Supply Chain Frameworks for the Service Industry: A Review of the Literature

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ABSTRACT
A well-defined supply chain is critical to any business. As the service industry grows in importance, so does the need for frameworks, performance measures and strategies for this industry. The level of efficiency and responsiveness that the manufacturing segment has seen due to the growth and study of supply chain management techniques over the last few decades must now be translated to the service industry. This paper explores the relevant literature devoted to frameworks and performance measures for this particular industry and draws comparisons to the existing models built for the goods industry and concludes with the need for future exploration in this area.

KEYWORDS: Services, supply chain, literature review, framework, performance measures

1 BACKGROUND
The transformation from an industrial based economy to a service based economy has been taking place in the United States over the last 20 years. The service industry continues to grow and is quickly becoming a main sector in the economy. Of the Dow Jones index stocks, 26.7% are in the service sector (CNN Money, 2012), with two of those companies – General Electric and IBM – among the world’s most competitive operations in the service sector. The ever-advancing, new information technologies are one of the main reasons behind this economic transformation in the US from manufacturing to services. The importance of these services cannot be overstated; because these service industries rely heavily on information technology, they are also drivers of technical progress.

While trade, transportation and utilities lead the list as the largest service industry employers (CSI), professional and business services, education and health and leisure and hospitality are also very crucial to the services contribution to the Gross Domestic Product (GDP). These services are not just for the use of United States residents alone either. In 2009, private services exports were in excess of $483 billion and this figure rose to over $526 billion in 2010 (CSI), with a trade surplus of over $180 billion (Commission, Recent Trends in U.S. Services Trade, 2011). This trend has grown in virtually every segment of the services industry.

One alarming statistic though, is often over-looked. Although the professional and business services segment contributed about 20%-22% to the GDP in both 2009 and 2010 (Commission, Recent Trends in U.S. Services Trade, 2011), there has been an increasing trend of offshoring these services in particular to
reduce labor costs. The largest area of this is seen in high-skilled jobs such as architecture, engineering, law and more recently, medical diagnostic services (Commission, Recent Trends in U.S. Services Trade, 2011). There are conflicting opinions as to whether or not this trend allows for a focus on core competencies (Wofit, 2004) or simply the desire to reduce labor costs. Some feel that offshoring these services will, in the long-run, boost productivity growth in the domestic economy by enhancing the economy of the consumer while others feel that it simply devalues the wages of the often highly educated service worker (Gorg, Geishecker, & Krieger-Boden, 2011).

The importance of service firms to the economy is crucial; however, improvement is needed to bring the service industry to the level of efficiency and responsiveness that the manufacturing sector has grown accustomed. Particularly since this sector relies heavily on its customer base, new paradigms, frameworks, and performance measures specifically designed for the service industry are necessary to ensure this growing trend. This paper explores the existing frameworks currently utilized for service supply chains (SSCs), from both a process-based view and a performance-based view. Additionally, the limitations posed by these frameworks is discussed, along with the lack of clear metrics for this important industry.

2 SUPPLY CHAINS IN THE SERVICE INDUSTRY

Just as the focus on building world-class supply chains (SCs) and collaborations in manufacturing began in the latter part of the 20th century, the attention needs to turn now on the supply chains within the service sector. Many questions need to be answered to determine whether or not existing models of frameworks, performance measures, network design and implementation are applicable to the service sector. Building a foundation for the supply chain in these service-type industries is crucial to the execution the activities within this sector (Ping & Jia, 2010).

First, an understanding of the external environment is crucial to any organization in order to allow for positive customer satisfaction. While goods-producing firms, tend to rely on generic SC models such as Porter’s Value Chain model (Porter, 1985), or the SCOR model (Supply Chain Operations Reference Model), the focus is typically centered around profit with some level of quality and service. However, the service industry incorporates not-for-profit, as well as for-profit firms. And within those for-profit firms, the level of human-interaction within those services and the reliance on person-to-person interaction on overall success of the firm is quite disparate. Thus, the question is raised: Is a generic supply chain model applicable for all service industries or is it service industry-specific?

