be mediated by internal and external collaboration. Dehning et al., (2007) further explored a firm's investment in IT-based supply chain management systems. They found that these investments directly impact input and output processes which in turn affected firm performance. Dedrick et al., (2003) provides an excellent summary on the breadth of research performed to provide computer technology's impact on productivity. Because of these effects, the following hypotheses have been formulated.

H42: Processing effectiveness will have a positive effect on information sharing

H43: Processing effectiveness will have a positive effect on long-term relationships

H44: Processing effectiveness will have a positive effect on supplier involvement

H45: Processing effectiveness will have a positive effect on customer involvement

H46: Processing effectiveness will have a positive effect on service performance

H47: Processing effectiveness will have a positive effect on firm performance

Researchers have also looked into the skills and capabilities of the information technology department within a firm. Some have researched this topic under the concept of 'IT Sophistication.' This term relates to the degree to which an organization's processes, equipment and personnel compare to their competitors. The level of IT

Sophistication was found to moderate the impact of service practices on the service performance of a firm (de Burca et al., 2006). These factors are indifferent to the establishment of electronic communication links or applications to affect processing effectiveness, but they imply that having higher levels of skill and capabilities should result in higher performance. This can be supported by the resource based view of the firm when considering IT Sophistication as a differentiating resource.

Meanwhile, others have confirmed that IT department skills lead to improved infrastructure flexibility (Byrd and Turner, 2000) and supply chain performance in general (Byrd and Davidson, 2003). Good information systems also allow firms to more quickly and efficiently gather historical information on purchased spend for a given product or service. This reduces one of the main barriers to the decision making process in supply base reduction efforts (Ogden, 2006). These results lead us to the following research hypotheses:

H48: Information technology sophistication will have a positive effect on communication

H49: Information technology sophistication will have a positive effect on information sharing

H50: Information technology sophistication will have a positive effect on supply base reduction

H51: Information technology sophistication will have a positive effect on service performance

Several lines of research have demonstrated the relationship between service performance and business performance. The most familiar line of research is based upon the SERVQUAL measure from Parasuraman et al., 1985 and 1988. Many others have extended this survey instrument into different measures of performance. Soteriou and Chase (1998) evaluated customer contact, Stanley and Wisner (2001, 2002) analyzed purchasing performance, Zhu et al., (2002) considered the impact on IT-based service performance, and Bennett and Barkensjo (2005) reviewed the performance in a charitable organization.

Additional research has been conducted to analyze the relationship between service practice and service performance, called the service practice – performance model, originally proposed by Voss and Johnston (1995). This line of research combined work completed by Heskett et al., (1997) in the service arena, with the work of Voss et al., (1995) in the manufacturing sector to identify the connection between practice and performance. Later, this work was extended into the supply chain management field by Glynn et al., (2003). Using either line of research, the resulting hypotheses should be the same.

H52: Service performance will have a positive effect on firm performance

Constructs Proposed:

Based upon the hypothesized models, the following constructs are proposed:

H_{C1}: *Supply chain management practices* will be made up of:

- Trust
- Effective Communication
- Information Sharing

- Supply base reduction
- Cross-functional teams
- Supplier involvement
- Long-term relations
- Supplier management / involvement
- Customer Interaction

H_{C2}: *Information Technology Effectiveness* will be made up of:

- Information Technology skills and capabilities
- Electronic communication links
- Information processing effectiveness

3.4 DATA COLLECTION

3.4.1. Methodology

In this paper, I intend to utilize statistical survey research over the research methods of case and field research (identified under the research paradigm known as interpretivism). The survey methodology is one of several types of study known as rationalist methods. Other rationalist types include optimization, simulation, statistical modeling and laboratory experiments. The rationalist research methods' strengths are in the precision they can achieve in their variables e.g., long-term relationships or firm performance measures and thus, the testability and reliability this offers. That is, the measurable quantitative variables can be very carefully specified and then precisely tested, or checked by another researcher. Another major advantage of this approach is the knowledge and wide acceptance of its standard research procedures model formulation,

variance reduction techniques, and sample size, particularly in operations management (Meredith, 1998).

This research project will utilize both a mail and web-based survey in order to increase response rates. The mail survey method will be employed as it has traditionally been considered the best approach for surveying a large population dispersed across a broad geographical area like the United States and within a large segment like the service industries (Emory, 1980). Meanwhile, providing a web-based survey option has proven successful in other research projects. When utilized on the right audience they have proven to provide several advantages: less expensive, eliminates missing data issues and reduces data capture costs (Froehle and Roth, 2004).

The general methodology utilized is intended to follow the procedure defined by Dillman (1978). First, an initial introduction email will be sent to all participants to inform potential respondents about the survey forthcoming and the importance of the topic. They will be informed of the option to complete the survey via email or web site. A letter will then be mailed to each participant using first class mail to request their input. A reminder email or postcard will be sent out one week later to encourage responses. For any non-responders, another mailing will be sent with a cover letter and the survey approximately 21 days after the initial mailing.

3.4.2. Survey Instrument

The survey instrument is designed to deliver a strong response rate as well as to provide a solid foundation for analyzing the constructs under review. Response rate will be managed by the ease of use of the form and web-site. The survey length will be managed to keep it to a reasonable number of items while still providing analytical

strength and statistical power. It is anticipated that no more than 130 questions are required for this project. All constructs will be made up of at least four items in order to ensure strong construct validity (Cronbach and Meehl, 1955). Each item will be evaluated on a Likert Measurement Scale. It is suggested that a seven point scale should be used on all items under consideration. Reliability has been found to be best obtained with a minimum of five points in the scale. Reliability increases with higher points, but not as significantly (Lissitz and Green, 1975). The higher point value will provide a higher variation of points in the data. No reverse score items are proposed due to the potential to introduce systematic errors that will reduce validity of the measures (Hinkin, 1995; Jackson et al., 1993). Instead, the question order sequence will flow in a logical order to provide ease of use (Flynn et al., 1994).

See Figure 3.6 (Proposed Constructs)

See Figure 3.7 (Survey Instrument)

3.4.3. Unit of Analysis

While the supply chain management construct is based upon a dyadic relationship, this study will only consider the perspective of the service industry buying firm. Its objective is to obtain information that explains the relationship between the buying firm's supply chain, their use of information technology and the performance affects that result. Therefore, this study will focus only upon the perspectives of the buying firm and their purchasing practices. Based upon this, the purchasing department of the buying service organization is the targeted source for providing this information. It is realized that all of the firms that respond to this instrument are themselves suppliers of their services to other customers. However, that is not the focus of this research project.

3.4.4. Sample Selection

This study will utilize a membership database from the National Association of Purchasing Management (NAPM) to obtain the list of possible survey participants. The database will be analyzed to pull out potential respondents working within any service organization. All service industries will be initially considered for inclusion in the survey except for public service organizations (refer to Table 2.2). It is believed that the purchasing practices of public service entities may not represent current supply chain management practices within the rest of the services industry.

All non-public service industries will be considered in order for this research to create a broad scale empirical study of supply chain management practices that is generalizable across the service sector. The survey will be targeted toward key purchasing / sourcing leaders within each service firm to answer the survey. The objective is to understand actions taken by the sourcing firm that drive positive operational and business results. The position titles of the respondents being sought from the survey companies are generally Chief, Vice President or Director from the departments of Purchasing, Procurement, or Materials Management. However, titles like Purchasing Manager will also be considered if the business is small to medium in size. The sample size will be limited to 1000 due to budget constraints.

3.4.4.1 Intended Focus

The focus of this research is to survey only service organizations, instead of both service and goods producers, in order to fully understand the practices of the service industry. This is because it is believed that service organizations act and source differently due to the unique connection they have with their customers, who are

generally involved with the very delivery of the service act. This makes service organizations act differently, which potentially translates into different priorities when sourcing items for their firms.

The survey will ask the service industry respondent to answer the questions related to the services sourced for their firm or division within their control. They will be asked to answer the questions based upon their top service sources that would make up roughly 60% of their overall services spend. It would be an alternative option to ask these service organizations to identify if their top sourcing dollars are spent on goods or services and to then target answers based upon this answer. However, this presents a problem because the analysis will be more difficult to generalize across industries if some managers focus upon goods sourcing and others upon services sourcing due to the inherent differences required for each (refer to Sections 2.5.2.6 and 3.3 regarding Supplier Involvement). These differences in sourcing services have been explained to be principally due to the characteristics of intangibility, heterogeneity, simultaneity (inseparability), perishability, and customer participation.

3.5.1 Measures

The indicators used to measure the theoretical constructs in this research project are based on a literature review of each concept. There are two second order factors to be analyzed: Services Supply Chain Management and Information Technology Effectiveness. The 'Services Supply Chain Management' construct is a second order factor made up of nine first order factors. Items encompassing this construct include the extent to which buying firms exhibit 1) trust, 2) effective communication with partners, 3) share information freely, 4) develop long-term relationships, 5) work to maintain

reduced supply bases, 6) involve supplies, 7) manage capacity, 8) manage service suppliers, and 9) involve customers in order to serve them more effectively.

Items identifying the "Trust" construct are based upon the works of Parasuraman et al., 1988; and Fredendall et al., 2005 who both analyzed these factors. The construct *"Effective Communication"* is operationalized by frequent personal and non-personal contact (Sriram and Stump, 2004) as well as communication that is timely, accurate, adequate, complete and credible (Fredendall et al., 2005). *"Information sharing"* is operationalized by items from previous supply chain management research about keeping each other informed, exchanging important information and sharing knowledge (Min and Mentzer, 2004; Chen and Paulraj, 2004a; and Li, et al., 2005 & 2006). It also includes items from Paulraj et al., 2008 who looked closely at inter-organizational communication. In a similar fashion, the *"Long-term relationships"* measure is operationalized from research measuring the extent to which buying firms 1) view their suppliers as extensions of their company, 2) expect their relationships to last a long time, and 3) work with their suppliers to improve (Bowersox, 1993; Chen and Paulraj, 2004a; Paulraj et al., 2008). The *"Supply base reduction"* construct is operationalized by indicators reflecting the extent to which firms tend to focus attention on a smaller group of supply partners (DeToni and Nassimbeni, 1999; Glynn et al., 2003; Chen and Paulraj, 2004a; Gonzalez-Benito, 2007). Meanwhile, the *"Supplier involvement"* construct is operationalized by items indicating the extent to which buyers involve key suppliers in planning, goal setting and new product/service design, as well as collaborate to solve problems (Chen and Paulraj, 2004; Min and Mentzer, 2004; and Li, et al., 2005 & 2006; Ahlstrom and Nordin, 2006; Gonzalez-Benito, 2007). *"Capacity management"* is conceptualized by items that

reflect the extent to which service organizations can flex their resource capacity or manage their demand profiles (Lovelock and Wright, 1999; Safizadeh et al., 2003; Ellram et al., 2004). The *"Supplier Management"* construct is operationalized by items identifying the extent to which 1) service agreements are clearly specified and formal, and 2) supplier relationships are actively managed (Li, et al., 2005 & 2006; Ahlstrom and Nordin, 2006; Gonzalez-Benito, 2007; Cooling, L., 2008). Meanwhile *"Customer Involvement"* is operationalized by the degree to which a firm focuses upon evaluation, interaction and attention to the customer's needs (Glynn et al., 2003; Chen and Paulraj, 2004a; Ellram et al., 2004; Min and Mentzer, 2004).

Similar to the services supply chain management concept, the indicators used to measure the theoretical constructs of "Information Technology Effectiveness" are based on an extensive review of related literature. Items encompassing this construct include the extent to which firms (a) use electronic communication links (b) implement effective tools for improving information processing, and (c) possess IT skills and capabilities necessary for their business needs. The "Communication Links" construct is based upon measures from Min and Mentzer, 2004; Chen and Paulraj, 2005; Fawcett et al., 2007; and Paulraj et al., 2008. The "Information Processing Effectiveness" construct is made up of items from the Byrd and Davidson, 2003 research project. The "IT Sophistication" construct is built upon work from Byrd and Davidson, 2003; Glynn et al., 2003 and de Burca et al., 2006.

Items encompassing the service performance construct measure a wide range of features relevant to the service's delivery efficiency, effectiveness and quality as well as the customer's evaluation of their performance. This construct is modeled as a first order

factor, though the survey items are partitioned into five sub-groups for conceptual categorization purposes. However, this is no prior research to confirm that these categories represent unique constructs that could be empirically substantiated. These categories represent the extent to which the buying firm exhibits the concepts of a) assurance, b) service comprehensiveness, c) service effectiveness, d) customer responsiveness and e) other intangible factors related to their resources.

The "Assurance" category includes items related to internal quality standards, employee expertise, retention and customer service (Parasuraman et al., 1988; Brannick et al., 2002; Glynn et al., 2003; Sanders and Premus, 2005). The "Service Comprehensiveness" category includes items measuring the service's flexibility, availability, speed and customization (Parasuraman et al., 1988; Brannick et al., 2002; Glynn et al., 2003; Schmenner, 2004; Sanders and Premus, 2005). The "Service Effectiveness" category includes measures for unit cost, reliability, on-time delivery, and cycle time (Parasuraman et al., 1988; Brannick et al., 2002; Glynn et al., 2003; Vickery et al., 2003; Chen and Paulraj, 2004a; Sanders and Premus, 2005; Fawcett et al., 2007). The construct "Customer Responsiveness" includes item measures for customer support, complaint resolution, attention and ultimately retention (Parasuraman et al., 1988; Brannick et al., 2002; Glynn et al., 2003; Vickery et al., 2003). Meanwhile, the "Tangibles" category includes measures for the appearance and/or age of the service's equipment, facility and employees (Parasuraman et al., 1988).

Lastly, *"Firm Performance"* of the buying firm is operationalized by items indicating the extent of changes in return on investment (ROI) (Vickery et al., 2003; Glynn and Ennis, 2003; Min and Mentzer, 2004; Byrd and Davidson, 2003; Chen and

Paulraj, 2004; Li et al., 2006), growth in market share (Glynn, Ennis, 2003; Min and Mentzer, 2004; Byrd, Davidson, 2003; Li et al., 2006; Fawcett et al., 2007; Wisner, 2007), growth in sales (Glynn, Ennis, 2003; Min and Mentzer, 2004; Li et al., 2006; Fawcett et al., 2007) and profit margin on sales (Vickery et al., 2003; Min and Mentzer, 2004; Chen and Paulraj, 2004; Li et al., 2006).

3.6 Measurement Instrument Development and Hypothesis Testing

For this research plan, an instrument development process similar to that used by Chen and Paulraj in their 2004 study of the supply chain management construct will be employed. Their iterative process was based upon prior recommendations from noted researchers for developing an instrument that satisfies the requirements of reliability, validity and unidimensionality. The first stage in the process will utilize the calculated Cronbach's alpha values of each construct. Using a three-step evaluation procedure introduced by Flynn et al., 1994, the constructs will be evaluated with those meeting predetermined hurdles deemed worthy to pass to stage two.

In stage two, an exploratory factor analysis (EFA) using principle component analysis with a varimax rotation will be employed (Loehlin, 1998). EFA has been characterized as a scheme for exploring the underlying factor structure without prior specifications of the number of factors and their loadings (Venkatraman, 1989). The number of constructs has been predetermined for this analysis. Meanwhile, indicator variables will be analyzed and discarded based upon their loadings within each construct. Much attention will be paid to ensure discriminant validity be ensuring variables load only on their intended scale.

Stage three will employ confirmatory factor analysis (CFA) to determine if construct validity and unidimensionality is achieved by the instrument. In comparing the relative roles of EFA and CFA, it has been noted that "in their pure forms, the EFA and CFA approaches can be thought of as end points on a continuum. At one extreme EFA represents a procedure for the discovery of structure, while at the other extreme, CFA is a technique for testing hypothesized structure formed on an a priori basis" (Bagozzi, 1983). Due to prior work in analyzing the supply chain management construct from which Service SCM is built, particularly researchers Chen and Paulraj (2004a), one may assume that the groundwork for Service SCM construct's structure has been uncovered. Meanwhile, CFA will confirm if the extended SSCM structure predicted in this model will hold true.

Several of the constructs in the model are proposed as second-order factors. Service Supply Chain Management is conceptualized as a second-order model composed of nine dimensions. Information Technology Effectiveness is constructed as a second-order model based upon three dimensions. Meanwhile, Service Performance will be evaluated as a second-order factor with four dimensions. Due to the number of indicator variables proposed within the overall model and these constructs in particular, it is unlikely that the sample size will afford the opportunity to measure the entire model at once. If this is the case, then the model will be broken up into sub-models for evaluation (Moorman, 1995, Song, Dyer and Thieme 2006). Each of these models will be analyzed against five key goodness-of-fit indices to justify their acceptance. The iterative evaluation process will repeat itself until all models exhibit acceptable results. Finally, structural equation modeling will be used to determine whether a higher-order factor

model is appropriate for these constructs. What follows is a more detailed description of the measurement instrument development testing scheduled for this research project.

3.6.1. Reliability

Reliability is one of the key steps to perform when developing a new scale (Hensley, 1999). It is traditionally assessed by measuring stability and internal consistency within the scales. Stability is the extent to which a questionnaire, scale or item will return the same results if repeatedly administered to the same respondents. Internal consistency is a measurement of each item compared to the other scale items. This is also known as equivalence, which can be tested by organizing and delivering an instrument in different forms. The objective is to measure the internal homogeneity of the items which comprise the scale itself (Hensley, 1999). Cronbach's Alpha (Cronbach, 1951) is the traditional analysis used to measure construct reliability. Using this procedure, with outputs ranging from 0 to 1, one identifies the lower bound of reliability for the construct being measured. The coefficient α is defined as the proportion of a scale's total variance attributable to a common source (Carr and Pearson, 1999). However, one must note that Cronbach's Alpha is based upon an assumption of equal importance of all indicators observed (Venkatraman, 1989).

Alternatively, reliability can be represented by the proportion of measure variance that can be attributed to the underlying trait, seen in the observed variables for each construct. The proportion of variance in an observed variable is measured by R^2. It was originally postulated that reliability R^2 values of 0.70 or higher were necessary to prove reliability (Cronbach, 1951), though others posited that slightly lower values (0.60 or higher) were acceptable for new scales (Nunnally, 1978). Because the basis for this study

is grounded on previous literature in the supply chain management arena, we should expect alpha values of 0.60 and higher when analyzing the services supply chain management construct.

3.6.2. Non-response bias

The survey results will be analyzed for non-response bias to ensure that both respondents and non-respondents come from the same population. This will be done using two common methods for analyzing this condition. First, the responses of early and late inflows of survey submissions will be compared to determine if non-response bias is possible (Narasimhan and Das, 2001; Stanley and Wisner, 2001; Lambert and Harrington, 1990; Armstrong and Overton, 1977). The returned surveys will be split into groups based upon the dates the surveys are received. Then T-tests will be performed to determine if any significant differences can be identified. It is an objective to be able to prove no significant differences exist at the 99% confidence level. Next, a random sample will be selected from the list of non-responding companies. Demographic information (employees, sales volume, etc.) will be pulled on these firms and combined with the respondent group to approximate the population mean values for the entire data set. Again T-tests will be run on the sample and population means from these demographic variables to determine if there are any significant differences. If both assessments indicate no significant differences, non-response bias will be ruled out.

3.6.3. Validity

Next, the instrument will be measured for its validity in content and constructs. Content validity is the extent to which an instrument represents the whole construct. It is

generally a subjective or judgmental evaluation based upon prior research or experts in the topic. Meanwhile, construct validity is the extent to which the items in the scale are affective for measuring the construct (Carmines and Zeller, 1979; Churchill, 1987). Because constructs are not measured directly, the scales used to measure them must be evaluated for their ability to capture the construct's theoretical essence (convergence) while not measuring other factors (discriminant).

For this study, content validity is obtained through several steps. First, an extensive review of prior literature on the subjects was conducted. The scales that are developed are based upon that research and an evaluation of prior scales that have been operationalized in these research areas. Next, managers in the purchasing and sourcing arena were asked to review the items so their face validity could be evaluated. Minor changes were made based upon this feedback. A discussion of each scale is provided in the 'Theoretical Domain and Constructs' Section of this proposal.

Convergent validity addresses the similarity, or convergence, between individual questionnaire items that are used to measure the same construct. There are two widely agreed upon methods for assessing convergent validity within a measurement model that will be used in this analysis. First using exploratory factor analysis (EFA), a cutoff will be maintained for eigenvalues > 1.0 and factor loadings > 0.30. Second, using confirmatory factor analysis (CFA), each individual item will be tested for significance by determining if their coefficient is more than 2 times its standard error (Anderson and Gerbing, 1988). Discriminant validity is evaluates if the survey items load only on one factor and thus only the postulated theoretical construct. If not, the item is measuring concepts outside of the intended construct and thus is not an appropriate item for

inclusion into the scale device (DeVellis, 1991). This concept it analyzed by reviewing the correlations between pairs of variables to see that they are significantly different from unity. It will be tested using CFA with a test of chi-square differences.

