

Service Supply Chain Risk Management

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ABSTRACT

Services are increasing in importance in international business and understanding the characteristics of services in the supply chain context can provide crucial information for enabling efficient and effective implementation of risk management. Service literature has in general suggested that the distinctive nature of services—in contrast to products—can be connected to the so-called IHIP attributes (intangibility, heterogeneity, inseparability of production and consumption, and perishability). In this study, we utilize these attributes in the task of identifying the distinctive features and dynamics of service supply chains in a risk management context. The study provides an important, yet sparsely addressed, viewpoint of the supply chain risk management literature by illustrating the special characteristics of services in this context. We develop a conceptual framework and a set of propositions to highlight our arguments. The findings of the study suggest that service supply chain risk management requires special attention in terms of the IHIP attributes, which include issues the traditional supply chain risk management tools can easily miss. The presented viewpoint is a novel one and provides a new perspective to supply chain risk management theory by linking the service theories to supply chain risk management.

Keywords: *services, supply chain, risk management, IHIP attributes, nature*

1. INTRODUCTION

Despite the extensive attention received by traditional manufacturing supply chains, service supply chains remain less explored (e.g., Sampson & Spring, 2012; Niranjana & Weaver, 2011; Sengupta et al., 2006). Lately, some scholars have become aware of the situation and have called for more contributions in this area (e.g., Ellram et al., 2004; Demirkan & Cheng, 2008). The importance of services has increased during the last few decades, and the transfer from production-based to service-dominant value creation has emphasized the role of services in the global economy. For example, Spohrer (2010) estimates that the value produced by services will increase to close to 90% of the total value production in the U.S. by 2050. Considering that the figures were 84% in 2001 and less than 40% in 1950, this illustrates the growing importance of services to international trade. An understanding of how vulnerable the long and complex international service supply chains can be suggests the importance of proper risk management.

For example, in logistics services provision the amount of knowledge and information required to manage the

supply chains and risks involved can be daunting. Training a logistics manager to efficiently manage the operations can take up to two years (Vilko et al., 2012). Taking into account the complex logistics operations and constantly changing operational environment, it is no surprise that supply chain risk management has become one of the important areas of competitive advantage (Sheffi, 2005). Today, as organizations are increasingly extending their reach deeper into complex and dynamic service supply chains (Mena et al., 2012; Choi & Linton, 2011), they are expected to collectively manage the value provision. Indeed, inter-organizational relationships in supply chains have become increasingly important (Soosay et al., 2008). The level of logistics services provisions can determine whether the organization will retain its customers or even attract new ones (Oflač et al., 2012). Thus, information and knowledge play a crucial role in providing services (Kritchanchai, 2012). For example, in the case of supply chain problems, investor reactions can be significant, and in such cases shareholder value has been seen to drop by 10% on average (Handfield & McCormack, 2008; Hendricks & Singhal, 2009).

Although the importance of service supply chains has been identified and discussed by several scholars, the specifics of their management have been addressed by relatively few (e.g., Arlbjørn et al., 2011; Baltacioglu et al., 2007; Ellram et al., 2007). The current studies on service supply chains have, so far, focused mainly on applying the existing supply chain management models to the service context (e.g., Arlbjørn et al., 2011; Baltacioglu et al., 2007; Ellram et al., 2007; Miah et al. 2013), while only a few have developed new frameworks for service supply chain management (e.g., Ellram et al., 2004; Baltacioglu et al., 2007). In doing this, some scholars have noticed that the current supply chain management applications do not work well in service management. For example, Cook et al. (2002) identified that traditional supply chain management is not implicit to the service sector practitioners due to the lack of a systematic integration of supply chain functions.

Many studies consider risks to be the main reason why desired performance levels are not achieved in supply chains (e.g., Tummala & Schoenherr, 2011; Blackhurst et al., 2005; Swink & Zsidisin, 2006; Craighead et al., 2007; Hendricks et al., 2009). Overall, the understanding of risk management in supply chains is still in its infancy, and further information is needed to bring about understanding of the phenomenon. To address this gap in the current scientific discussion, this study aims to increase the understanding of

the distinctive features of service supply chain risk management by assessing the attributes distinguishing them from traditional supply chain risk management. In doing this, we build a conceptual framework for service supply chain risk management, which helps to grasp the issue from both theoretical and practitioner perspectives.