The importance of developing foundational models of SCs for the service industry is an imminent task and very little work as been accomplished to date. As evidence of this urgency, one can look at the efficiency seen in the United States and abroad. In 2011, the service sector contributed to more than 75% of the USA’s GDP (The World Factbook, 2012). However, that percentage is due to approximately 70% of the population being employed in that industry, while services in countries such as India contribute a little over 50% to the GDP and employ just 25% of the population. While that ratio of GDP contribution to employment percentage has decreased from a decade ago, it is disproportionately high in comparison to other countries, as well as the manufacturing industry. Therefore, a strong base of modeling the SCs in these industries must be explored to provide for future growth and a higher level of quality and efficiency.
2.1 LACK OF FOCUS
In the early part of 2012, the Institute for Supply Management (ISM) reported that, while the service sector has been growing for the previous two years, and is continuing to grow, hiring in this sector has stagnated (Homan, 2012). One can assume that this is, at least partially, due to more focus in this area in terms of the management and execution of service systems. The decrease in the GDP contribution to employment percentage may be an indicator of this, however, literature remains sparse on definitions regarding both frameworks and performance measures. One can assume that, through more increased focus in this area of service supply chains, the productivity, capabilities and performance of them can only increase as those of traditional supply chains of the previous few decades.

2.2 SERVICE INDUSTRY DEFINED
Most visibly, the main defining characteristic between a manufacturing and service firm is that human labor is the primary component of the latter, while a physical product is that of the former. The characteristics that define each of these then, also differ. Many authors argue the definition of these characteristics. Fisk et al. (Fisk, Brown, & Bitner, 1996) argue that the four major defining characteristics of a service industry from a goods industry are intangibility, inseparability of production and consumption, heterogeneity and perishability. Others, such as Pride and Ferrel (Pride & Ferrel, 2003) argue that there are six main defining characteristics: the previously-mentioned four and client-based relationships and customer contact. While some may argue that goods industries also incorporate these last two, it is the service industry which relies on these characteristics as an inherent part of their service. In addition to intangibility, heterogeneity and perishability, Baltacioglu et al. (Baltacioglu, Ada, Kaplan, & Kaplan, 2007) also argue that simultaneity is another significant piece of a service system.

Service systems can also be delineated from manufacturing systems by their processes. For example, Sengupta et al. argue that the decisions are very controlled in a goods industry with much standardization and little variation, while in a service system, the level of variation is significant due to local decision-making made by humans (Sengupta, Heiser, & Cook, 2006).

Table 1: Disparity between a manufacturing and services supply chain

<table>
<thead>
<tr>
<th>Area</th>
<th>Manufacturing systems supply chain</th>
<th>Service industry supply chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production System</td>
<td>Push (sell from inventory)</td>
<td>Pull (initiated by customer demand)</td>
</tr>
<tr>
<td>Logistics System</td>
<td>Uniform, mass approach</td>
<td>Customized to customer need</td>
</tr>
<tr>
<td>Finished Goods</td>
<td>Tightly controlled</td>
<td>Kept at low level</td>
</tr>
<tr>
<td>Inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suppliers</td>
<td>Responsiveness not critical</td>
<td>Must be responsive</td>
</tr>
<tr>
<td>Customer relations</td>
<td>Often at a low level</td>
<td>Critical to overall success</td>
</tr>
</tbody>
</table>

Whatever the characteristics may be, most authors agree that a service is an execution of an activity, rather than a tangible item. Table 1 illustrates some major differences of the characteristics of a manufacturing goods supply chain and a service industry supply chain. Traditionally, goods industries are push systems, with companies keeping high levels of raw and finished goods inventory. The suppliers in a
service industry often ARE the “goods” and thus, must be responsive to the needs of the customers. Very often, these industries are dealing face-to-face with their customers and thus the relations between them are crucial. Thus, the metrics by which a service firm will measure itself must be distinct from a manufacturing firm.

3  FRAMEWORKS
One of the major enabling factors of supply chain management is that the corporate vision is customer-centered and able to drive change throughout the firm and between its external linkages. The goal of the SC framework is to create process and functions that are integrated across the SC to create a competitive advantage(Tan, 2001). There are many well-developed SC frameworks in the literature which relate directly to manufacturing, stemming from the 1980s. Croom et al. (Croom, Romano, & Giannakis, 2000), classify these literatures into two criteria: content and methodology. A more specific framework for a built-to-order supply chain considers four aspect: organizational competitiveness, development and implementation, operations and information technology (Gunasekaran & Ngai, 2005). Since the differences in both processes and performance measures are distinct, existing SC frameworks for services have been reviewed and categorized into process-centered and performance measure-centered. These literatures are discussed below along with their background and applicability to service the industry.