3.6.4. Unidimensionality

When a measurement instrument has unidimensionality it indicates that all of the items (indicator variables) are measuring a single theoretical construct (Gerbing and Anderson, 1988). To establish that unidimensionality exists, the item being studied must be significantly associated with the empirical representation of a construct and it must be associated with one and only one construct (Anderson and Gerbing, 1982; Hair et al., 1995). This study will use confirmatory factor analysis (CFA). However, because of the magnitude of indicator variables and constructs, it is most likely that the sample size will not afford the opportunity to measure the entire model at once. Therefore, the model will be broken up into sub-models for evaluation (Moorman, 1995, Song, Dyer and Thieme 2006). Unidimensionality will be established by assessing the overall model fit of these models. The following is a summary of the recommendations for measuring acceptable fit:

Acceptable fit will be measured by:

Ratio of Chi-square statistic to degrees of freedom	value < 2.0
AGFI (Adjusted goodness of fit index)	> 0.80
RMR (Root mean square residual)	< 0.05 (though 0.10 acceptable)
NNFI (Bentler and Bonnet non-normed fit index)	> 0.90
CFI (Bentler comparative fit index)	> 0.90

If all measurements models have acceptable fit indices, one would conclude that unidimensionality exists with all constructs.

3.6.5. Common method bias

Common method biases (CMB) arise from having a common rater, a common measurement context, a common item context, or from the characteristics of the items themselves. One or many of these factors may exist in any study which is why precautions should be taken assess potential method biases in advance before a survey is released. These conditions lend themselves more prevalently to studies in which the data for both the predictor and criterion variable are obtained from the same person in the same measurement context using the same item context and similar item characteristics (Podsakoff et al., 2003). These conditions lend themselves to the type of research proposed for this study.

While there are methodological approaches, like Structural Equation Modeling, that will help to address common method bias, it is believed that statistical procedure approaches should also be employed. For that reason, this study will employ a partial correlation technique through the use of a marker variable to control for common method biases. In this method, a variable is selected which poses no theoretically predicted correlation to at least one other variable in the study. This variable is then used as a "marker" to estimate the common method variance that may exist based upon any observed relationships in the data. The estimate is determined by partialling out the average correlation between this marker variable and all other variables (Lindell & Brandt, 2000; Lindell & Whitney, 2001; Podsakoff et al., 2003, Malhotra et al., 2006).

3.6.6. Research Plan

The first step is to develop an instrument for measuring the supply chain management construct for service operations. Using the instrument development process

outlined by Chen and Paulraj (2004a), an iterative process will be used to obtain the best model meeting the requirements for reliability, validity and unidimensionality. Construct validity will be assessed via exploratory factor analysis (EFA) using principal component analysis. Then, a confirmatory factor analysis (CFA) will be used to assess construct validity and unidimensionality. My hypothesized SSCM model will then be tested using structural equation modeling.

3.7 STRUCTURAL EQUATION MODELING

Structural equation modeling (SEM) is a multivariate statistical tool that essentially combines multiple regression and factor analysis to simultaneously test a series of dependent relationships (Hair et al., 1992). The data analysis performed for this paper will follow the two-step approach recommended by Anderson and Gerbing (1988). The first step involves a confirmatory factor analysis to purify and test the measurement part of the model. Subsequent to the validation procedures, the measurement model will be analyzed for significance. In order to perform this process, the following steps will be taken. First, the model will be specified for both a measurement model and a structural model. Second, the relationship between the free parameters (information to be estimated) and observed variances (information under study) will be determined. This is known as identification. Third, an estimating procedure will be used to calculate the difference between the observed and estimated matrices. Forth, the model's fit will be assessed by a number of evaluation criteria. Finally, the model's specification is considered to determine if a better fitting model might exist.

3.8 Conclusion:

The previous studies on supply chain management will be broadened in this research study to consider the impact of the service industry as the principle target group. When considering services, one must consider the impact of the customer in the delivery mechanism as well as the perishability of customer inventory. As indicated in Chase, Tansik (1983), the direct participation of customers in the service process adds complexity that is generally not found in manufacturing. These factors require a broader view of the supply chain management construct than traditionally posited. As a result, the services supply chain management construct is presented with additional factors for capacity management, supplier management, and customer involvement. Meanwhile the overall model development included insight obtained from the schools of strategic management, service operations management, logistics management, purchasing and supply, computer information systems, marketing, accounting and finance. A thorough review of service frameworks was also helpful in developing the model and constructs.

CHAPTER IV

RESULTS

This chapter provides a review of the instrument development analysis performed. There is also an overview of the model analysis utilized. The chapter begins with a review of the research design, including a short summary of the data collection methods, details on the respondent profile and a summary of non-respondent analysis data. Next is a general summary of responses with commentary on key observations identified. This is followed by a review of the measurement instrument development process performed in this study. Finally this section concludes with a review of the research models analyzed. The models and individual paths are compared on appropriate fit indices.

4.1 RESEARCH DESIGN

4.1.1 Data Collection

In order to increase response rates, this study employed a mail survey in conjunction with an option to utilize a web survey tool. Respondents were directed to utilize either method to complete the survey instrument. The goal was to pull respondents from a cross-section of service industries with the United States covering the

two-digit Standard Industrial Classification (SIC) codes between 40 and 89. These codes cover all non-public service classifications for businesses (Table 2.2).

Several sources were considered for identifying the sampling frame. Ultimately the Institute for Supply Management (ISM) was selected due to its healthy list of service industry members. A targeted group of 954 individuals were selected from the member list provided by ISM for this project (Table 4.1). A modified version of Dillman's survey design method was employed for reaching out to the survey population. First, an initial introduction postcard was sent to all participants to inform potential respondents about the survey that was coming. They were informed of the option to complete the survey through a web site or using the mailed survey instrument. A letter was then mailed to each participant using first class postage requesting their input. A reminder postcard was sent out a few weeks later encouraging their response. In order to encourage participation, a calling campaign was employed to reach out to everyone on the list asking them to consider participating. Two calls were made to each non-respondent with a message left on their phone reminding them of the survey if they did not answer the calls.

Of the 954 original surveys mailed, 63 were returned due to invalid contact information. From the remaining pool of 891, 130 responses were received, equating to a 14.6% response rate. There were 7 responses discarded due to incomplete information leaving 123 complete surveys. The effective rate of these 123 responses was 13.8%. While this rate is not as high as some, it compares favorably to several recent surveys involving supply chain management (e.g. Li et al., 2005, Van der Vaart and van Donk 2008, Paulraj 2011, Cao, Zhang 2011 and Rexhausen 2012). While the respondent pool

was not as large as desired, it is not considered small. De Beuckelaer and Wagner, 2012 draw the line at 110 usable responses for the minimum survey responses.

To analyze the respondent population, the ISM membership list titles were broken up into four classifications (President/Vice President, Director/General Manager, Manager and Other). The 'Other' category referred to non-managerial roles like Purchasing Agents, Buyers and Specialists. Table 4.1 illustrates the breakdown of the service respondents into these classes. The category with the greatest amount of responses was the Manager category with 47% of the total survey population. This group also had the largest percentage of the overall survey population with 52%. However, the categories that showed the highest response rate out of the respondent pool was the President/Vice President pool at 17.2% and the Other pool at 16.9%. When analyzing the response rates between the four groups, no significant differences were found.

An analysis of the SIC codes returned a similar result (Table 4.1). The responding firms represented a wide array of service industries, covering all five core service divisions. While there were differences in responses when using the three digit SIC codes, overall twenty-eight of the thirty-eight service related SIC codes had at least one respondent. The General Services group (Division I) represented the largest segment of the survey population and the largest percentage of the respondents (57.7%). This was followed by the Transportation, Communication and Utilities group (Division E) at 13.8% and the Finance, Insurance and Real Estate segment (Division H) following closely behind with 13.0% of the respondents.

When considering the use of the web survey tool, one can conclude that it provided several advantages. As suggested by Froehle and Roth, 2004, it is less

expensive to administer than traditional postal mail and allows for faster response time; but more importantly, it allows for error traps to prevent the respondent from skipping questions. This resulted in no missing data points for the web respondents who completed the survey. Out of the 123 responses received, 103 were completed using the website, representing almost 84% of the responses received. Since the website was an alternative method for responding and not the sole method, there was no concern of negatively influencing the responses.

Finally, it should be noted that based upon a recommendation from the proposal review committee, several reverse-coded survey questions were included in the tool in order to confirm the respondents were paying attention throughout the survey. Reverse-coding was utilized on the second question under Trust and the fifth question under Supplier Involvement as well as the entire Service Performance section of the survey instrument (Appendix 2). T-tests performed on these scores indicate no significant differences in scores compared to the other survey questions. With this result, we can conclude that the respondents were adequately attentive to the survey questions as the proceeded through the instrument.

4.1.2 Respondent and Firm Profile

The final response pool consisted of a broad cross-section of purchasing-based employees, as shown in Table 4.1. Details show that this pool was made up of 22 presidents/vice presidents (17.9%), 28 directors/general managers (22.8%), 58 managers (47.2%) and 15 others (12.2%). The respondents worked predominantly for medium to large firms (> 250 employees) with 69.1% from these firms (Table 4.2). The largest segment was from firms employing more than 1,000 employees (46%). Based upon

revenue, 63.4% of the respondents were from firms that earned $100 million or more in revenue. The largest segment was from firms earning more than $1 billion (30.1%). In addition, the smallest sized firms were well represented with 8.9% respectively received from firms under 25 employees and earning less than $1 million. This compares favorably to the typical response from manufacturing firms that tend to under-represent the smallest segments (Rexhausen et al, 2012).

4.1.3 Non-response bias

This study used the method of comparing early and late inflows of survey responses to determine non-response bias (Narasimhan and Das, 2001; Stanley and Wisner, 2001; Lambert and Harrington, 1990; Armstrong and Overton, 1977). This method assumes that response opinions of late respondents can represent the opinions of non-respondents. If this is the case, when the late respondents' answers are not significantly different from those obtained earlier, one could conclude that they also represent the non-respondent population. Using this as the model, this study's response population was split into two groups that represented differences in response time. Based upon this, 30 of the model variables were randomly selected along with 14 of the demographic variables (employees, sales volume, and service nature). T-tests comparing the differences in mean of the two groups identified no significant differences at a 99% confidence interval.

Next, a random sample was selected from the non-responding population. Demographic information (employees, sales volume) was pulled and combined with the respondent group to approximate the population mean values for the entire data set. T-

tests were run comparing the sample and population means for these variables. Again, there was no statistically significant differences found. These results suggest that non-response bias may not be present in this study.

4.2 GENERAL OBSERVATIONS

The mean and standard deviation values for all the survey questions related to the model are include in Table 4.3. Reverse-scored items were re-coded in these tables so that a comparative visual review could be made. Each of these questions were measured using a 7-point Likert scale. The 46 questions related to services supply chain management were all anchored by "strongly agree" measured with a value of 7 and "strongly disagree" measured as a value of 1. The three constructs related to Information Technology Effectiveness each had their own measures. *Communication links* was anchored by "strongly agree" (7) and "strongly disagree" (1), *IT sophistication* was anchored by "very superior" (7) and "very inferior", and *information processing impact* was anchored by "extensively" and "not much". There were two constructs for performance. *Service performance* was anchored by "much worse" and "much better" while *firm performance* was anchored by "much higher than" and "much lower than".

Reviewing the mean values of the 81 survey questions can provide one with a perspective on the highest and lowest ranked items as scored by the respondents. One can see from this review that the respondents placed high ratings on each of the *effective communication* and *trust* constructs as well as most of the *supplier management* and *customer involvement* constructs. There was also some important placed on a few of the *long-term relationships* as well as the overall rating of some of the *service performance* questions. It is obvious from these reviews that respondents place a lower rating on some

of the *communication link* items, along with one each of the *supply base reduction, capacity management, customer involvement* and *information processing* questions. These results lead into the next section where efforts were taken to analyze the factors based upon these questions and the relationship between constructs.

4.3 MEASUREMENT INSTRUMENT

The instrument development process was based upon recommendations from other noted researchers for developing an instrument that satisfies the requirements of reliability, validity and unidimensionality. This three-stage process is detailed in Section 3.6 and highlighted briefly here. In the first stage, constructs are filtered using a Cronbach's alpha value of 0.60. This is followed in the second stage by an exploratory factor analysis where factor loadings are reviewed for each indicator. Item simplification occurs whenever an indicator does not load clearly on a single factor or on the factor it was theorized to measure. In the third and final stage, confirmatory factor analysis is evaluated to confirm the hypothesized structure meets acceptance 'criteria. Critical to this portion of the analysis will be to determine if the added factors, specifically intended to draw out service industry features, will prove to provide significant value. The following sections review each portion of the instrument development process.

4.3.1 Normality

Prior to the model development phase, the variables were tested for normality based upon the univariate skewness and kurtosis statistics. General guidelines require that absolute value of skewness be less than 2.0 and kurtosis remain under 7.0. All indicators met these standards except for the EFCOM4 indicator which had a skewness of

2.218 and a kurtosis of 7.947. Outside of this variable, the values fall within the recommended limits, suggesting that the variables meet the requirements for normality. The EFCOM4 variable was retained because it was not outside the acceptable ranges by much and will continue to be researched against the remaining criteria before a final decision is rendered.

4.3.2 Reliability

The Cronbach alpha measure for the scales are shown in Table 4.4 at different points in the analysis. The first column illustrates the alpha values prior to application of any scale reduction methods. The second column presents the alpha values after the Exploratory Factor Analysis was completed. The values in parentheses represent the number of variables included in each scale. The third column provides the Cronbach's alpha values after Confirmatory Factor Analysis. Because no additional indicators were removed or added, these values are identical to the second column.

In reviewing the reliability of the services supply chain management factors, all scores except one meet the widely accepted rule of thumb of 0.70 suggested by Nunnally (1978). Even that one factor, supply base reduction, comes in at 0.653, which is above the cutoff of 0.60 for potential inclusion based upon their potential for improving the analysis. Meanwhile six of the eight factor reliabilities under this category were greater than 0.80 with the highest topping out at 0.893 for supplier involvement. The composite reliability for the services supply chain management second order factor was 0.922. These values represent very solid indicators of reliability within the construct.

The other constructs performed even higher with information technology impact, service performance and business performance all coming in with reliability scores over

0.92. Because this study was grounded on previous literature in the supply chain management arena, we expected alpha values of 0.60 and higher in the supply chain management construct (Nunnally, 1978). The results support this expectation, even though we added several new factors specifically intended to capture the unique features introduced by services.

4.3.3 Content Validity

As mentioned prior to conducting the research study, content validity was obtained through several steps. An extensive review of prior literature was conducted in the areas of supply chain management, service management and operations, information technology and performance. The scales were developed from this research and an evaluation of prior operationalized scales in these research areas. Next, three managers in the purchasing and sourcing arena were asked to review the items to evaluate the face validity of the measures. A final instrument was prepared after adjusting the questions based upon their feedback and that of this research's dissertation committee. Some factors were pared to reduce the survey length. This work indicated that the resulting instrument represented the factors measured in the study.

4.3.4 Unidimensionality

Unidimensionality is obtained using confirmatory factor analysis in order to determine if the indicator variables are measuring a single theoretical construct. It can be evaluated by assessing several key fit indices to obtain an overall evaluation of the model's fit to the data. These indices of fitness were obtained using the CALIS procedure in SAS version 9.2 for Windows. As suggested prior to commencing the

survey, the number of indicator variables and constructs makes it difficult to be able to analyze the entire model at once. Given the number of responses received, three sub-models were evaluated (Moorman, 1995, Song, Dyer and Thieme 2006, Paulraj 2011), one for the services supply chain management factors, another for the three information technology impact factors and the last to measure the two performance factors (Tables 4.5a – 4.5c).

The first indicator is the ratio of the chi-square statistic to the degrees of freedom. Here, some researchers recommend a ratio less than 3.0 (Hair et al, 1995) while others suggest a ratio less than 2.0 (Hatcher, 1994). Other measures of fit used in this study include adjusted goodness of fit (AGFI), root mean square residual (RMR), Bentler comparative fit index (CFI), and Bentler and Bonnet non-normed fit index (NNFI). When targeting values of AGFI > 0.80, RMR < 0.05 (or at least < 0.10), CFI > 0.90, and NNFI > 0.90. When using these indicators, it can be seen in Table 4.5a that the services supply chain management measurement model meets three of the five measures, narrowly lagging with a CFI of 0.86 and an NNFI of 0.84. The information technology impact model meets four of the five measures, with an AGFI of 0.78 compared to the goal of 0.80. Lastly, the performance model meets three of the five measures. The AGFI is close at 0.77. The chi-square to degrees of freedom is 3.26, which is below the goal but within a reasonable level as mentioned by Marsch and Hocevar (1985). While these model statistics are not all beyond the ideal range, they are all very close, representing an adequate fit for a model of this scale.

4.3.5 Construct Validity

Construct validity measures the extent to which the items in the scale are affective for measuring the theoretical construct (Carmines and Zeller, 1979; Churchill, 1987). To perform a measurement of construct validity requires that the researcher not only determine that each item measures the construct it was intended for but also to validate that the items do not measure any other factor. Combining tests of "convergent" and "discriminant" validity ensure that this is accomplished.

Convergent Validity

Convergent validity was tested using both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). As with the unidimensionality analysis, the analysis broke up the overall model into three subgroups. With EFA, convergence is evaluated by determining if all eigenvalues are greater than 1.0 and all factor loadings exceed a minimum of 0.30 (Hair et al, 1995). With CFA, convergence is determined by testing whether or not each individual item's coefficient is greater than two times its standard error. The t-values for each item can also be evaluated to determine the strength of the relationship. T-values greater than 2.576 indicate a significance level of 0.01. Lastly, the inter-correlation (R^2) value was reviewed. Items with a score below Flynn et al. (1994) recommended 0.30 were marked for possible deletion. R^2 is a measure of the proportion of variance identified in an observed variable as a ratio of the total variance in the construct being measured.

Convergent validity for the services supply chain management construct is maintained by an eigenvalue greater than 1.0. After completing the EFA, eight factors remained that met that criteria (Figure 4.1a). Meanwhile, Table 4.6a shows that all 34

indicators had loadings well above 0.30 with only one factor loading less than 0.50. In Table 4.7a one can determine that all variables meet the requirement for coefficients (factor loadings) to be more than two times their standard error. We also see that the t-values and R^2 values are all very strong with no t-value less than 5.70. For the information technology impact construct, the three eigenvalues greater than 1.0 are pictured in Figure 4.1b. Table 4.6a shows that all 15 indicators had loadings well above 0.30 as the lowest factor loading was 0.723. Table 4.7b proves that all variables meet the requirement for factor loadings to be more than two times their standard error and all t-values and R^2 values are very strong. Finally the performance measures separated into two factors, each with an eigenvalue greater than 1.0 (Figure 4.1c). The coefficients, t-values and R^2 values were all significant.

Discriminant Validity

Once again, EFA is utilized to analyze the models, this time to evaluate the discriminant validity of the items. By reviewing the factor loadings during the EFA, one can ascertain if a survey item loads on one and only one factor. If that factor is hypothesized as the theoretical construct, then one can assume that the item is appropriately measuring the theoretical factor. During the exploratory factor analysis stage, several indicators were discarded due to violations of this property. An entire theorized factor regarding Information Sharing was removed because the construct, while demonstrating strong reliability, did not explain a significant amount of variance and the individual indicators loaded heavily on secondary factors. These items were removed from the analysis and the cycle of review restarted.

Going back to Table 4.6a – 4.6c, one can review the final item loadings. In the services supply chain management view (Table 4.6a) only two of the thirty-four factors have a loading greater than 0.40 on a second factor. For those two, EFCOM5 loaded on Factor 1 with a value of 0.425 and SBR4 loaded on Factor 5 with a value of 0.406. In both of these cases the primary factor was considered a stronger relationship. Meanwhile in the information technology model (Table 4.6b) no factors loaded over 0.40 on a second factor. Last, in the performance model (Table 4.6c) nine items loaded on a second factor with a value of 0.40 but none of these had a value greater than 0.50. In each case, the item loaded on its primary factor with a score of greater than or equal to 0.75. Thus we conclude that these results provide strong evidence for discriminant validity within the constructs.

4.3.5 Common Method Bias

Common Method Bias was estimated using the Marker Variable Technique proposed by Lindell & Brandt (2000) and Lindell & Whitney (2001) which estimates the model's common method variance (CMV). To calculate this, a "marker" is identified within the variables studied in the survey (Lindell & Brandt, 2000; Lindell & Whitney, 2001; Podsakoff et al., 2003, Malhotra et al., 2006). This item should be identified from questions with no theoretically predicted correlation to the other variables being studied. In this analysis, the marker variable was identified post hoc by selecting the variable having the second-smallest positive average correlation to the other factor variables. The second-smallest variable was suggested by Lindell & Whitney (2001) to prevent the likelihood of capitalizing on chance factors when using the post hoc approach. The marker variable is used to calculate a common method variance-adjusted correlation for

each factor in the model. Next a new measurement model is calculated using the marker variable to determine if the new model is significantly different from the original.

In this analysis, the lowest correlations were found for the respondent state (0.011) and percentage of business-to-business sales (0.020). Using the percentage of business-to-business sales (BothPct), CMV-adjusted correlations were calculated for each of the remaining factors making up the services supply chain management construct (Table 4.8). The differences between the original and CMV-adjusted correlations are relatively small. Analyzing the model statistics, the chi-square increased by 39.6 with 31 additional degrees of freedom. The differences in chi-square are compared to the chi-square statistic for 30 degrees of freedom at 95% significance (43.773). Because the chi-square difference is less than 43.773, we can conclude that our new model is not significantly different than the original model, implying the bias are not significant to this model.

4.4 MODEL RESULTS

To analyze the models, a series of analyses were conducted that traced the success of the proposed theoretical constructs. In the previous sections, evidence was provided to determine if the indicator variables proposed in this research project adequately defined the constructs for services supply chain management, information technology impact, service performance and business performance. Reliability values showed strong results confirming the common indicators provided strong internal consistency. Non-response bias was assessed with no evidence to assume the respondents do not represent the overall population. Content validity was obtained through a thorough literature review and feedback from industry representatives. Unidimensionality was evaluated with

reasonably strong results for a seminal research study. Finally construct validity was evaluated for both convergent and discriminant validity and excellent results were obtained. Collectively the results indicate a strong measurement instrument for assessing the core model. The following sections will evaluate the mediator and moderator effect models

4.4.1 Mediation Analysis

With fully vetted measurement models, the analysis turns to evaluating a mediation model. Under review is the hypothesis that information technology is mediated by purchasing practices. This implies that the effect that information technology has on performance is mediated by the strength of the buyer-supplier relationship. For service businesses, that relationship is captured by the services supply chain management construct. To test the mediating effect of services supply chain management, a structural equation modeling approach was used, similar to those proposed by James, Mulaik and Brett (2006). They suggested that the mediation effects could be confirmed by a structural model based upon the significance of the path coefficients. To apply this concept to the services supply chain model a series of models were evaluated in SAS using the CALIS procedure. These models represented a fully mediated model, a partially mediated model and a direct model. Each of the models will be analyzed and the managerial implications to the results will be reviewed.

4.4.1.1 Model 1: Full Mediation

The Full Mediation model assumes that the effect of information technology passes completely through the services supply chain management construct in order to

impact performance (both service and business performance separately). Figure 4.2 illustrates this scenario. A review of Table 4.8a shows that this model met all five fit criteria as the ratio of chi-square to degrees of freedom was under 2.0, as well as having AGFI > 0.80, RMR at least < 0.10, CFI > 0.90, and NNFI > 0.90. In addition, the following path coefficients were significant at the 0.01 level:

ITI	→	SSCM	0.774 **
SSCM	→	SPERF	0.331 **
SSCM	→	BPERF	0.162 **
SPERF	→	BPERF	0.716 **

Thus information technology impact has a positive significant effect on services supply chain management, which has a positive significant effect on both service and business performance. Lastly, service performance has a positive significant effect on business performance.

4.4.1.2 Model 2: Partial Mediation

The Partial Mediation model assumes that some of the effect of information technology passes through the services supply chain management construct prior to impacting performance while other portions impact performance directly (both service and business performance). Figure 4.3 illustrates this scenario. A review of Table 4.8b shows that this model was nearly as effective as the full mediation model meeting all five fit criteria as the ratio of chi-square to degrees of freedom was under 2.0, in addition to an AGFI > 0.80, a RMR at least < 0.10, a CFI > 0.90, and an NNFI almost > 0.90. However, of the six path coefficients proposed only two were significant at the 0.01 level and the remaining four were not significant at all.

ITI → SSCM 0.767 **

SSCM → SPERF 0.167 NS

SSCM → BPERF 0.066 NS

ITI → SPERF 0.196 NS

ITI → BPERF 0.117 NS

SPERF → BPERF 0.711 **

Thus from this model we can only conclude that information technology has a positive significant effect on services supply chain management. But neither information technology nor services supply chain management has a direct affect on service or business performance when both are considered at the same time. Finally, even with this model the service performance construct still had a positive significant effect on business performance.

4.4.1.3 Model 3: Direct Effects

The Direct Effect model assumes that all of the effect of information technology passes directly to impact performance (both service and business performance) and likewise all of the effect of services supply chain management passes directly to impact performance (both service and business performance). Figure 4.4 illustrates this scenario. A review of Table 4.8c shows that this model has identical fit characteristics as the partial mediation model, meeting all five fit criteria. However, of the five path coefficients proposed only two were significant at the 0.01 level and the remaining four were not significant at all.

SSCM → SPERF 0.365 NS

SSCM → BPERF 0.144 NS

ITI	→	SPERF	0.273 NS
ITI	→	BPERF	0.163 NS
SPERF	→	BPERF	0.712 **

From this information, we conclude that neither information technology impact nor services supply chain management has a direct impact on performance. This is not surprising as other research has shown that information technology's impact on performance is usually found to interact with a purchasing practice affect (i.e. something that affects processes, attitudes, relationships or systems). Similar to the first two models, the service performance construct had a positive significant effect on business performance.

4.4.1.4 Managerial Implications

Based upon a review of all three of these models we can conclude with high significance that information technology's effect on performance (both service and business) is mediated by service supply chain management. This is a significant result as it confirms this research's hypothesis that services supply chain management should not be reviewed in a vacuum. Instead it should be considered as a significant factor towards driving performance when coupled with an effective information technology capability. Conceptually this implies that the more effective a service firm is at managing its supply chain the greater the effect information technology will have on its service and business performance.

In fact, a firm's information technology capability has been shown on several cases to impact a firm performance but only when viewed through the lens of a secondary factor (in this case service supply chain management). For example, Dehning et al.,

(2007) showed that a firm's information technology capability had an impact on performance but was controlled by the way a firm's business processes were conducted. Sanders et al., (2005) showed that IT capability's impact on performance was mediated by the ability of a firm to collaborate. Meanwhile, Sriram and Summp (2004) showed that IT capability was mediated by relationship quality. All of these research projects show similar concepts and imply that information technology does not affect performance directly without tying it to some facet of the business that can drive results. For some firms, those areas might be improving business collaboration both internally and externally. For others, this will be in core operational processes. This research confirms that for service businesses, information technology can augment the firm's supply chain management practices which in turn drive performance. Looking at the information technology factors within the measurement model, one can imagine how these factors help to affect improvements in purchasing practices. Information technology can facilitate the connection of buyers and suppliers through electronic connections. It can provide effective business applications and systems that create business capabilities. It can also impact supply chain processes by fostering improvements to the means for collecting inputs, delivering the service, or coordinating with customers and suppliers.

4.4.3 Other Research Questions

4.4.3.1 Respondent Profile

The survey respondents' distribution of scores were analyzed to determine how the firm profiles influenced the first order factors in order to determine if firm demographics played a role in this model. T-tests were performed on 0/1 variables

representing firm size based upon employee counts and annual revenue. The result of these comparisons showed that smaller firms based upon employee count (≤ 500 employees) were more effective at communicating (EFCOM) and reducing their supply base (SBR) than large firms at a 95% significance level. When comparing based upon revenue, the analysis showed that small firms were again more effective at supply base reduction. However, when using this factor, the larger firms (≥ $100 M) outperformed their counterparts in establishing communication links (CLINK) and information technology sophistication (ITSSC) at a 95% significance level and supplier involvement (SINV) and supplier management (SMGT) at a 90% significance. These results imply that smaller firms are more effective at communicating with their supply chain partners and have made efforts to reduce their supply base size. These are two areas that are not heavily influenced by capital. However, the larger firms are able to employ more technological solutions. They also have more structure applied to the manner in which they oversee their supply chain partners. Neither of these results comes as a surprise. Though one may have thought that larger firms would have seen a significant difference in the effectiveness of processing information (INFOP).

4.4.3.2 Service Nature

By looking at the respondents based upon the nature of their service offerings, additional insights were obtained when analyzing the distribution of scores. Service firms whose principal service was classified as tangible were found to outperform their counterparts in the areas of trust (at 99% confidence), effective communication (at 95%) and capacity management (at 90%). When looking at the recipient of the service (people

vs. things), the research shows that those firms purchasing things had established higher ranking long term relationship measures at a 90% confidence.

Further review was completed on the type of service offered (based upon the SIC code Divisions). While some of these divisions are not homogeneous in nature, particularly the 'General Services' Division I, there are some things that can be learned from breaking the responses up in these classifications. In Division E (Transportation and Energy), the "non" Division E firms outperformed the Division E firms in effective communication and supplier involvement at the 90% level. In Division F (Wholesale Trade), the Division F firms performed better on average than their counterparts in service performance and business performance (at 95% confidence), while their counterparts performed better at customer involvement. Division G (Retail Trade) provided interesting results. The analysis showed that firms in this Division were outperformed by the field in seven of the thirteen factors. The results show they under-performed in trust, effective communication, capacity management and information processing (at 95% confidence) and supplier involvement, long term relationships and supplier management (at 90%). The last group of firms was from Division I (General Services). This group also under-performed on some factors compared to the rest of the firms. Specifically, they scored lower in long term relationships, supplier management and information processing all at a 95% confidence level.

4.7 CONCLUSION

This chapter covers the concepts of measurement instrument development and model review as well as an analysis of firm profile and service nature. The measurement instrument discussion illustrates the process taken to develop the final survey tool. The

results indicate a solid instrument possessing solid reliability, content validity, unidimensionality and construct validity. The model fit characteristics for the full mediation model illustrated that this model explained the effect that information technology has on performance (both service and business). From this analysis, it can be shown that information technology's impact is fully mediated by the level of services supply chain management. This result is in line with the original hypothesis here and is well supported by other research on related topics.

CHAPTER V

DISCUSSION AND MANAGERIAL IMPLICATIONS

This chapter provides a detailed review of the theoretical constructs and their inter-relationships. It is broken up into three sections: general observation, theoretical constructs and conclusion. The first section provides a general observation of the research responses from the survey. The next section provides a review of each of the remaining constructs after the model purification step. Each main area is discussed (services supply chain management, information technology effectiveness and performance) as well as a review of the underlying factors making up those constructs. Managerial implications and learnings based upon the data analysis are provided throughout this section. The chapter concludes with a summary of the main points.

5.1 GENERAL OBSERVATION

Based upon measures of reliability, unidimensionality and validity, all of the theoretical constructs proposed in this analysis were found to possess strong statistical qualities. These measurements, reviewed in Tables 4.4 through 4.8, illustrate that the survey instrument effectively represents the factors making up the constructs and that the

constructs are thoroughly defined. Even though services supply chain management has been less rigorously studied in the past, the results indicate that it is well constructed. The three service-specific factors (capacity management, supplier management and customer involvement) all play vital roles in the construct's make-up. Meanwhile, the information technology impact construct is effectively defined with the use of three key factors.

5.2 THEORETICAL CONSTRUCTS

5.2.1 Services Supply Chain Management

The services supply chain management construct was conceptualized to consist of nine indicators. However, during exploratory analysis the information sharing factor was removed as it appeared to be well represented within the effective communication factor. This would appear on the surface to be a valid result as several studies indicated only a single factor could represent the value of communication within the supply chain. Yet the value of sharing key information should still be considered important in a supply chain. Supply partners should also consider it as part of the communication that transpires on a regular basis in order to effectively do business.

Overall, the services supply chain management construct was found to have a reliability of 0.730 with no factor having a reliability measurement below 0.718. This analysis illustrates the value of a corporate approach to managing a firm's supply chain and the various entities involved. There are factors relating to the management of suppliers, the involvement of the firm's customers as well as the effective management of internal resources. The following is a review of the individual factors underlying the services supply chain management construct.

5.2.1.1 Trust

Trust has often been shown to play a critical role in developing the relationship between two firms. The survey instrument contained five indicators, all which proved to effectively help to define the concept represented in this study. An analysis of this construct shows that the respondents recognize the importance of this factor as the reliability level is very high, the average score was 5.39 and the standard deviation was only 0.94. In line with previous research, this factor also shows a strong covariance with the measures of communication (Handfield, 2002), supplier involvement (Anderson and Narus, 1990; Fawcett et al., 2009; Fredendall et al., 2005) and long-term relationship, indicating the need for trust in any partnership as mentioned in Section 2.5.2.1. The t-values of the indicator variables range from 6.2 to 12.3 indicating a confidence significantly greater than 99%. As a firm shows trust in its partners and a commitment to maintain the relationship, it reaps the benefits of its partners' involvement (Currall and Inkpen, 2002).

5.2.1.2 Effective Communication

Effective communication was formulated to represent a firm's communication with its suppliers. This construct was theorized to be made up of 5 indicators representing the firm's communication frequency as well as the timeliness, accuracy and completeness of the information shared. While all five indicators load effectively on this factor, the frequency of personal and non-personal contact is not always as strong as the firms believe they should be. However, based upon this factor's descriptive statistics we see the overall importance the respondents place on this construct, regardless of firm performance. This factor has the highest mean score values (5.68) and lowest standard

deviation (0.83) of all services supply chain management constructs. Its t-values range from 5.4 to 13.9, indicating strong significance. This construct covaries most strongly with the Trust/Commitment (Kelly et al., 2002), Supplier Involvement factors (Hahn et al., 1990; Krause, 1999, Lascelles and Dale, 1989; Newman and Rhee, 1990), and both performance factors, but not very highly with any other service supply chain management constructs. This indicates the strong relationship that communication has with trust and the benefits in supplier involvement that are generated by communicating effectively. Doing this leads to a competitive advantage for the firm (Paulraj et al., 2008). These results indicate that the timely exchange of relevant information will improve the coordination of events between the buyer and supplier firms and lead to stronger performance.

5.2.1.3 Information Sharing

This factor was formulated to represent the sharing of information like 'events that may affect the other partner', 'core business knowledge', 'sensitive data' and 'business plans'. This factor had a mean factor score of 5.09 and a very strong initial reliability of 0.888. However, through the measurement development process it was obvious that this construct did not explain enough of the variances in the firm's responses for the added complexity inherent in maintaining this factor in the analysis even though it exhibited strong mean values. There was concern from the beginning that this factor may be too closely related to the effective communication construct, but it was included in the original model to insure the sharing concept was considered. In the process of maintaining a parsimonious measurement model, this factor was dropped.

5.2.1.4 Long-Term Relationship

Through the measurement development process, one of the original five indicators was dropped. This indicator related to an expectation to maintain relationships with key suppliers for a long period of time. This indicator was removed even though its mean score was the highest (5.86) and it possessed the lowest standard deviation (1.035) among the five indicators. This is because respondents did not score this question much differently across the various types of firms. This indicates that service firms see this as almost an expectation for all their suppliers. Yet when challenged, other factors tend to play a larger role in determining their willingness to maintain a long-term relationship.

This construct possessed a strong reliability regardless of the number of indicators. The lowest t-value was 7.43 among the four indicators, illustrating strong significance across the board. Not surprisingly, this factor was shown to covary strongly with trust, supplier involvement, supply base reduction and capacity management. Each of these can be improved as the relationship is maintained over time. Firms participating in long-term relationships tend to trust each other and build upon their relationship through the strong sense of mutual commitment to the relationship that has been made (Dyer, 1997; Krause, 1999). For a service organization, this will encourage them to find ways to employ methods of managing the capacity within the system.

5.2.1.5 Supply Base Reduction

Supply base reduction was originally conceived as a four indicator factor, but was reduced to three during the measurement development process. After making this change, it was shown to possess the lowest reliability of all the factors in the services supply chain management construct at 0.718. Yet it meets any reasonable standard for

acceptance based upon this value. Plus all indicators in the measurement model possess t-values of 5.9 or greater, indicating strong significance to support their inclusion. The indicator that was dropped relates to dropping suppliers for price reasons. One may conjecture that this indicator is not valid in services if the supplier is not at least price competitive with the competition.

This factor has been included in many manufacturing-based supply chain management constructs. Its implication in the services arena is similar as it relates to the measurement of a firm's intentions to rely on a small (and even reduced) number of high quality suppliers. The need for this in services may be even more significant at times when procuring intangible services, particularly if they must change frequently over time. This factor covaries strongly with long-term relationships indicating that in order for a firm to reduce its base of suppliers, it must be working to develop long-term relationships with a small group of supply chain partners (Handfield, 1993).

5.2.1.6 Supplier Involvement

The supplier involvement construct has been theoretically identified to represent the need for a supplier's participation in planning, goal setting and improvement efforts. Originally this factor was conceptualized through six different indicators. However, one indicator related to the willingness of a firm to hand over a portion of their service delivery was found to not represent the factor. This may be due to some firm's general unwillingness to offload critical portions of their service delivery. While sighted in several studies as a means to gain market share, service businesses are often unwilling to permit other firms to connect with their clients (Ahlstrom and Nordin, 2006; Karlsson, 2003; Lonsdale and Cox,1998). This is due to the fear of a supplier bypassing the buying

firm and contracting work directly with the end customer. After removing this indicator, the factor had a consolidated average score of 4.47 and a standard deviation of 1.40. While these scores were the second lowest among the services supply chain management factors, the reliability of this factor was the highest at 0.901. This indicates that the survey instrument showed consistency in respondent scores between the five remaining indicators.

For manufacturing firms, a supplier's role is usually focused on ensuring a high quality reproducible part can be manufactured and delivered to fit into the final product. However, in the service environment the deliverable may not be a tangible item. In these cases, the buyer and supplier focus their attention on ensuring clear expectations for the service to be delivered. It is generally believed, that the more intimately involved the supplier is in the early stages of the service design, the higher the chance that conformance will be maintained. However, even if early involvement is not possible, clear definitions and on-going collaboration are tantamount to ensuring success (Bovel and Martha, 2000). This factor captures these concepts.

This factor showed a high level of covariance with trust (Anderson and Narus, 1990; Fawcett et al., 2009; Fredendall et al., 2005) and effective communication (Hahn et al., 1990; Hauptman and Hirhi, 1996; Krause, 1999, Lascelles and Dale, 1989; Newman and Rhee, 1990), as previously discussed. But it also had high covariance with the long-term relationship and capacity management (Ng et al., 1999; Renner and Palmer, 1999; Shah, 2007). The connection to long-term relationship would indicate that long-term relationships with suppliers have a high degree of supplier involvement. Even if the involvement is light initially, over time the two partners will share more and more

information. The connection to capacity management indicates the strong connection a firm has with its suppliers to help manage its operating capacity. The stronger the supplier's involvement, the more the buying firm is able to manage the variances that are inherent in most services.

5.2.1.7 Capacity Management

Capacity management was formulated to consist of five indicators dealing with how a firm manages its capacity using both internal and external levers to meet demand variations. Two of these indicators were removed during the measurement refinement process. Removing the first indicates that firms there are not significant differences in the efforts of services to manage demand for their services against supply. The second removal related to firms willingness to share demand forecasts with their supply base. Removing these implies that services are focused more upon optimizing demand and working to meet it through a variety of alternatives than to limit demand and potentially revenue. This indicates that service firms may not understand their cost structures well enough to successfully evaluate the cost of significant demand fluctuations (Kimes and Chase, 1998). A weakness in this area can lead firms into trouble. Meanwhile, services are focused upon managing their capacity through a variety of methods. The most common methods are variable labor strategies such as employing part-time, temporary, or seasonal employees, flexible work schedules and subcontractor labor (Lovelock and Wright, 1999). Not surprisingly, supplier involvement was shown to have a positive impact on capacity management due to the value that a supply chain can provide to the buying firm, including providing capacity flexibility (Ellram et al., 2004; Sasser, 1976). More interestingly, capacity management also covaried with trust and long-term

relationships. Both of these factors relate to the buying firm's willingness to utilize their supply chain partners to help solve problems. The more trust found in a relationship, the more willing a buying firm will be to lean on its partner suppliers to solve problems, like filling in for short-term capacity constraints. The longer the relationship between buyer and supplier, the more likely these types of circumstances will arise. Statistically, this factor had a solid reliability level (0.772) with average scores of 4.27. This was the second lowest score among the service supply chain management factors. The t-values were 7.94 or higher for the three indicators, which are highly significant scores.

5.2.1.8 Supplier Management

The reliability of the supplier management first-order factor was 0.830. The descriptive statistics show an average score of 5.30 and standard deviation of 1.22. Originally conceived as factor of six variables, it was reduced to four during the measurement development process. Supplier management is a measure of the degree to which a buying firm proactively oversees its service providers. Due to the intangible nature of so many services, they are often hard to codify into clear written legal agreements. If not managed by a sourcing professional, the buying firm will struggle to maintain control of the service quality and cost. This factor's significance shows the importance that a service must place on these activities in order to manage their supply base. This factor is moderately influenced by supplier involvement and long-term relationships, but has little impact on the other service supply chain management factors. This indicates the ability to effectively manage the service supply base goes hand-in-hand with a focus on a nurtured and supportive supplier relationship (Ellram et al., 2004).

5.2.1.9 Customer Involvement

Customer expectations continue to evolve and generally escalate the more they utilize a service. Customer involvement is shown in this study to provide significant value to the effectiveness of a business' ability to manage their supply chain. While this may be true in manufacturing businesses, it is accentuated in services, particularly services that are co-produced with the customer. The added impact of customer involvement in services only heightens the need to include customer feedback in planning, goal setting and performance measurements (Sampson, 2000). This factor was shown to have a moderate impact on a firm's ability to effectively manage capacity. Of note, an analysis of the distribution of mean responses showed firms that co-produced their service with the customer (e.g. Real estate transactions through real estate agencies) on average showed no improvement in customer involvement than any other firm. This tells us that customer involvement remains independent of the degree to which the customer is involved in the production of the service (i.e. co-production).