3.1  PROCESS-CENTERED FRAMEWORKS
The majority of literature on SC frameworks for the service sector stem from adaptation of an existing, established framework into this service industry. These frameworks are summarized in Table 2 along with their reference manufacturing paradigm. Ellram etal.(Ellram, Tate, & Billington, 2004) focus on three existing frameworks developed for manufacturing: the Hewlett Packard employed model by Lee and Billington(Lee & Billington, 1993), the SCOR model (Supply Chain Operations Reference Model), and Global Supply Chain Forum Framework (GSCF), based on Porter’s model(Porter, 1985) and proposed by Croxton(Croxton, Dastague-Garcia, Lambert, & Rogers, 2001). The authors discuss the strengths and weaknesses of each of these as applying them to service systems. In particular, the Lee and Billington model is strong for services that have uncertain demand and that can benefit from the flexibility capacity. In addition, they suggest that the growth in the service sector is linked to the growth in service purchasing and that there is little control over this system, thus yielding to a lack of SC Management frameworks. They conclude that a process model is best applied to the service industry and thus develop a seven step process model including: information flow, capacity and skills management, demand management, supplier relationship management, customer relationship management, service delivery management and cash flow.
Baltacioglu et al. (Baltacioglu, Ada, Kaplan, & Kaplan, 2007) also developed a SC service model framework. Using the SCOR model (Supply Chain Operations Reference Model) and Ellram et al. (Ellram, Tate, & Billington, 2004), the authors develop the “IEU-SSC Model” in which there are three units: supplier, service provider and consumer. The focal point lies with the provider as they are the interface with the customer. This is a process-centered model in which seven essential activities exist in this model: demand management, capacity and resource management, customer relations management, supplier relations management, order process management, service performance management and information and technology management. This framework is then applied to Hewlett Packard.

While not directly creating a framework, Cook et al., (Cook, 2001), discuss crucial characteristics which much be considered when developing a supply chain for services. These are: relationships, technology, forecasting, outsourcing and cost management. Relationships are necessary in the services to increase the stability of the service. Level of technology is extremely important when the service is involved in electronic commerce as it can be used to leverage competitive advantages. Forecasting and cost management are crucial to any supply chain, as they will yield increased efficiencies and higher profits. However, the procurement process of selecting outsourcers is crucial to the value of the end service provider’s product.

Based on Porter’s value chain model, Armistead and Clark (Armistead & Clark, Resource Activity Mapping: The Value Chain in Service Operations Strategy, 1993) developed a value chain model for a service company based on the location of the related costs and the value they give rise to. The authors claim that there are typically five to seven primary processes within a service industry and by linking these processes to the resources utilized, the physical configuration of those resources and the flow of these processes from an external view, critical areas of potential problems, poor performance and bottlenecks can be seen more readily.

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TABLE 2: PROCESS CENTERED SERVICE SUPPLY CHAIN FRAMEWORKS

<table>
<thead>
<tr>
<th>Author</th>
<th>Manufacturing Framework(s) Utilized</th>
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<tbody>
<tr>
<td>Ellram et al. (Ellram, Tate, &amp; Billington, 2004)</td>
<td>SCOR (Supply Chain Operations Reference Model)</td>
</tr>
<tr>
<td>Baltaccioglu (Baltaccioglu, Ada, Kaplan, &amp; Kaplan, 2007)</td>
<td>SCOR (Supply Chain Operations Reference Model)</td>
</tr>
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</table>
3.2 PERFORMANCE MEASURED FRAMEWORKS

A performance measurement system can be defined as the set of metrics used to quantify both the efficiency and effectiveness of actions (Neely, et al., 2000). Most goods-producing firms define their performance measures in the areas of quality, delivery speed, reliability, cost and flexibility (Leong, Snyder, & Ward, 1990). While the definitions of them vary and are often blurry, the literature on performance measures in manufacturing is extensive. However, one common theme is that a firm elects to measure what is most critical to the success of the company. To illustrate the inconsistency in critical areas, take for example, the often-cited balanced scorecard (Kaplan & Norton, 1992). Here, the authors group critical areas of success into four equal areas: financial, customer relations, core competencies and innovativeness. In a study of 1,000 companies, Zhang and Sharifi (Zhang & Sharifi, 2000) concluded that those practices which directly related to people and organizational issues were more critical for the success of manufacturing firms, when success is defined in terms of agility. Beamon (Beamon, 1999) more widely defines the critical factors to measure for success as resources, outputs and flexibility.