The reliability of this factor was very high at 0.875, while the average summated score was 5.45. Meanwhile with a standard deviation of 1.034 it represents the lowest variability in scores among the eight first-order factors in this section. During the measurement development process, the indicators were reduced from six to five variables. The item removed was related to supply chain partner's proactive involvement in determining how to serve one's customer. Eliminating this factor indicates that these activities are most likely not occurring within most service businesses.

5.2.2 Information Technology Impact

Information technology impact was conceived to capture three very unique features of the information technology realm. It was formulated to measure the electronic communication links utilized, the skills and capabilities of the IT department (termed IT sophistication) and the effectiveness of the firm's utilization of technology to impact processes. This second-order relationship provides a more thorough analysis of the impact technology can have on the firm. It is also consistent with other research (Sheu et al, 2006 and Rust and Miu, 2006) that looked at information technology for not only its transactional power, but also its ability to coordinate supply chain structure and drive foundational change within an organization. This research showed strong support for this concept based upon the strength of the three first order factors (detailed next) as well as the model characteristics (shown in Table 4.5).

5.2.2.1 Information Technology Sophistication

The information technology sophistication construct is made up of four indicator variables that relate to the performance of a firm's hardware and operating systems, business applications as well as their staff's skills and abilities. The reliability of this first order factor was very strong (0.932). The average summated scores were 4.63 with a standard deviation of 1.37. The t-values of the factors ranged from 11.9 to 12.6, strongly indicating their significance.

It is generally assumed that the skills and capabilities of the information technology department are indicators of the strength of the firm's use of technology. Past research illustrates this point fairly clearly. The more capable the firm is at managing and developing its IT department technical skills, the more apt it is to solve critical problems

in the business (de Burca et al., 2006). This research supports that assumption by confirming the strong relationship that IT Sophistication has on communication links and its ability to improve processes (information processing effectiveness). There is also a positive relationship this factor has on performance. The structure of this relationship was explored in more detail in Section 4.4.1.

5.2.2.2 Electronic Communication Links

In order for organizations to share information effectively, it needs to be timely, accurate and complete. The use of electronic communication methods has elevated the effectiveness of the supply chain to accomplish this through integrated systems and shared information sources. Respondents considered electronic communication links to be instrumental in accomplishing this for their service organizations. This construct was also found to have significant impact on information technology processing impact suggesting that electronic connections reduce communication barriers that impede progress. This result implies that linking firms together electronically will increase the ability of the buying firm to impact its supply chain. The more integrated a supply chain is, the more likely it will drive services that enhance its service value. This is not surprising as previous evidence has shown that integrated information technologies are related to supply chain integration (Vickery et al., 2003). Communication links show a significant impact on performance as well, both service and firm performance. Based upon the advantages identified by firms that have linked their information systems, this should not be a surprise.

This construct was conceived as a combination of six indicator variables. Through the measurement development stage, five factors remained. The reliability of

the remaining indicators showed a reliability of 0.896. The magnitude of this value shows the strength of this construct. The descriptive statistics measure the mean score of 4.48 and the standard deviation of 1.60. This value was the highest of all factors measured in this survey and it indicates the variability of this factor based upon capabilities of the firm being measured. The t-values of the five indicators ranged from 6.6 to 13.1, indicating a very strong confidence that these variable means are not zero.

5.2.2.3 Information Processing Effectiveness

Information processing effectiveness was conceptualized to represent the ability for a firm to utilize technology in manners that improve the performance of the supply chain and ultimately the business. It is based upon the works of many researchers who have proven the impact information technology can have on a business (Sanders et al., 2005; Sheu et al., 2006; Sriram and Stump, 2004). It was conceptualized as a first order factor made up of six indicator variables that explore various areas of the firm's business (from purchased inputs, through the conversion of inputs into outputs and ultimately to the coordination of activities with the supplier and customer). The indicators were all strongly significant and had a reliability measure of 0.895. The mean scores were 4.54 with a standard deviation of 1.33. The t-values ranged from 7.8 to 11.3, showing a strong significance. Based upon the results from this study, one can ascertain the value that these activities have on the performance of the firm. This factor is strongly impacted by the electronic communication links established by the firm to manage its work. The stronger the linkages, the greater the impact on the supply chain.

5.2.3 Service Performance

Service performance was formulated as a first order factor made up of 15 indicator variables related to the how a firm's service operation performed. This factor was based upon the work by Glynn et al, 1995. While it has components that relate to the SERVQUAL measure from Parauraman et al., 1995 and 1988, it was developed to include additional factors that relate to a service's overall performance. In the measurement refinement process, two of the indicators were removed (customer retention rates and customer complaint resolution levels, both part of Glynn's customer responsiveness factors). The remaining thirteen indicators cover a broad scope of service measurements and maintain the core elements of Glynn's original concept. Overall, this research shows strong support for this performance measurement. It possesses a very strong reliability level (0.969) anad solid model characteristics. In addition, the indicator's t-values range from 7.5 to 13.4, but 11 of 13 have values greater than 11.46. The model also showed service performance to have a very significant impact on business performance indicating that a service business should improve their service operational performance first if they wish to improve their overall business performance (Heskett et al., 1997; Voss and Johnston, 1995).

5.2.4 Firm Performance

Firm performance was measured based upon four indicators of business performance (return on investment, market share growth, sales growth and profit margin). All four indicators remained in the model after refinement. The reliability of this construct was 0.938 with t-values ranging from 10.9 to 13.5. The analysis showed that firm performance was impacted by both service performance and the firm's service

supply chain management practices. The stronger the firm's operational performance rating is the greater the firm's performance. This is consistent with studies (Glynn et al., 2003; Chen, Paulraj, 2004; Fawcett, et al., 2007) that prove the value the firm's operational performance has on its overall performance.

5.3 CONCLUSION

This chapter provided a discussion on the results of the variables and relationships involved in this study. The study results are in line with original expectations and based upon the theoretical concepts that backed up the original hypotheses. Reviewing results of the analysis on the variables helps us to understand the managerial implications to this topic. We are also able to uncover implications to businesses based upon variables that were removed from the analysis due to their limited ability to explain the overall variance in respondent scores. From this study we are able to see how effective management of a service supply chain impacts the operational and business performance of the service business.

CHAPTER VI

SUMMARY AND CONCLUSION

After more than ten years of research in the supply chain management arena, much has been learned and discussed. Researchers have proposed and developed different measurement instruments based upon a myriad of different theories (Tan 1998, 2001; Alvarado and Kotzab, 2001; Chen and Paulraj, 2004; Min and Mentzer, 2004; Li et al., 2005, 2006; Burgess et al., 2006). Others have focused upon key supporting components like supplier selection and certification (Chen and Paulraj, 2004) supplier development (Krause 1999, Hahn et al., 1990) or supply chain integration (Frohlich and Westbrook, 2001; Kim, 2006). Still others have considered the strategic importance of the strategic construct (Carr and Peterson 1999, Chen and Paulraj 2004, Talluri and Narasimhan 2004). All of this research has served to improve the overall understanding of supply chains and their impact on businesses. Yet with all of this research focused heavily upon manufacturing industries, it is astounding how little research has been done on the fundamental differences in sourcing services from sourcing products.

This is what makes this research project so valuable because it is wholly focused upon identifying the unique characteristics of supply chain management practices employed by services. Built upon theory, this research works to develop a construct measuring instrument that can be utilized for evaluating the service industry's supply chain management practices. As stated by Venkatraman (1989) so long ago, construct measurement development is critical to any theory building, which is why an extensive iterative process was employed to analyze the constructs and measurements in this study. The end result is a measurement instrument that is able to be utilized by researchers to build upon or to refine when uncovering new facets in this field of study. Likewise, learnings from this study can be applied by practitioners involved in service industry sourcing roles as well as suppliers looking to understand how to increase the value of their goods or services to an upstream service provider. Taken as a whole, this research helps to extend our overall understanding of services in today's business world.

6.1 SUMMARY OF RESULTS

After completing the model development process on the services supply chain management construct, a more refined instrument remains. This second order construct now contains eight factors, each made up of anywhere between three and five indicator variables. Thus each factor meets standard guidelines for the number of indicator variables needed. The information technology impact construct went through the same refinement process. The final result was a second order construct consisting of three first order factors. These factors are made up of four to thirteen indicator variables, again within desired ranges.

6.2 RESEARCH CONTRIBUTIONS

Back in 2005 it was stated that competition is no longer between organizations but among supply chains (Li et al., 2005). This research project finally extends the reach of that statement to confidently encompass service firms. The results of this research project will have an impact on academicians and practitioners alike. The measurement instruments developed within this study will be helpful to academic researchers who have contemplated how to accommodate supply chain management principles within service industries, as well as those who are considering how to measure information technology impact on a broader scale then typically presented. For the practitioner, this research will clarify the importance of key factors that should be accounted for when attempting to impact operational performance. Overall, this study provides a more thorough understanding of the critical factors affecting services supply chain management as well as their affect on operational and business performance. The following is a listing of the key contributions this research will have:

Primary Contributions:

- Presenting a thoroughly developed measurement instrument for the services supply chain management construct.
- Uniquely clarifying critical factors for effective service purchasing practices not uncovered in traditional manufacturing-based supply chain management models.
- Creating a new framework for understanding the supply chain management in the service industry not supported by previous service frameworks.

- Presenting a validated model on the role of SSCM's effect on performance and information technology's impact to the model.
- Providing a fully developed measurement instrument for information technology impact that incorporates the tenets of information technology sophistication, electronic communication links and information processing effectiveness.
- Validating a research framework that relates services supply chain management, information technology, operational performance and business performance.

Additional Contributions:

- Providing a theoretical model for understanding the implications of sourcing within the service industry.
- Identifying the critical importance of capacity management, supplier management, and customer involvement on service sourcing initiatives.
- Validating the importance of information technology on the management of supply chains in service industries.
- Confirming the effect of information technology on operational and business performance.
- Providing validation of Glynn et al's service operational performance measurement model.
- Identifying differences in impact on supply chain management practices based upon firm profile as well as various service characteristics.

- Confirming the value of analyzing services separately from manufacturing firms on topics that are influenced by firm characteristics.
- Providing managerial implications that help the practitioner to understand their services more thoroughly.
- Highlighting the importance of capacity management on service management.
- Confirming customer involvement's impact on purchasing practices in the service industry.
- Creating a definition of services supply chain management that accounts for tangible and intangible services as well as for the purchase of services and goods.
- Provides further proof of the applicability of the Resource Based View to support the value of information technology as an enterprise-wide capability, applied here to the service environment.
- Supports the use of the Relational View of the firm as a theoretical foundation that applies customer experience in service delivery to the sourcing practices of a firm.

6.3 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This research is focused upon identifying and developing constructs that are critical to a service firm's sourcing practices. These practices were then integrated into a model that clarifies how sourcing practices interact with information technology assets. During the model development phase, many variables were considered for inclusion into the services supply chain management construct; however, there were limitations to the number of factors that could be included. Originally nine first order factors were

proposed, made up of a total of eighty-two variables. Through the measurement refinement process one first order factor (information sharing) and seventeen indicator variables were dropped in order to improve reliability and validity as well as to maintain parsimony in the final instrument. Even after dropping out seventeen variables, the final measurement instrument remains large when considered for use in a broader theoretical model. This fact is not lost on this research project. With only 123 usable surveys received, there are limitations to the analysis that can be conducted.

The survey sample and response pool size also limits the research's ability to prove the results across the general service population. There are thirty-eight 3-digit SIC codes that represent the breadth of service industry categories. While responses were received from twenty-eight of these SIC codes, there was not enough codes responding to provide the statistical power necessary to prove its application to these individual service units. Instead the research results should be considered as indicators of future results within the various SIC codes.

A limit was placed on the number of variables explored in this research project related to the services supply chain management construct. While this is not a small number of variables, these will also not capture the full scope of this complex and multidimensional construct. Future research could explore how other factors may impact the overall construct. From traditional manufacturing supply chain management constructs one may consider supplier selection and certification (Chen and Paulraj, 2004a), supplier development (Krause, 1999; Handfield, et al., 2000), supply chain leadership (Min and Mentzer, 2004; Burgess et al., 2006) or strategic purchasing (Carr and Pearson, 1999; Chen, Paulraj, Lado, 2004; Talluri and Narasimhan, 2004).

Alternatively a researcher may opt to consider characteristics from service operations such as customer service orientation (Matteis, 1979; Vickery et al., 2003; Froehle and Roth, 2004), service delivery systems (Roth and van der Velde, 1991) or supply chain visibility for providing competitive advantages through information linkages (Barratt and Oke, 2007).

The sample population creates another limitation. The ISM database draws upon a limited membership list. While they possess a broad selection of service firm members, their membership ranks has limits which prevents generalization beyond the firms in this population. By the vary nature of studying all service industries in the same research study creates the potential for missing industry-specific strategically relevant factors. There are large industry-specific databases available for retail, healthcare and logistics that could be explored; however, these alternatives are limited to the industry they represent.

This study provided a decent analysis of individual factors. However, limitations had to be placed on the number of indicator variables used for each construct. Future studies could delve deeper into one or more factors to confirm the results and explain some of the variances seen. The concepts of capacity management, supplier management and customer involvement should provide the most significant opportunity for further research because they are specifically defined in this research project to represent key service operational differences.

This study was also limited to only one model. Future research could expand upon this model to include other factors relevant to sourcing practices. Previous research indicates that the factors of environmental uncertainty (including supply, demand and

technology uncertainty) (Chen and Paulraj, 2004a; Paulraj and Chen, 2008) and yield management to control customer demand (Kimes and Chase, 1998) may provide additional understanding of the supply chain management model. In addition, the constructs developed in this study could greatly enhance alternative models looking to incorporate the concepts of services supply chain management or information technology impact. Researchers may also apply similar methods for extending the supply chain management construct into other fields of study.

This research project only looked at the results provided from the sourcing firm's perspective. A more thorough analysis would take into account the dyadic nature of supply chain management relationships. However, surveying both the sourcing firm and the supplying firm was too complex to attempt in this research project. A final limitation of this study was the decision to only research purchasing goods or services by a service business. While this decision was specifically constructed to draw out the unique nature of the service business' decisions and practices, it does leave open for future research a review of how goods producers purchase services and compare that to how service businesses purchase services. This research should identify key similarities and differences regarding their purchasing methods.

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Table 1.1
Researchers and their Supply Chain Management Frameworks

Researcher(s)	Factors Identified	Research Notes
Donlon (1996):	Supplier partnership Outsourcing Cycle time compression Continuous process flow Information technology sharing	
Tan et al., (1998):	Purchasing Quality Customer Relations	
Tan, (2001)	Supply chain integration Information sharing Supply chain characteristics Customer Service management Geographical proximity JIT capability	Theoretical / Conceptual paper Scales not developed
Alvarado and Kotzab (2001):	Concentration on core competencies Use of inter-organizational systems (ex. EDI) • EDI projects are instrumental in allowing interaction between partner firms Elimination of excess inventory levels	
Chen and Paulraj (2004):	Supply base reduction Long-term relationship Communication Cross-functional teams Supplier involvement	
Chen and Paulraj (2004a)	Communication Supplier base reduction Long-term relations Supplier selection Supplier certification Supplier involvement Cross-functional teams Trust and commitment	
Min and Mentzer (2004):	Agreed vision and goals Information sharing Risk and reward sharing Cooperation Process integration Long-term relationship Agreed on supply chain leadership	
Li et al. (2005, 2006)	Strategic supplier partnership Customer relationship Information sharing Information quality Internal lean practices Postponement	
Burgess et al. (2006):	Leadership Intra-organizational relationships Inter-organizational relationships Logistics Process improvement orientation Information systems Business results and outcomes	Theoretical / Conceptual paper Scales not developed

Table 1.2
Lovelock's Classification of Tangible Versus Intangible Services

Nature of action	Towards	Examples
Tangible	People	Haircut, medical operation
Tangible	Goods or physical possessions	Transportation services, automotive repair
Intangible	People	Radio, education
Intangible	Goods or physical possessions	Insurance, banking and consulting

Table 1.3
Service Sourcing Issues

Cause	Effects
Intangible nature of services makes the evaluation of the vendor more difficult	Outsourcing and contracting decisions
Competencies of the customer-facing employees affects service delivery	Relationship and performance measurement
Many services have to be delivered close to the customer	Service provision decisions
Loose connection between price and value of a service	Contracting decisions
Service delivery failures cannot be singled out and isolated	Contracting and relationships
Customer interaction must be taken into account when establishing service supply relationships	Contracting and relationships

Table 1.4
"Service Package" Elements

Elements	Examples
Core Services:	
1. Supporting facilities	Facilities layout, décor, support technology and equipment, branch network, kiosks, roller coasters
2. Facilitating goods (Physical items)	Food, ATM cards, forms, receipts, checkbook, golf clubs, clothes
3. Facilitating information	Schedules, fee structures, data, medical records, web page design, diagnostics
4. Explicit services (Experiential / sensual)	Satisfy hunger, transportation, surgery, "transactions," entertainment
5. Implicit services (Psychological benefits)	Comfort, status, convenience, well-being, delight
Peripheral Services:	Services/facilities that supplement or "surround" the core service (e.g., valet parking for hospital services, shopping at terminals for air transportation services)

Adapted from Roth and Menor, 2003

Table 1.5
Outsourcing Manufactured Goods Versus Services

Dimension	Manufacturing	Services
Expectations	Precise specifications	Vague Service Level Agreements (SLAs)
Quality	Measurable, pre-specified	Subjective, user-dependent
Predictability of Demand	Dependent on forecast or final customer	Vary with project scope
Cost	Pre-negotiated, per unit	Dependent on changing scope and requirements
Verification of contract completion	Physical evidence in shipment	Internal sign-off
Payment	Match receipt with purchase orders, highly verifiable	Bills submitted without tangible evidence, pay as you go
Specification development	Readily defined	Difficult to define, even if currently provided internally
Problem identification	Governed by sound quality principles	Limited history in implementing quality management principles.

Ellram et al., 2004

Table 2.1
Comparison of Relevant Theoretical Views

Comparing the Industry Structure. Resource-Based, and Relational Views of Competitive Advantage

Dimensions	Industry Structure View	Resource-Based View	Relational View
Unit of Analysis	Industry	Firm	Pair or network of firms
Primary sources of super-normal profit returns	Relative bargaining power Collusion	Scare physical resources (e.g. land, raw mat'l inputs) Human resources/know-how (e.g. managerial talent) Technology resources (e.g. process technology) Financial resources Intangible resources (e.g. reputation)	Relation-specific investments Inter-firm knowledge-sharing routines Complementary resource endowments Effective governance
Mechanisms that preserve profits	Industry barriers to entry • Gov't regulations • Production economies/ sunk costs	Firm-level barriers to imitation: • Resource scarcity/ property rights • Causal ambiguity • Time compression diseconomies • Asset stock inter-connectedness	Dyadic/network barriers to imitation: • Causal ambiguity • Time compression diseconomies • Inter-organizational asset stock interconnectedness • Partner scarcity • Resource indivisibility • Institutional environment
Ownership/Control of rent-generating process/resources	Collective (with competitors)	Individual firm	Collective (with trading partners)

Table 2.2
SIC Codes Considered in the Study

		SIC Codes Considered
Division A.	AGRICULTURE, FORESTRY, AND FISHING	No
	01 AGRICULTURAL PRODUCTION-CROPS	No
	02 AGRICULTURAL PRODUCTION-LIVESTOCK AND ANIMAL SPECIALTIES	No
	07 AGRICULTURAL SERVICES	No
	08 -FORESTRY	No
	09 FISHING, HUNTING, AND TRAPPING	No
Division B.	MINING	No
	10 METAL MINING	No
	12 COAL MINING	No
	13 OIL AND GAS EXTRACTION	No
	14 MINING AND QUARRYING OF NONMETALLIC MINERALS, EXCEPT FUELS	No
Division C.	CONSTRUCTION	No
	15 BUILDING CONSTRUCTION-GENERAL CONTRACTORS AND OPERATIVE	No
	16 HEAVY CONSTRUCTION OTHER THAN BUILDING CONSTRUCTION-CONTI	No
	17 CONSTRUCTION-SPECIAL TRADE CONTRACTORS	No
Division D.	MANUFACTURING	No
	20 FOOD AND KINDRED PRODUCTS	No
	21 TOBACCO PRODUCTS	No
	22 TEXTILE MILL PRODUCTS	No
	23 APPAREL AND OTHER FINISHED PRODUCTS MADE FROM FABRICS AN	No
	24 LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE	No
	25 FURNITURE AND FIXTURES	No
	26 PAPER AND ALLIED PRODUCTS	No
	27 PRINTING, PUBLISHING, AND ALLIED INDUSTRIES	No
	28 CHEMICALS AND ALLIED PRODUCTS	No
	29 PETROLEUM REFINING AND RELATED INDUSTRIES	No
	30 RUBBER AND MISCELLANEOUS PLASTICS PRODUCTS	No
	31 LEATHER AND LEATHER PRODUCTS	No
	32 STONE, CLAY, GLASS, AND CONCRETE PRODUCTS	No
	33 PRIMARY METAL INDUSTRIES	No
	34 FABRICATED METAL PRODUCTS, EXCEPT MACHINERY AND TRANSPOR	No
	35 INDUSTRIAL AND COMMERCIAL MACHINERY AND COMPUTER EQUIPME	No
	36 ELECTRONIC AND OTHER ELECTRICAL EQUIPMENT AND COMPONENTS	No
	37 TRANSPORTATION EQUIPMENT	No
	38 MEASURING, ANALYZING AND CONTROLLING INSTRUMENTS; PHOTOGI	No
	39 MISCELLANEOUS MANUFACTURING INDUSTRIES	No
Division E.	TRANSPORTATION, COMMUNICATIONS, ELECTRIC, GAS, AND SANITARY SE	Yes
	40 RAILROAD TRANSPORTATION	Yes
	41 LOCAL AND SUBURBAN TRANSIT AND INTERURBAN HIGHWAY PASSEN	Yes
	42 MOTOR FREIGHT TRANSPORTATION AND WAREHOUSING	Yes
	43 UNITED STATES POSTAL SERVICE	Yes
	44 WATER TRANSPORTATION	Yes
	45 TRANSPORTATION BY AIR	Yes
	46 PIPELINES, EXCEPT NATURAL GAS	Yes
	47 TRANSPORTATION SERVICES	Yes
	48 COMMUNICATIONS	Yes
	49 ELECTRIC, GAS, AND SANITARY SERVICES	Yes

Table 2.2 (Cont.)

		SIC Codes Considered
Division F.	WHOLESALE TRADE	Yes
	50 WHOLESALE TRADE¨DURABLE GOODS	Yes
	51 WHOLESALE TRADE¨NONDURABLE GOODS	Yes
Division G.	RETAIL TRADE	Yes
	52 BUILDING MATERIALS, HARDWARE, GARDEN SUPPLY, AND MOBILE H(	Yes
	53 GENERAL MERCHANDISE STORES	Yes
	54 FOOD STORES	Yes
	55 AUTOMOTIVE DEALERS AND GASOLINE SERVICE STATIONS	Yes
	56 APPAREL AND ACCESSORY STORES	Yes
	57 HOME FURNITURE, FURNISHINGS, AND EQUIPMENT STORES	Yes
	58 EATING AND DRINKING PLACES	Yes
	59 MISCELLANEOUS RETAIL	Yes
Division H.	FINANCE, INSURANCE, AND REAL ESTATE	Yes
	60 DEPOSITORY INSTITUTIONS	Yes
	61 NONDEPOSITORY CREDIT INSTITUTIONS	Yes
	62 SECURITY AND COMMODITY BROKERS, DEALERS, EXCHANGES, AND	Yes
	63 INSURANCE CARRIERS	Yes
	64 INSURANCE AGENTS, BROKERS, AND SERVICE	Yes
	65 REAL ESTATE	Yes
	67 HOLDING AND OTHER INVESTMENT OFFICES	Yes
Division I.	SERVICES	Yes
	70 HOTELS, ROOMING HOUSES, CAMPS, AND OTHER LODGING PLACES	Yes
	72 PERSONAL SERVICES	Yes
	73 BUSINESS SERVICES	Yes
	75 AUTOMOTIVE REPAIR, SERVICES, AND PARKING	Yes
	76 MISCELLANEOUS REPAIR SERVICES	Yes
	78 MOTION PICTURES	Yes
	79 AMUSEMENT AND RECREATION SERVICES	Yes
	80 HEALTH SERVICES	Yes
	81 LEGAL SERVICES	Yes
	82 EDUCATIONAL SERVICES	Yes
	83 SOCIAL SERVICES	Yes
	84 MUSEUMS, ART GALLERIES, AND BOTANICAL AND ZOOLOGICAL GARD	Yes
	86 MEMBERSHIP ORGANIZATIONS	Yes
	87 ENGINEERING, ACCOUNTING, RESEARCH, MANAGEMENT, AND RELAT	Yes
	88 PRIVATE HOUSEHOLDS	Yes
	89 SERVICES, NOT ELSEWHERE CLASSIFIED	Yes
Division J.	PUBLIC ADMINISTRATION	No
	91 EXECUTIVE, LEGISLATIVE, AND GENERAL GOVERNMENT, EXCEPT FIN/	No
	92 JUSTICE, PUBLIC ORDER, AND SAFETY	No
	93 PUBLIC FINANCE, TAXATION, AND MONETARY POLICY	No
	94 ADMINISTRATION OF HUMAN RESOURCE PROGRAMS	No
	95 ADMINISTRATION OF ENVIRONMENTAL QUALITY AND HOUSING PROGR	No
	96 ADMINISTRATION OF ECONOMIC PROGRAMS	No
	97 NATIONAL SECURITY AND INTERNATIONAL AFFAIRS	No
Division K.	NONCLASSIFIABLE ESTABLISHMENTS	No
	99 NONCLASSIFIABLE ESTABLISHMENTS	No

Table 2.3
Service Typologies / Taxonomies

Author(s)	Categories/groups
Sasser et al. (1978) The Service Concept	Service Concept = facilitating good, explicit intangibles and implicit intangibles The service concept dictates, and is defined by, the service delivery system (performance characteristics of materials, atmosphere and image of facilities, attitudes of employees). Both of these are used to create service levels communicated to the consumer to determine "consumer perceived service levels."
Hayes and Wheelwright (1979) Product/process Matrix	The product mix (volume, number of products, degree of standardization) determines the choice of process type. Here, the direction of causation is clearly from the product to the process. If an organization stays on the diagonal of the matrix, the product and process characteristics are well matched, and therefore, organizational performance is enhanced. However, the relationship between volume and process is not found in some service businesses. o See Schmenner (1984), etc.
Chase (1978, 1981); Chase and Tansik, (1983) Customer Contact Model (CCM)	Degree of customer contact o The approach holds that the potential efficiency of a service system is a function of the degree of customer contact entailed in the creation of the service product. o Potential Facility Efficiency = A function of { 1- (customer contact time / service creation time)} o This was one of the first papers that highlighted the effect that customer contact has on the efficiency and effectiveness of the service delivery. o The CCM (Chase, 1978) suggests that certain service processes should be buffered from the customer in order to reap the performance benefits of standardization—lower costs and higher efficiency—that manufacturers enjoy. o Criticized for failing to sufficiently distinguish between service systems that involve high interaction and customization and those that primarily provide accommodation.
Lovelock (1983)	Introduced a classification scheme based upon service industries. Five two-by-two classification matrices based on the following ideas: Nature of service act Relationship between service provider and customer Customization Demand and supply Service delivery
Schmenner (1986) Service Process Matrix (SPM)	Service process matrix based on two dimensions: X-axis = The degree of customer interaction with and customization for the consumer Y-axis = The degree of labor intensity o Schmenner defined the service factory as the service type that exhibits low labor intensity and a low degree of interaction and customization. o Schmenner argued that many of the moves that had been made in the service sector involved moves toward a diagonal and up that diagonal toward the service factory. o SPM expands Chase's (1978, 1981) customer-contact approach o Verma (2000): It will not be an exaggeration to say that a majority of the service management community regards SPM as the primary service classification scheme o But later disproved: See Wright and Mechling, (2002), Prajogo, (2006)

Table 2.3 (Cont.)

Author(s)	Categories/groups
Schmenner (2004) The Modified Service Process Matrix	X-axis = Degrees of Variation (customization for and interaction with customers) Y-axis = Relative Throughput Time (compared to others in the industry) o This is the service counterpart of the revised version of Hayes & Wheelwright's (1979a, 1979b) product-process matrix for mfg proposed in Schmenner & Swink (1998). o "Degree of interaction with and customization for the consumer" translates to variation in service provision and thus the x-axis can be re-titled "variation."
Mersha (1990) Enhanced Customer Contact Model	Proposed a broadened definition of customer contact than Chase to address concerns regarding the degree of interaction and customization during the contact event. o Customer contact expanded to include active and passive contact.
Wemmerlov (1990)	Proposed a classification of service processes that included degree of customer contact, complexity and divergence. o Ttwo-dimensional matrix was based on ``rigid'' vs ``fluid'' service processes and degree of customer contact (no contact, indirect or direct contact) o Low divergence (standardized services) vs. high divergence (customized services) o Customized services: More flexibility & judgment required to perform the service tasks. More info is exchanged between the customer & service worker o His definition does not clearly distinguish between services that merely require the physical presence of the customer and those involving a high degree of interaction
Armistead (1990)	Framework to categorize & match the service operations task and the service delivery system o Volume of output variety versus flexibility of services offered
Silvestro, Fitgerald, Johnston and Voss (1992)	Classification matrix based on rigid vs. fluid service process & degree of customer contact o Their service taxonomy is based on the volume of daily service activity and six classification dimensions—length of customer contact time, degree of customization, level of employee discretion, value added, product/process focus, and labor intensity. o Depending upon a firm's service activity and ranking on the six dimensions, it would be classified as a mass service, service shop or professional service. o The six dimensions on the vertical axis may be overly complex to define one construct given that they are likely correlated (Collier and Meyer, 1998)
Fitzsimmons & Fitzsimmons (1994) Service Package (used by Kellogg & Nie)	Their definition of the service package consists of four features • Supporting facility – The physical resources in place to offer the service. • Facilitating goods – The goods used or consumed by the customer • Explicit services – The benefits that are readily sensed by the customer and are essential features of the service. • Implicit services – Benefits sensed by the customer vaguely and are extrinsic features ancillary to the service.
Kellogg and Nie (1995) Service Process Design Matrix (SP/SP)	Two-dimensional classification matrix based on service process structure & service package structure (connected the characteristics of service-products w/ service-processes) o X-axis = The service process dimension (also called customer influence) o Y-axis = The service package dimension (i.e. degree of customization) o Similar to SPM matrix but with more of a focus toward linking operations issues with marketing concepts and address the strategic issues faced by service firms. A service offering is actually a package of goods, facilities and implicit and explicit services. Process for producing a service is determined less by the level / sophistication of the equipment used as by the degree to which the customer influences the service process. o Considered difficult to interpret as customer's influence in both dimensions.

Table 2.3 (Cont.)

Author(s)	Categories/groups
Tinnila & Vepsalainen Service Process Analysis Model (SPA)	Type of service (product) vs. Type of service channel o Products = mass transactions, standard contracts, customized delivery, and contingent relationships o Channels of access to the service = market network, service personnel, agent alliance, internal hierarchy Services defined: *mass transactions* are services with few options and little customization. *Standard contracts* have complex specifications but are not extensively adapted to an individual customer. *Customized delivery* are services tailored to individual customers involving some uncertainty and contingencies. *Contingent relationships* involve complex problems, several interrelated activities, risk sharing and intensive communication between service provider and customer.
Roth, Chase and Voss (1997)	Two-dimensional classification matrix based on service practice and performance index.
Collier & Meyer (1998) A Service Positioning Matrix	A two-dimensional classification matrix of service encounter activity sequence (unique – highly repeatable) vs. the number of service system pathways (many – few). (1) **Customer routed services** are those that offer the customer broad freedom to select from many possible routes through the service delivery system; o Nike Town, Internet, Club Med, Parks, Museums and health clubs (2) **Co-routed services** offer customers a moderate number of routes through the service delivery system; o Co-routed services include consulting, investment portfolio, and legal and medical services, a golf course (3) **Provider routed services** constrain customers to follow a very o Newspaper dispenser, ATM, McDonalds, Network TV program, credit cards
Verma and Young (2000) Low Contact Services	Developed a taxonomy for one type of service – low contact services. o Research based upon fast food (pizza) restaurants and auto repair services o The discovered five clusters based on the relative importance given to what they called the operational, market and financial objectives.
Metters and Vargas (2000) Decoupling Categories	Offered a four-category classification of front-office and back-office processes based upon their study in retail banking. X-axis = Cost position (low cost vs. high cost) Y-axis = Degree of decoupling (separation of processes into back office) Four categories of Retail service firms that result: o Cheap convenience = low – low o Cost leader = low – high o Premium service = high – low o Dedicated service = high – high For some services, the objective of the back-office process is not always to minimize cost of operations, but to help the front-office employees more effectively serve customers.
Cohen et al. (2000) Service Parts Strategy	X-axis = service criticality for the customer (low – high) Y-axis = service strategy for service parts location (centralized – distributed) o All parts should be matched to the low / centralized or high / distributed quadrants o Based upon a case study at Saturn Corporation.
Buzacott (2000) Service System Structures	X-axis = Nature of service offering (standard to complex) Y-axis = Service system structure Examples: o Standard service vs. series—cafeteria; o complex service vs. parallel—fast food; o ‘‘menu’’ vs. specialized—bank branch; o bottom-up vs. simple diagnosis—repair; o top–down vs. complex diagnosis—law firm

Table 2.3 (Cont.)

Author(s)	Categories/groups
Heim & Sinha (2001) Electronic B2C Product-Process Matrix	A review of the electronic B2C marketplace as mapped into the product-process matrix based upon Hayes – Wheelwright 1979. o Electronic Service Process structure – based upon degree of flexibility o Electronic Service Product Structure – Market Segments
Sampson and Froehle (2001 / 2006) Unified Services Theory	The UST states that all managerial issues unique to services stem from the fact that service processes involve customer inputs. o They propose a process-based definition of services that considers the magnitude of customer inputs into the production process as the distinctive difference between manufacturing and services. o They indicate that the definition of "customer" is complex. There may be multiple "customers" besides the consumer of a service.
Menor et al., (2002) Strategic Service Groupings in Retail Banking	Applying cluster analytic techniques to retail banks, using capabilities as taxons, they developed a taxonomy of strategic service groups and identified four strategic service groups: agile, traditionalists, niche, and straddlers. o Their focus was upon the agile group which demonstrated high marks for service quality, delivery, flexibility and cost control
Jambulingam et al., (2005) Entrepreneurial Orientation in Retail Pharmacy Industry	Development of a taxonomy for service providers based on the pharmacies' ability to gather and use combinations of entrepreneurial activities such as innovativeness, proactiveness, risk-taking, motivation, autonomy, and competitive aggressiveness. o The 6 groups of pharmacies adopted different mixes of entrepreneurial orientation as intangible resources regardless of their traditional ''type'' classification.

Table 2.4
Performance Measures & Metrics in a Supply Chain Environment

		Financial	Non-Financial
Strategic	Total supply chain cycle time		X
	Total cash flow time	X	X
	Customer query time	X	X
	Level of customer perceived value of product		X
	Net profit vs. productivity ratio	X	
	Rate of return on investment	X	
	Range of product and services		X
	Variations against budget	X	
	Order lead time		X
	Flexibility of service systems to meet particular customer needs		X
	Buyer-supplier partnership level	X	X
	Supplier lead time against industry norm		X
	Level of supplier's defect free deliveries		X
	Delivery lead time		X
	Delivery performance	X	X
Tactical	Accuracyof forecasting techniques		X
	Product development cycle time		X
	Order entry methods		X
	Effectiveness of delivery invoice methods		X
	Purchase order cycle time		X
	Planned process cycle time		X
	Effectiveness of master production schedule		X
	Supplier assistance in solving technical problems		X
	Supplier ability to respond to quality problems		X
	Supplier cost saving initiatives	X	
	Supplier's booking in procedures		X
	Delivery reliability	X	X
	Responsiveness to urgent deliveries		X
	Effectiveness of distribution planning schedule		X
Opera-tional	Cost per operation hour	X	
	Information carrying cost	X	X
	Capacity utilization		X
	Total inventory as:	X	
	- incoming stock level		
	- work-in-progress		
	- scrap level		
	- finished goods in transit		
	Supplier rejection rate	X	X
	Quality of delivery documentation		X
	Efficiency of purchase order cycle time		X
	Frequency of delivery		X
	Driver reliability for performance		X
	Quality of delivered goods		X
	Achievement of defect free deliveries		X

Table 4.1: Respondent Profile

Title	Count	Percent
President/Vice President	22	17.9%
Director / General Manager	28	22.8%
Manager	58	47.2%
Other	15	12.2%
Totals	**123**	

Div.	SIC Category	Surveys	Responses	Pct
E	Transport, Communication, Utilities	293	17	13.8%
F	Wholesale Trade	35	8	6.5%
G	Retail Trade	56	11	8.9%
H	Finance, Insurance, Real Estate	90	16	13.0%
I	Services	419	71	57.7%
Totals		**891**	**123**	

Table 4.2: Company Profile

Number of Employees	Count	Percent
Less than 25	11	8.9
25 – 100	15	12.2
101 – 250	12	9.8
251 – 500	16	13.0
501 – 1000	12	9.8
More than 1000	57	46.3

Annual Sales Volume (In Millions)	Count	Percent
Less than $1	11	8.9
$1 - $49	22	17.9
$50 - $99	12	9.8
$100 - $499	23	18.7
$500 - $999	18	14.6
More than $1000	37	30.1

Service Type	Count	Percent
Tangible	88	71.5
Intangible	35	28.5

Service Recipient	Count	Percent
Businesses	57	46.3
Consumers	41	33.3
Both	25	20.3

Largest Sourced Item	Count	Percent
Good	66	53.7
Service	57	46.3

Table 4.2: Company Profile (Cont.)

Service Type	Recipient	Count	Group Percent	Overall Percent
Tangible	People	51	58.0	41.5
Tangible	Things	37	42.0	30.1
Tangible	All	88		71.5
Intangible	People	28	80.0	22.8
Intangible	Things	7	20.0	5.7
Intangible	All	35		28.5
	People	79	64.2	64.2
	Things	44	35.8	35.8

Customer Type	Recipient	Count	Group Percent	Overall Percent
Businesses	Good	35	61.4	28.5
Businesses	Service	22	38.6	17.9
Businesses	All	57	100.0	46.3
Consumers	Good	19	46.3	15.4
Consumers	Service	22	53.7	17.9
Consumers	All	41	100.0	33.3
Both	Good	12	48.0	9.8
Both	Service	13	52.0	10.6
Both	All	25	100.0	20.3
	Good	66	53.7	
	Service	57	46.3	

Table 4.3: Descriptive Statistics (Before Factor Analysis)
Mean and Standard Deviation of Original Survey Questions

Service Supply Chain Management Variables:

Trust:

Questions	1	2	3	4	5
Mean	5.06	5.43	5.50	5.43	5.53
Std. Dev.	1.289	1.262	1.027	1.153	1.140

Effective Communication:

Questions	1	2	3	4	5
Mean	5.35	5.91	5.66	5.81	5.67
Std. Dev.	1.221	1.131	0.957	0.944	1.036

Information Sharing:

Questions	1	2	3	4	5
Mean	5.480	5.374	5.333	4.325	4.919
Std. Dev.	1.183	1.176	1.164	1.647	1.485

Supplier Involvement:

Questions	1	2	3	4	5	6
Mean	4.30	4.54	4.30	4.83	4.92	4.40
Std. Dev.	1.769	1.651	1.713	1.546	1.781	1.673

Supply Base Reduction:

Questions	1*	2	3	4
Mean	3.54	4.69	5.12	4.68
Std. Dev.	1.500	1.699	1.284	1.646

Long-Term Relationship:

Questions	1	2	3	4	5
Mean	5.86	5.17	5.70	4.89	4.39
Std. Dev.	1.035	1.430	1.318	1.580	1.697

Capacity Management:

Questions	1	2	3	4	5
Mean	3.93	4.67	4.11	4.64	4.05
Std. Dev.	1.773	1.817	2.064	1.756	1.717

Supplier Management:

Questions	1	2	3	4	5*	6*
Mean	5.71	5.55	5.47	4.46	5.31	4.92
Std. Dev.	1.475	1.202	1.656	1.714	1.249	1.316

Customer Involvement:

Questions	1	2	3	4	5
Mean	5.44	5.59	5.32	5.54	5.33
Std. Dev.	1.188	1.330	1.210	1.326	1.291

* Items removed during Exploratory Factor Analysis step

Table 4.3: Descriptive Statistics (Before Factor Analysis)
Mean and Standard Deviation of Original Survey Questions

Information Technology Impact Variables:

Communication Links:

Questions	1	2	3	4	5*	6
Mean	4.85	4.63	4.15	4.30	3.43	3.43
Std. Dev.	1.674	1.843	1.895	1.788	2.004	1.807

Information Technology Sophistication:

Questions	1	2	3	4
Mean	4.91	4.71	4.17	4.72
Std. Dev.	1.403	1.47	1.633	1.522

Information Processing Impact:

Questions	1	2	3	4	5	6
Mean	4.57	4.65	4.72	4.66	3.94	4.69
Std. Dev.	1.574	1.664	1.682	1.659	1.686	1.553

* Items removed during Exploratory Factor Analysis step

Table 4.3: Descriptive Statistics (Before Factor Analysis)
Mean and Standard Deviation of Original Survey Questions

Performance Variables:

Service Performance:

Questions	1	2	3	4	5	6
Mean	5.03	4.93	4.98	4.99	4.93	4.95
Std. Dev.	1.312	1.374	1.397	1.463	1.521	1.509

Service Performance:

Questions	7	8	9	10	11	12*
Mean	5.05	4.63	5.04	4.87	4.80	5.10
Std. Dev.	1.442	1.250	1.484	1.431	1.379	1.473

Service Performance (cont.):

Questions	13*	14	15
Mean	5.08	4.93	4.82
Std. Dev.	1.441	1.398	1.426

Business Performance:

Questions	1	2	3	4
Mean	4.76	4.88	4.77	4.77
Std. Dev.	1.248	1.429	1.396	1.348

* Items removed during Exploratory Factor Analysis step

Table 4.4: Scale Reliability (Cronbach Alpha Scores)

Factors	Exploratory Factor Analysis		Confirmatory Factor Analysis
	Before	After	After
Service Supply Chain Management	**0.948**	**0.922**	**0.922**
Trust	0.858 (5)	0.858 (5)	0.858 (5)
Effective Communication	0.837 (5)	0.837 (5)	0.837 (5)
Information Sharing	0.888 (5)	---	---
Supplier Involvement	0.870 (6)	0.893 (5)	0.893 (5)
Supply Base Reduction	0.560 (4)	0.653 (3)	0.653 (3)
Long-Term Relationship	0.848 (5)	0.822 (4)	0.822 (4)
Capacity Management	0.825 (5)	0.773 (3)	0.773 (3)
Supplier Management	0.814 (6)	0.809 (4)	0.809 (4)
Customer Involvement	0.833 (6)	0.872 (5)	0.872 (5)
Information Technology Impact	**0.934**	**0.927**	**0.927**
Communication Links	0.899 (6)	0.889 (5)	0.889 (5)
IT Sophistication	0.931 (4)	0.931 (4)	0.931 (4)
Information Processing Effectiveness	0.896 (6)	0.896 (6)	0.896 (6)
Service Performance	**0.974 (15)**	**0.969 (13)**	**0.969 (13)**
Business Performance	**0.928 (4)**	**0.928 (4)**	**0.928 (4)**

Note: Values in parentheses represent the number of variables included in the scale.