3.2.1 DRIVING FACTORS FOR SUCCESS IN SERVICE SYSTEMS

Some authors have chosen to define broadly the factors that will promote the most success in a service organization. In order to explore SC practices in both manufacturing and services, a large study was performed by Sengupta et al. (Sengupta, Heiser, & Cook, 2006) to determine correlations between certain SC strategies and metrics. The authors focused on the performance measures of service SCs and the differences between those and manufacturing as the basis to determine the critical factors for success. Distinction is made between operational performance and financial performance. The former is attributed directly to perceived customer satisfaction. The latter relates to cost and profit measures in relation with its competitors. Results indicate that these differ between manufacturing and services. Certain key results were found: information sharing and level of customization (compared to competitors) is much more crucial to operational performance in the service sector and placing strategic importance on the distribution network can greatly affect financial performance. However, higher cost of customization is associated with lower profit which seems to be due to the fact that service industries are unable to obtain the price premium unlike their partners in manufacturing.

As shown in Table 3, Armistead and Clark (Armistead & Clark, Resource Activity Mapping: The Value Chain in Service Operations Strategy, 1993) state that competitive advantage can be achieved by centering the entire service delivery system around three items: resources, the flow of the processes and the configuration. Each one of these three key areas has five to seven associated key activities.
Kathawaia and Abdou (Kathawaia & Abdou, 2003) also define critical areas in terms of the processes as well as corporate strategies such as best practices, connection and visibility within the organization, simplicity of the processes and a unified vision. Visibility is a common theme also with Ellram et al. and those authors extend it to outside visibility with suppliers.

### 3.2.2 PERFORMANCE MEASURE-CENTERED FRAMEWORKS

Most authors, however, choose to define more specific performance metrics by which the framework for the SC should be defined. Some of these are broad enough to extend across most types of service industries, while others are not as shown in Table 4. For example, Kathawaia and Abdou (Kathawaia & Abdou, 2003) develop a different framework for service systems, and in particular, financial auditing firms. The authors develop a definition for SC strategy for services which is based on three characteristics: quality of service, efficiency of process and responsiveness to the market. While the authors treat both services and manufacturing to have a physical product, while admitting that the service product is intangible, a comparison is made between each for the three characteristics listed above. These characteristics are compared to Fisher’s model (Fisher, 1997) of the six points of comparison: purpose, focus, inventory strategy, lead-time, supplier selection and product strategy. Out of this yields a framework consisting mainly of characteristics which can be utilized as performance measures for a service industry.

<table>
<thead>
<tr>
<th>Author</th>
<th>Factors for effectiveness and efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kathawaia, Abdou (Kathawaia &amp; Abdou, 2003)</td>
<td>Process (controllable, well-defined), best practices, removal of organizational barriers, visibility to demand, simple flow, responsiveness, vision sharing</td>
</tr>
<tr>
<td>Ellram et al. (Ellram, Tate, &amp; Billington, 2004)</td>
<td>Visibility, proper distribution of labor, aligned and visible incentives, visibility of outsourced activities</td>
</tr>
<tr>
<td>Sengupta et al. (Sengupta, Heiser, &amp; Cook, 2006)</td>
<td>Information sharing and level of customization (compared to competitors) is much more crucial to operational performance in the service sector and placing strategic importance on the distribution network can greatly affect financial performance</td>
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Cho et al. (Cho, Young, Sung, & Swang, 2012) utilize the framework by Baltacioglu et al. (Baltacioglu, Ada, Kaplan, & Kaplan, 2007) as a model for their performance measures. Thus the performance measures are divided into the seven specific processes of Baltacioglu (Baltacioglu, Ada, Kaplan, & Kaplan, 2007) discussed in Section 3.1. From there, they develop a hierarchy of sub-metrics which can be used to evaluate each of the seven processes.