Table 4.5: Unidimensionality Using Confirmatory Factor Analysis

Table. 4.5a: Services Supply Chain Management Measurement Model

Model Fit Statistics	Value	Recommended
Chi-square	853.52	
Degrees of freedom	511	
Chi-square / degrees of freedom	1.67	≤ 2.00
Adjusted Goodness of Fit Index (AGFI)	0.806	≥ 0.800
Bentler Comparative Fit Index (CFI)	0.856	≥ 0.900
Bentler and Bonett's Non-normed Fit Index (NNFI)	0.842	≥ 0.900
Root Mean Square Residual (RMSR)	0.086	≤ 0.100
Root Mean Square Error of Approximation (RMSEA)	0.074	≤ 0.100

Table. 4.5b: Information Technology Impact Measurement Model

Model Fit Statistics	Value	Recommended
Chi-square	192.43	
Degrees of freedom	84	
Chi-square / degrees of freedom	2.29	≤ 3.00
Adjusted Goodness of Fit Index (AGFI)	0.781	≥ 0.800
Bentler Comparative Fit Index (CFI)	0.921	≥ 0.900
Bentler and Bonett's Non-normed Fit Index (NNFI)	0.901	≥ 0.900
Root Mean Square Residual (RMSR)	0.053	≤ 0.100
Root Mean Square Error of Approximation (RMSEA)	0.103	≤ 0.100

Table. 4.5c: Performance Measurement Model

Model Fit Statistics	Value	Recommended
Chi-square	384.28	
Degrees of freedom	118	
Chi-square / degrees of freedom	3.26	≤ 3.00
Adjusted Goodness of Fit Index (AGFI)	0.773	≥ 0.800
Bentler Comparative Fit Index (CFI)	0.889	≥ 0.900
Bentler and Bonett's Non-normed Fit Index (NNFI)	0.872	≥ 0.900
Root Mean Square Residual (RMSR)	0.040	≤ 0.100
Root Mean Square Error of Approximation (RMSEA)	0.136	≤ 0.100

Table 4.6a: Construct Validity (Exploratory Factor Analysis)
Convergent Validity Analysis
Rotated Component Matrix (Varimax)

Service Supply Chain Management Factors

		Item Loading							
Variable	**Factor**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
TRUST1	Telling the truth	0.744							
TRUST2	Provide accurate info	0.730							
TRUST3	Keeps promises	0.696							
TRUST4	Share best judgment	0.725							
TRUST5	Sincere	0.720							
EFCOM1	Personal contact		0.546						
EFCOM2	Non-personal contact		0.661						
EFCOM3	Timely commun.		0.846						
EFCOM4	Accurate commun.		0.839						
EFCOM5	Complete commun.		0.739 (a)						
SInv1	Joint task forces			0.759					
SInv2	Part of service design			0.794					
SInv3	Planning / Goal setting			0.725					
SInv4	Collaborates on problems			0.761					
SInv6	Increased involvement			0.631					
SBR2	Small number of suppliers				0.802				
SBR3	Close relationship				0.771				
SBR4	Reduced supply base				0.463 (a)				
LTR2	Improve their quality					0.639			
LTR3	Long-term partnership					0.516			
LTR4	Extension of our firm					0.746			
LTR5	Have guidelines					0.690			
CMGT3	Part-time or flex workers						0.821		
CMGT4	Suppliers help capacity						0.526		
CMGT5	Rapid staffing changes						0.772		
SMGT1	Written legal agreements							0.869	
SMGT2	Clear agreements							0.829	
SMGT3	Central purchasing							0.770	
SMGT4	Supplier assessments							0.626	
CINV1	Anticipate needs								0.751
CINV2	Evaluate complaints								0.834
CINV3	Set standards								0.848
CINV4	Business planning								0.828
CINV5	Solicit service feedback								0.661

(a) Indicates a variable with a loading greater than 0.40 on a second item

Table 4.6b: Construct Validity (Exploratory Factor Analysis)
Convergent Validity Analysis
Rotated Component Matrix (Varimax)

Information Technology Impact Factors

		Item Loading		
Variable	**Factor**	**1**	**2**	**3**
CLINK1	Electronic links	0.775		
CLINK2	Practice EDI	0.856		
CLINK3	Integrated systems	0.770		
CLINK4	Satisfy communication	0.763		
ITSSC1	Hardware & OS		0.884	
ITSSC2	Application software		0.870	
ITSSC3	Computers & Equipt		0.838	
ITSSC4	IT staff		0.870	
INFOP1	Purchasing inputs			0.723
INFOP2	Transforming inputs			0.800
INFOP3	Final delivery			0.764
INFOP4	Maintenance			0.743
INFOP5	Supplier coordination			0.783
INFOP6	Customer coordination			0.786

(a) There are no variables with a loading greater than 0.40 on a second item

Table 4.6c: Construct Validity (Exploratory Factor Analysis)
Convergent Validity Analysis
Rotated Component Matrix (Varimax)

Performance Factors

Variable	Factor	Item Loading 1	2
SPERF1	Customer knowledge	0.827	
SPERF2	Quality standards	0.845	
SPERF3	Customer trust	0.821 (a)	
SPERF4	Employee courtesy	0.787 (a)	
SPERF5	Service customization	0.778 (a)	
SPERF6	Service availability	0.830	
SPERF7	New service speed	0.752	
SPERF8	Service reliability	0.525	
SPERF9	On-time delivery	0.772 (a)	
SPERF10	Delivery speed	0.743 (a)	
SPERF11	Customer support	0.717 (a)	
SPERF14	Individual attention	0.732 (a)	
SPERF15	Appearance	0.675 (a)	
BPERF1	Return on investment		0.841
BPERF2	Market share growth		0.819
BPERF3	Sales growth		0.835 (a)
BPERF4	Profit margin		0.817

(a) Indicates a variable with a loading greater than 0.40 on a second item

Table 4.7a: Construct Validity (Confirmatory Factor Analysis)
Services Supply Chain Management (Measurement Model)

Parameter Estimates, Error Term, t-values, and R^2

Factors and Items	Standard Loading	Error Term	t-value	R^2
Trust:				
TRUST1	0.719	0.049	14.62	0.52
TRUST2	0.549	0.068	8.04	0.30
TRUST3	0.666	0.056	11.99	0.44
TRUST4	0.850	0.032	25.94	0.72
TRUST5	0.894	0.028	32.10	0.80
Effective Communication:				
EFCOM1	0.475	0.073	6.54	0.23
EFCOM2	0.509	0.070	7.31	0.26
EFCOM3	0.819	0.033	25.49	0.67
EFCOM4	0.958	0.018	54.73	0.92
EFCOM5	0.885	0.025	35.66	0.78
Supplier Involvement:				
SINV1	0.839	0.031	26.86	0.70
SINV2	0.878	0.026	34.05	0.77
SINV3	0.843	0.031	27.45	0.71
SINV4	0.880	0.026	34.39	0.77
SINV6	0.544	0.067	8.09	0.29
Supply Base Reduction:				
SBR2	0.621	0.074	8.34	0.39
SBR3	0.915	0.072	12.71	0.84
SBR4	0.468	0.082	5.70	0.22
Long-Term Relationship:				
LTR2	0.789	0.044	18.16	0.62
LTR3	0.794	0.043	18.47	0.63
LTR4	0.738	0.050	14.88	0.54
LTR5	0.634	0.061	10.32	0.40

Parameter Estimates, Error Term, t-values, and R^2

Factors and Items	Standard Loading	Error Term	t-value	R^2
Capacity Management:				
CMGT3	0.702	0.061	11.46	0.49
CMGT4	0.757	0.057	13.33	0.57
CMGT5	0.728	0.059	12.34	0.53
Supplier Management:				
SMGT1	0.875	0.039	22.58	0.77
SMGT2	0.800	0.045	17.87	0.64
SMGT3	0.689	0.056	12.26	0.47
SMGT4	0.583	0.067	8.66	0.34
Customer Involvement:				
CINV1	0.676	0.056	12.18	0.46
CINV2	0.842	0.035	23.95	0.71
CINV3	0.784	0.042	18.52	0.61
CINV4	0.827	0.037	22.41	0.68
CINV5	0.684	0.055	12.53	0.47

Table 4.7b: Construct Validity (Confirmatory Factor Analysis)
Information Technology Impact (Measurement Model)

Parameter Estimates, Error Term, t-values, and R^2

Factors and Items	Standard Loading	Error Term	t-value	R^2
Communication Links:				
CLINK1	0.778	0.039	19.78	0.61
CLINK2	0.778	0.039	19.83	0.61
CLINK3	0.920	0.020	46.45	0.85
CLINK4	0.902	0.022	40.89	0.81
CLINK6	0.566	0.065	8.76	0.32
Information Technology Sophistication:				
ITSSC1	0.868	0.027	32.61	0.75
ITSSC2	0.881	0.025	35.55	0.78
ITSSC3	0.876	0.026	33.67	0.76
ITSSC4	0.898	0.023	39.98	0.81
Information Processing Effectiveness:				
INFOP1	0.652	0.057	11.47	0.42
INFOP2	0.762	0.043	17.65	0.58
INFOP3	0.850	0.032	27.01	0.72
INFOP4	0.833	0.034	24.71	0.69
INFOP5	0.713	0.049	14.43	0.51
INFOP6	0.779	0.041	19.03	0.61

Table 4.7c: Construct Validity (Confirmatory Factor Analysis)
Service and Business Performance (Measurement Models)

Parameter Estimates, Error Term, t-values, and R^2

Factors and Items	Standard Loading	Error Term	t-value	R^2
Service Performance:				
SPERF1	0.874	0.023	38.51	0.76
SPERF2	0.903	0.018	50.05	0.82
SPERF3	0.915	0.016	57.14	0.84
SPERF4	0.902	0.018	49.83	0.81
SPERF5	0.889	0.019	45.86	0.79
SPERF6	0.822	0.027	30.54	0.68
SPERF7	0.735	0.043	17.14	0.54
SPERF8	0.617	0.057	10.77	0.38
SPERF9	0.900	0.019	48.56	0.81
SPERF10	0.870	0.023	37.39	0.76
SPERF11	0.840	0.028	30.16	0.71
SPERF14	0.850	0.026	32.24	0.72
SPERF15	0.790	0.035	22.38	0.62
Business Performance:				
BPERF1	0.835	0.031	27.32	0.70
BPERF2	0.901	0.021	42.75	0.81
BPERF3	0.935	0.017	55.89	0.87
BPERF4	0.820	0.033	25.03	0.67

Table 4.8: Common Method Bias
Services Supply Chain Management

Factor	Uncorrected Correlation	Adjusted Correlation[(a)]
Trust & Commitment	0.858	0.855
Effective Communication	0.837	0.834
Supplier Involvement	0.893	0.891
Supply Base Reduction	0.653	0.646
Long-Term Relationship	0.822	0.818
Capacity Management	0.773	0.768
Supplier Management	0.809	0.805
Customer Involvement	0.872	0.869

Model Fit Statistics	Value	Recommended
Chi-square	893.09	
Degrees of freedom	542	
Chi-square / degrees of freedom	1.65	≤ 2.00
Adjusted Goodness of Fit Index (AGFI)	0.684	≥ 0.800
Bentler Comparative Fit Index (CFI)	0.853	≥ 0.900
Bentler and Bonett's Non-normed Fit Index (NNFI)	0.838	≥ 0.900
Root Mean Square Residual (RMSR)	0.085	≤ 0.100
Root Mean Square Error of Approximation (RMSEA)	0.073	≤ 0.100

(a) Adjusted correlation using Marker Variable

Table 4.9: Model Fit

Table 4.9a Full Mediation Model

Model Fit Statistics	Value	Recommended
Chi-square	110.55	
Degrees of freedom	63	
Chi-square / degrees of freedom	1.75	≤ 2.00
Goodness of Fit Index (GFI)	0.876	≥ 0.900
Adjusted Goodness of Fit Index (AGFI)	0.821	≥ 0.800
Bentler Comparative Fit Index (CFI)	0.919	≥ 0.900
Bentler and Bonett's Normed Fit Index (NFI)	0.833	≥ 0.900
Bentler and Bonett's Non-normed Fit Index (NNFI)	0.899	≥ 0.900
Root Mean Square Residual (RMSR)	0.075	≤ 0.100
Root Mean Square Error of Approximation (RMSEA)	0.079	≤ 0.100
Akaike Information Criterion	166.55	
Bozdogan CAIC	273.29	

Table 4.9: Model Fit

Table 4.9b Partial Mediation Model

Model Fit Statistics	Value	Recommended
Chi-square	108.6	
Degrees of freedom	61	
Chi-square / degrees of freedom	1.78	≤ 2.00
Goodness of Fit Index (GFI)	0.879	≥ 0.900
Adjusted Goodness of Fit Index (AGFI)	0.819	≥ 0.800
Bentler Comparative Fit Index (CFI)	0.913	≥ 0.900
Bentler and Bonett's Normed Fit Index (NFI)	0.836	≥ 0.900
Bentler and Bonett's Non-normed Fit Index (NNFI)	0.896	≥ 0.900
Root Mean Square Residual (RMSR)	0.073	≤ 0.100
Root Mean Square Error of Approximation (RMSEA)	0.080	≤ 0.100
Akaike Information Criterion	168.65	
Bozdogan CAIC	283.02	

Table 4.9: Model Fit

Table 4.9c Direct Model

Model Fit Statistics	Value	Recommended
Chi-square	108.65	
Degrees of freedom	61	
Chi-square / degrees of freedom	1.78	≤ 2.00
Goodness of Fit Index (GFI)	0.879	≥ 0.900
Adjusted Goodness of Fit Index (AGFI)	0.819	≥ 0.800
Bentler Comparative Fit Index (CFI)	0.913	≥ 0.900
Bentler and Bonett's Normed Fit Index (NFI)	0.836	≥ 0.900
Bentler and Bonett's Non-normed Fit Index (NNFI)	0.896	≥ 0.900
Root Mean Square Residual (RMSR)	0.073	≤ 0.100
Root Mean Square Error of Approximation (RMSEA)	0.080	≤ 0.100
Akaike Information Criterion	168.65	
Bozdogan CAIC	283.02	

FIGURE 1.1
United States Trade Picture
Sales Dollars, 1960 – 2007

Bureau of Economic Analysis, part of the U.S. Department of Commerce
www.bea.gov ;

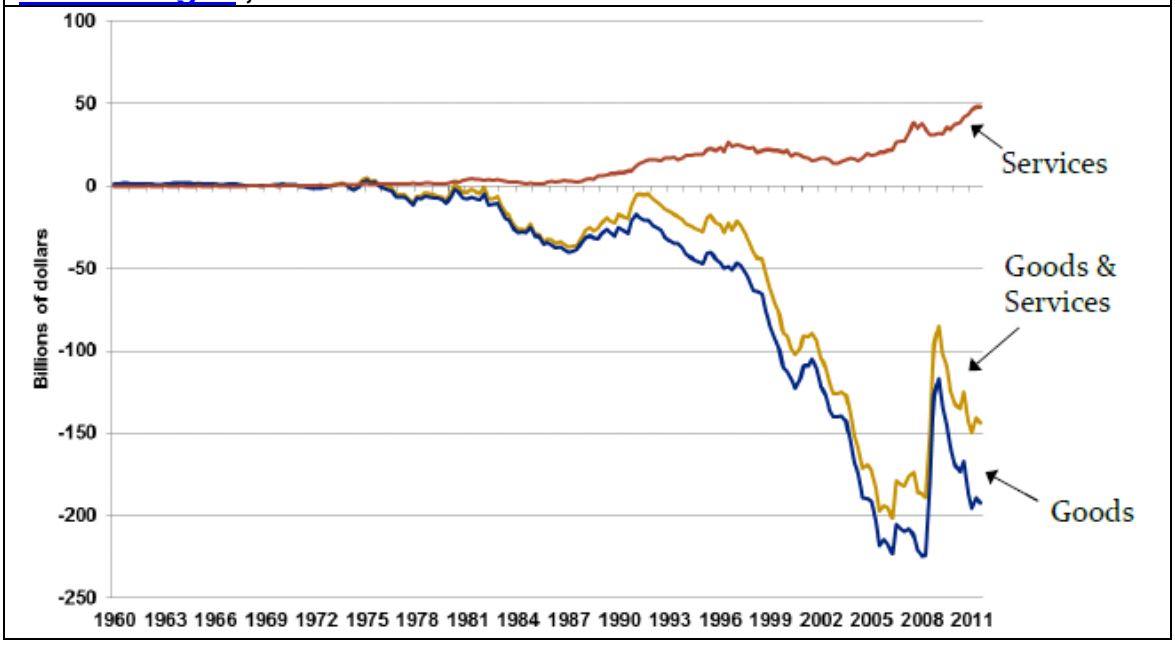


FIGURE 1.2
Service Sector Growth During Economic Evolution
Percent of GDP, 1970 – 2001

Office of the United States Trade Representative; www.ustr.gov ;
Benefits of Trade – January 2007

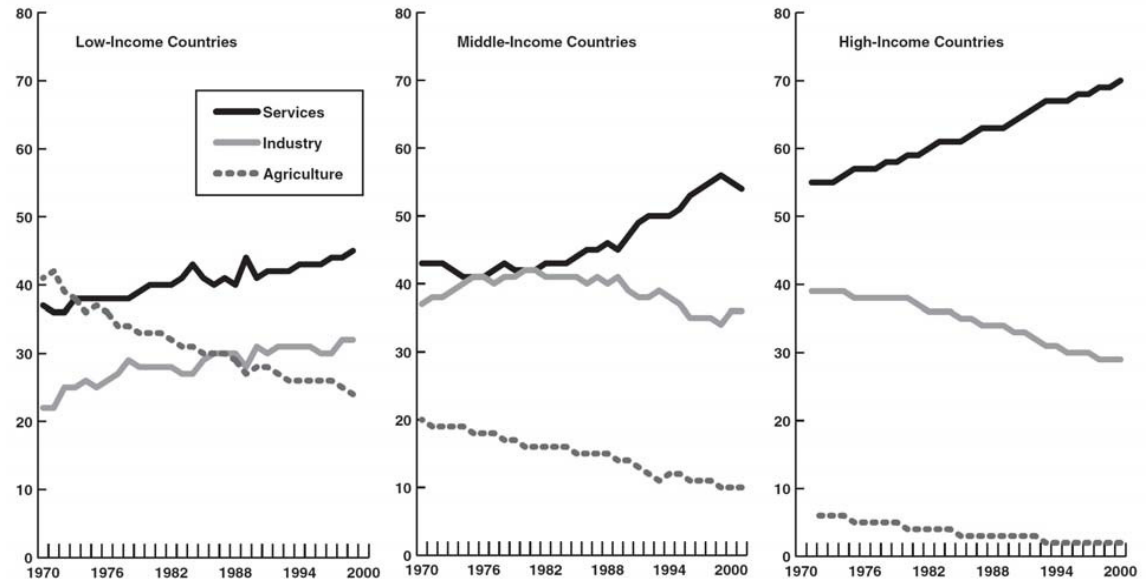


FIGURE 1.3
Supply Chain Management Definitions

Institute for Supply Chain Management (ISM):
Supply Chain Management is the design and management of seamless, value-added processes across organizational boundaries to meet the real needs of the end customer.

Council of Supply Chain Management Professionals (CSCMP):
Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities as well as coordination and collaboration with channel partners.

Council of Logistics Management (CLM) (2000):
Supply Chain Management is the systemic, strategic coordination of the traditional business functions and tactics across these businesses functions within a particular organization and across businesses within the supply chain for the purposes of improving the long-term performance of the individual organizations and the supply chain as a whole.

The Supply Chain Council (2002):
A supply chain encompasses every effort involved in producing and delivering a final product from the supplier's supplier to the customer's customer.

Mentzer et al. (1999):
Supply Chain Management is "the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain that consists of multiple firms for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole"

FIGURE 2.1
Outsourced Information Technology-Based Services in the Service Concept

Examples:

Firm-specific evolution:

- Websites linking to Mapquest.com for directions to their place of business
- Cleveland Clinic Health System's creation of eCleveland Clinic (with MyConsult & MyChart web services)

Industry related evolutions:

- Education: On-line & distance learning opportunities are growing. Web-based classes are also increasing
- Financial: On-line banking features are increasing
- Healthcare: Self serve search engines to research your conditions (WebMD), as well as 24x7 nursing assistance lines.
- Hotels: On-line ordering systems and low-price search engines
- Insurance: Large insurance firms are using the National Council on Aging (NCOA's) BenefitsCheckup site to help pre-screen their Medicare members
- Public Services:
    - Social Security Administration has created an on-line benefits application processing site to determine benefits eligibility. Other private firms are offering related services to determine if you may be eligible for benefits.
    - Public and Institutional Libraries have made on-line research easy.
- Restaurants: On-line ordering and scheduling systems.
- Retail: On-line ordering of products is growing exponentially

FIGURE 3.1 & 3.2
Proposed Models 1A and 1B

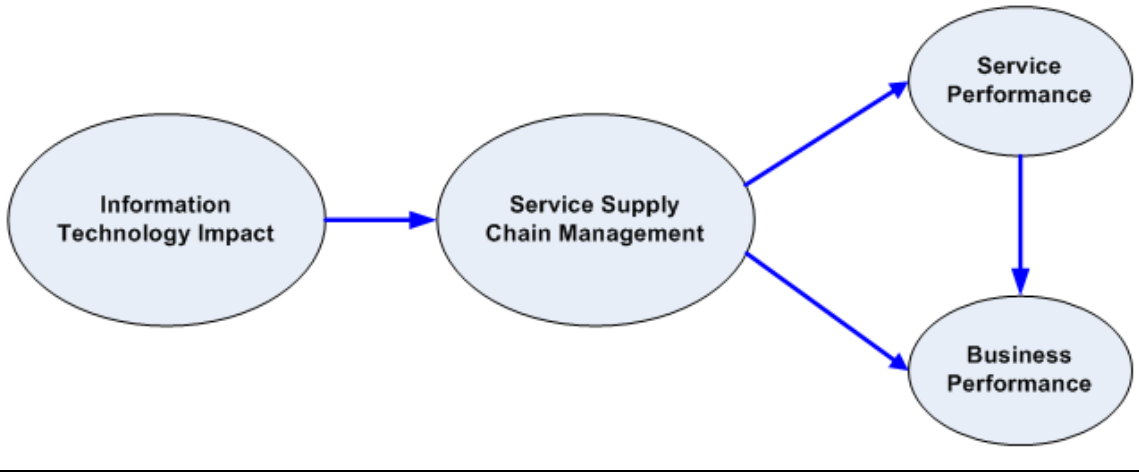


Figure 3.1
Model 1A – Service Supply Chain Management as a Mediator

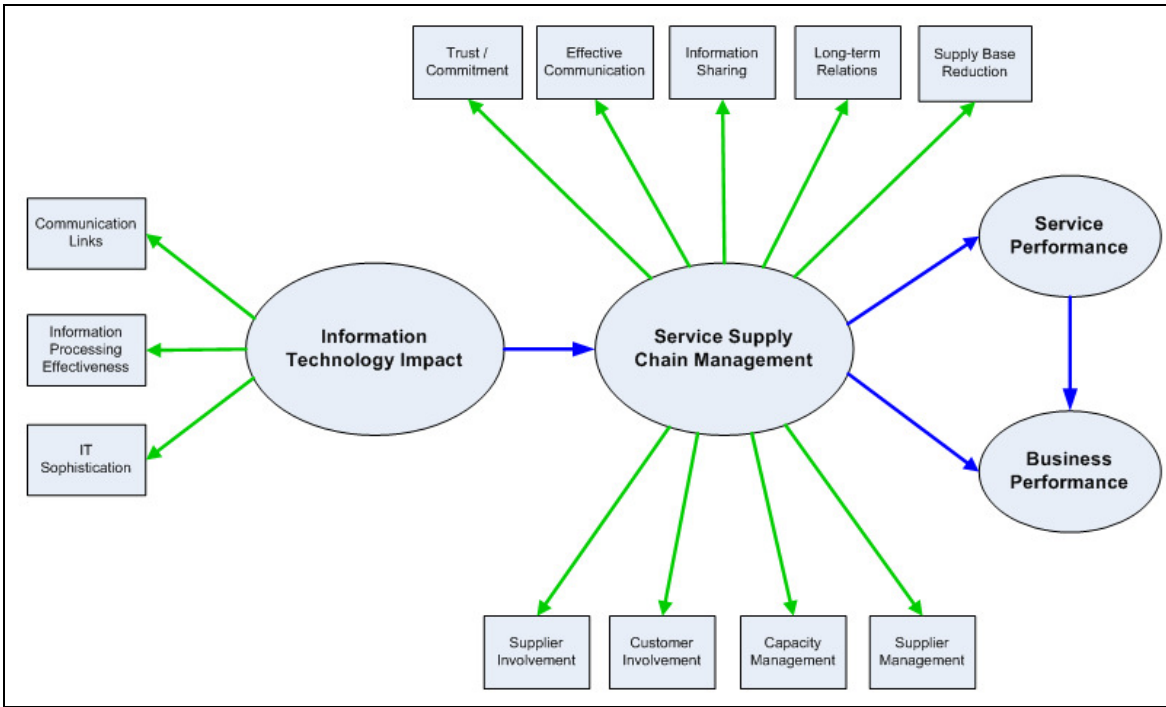


Figure 3.2
Model 1B: Service Supply Chain Management as Mediator
Expanded Model View

FIGURE 3.5
Comparing Glynn / Ennis Measure to SERVQUAL

The SERVQUAL Measurement Instrument

GREY highlights = *SERVQUAL items represented in Glynn / Ennis' Measure*

Tangibles:
Pl. XYZ has up-to-date equipment.
P2. XYZ's physical facilities are visually appealing.
P3. XYZ's employees are well dressed and appear neat.
P4. The appearance of the physical facilities of XYZ is in keeping with the type of services provided.

Reliability:
P5. When XYZ promises to do something by a certain time, it does so.
P6. When you have problems, XYZ is sympathetic and reassuring.
P7. XYZ is dependable.
P8. XYZ provides its services at the time it promises to do so.
P9. XYZ keeps its records accurately.

Responsiveness:
P10. XYZ does not tell customers exactly when services will be performed. (-)
P11. You do not receive prompt service from XYZ's employees. (-)
P12. Employees of XYZ are not always willing to help customers. (-)
P13. Employees of XYZ are too busy to respond to customer requests promptly. (-)

Assurance:
P14. You can trust employees of XYZ.
P15. You feel safe in your transactions with XYZ's employees.
P16. Employees of XYZ are polite.
P17. Employees get adequate support from XYZ to do their jobs well.

Empathy:
P18. XYZ does not give you individual attention. (-)
P19. Employees of XYZ do not give you personal attention. (-)
P20. Employees of XYZ do not know what your needs are. (-)
P21. XYZ does not have your best interests at heart. (-)
P22. XYZ does not have operating hours convenient to all their customers (-)

FIGURE 3.5 (Cont.)

The Glynn / Ennis Measurement Instrument

Service performance scale items:
SP-A1 Staff rewards for improved service delivery
SP-A2 Employee expertise
SP-A3 Employee knowledge of customer needs
SP-A4 Service quality standards
SP-A5 Employee courtesy/politeness
SP-A6 Level of customer trust in our service

Service comprehensiveness:
SP-B1 Flexibility in dealing with customer requests (Customization)
SP-B2 Service availability (hours)
SP-B3 Speed of new service introductions
SP-B4 Service customization

Service efficiency:
SP-C1 Unit cost of service provision
SP-C2 Service reliability
SP-C3 Employee retention

Customer responsiveness:
SP-D1 Customer support and service level
SP-D2 Customer retention rates
SP-D3 Customer complaint resolution levels
SP-D4 Level of individual customer attention

Figure 3.6
Proposed Constructs

Service Supply Chain Management (SSCM)
Trust & Commitment
Effective Communication
Information Sharing
Long-term Relationship
Supply Base Reduction
Supplier involvement
Capacity Management
Supplier Management
Customer Involvement

Information Technology Impact
Communication Links (i.e. Connectivity / Integration)
Information processing effectiveness
IT Sophistication (i.e. Skills and Capabilities)

Service Performance
Service performance scale items
Service comprehensiveness
Service efficiency
Customer responsiveness
Tangibles