Johnson and Mena (Johnson, 2008) developed a model for a product which has both a manufacturing and service component. The resulting framework is a combination of the models of both Croxton et al. (Croxton, Dastague-Garcia, Lambert, & Rogers, 2001) and Ellram et al. (Ellram, Tate, & Billington, 2004). The resulting model resembles the GSCF model where the product flow across the supply chain is replaced with information flow and the processes by which the information flows is replaced with:

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Framework Utilized</th>
<th>Performance Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baltacioglu et al. (Baltacioglu, Ada, Kaplan, &amp; Kaplan, 2007)</td>
<td>Fisher</td>
<td>Purpose, focus, inventory strategy, lead-time, supplier selection, product strategy</td>
</tr>
<tr>
<td>Cho et al. (Cho, Young, Sung, &amp; Swang, 2012)</td>
<td>Baltacioglu(Baltacioglu, Ada, Kaplan, &amp; Kaplan, 2007)</td>
<td>Categorized by process: demand management, capacity and resource management, supplier relationship management, order process management, service performance management and information and technology management</td>
</tr>
<tr>
<td>Johnson and Mena (Johnson, 2008)</td>
<td>Croxton et al. (Croxton, Dastague-Garcia, Lambert, &amp; Rogers, 2001); Ellram et al. (Ellram, Tate, &amp; Billington, 2004)</td>
<td>Information flow management, customer relationship management, supplier relationship management, demand management, cash flow, production management, order delivery management, returns management and end-of-life, product development management and risk management</td>
</tr>
<tr>
<td>Kathawaia, Abdou(Kathawaia &amp; Abdou, 2003)</td>
<td>Sengupta and Turnbull (Sengupta &amp; J., 1996)</td>
<td>Quality of service, efficiency of process and responsiveness to the market</td>
</tr>
</tbody>
</table>
processes. Five of these are from those mentioned in Ellram et al. (Ellram, Tate, & Billington, 2004) above: information flow management, customer relationship management, supplier relationship management, demand management and cash flow (termed financial flow management). The remaining five are: production management, order delivery management, returns management and end-of-life, product development management and risk management. Production management is a result of manufacturing management (Croxton, Dastague-Garcia, Lambert, & Rogers, 2001) and capacity management (Ellram, Tate, & Billington, 2004). Order delivery management is combination of order fulfillment, customer service management (Croxton, Dastague-Garcia, Lambert, & Rogers, 2001) and capacity management (Ellram, Tate, & Billington, 2004). Returns management and end-of-life stems from the recycling, re-commissioning or decommissioning of a product. Product development management applies the product development process of Rogers et al. (Rogers, 2004) to service industries. Finally, risk management was adopted from Christopher (Christopher, 2003), Juttner et al. (Juttner, 2003) and Tang (Tang, 2006). This process includes both the identification of risk factors as well as the management of the inherent risk though collaborative activities.

An application of this in a case test revealed that there were two main processes that were particularly important: information flow management and risk management. In particular, information flow management directly affects customer relationship management, while risk management is very much fueled by the network design. This yields to the need for better collaboration and long-term partnerships, impacting both customer relationship management and supplier relationship management.

4. CONCLUSION

There is much literature on SC operations and management, and while they differ in their scope, the majority of them agree that SC operations and processes include: sales, marketing, sourcing, manufacturing and transportation. Thus, if the “product” is actually an event, then some of these traditional SC operations, in particular, manufacturing and transportation, are not present in the traditional sense of the definition. New paradigms must be made in order to accommodate the prevalence of the services and its contribution to the GDP. Much work needs to be done in order to assure that these service industries are operating at an efficient level.

The attention paid to SC management over the last three decades which has allowed firms to grow from the starting point of functional independence to inter-organizational integration, as suggested by Stevens (Stevens, 1989). The last stage, suggested by Hewitt (Hewitt, 1994) integrates intra-company and inter-company management. This last stage is the epitome of optimal supply chain management and literature for manufacturing has reached that level. What is now needed is the translation of that optimization to the service industry.
Bibliography