Business performance

Figure 4.1a
Exploratory Factor Analysis
Scree Plots

Service Supply Chain Management

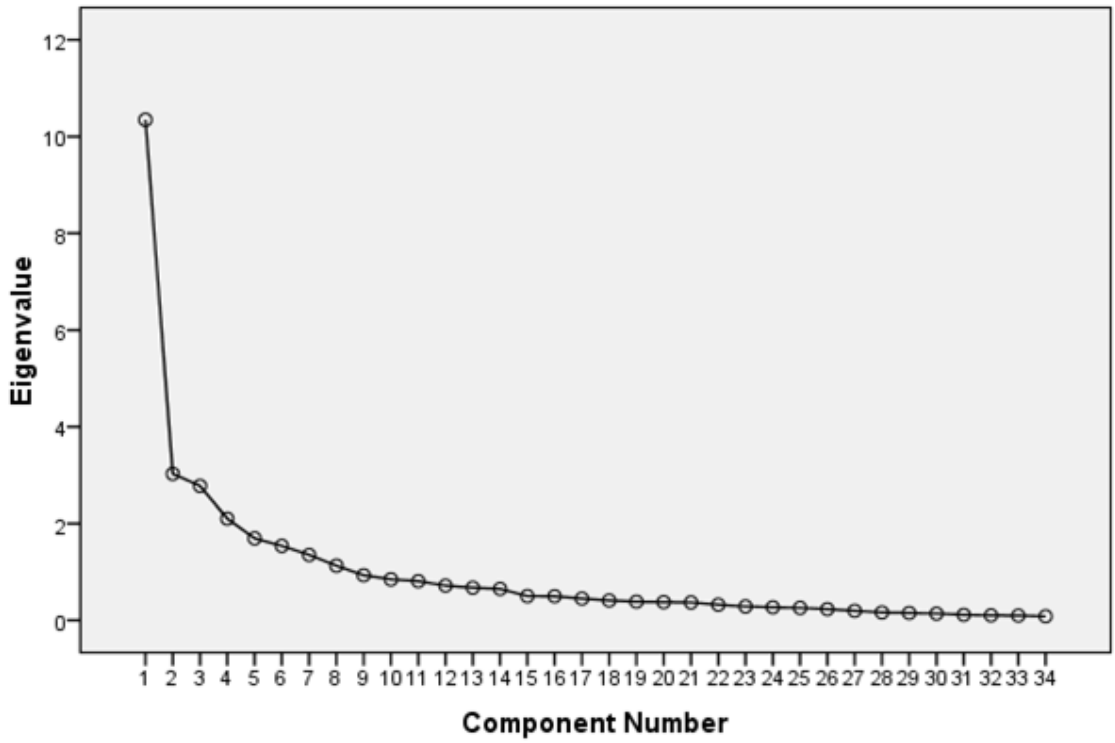


Figure 4.1b
Exploratory Factor Analysis
Scree Plots

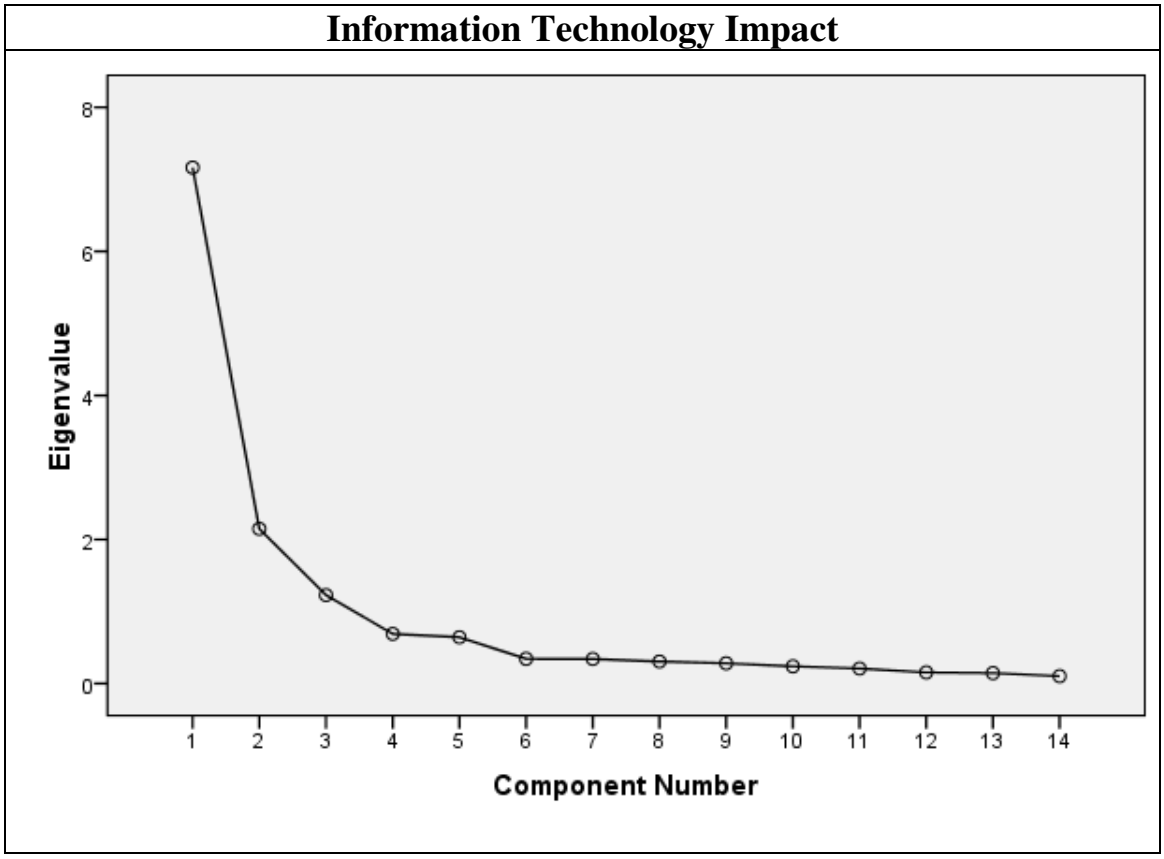


Figure 4.1c
Exploratory Factor Analysis
Scree Plots

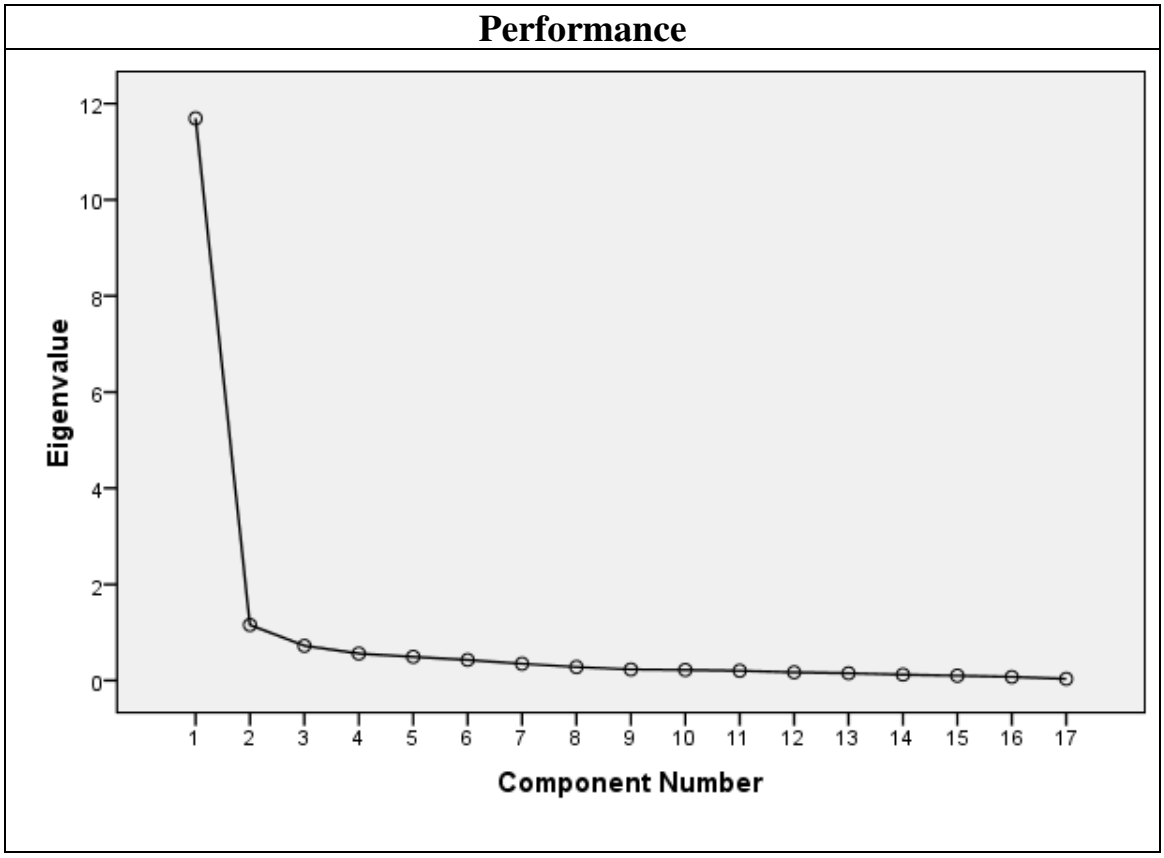


Figure 4.2
Full Mediation Model

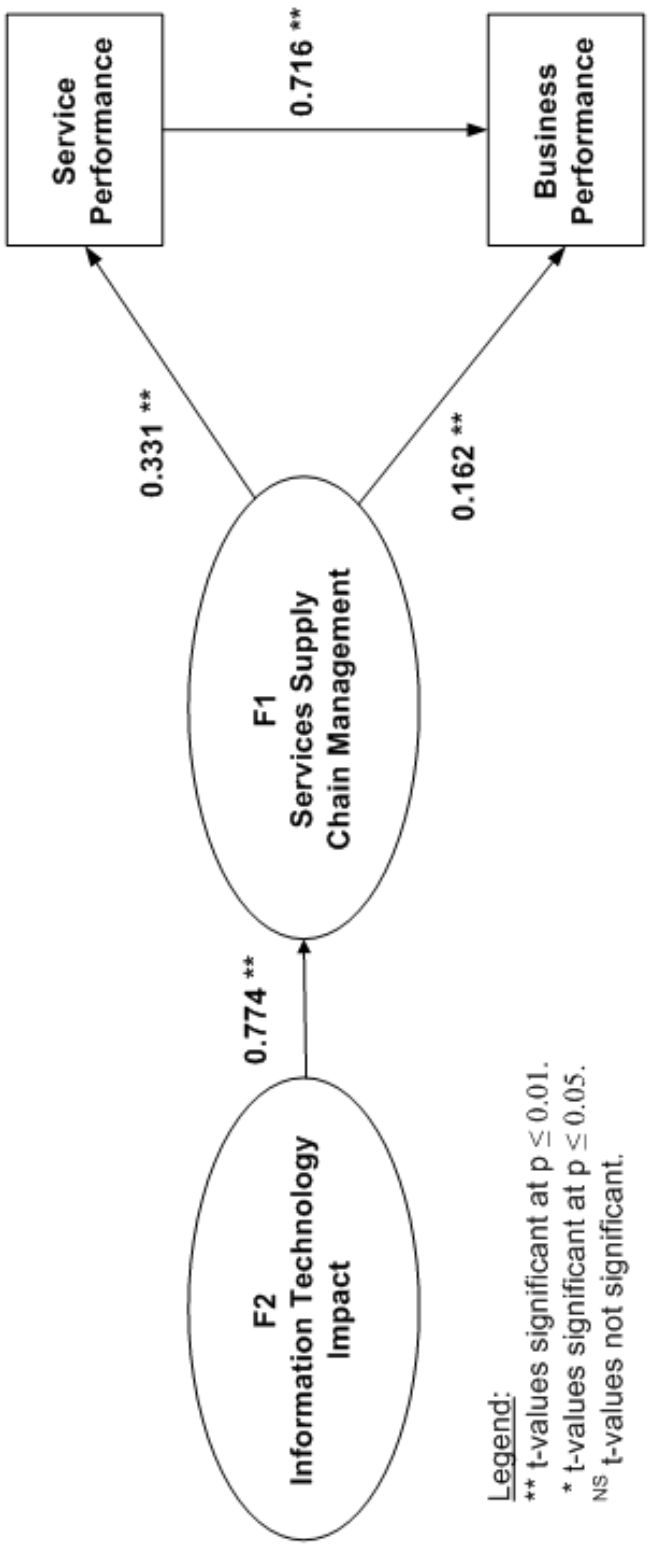


Figure 4.3
Partial Mediation Model

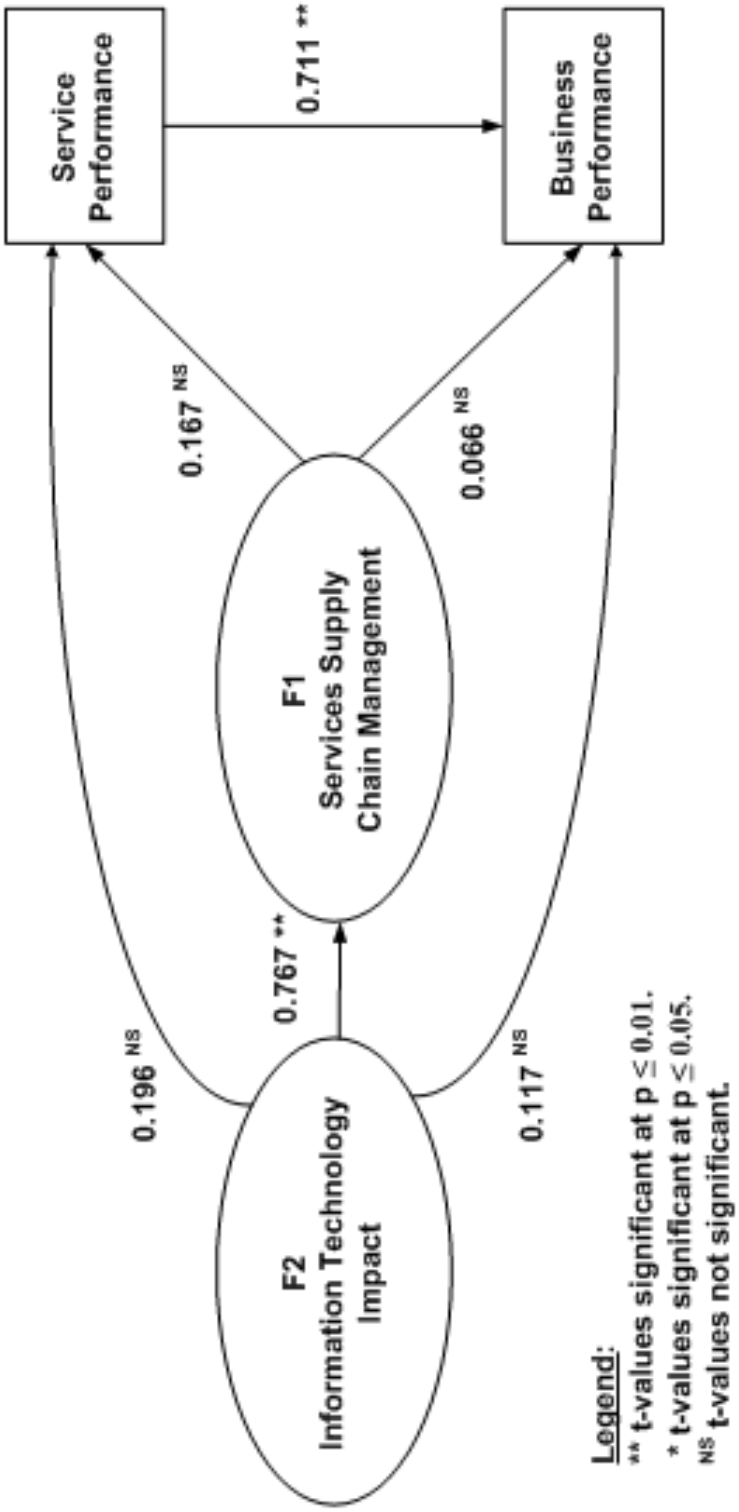
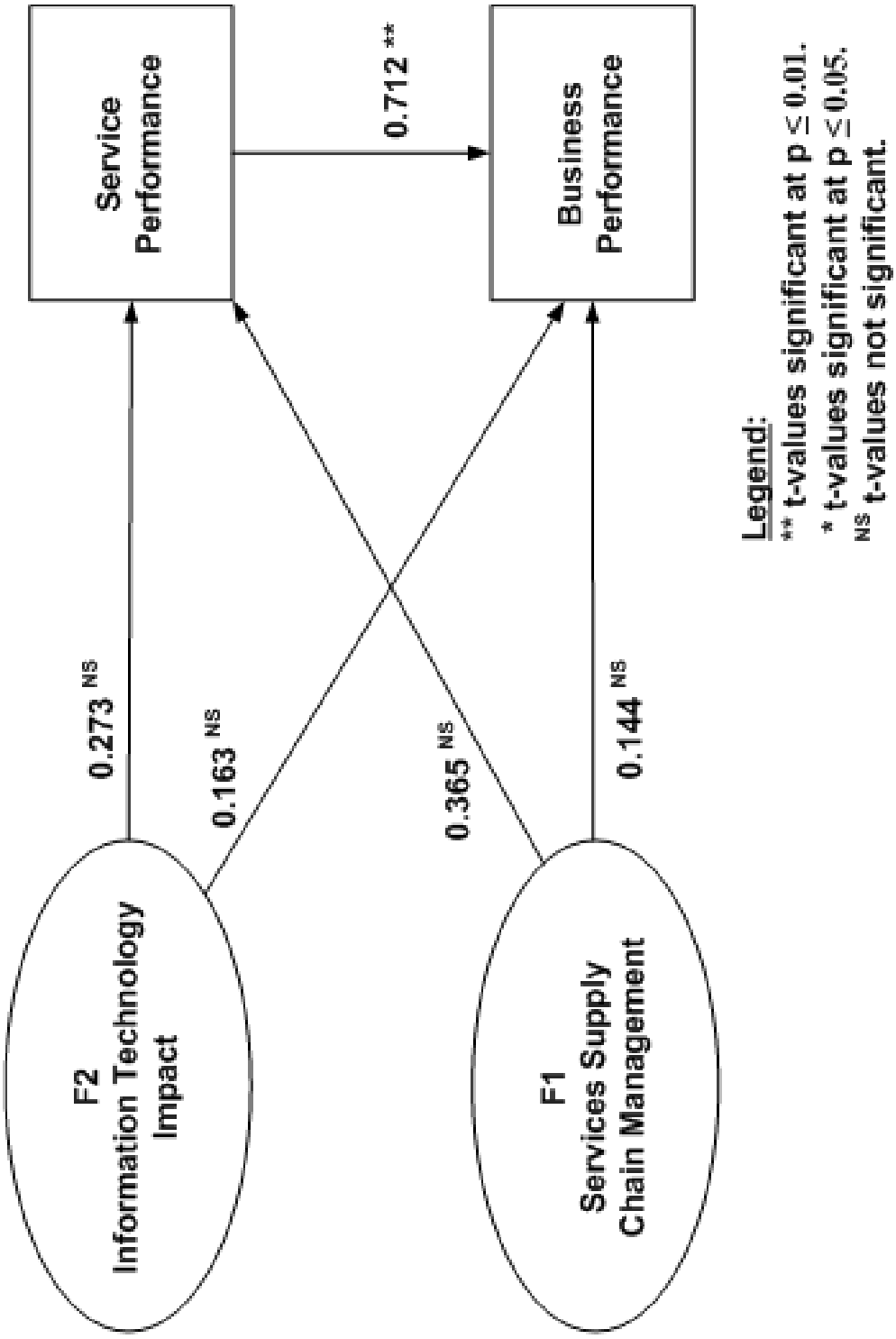


Figure 4.4
Direct Model



APPENDIX 1
Cleveland State University
Service Supply Management Survey

John D. Smith
1457 East 40th Street
Cleveland, OH 44103

{Date} Survey Respondent ID: {Resp ID}

{Respondent Name}
{Title}
{Company}
{Address}
{City, St Zip}

Dear {Respondent Name}:

Have you considered how the past 20 years have changed the rules by which your service operates?

- Competitive pressures are pushing businesses to evaluate their service strategy,
- An aging workforce is giving way to Generations X and Y employees,
- Technological advances are radically changing service delivery methods, and
- Customers are expecting real-time data with each transaction.

Is it any wonder service providers are struggling to keep pace with these changes? Have you turned to your supply chain to help meet these requirements or do you continue to tackle the challenge alone? This doctoral dissertation analyzes these topics to evaluate the driving forces within the service industry's supply chain. While work has been performed in the manufacturing sector to evaluate supply chain influence, little empirical research has been performed on the service sector. How have service industries translated the supply chain literature to meet their customer-driven, customer-produced or customer-interfacing services? With your help, we will answer these questions.

As part of the Institute for Supply Management's™ (ISM) mission to lead supply management, ISM encourages the pursuit of academic research. As a member of ISM, you have been selected to participate in this research project. Responding to the survey is completely voluntary. ISM Policy allows for the release of limited member information to researchers, to be used only for specific approved research projects. Your position and industry segment make you uniquely qualified to help with this study. That is why you are being asked to contribute to this study's success. I would greatly appreciate it if you would fully complete a web-based survey made available through a third-party survey tool. The web address here will take you to the secure web site for your use:

http://www.surveymonkey.com/s/SSCMwebsurvey

I assure that your questionnaire responses will not be released to anyone and that you and your company will not be identifiable to others. The results of this survey will be reported only in summary form. No mention of particular companies or participants will be given. If you have any questions about your rights as a research participant, you can contact the Cleveland State University's Institutional Review Board at (216) 687-3630 or my supervisor at (216) 687-4776.

If you would like a copy of the findings from this research, please email your request to my attention at j.d.smith80@csuohio.edu. I will be more than happy to forward you a copy of the report when it is complete. If you have any questions about the survey you may use that same email to get your response. Thank you very much for your contribution to this significant service industry research study.

Sincerely,

John D. Smith
Doctoral Candidate
Operations & Supply Chain Management Department
Cleveland State University

APPENDIX 2
Cleveland State University
Survey Instrument

Instructions: Your initial response to agreement or disagreement to each of the statements provided below is requested.

[ ] Please check here if you would like to receive a copy of the results from this study

Section A: Company Profile Information:

The following questions relate to the firm where you are currently employed.

1. Number of employees in your firm (or at this division)? [ ] Less than 25 [ ] 25 to 100 [ ] 101 to 250 [ ] 251 to 500 [ ] 501 to 1000 [ ] Over 1000

2. Annual sales volume at this division? (In Millions) [ ] Less than $1 [ ] $1 to $49 [ ] $50 to $99 [ ] $100 to $499 [ ] $500 to $999 [ ] Over $1000

3. Primary customer Type: [ ] Businesses [ ] Consumers [ ] Both
   Note: Sales must be ≥ 20% of total business in each category to answer both

4. If both, approximately what percentage is Business to Businesses? [ ] 20 to 39 [ ] 40 to 59 [ ] 60 to 80

5. Is your single largest sourced item a good or a service? [ ] Good [ ] Service

Section B: Nature of the Service Act:

The following questions relate to the principle service that your organization provides to your customers.

1. Is the service tangible (healthcare, food service, transportation, etc.) or intangible (education, information services, accounting, etc)? [ ] Tangible [ ] Intangible

2. If a tangible service: Who or what is the direct recipient of the tangible service?
   People – Services directed at people's bodies [ ] People [ ] Things
   Things – Services directed at goods and other physical possessions

3. If an intangible service: Who or what is the direct recipient of the intangible service?
   People – Services directed at people's minds [ ] People [ ] Things
   Things – Services directed at intangible assets

4. Nature of the service delivery: Delivered continuously or in discrete transactions
   [ ] Continuously [ ] Discrete

5. Which classification best describes your customers' participation in the 'production Process'?
   [ ] A: The product is produced entirely by the firm and its employees, with no participation by the customer.
   [ ] B: Both the customer and the firm's contact employees interact and participate in the production.
   [ ] C: The product is produced entirely by the customer, with no participation by the firm or its employees

6. This section concerns the nature or characteristics of the main services offered by your firm. Select from a seven-point scale anchored by 'Low' and 'High'.

	Low						**High**
The amount of service variety	1	2	3	4	5	6	7
The volume of output produced	1	2	3	4	5	6	7
The degree of labor intensity	1	2	3	4	5	6	7
The degree of technology intensity	1	2	3	4	5	6	7
The overall amount of customer contact	1	2	3	4	5	6	7
Extent to which customer contact personnel exercise judgment in meeting individual customer needs	1	2	3	4	5	6	7

Section C: Service Supply Chain Management:

Below are item measures of Service Supply Chain Management. When rating this section, consider your "key" suppliers of services purchased by or for your facility or division. Circle the indicator which best describes your business environment. All items are measured on a 7-point scale with 1 = Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = Neither agree or disagree, 5 = Somewhat agree, 6 = Agree, and 7 = Strongly agree.

	Strongly Disagree						**Strongly Agree**
Trust:							
1. Even when the supplier gives us a rather unlikely explanation, we are confident they are telling the truth.	1	2	3	4	5	6	7
2. These suppliers have often provided us information that has later proven to be inaccurate.	1	2	3	4	5	6	7
3. The supplier usually keeps the promises they make to our firm.	1	2	3	4	5	6	7
4. Whenever the supplier gives us advice on our business operations, we know they are sharing their best judgment.	1	2	3	4	5	6	7
5. Our organization can count on the suppliers to be sincere.	1	2	3	4	5	6	7
Effective Communication:							
1. We have frequent personal contact (i.e., telephone, visits) with our suppliers	1	2	3	4	5	6	7
2. We have frequent non-personal contact (i.e., e-mail, EDI) with our suppliers	1	2	3	4	5	6	7
3. We believe our business unit's communication with the supplier is timely	1	2	3	4	5	6	7
4. We believe our business unit's communication with the supplier is accurate	1	2	3	4	5	6	7
5. We believe our business unit's communication with the supplier is complete	1	2	3	4	5	6	7
Information Sharing:							
1. We and our key suppliers keep each other informed about events or changes that may affect the other partners.	1	2	3	4	5	6	7
2. We inform key suppliers in advance of changing needs	1	2	3	4	5	6	7
3. We and our key suppliers exchange information that helps establishment of business planning.	1	2	3	4	5	6	7
4. We share sensitive information (financial, service design, strategy, research, and/or competition).	1	2	3	4	5	6	7
5. Our key suppliers share business knowledge of core business processes with us.	1	2	3	4	5	6	7
Supplier Involvement:							
1. We promote task force teams with our suppliers	1	2	3	4	5	6	7
2. We involve key suppliers in the service design and development stage	1	2	3	4	5	6	7
3. We include our key suppliers in our planning and goal-setting activities	1	2	3	4	5	6	7
4. Our key suppliers collaborate with us to solve problems within our services	1	2	3	4	5	6	7
5. Our firm is not willing to hand over a portion of the service delivery to our suppliers to meet our customer's needs	1	2	3	4	5	6	7
6. Over the past 5 years, our suppliers are providing a greater percentage of the total service package to our customers	1	2	3	4	5	6	7
Supply Base Reduction:							
1. We drop suppliers for price reasons	1	2	3	4	5	6	7
2. We rely on a small number of high quality suppliers (generally 1 per svc)	1	2	3	4	5	6	7
3. We maintain close relationship with a limited pool of suppliers	1	2	3	4	5	6	7
4. The number of supplier sources we use has reduced in the past 5 years	1	2	3	4	5	6	7
Long-term Relationship:							
1. We expect our relationship with key suppliers to last a long time	1	2	3	4	5	6	7
2. We work with key suppliers to improve their quality in the long run							
3. The suppliers see our relationship as a long-term alliance	1	2	3	4	5	6	7
4. We view our suppliers as an extension of our company	1	2	3	4	5	6	7

5.	We have guidelines for developing, maintaining and monitoring long-term supply chain relationships with our suppliers	1	2	3	4	5	6	7

Capacity Management:

1.	Our firm works to manage demand in order to match our supplier's capacity	1	2	3	4	5	6	7
2.	We forecast demand and provide this information to our key suppliers	1	2	3	4	5	6	7
3.	We employ part-time, seasonal employees or flexible work schedules to help our capacity meet the demand variations	1	2	3	4	5	6	7
4.	We utilize our supply chain to help our capacity meet the demand variations	1	2	3	4	5	6	7
5.	We make rapid staffing changes to match supply with demand and volume	1	2	3	4	5	6	7

Supplier Management:

1.	When purchasing services, we always use written legal agreements for the service exchange	1	2	3	4	5	6	7
2.	Our service contracts / agreements clearly specify the service processes to be provided by our suppliers	1	2	3	4	5	6	7
3.	We have centralized requisition processing, preventing individual departments from signing their own service agreements	1	2	3	4	5	6	7
4.	We consider quality as our number one criterion in selecting suppliers	1	2	3	4	5	6	7
5.	We regularly and systematically assess the capabilities of our suppliers (there are formal processes for this)	1	2	3	4	5	6	7
6.	We are working on strengthening the relationships with our key suppliers	1	2	3	4	5	6	7

Customer Involvement:

1.	We anticipate and respond to customers' evolving needs and wants	1	2	3	4	5	6	7
2.	We emphasize the evaluation of formal and informal customer complaints	1	2	3	4	5	6	7
3.	We interact with customers to set reliability, responsiveness, & other standards	1	2	3	4	5	6	7
4.	Customer focus is reflected in our business planning	1	2	3	4	5	6	7
5.	We actively solicit information on service quality from our customers	1	2	3	4	5	6	7
6.	An inter-functional team from our firm, together with teams from our supply chain members, has meetings to figure out how to serve our mutual customers better.	1	2	3	4	5	6	7

Section D: Information Technology Effectiveness:

Information Technology Effectiveness is made up of three components, communication linkages, IT sophistication and information processing impact.

Communication Links:

Firms often use technology to link their firm's system to their customer's or supplier's systems. The following questions explore the extent to which your organization employs these capabilities. Select from a seven-point scale anchored by 'Strongly Disagree' and 'Strongly Agree'.

		Strongly Disagree						**Strongly Agree**
1.	Across-firm coordination is achieved using electronic links	1	2	3	4	5	6	7
2.	Our supply chain members practice Electronic Data Interchange, either via FTP, Internet or similar means	1	2	3	4	5	6	7
3.	Our information systems are highly integrated throughout the supply chain	1	2	3	4	5	6	7
4.	Our information systems satisfy supply chain communication requirements	1	2	3	4	5	6	7
5.	Our supply chain partners have access to our systems to view key information	1	2	3	4	5	6	7

IT sophistication, skills and capabilities:

The next set of questions measure your IT department's technical skills. Select from a seven-point scale anchored by "very inferior to" and "very superior to" closest competitors.

		Very Inferior						**Very Superior**
1.	Hardware and operating systems performance	1	2	3	4	5	6	7
2.	Business applications software performance	1	2	3	4	5	6	7
3.	Our computer hardware and related equipment	1	2	3	4	5	6	7
4.	Our IT staff skills and abilities	1	2	3	4	5	6	7

Information Processing Impact:
The following questions explore how your firm's Information Technology impacts your supply chain. Select from a seven-point scale anchored by "not much" and "extensively".

		Not Much						Exten-sively
1.	Activities associated with purchasing inputs required by your firm	1	2	3	4	5	6	7
2.	Transforming inputs into the final service output	1	2	3	4	5	6	7
3.	Collecting, storing, distributing the final delivered svc to your firm's customers	1	2	3	4	5	6	7
4.	Providing additional services to maintain or enhance the value of the service (e.g. maintenance notices, upgrades or add-on services)	1	2	3	4	5	6	7
5.	Interacting and coordinating activities with suppliers	1	2	3	4	5	6	7
6.	Interacting and coordinating activities with customers	1	2	3	4	5	6	7

Section E: Service Performance:
Assess the current level of service performance provided by your firm/organization to its external customers. Select from a seven-point scale anchored by 'much better than the industry average' and 'much worse than the industry average'.

		Much Better						Much Worse
1.	Employee knowledge of customer needs	1	2	3	4	5	6	7
2.	Service quality standards	1	2	3	4	5	6	7
3.	Level of customer trust in our service	1	2	3	4	5	6	7
4.	Employee courtesy/politeness	1	2	3	4	5	6	7
5.	Flexibility in dealing with customer requests (Customization)	1	2	3	4	5	6	7
6.	Service availability (hours)	1	2	3	4	5	6	7
7.	Speed of new service introductions	1	2	3	4	5	6	7
8.	Service reliability	1	2	3	4	5	6	7
9.	On-time delivery/due-date performance	1	2	3	4	5	6	7
10.	Service Delivery speed (or cycle time)	1	2	3	4	5	6	7
11.	Customer support and service level	1	2	3	4	5	6	7
12.	Customer retention rates	1	2	3	4	5	6	7
13.	Customer complaint resolution levels	1	2	3	4	5	6	7
14.	Level of individual customer attention	1	2	3	4	5	6	7
15.	The appearance of the physical facilities, staff or service interface is in keeping with the type of services provided	1	2	3	4	5	6	7

Section F: Buyer Firm Performance:
Item measures of Firm Performance: How would you compare your firm's performance on the following measurements compared to your nearest competitor over the past 3 years? Select from a seven-point scale anchored by 'much lower than' and 'much higher than' your competitor(s).

		Much Lower Than						Much Higher Than
1.	Return on investment (ROI)	1	2	3	4	5	6	7
2.	The growth of market share	1	2	3	4	5	6	7
3.	The growth of sales	1	2	3	4	5	6	7
4.	Profit margin on sales	1	2	3	4	5	6	7