The paper begins by describing the related concepts of service supply chain risk management and its distinctive attributes. Next, the conceptual framework will illustrate the special features of service supply chains in terms of risk management. Finally, the fourth section will conclude the study with theoretical and practical implications, limitations, and suggestions for further research.

2. RISK MANAGEMENT IN SERVICE SUPPLY CHAINS

The second section of the study will present the theoretical foundation of the study by first illustrating an overview of traditional (production) supply chain risk management and then looking at service supply chain risk management and its distinctive attributes.

2.1 Supply Chain Risk Management

Supply chain risk management has been increasingly attracting attention from academic researchers. However, for the most part, the concepts are still under development, and many continue to be without a commonly accepted definition (Vilko et al., 2012).

In order to understand supply chain risk management, it is essential to understand the characteristics of risk. According to Waters (2007), risk in a supply chain is “a threat that something might occur to disrupt normal activities and stop things happening as planned.” A standard formula for (supply chain) risk is (Mitchell, 1995): $Risk = P(Loss) * I(Loss)$, where risk is defined as the probability (P) of loss and its significance (I).

While supply chain management is the function responsible for the transport and storage of materials on their journey from the original suppliers via intermediate operations to the final customers (Waters, 2007), supply chain risk management aims to identify the potential sources of risk and implement appropriate actions to avoid or contain supply chain vulnerability. Jüttner et al. (2003) define supply chain risk management as: “the identification and management of risks of the supply chain, through a coordinated approach amongst supply chain members, to reduce supply chain vulnerability as a whole.”

2.2 Service Supply Chain Risk Management

As mentioned, work on traditional supply chain management has dominated the academic literature as compared with work on service supply chains. The topic of service supply chains has received some attention regarding its management frameworks, and as a concept, service supply chain management has been defined to include the management of information, processes, capacity, service performance, and funds from the earliest supplier to the ultimate customer (e.g., Ellram et al., 2004; Baltacioglu et al., 2007). The benefits that service supply chain management provides can include, for example, better coordination of processes, improved performance through

process integration, and improvement of the customer interface (Giannakis, 2011).

According to Arlbjørn et al. (2011), it is important to differentiate the tasks in service supply chain management, which can be achieved through different types of relationships with customers as well as suppliers (Cho et al., 2012). Ellram et al. (2004) list seven theoretical processes of service supply chains, including: information flow; capacity and skills management; demand management; customer relationship management; supplier relationship management; service delivery management; and cash flow. In further developing the Ellram model, Baltacioglu et al. (2007) proposed a service supply chain framework with an application to the healthcare industry to include the following activities: demand management; capacity and resources management; customer relationship management; supplier relationship management; order process management; service performance management; and information and technology management.

More importantly for our case, even less work has been done to investigate service supply chain risk management. The very limited work conducted by academics aimed at understanding the special features of service supply chain risk management can be illustrated by Internet search results for the concept. A search conducted by the authors with Google Scholar for “service supply chain risk management” produced only five results, and Scopus returned no results. Considering that no proper definition of the concept has been developed and agreed upon, we utilize these existing definitions:

- 1) Services supply chain management: “Management of information, processes, capacity, service performance and funds from the earliest supplier to the ultimate customer” (Ellram et al., 2004).
- 2) Supply chain risk management: “The identification and management of risks of the supply chain, through a coordinated approach amongst supply chain members, to reduce supply chain vulnerability as a whole” (Jüttner et al., 2003).

Based on these definitions and the discussion so far, for the purposes of this study, we put forward our own definition of service supply chain risk management as follows:

Identification, analysis, and mitigation of risks in the service supply chain, involving the whole service supply chain system.

Our proposed definition takes into account the special systemic nature of service supply chains, where the customers’ roles should be considered (Maull et al., 2012) and the overall complexity is higher (Mena et al., 2013). We argue that these issues are integrally linked to the inherent intangibility of service supply chains and to other service specific features, which we will discuss in detail in the following section.

Table 1 summarizes the discussion thus far, and categorizes the differences between traditional production supply chain risk management and service supply chain risk management. We highlight the contrast between risk management emphasis, key risk management inputs and key risk management activities regarding these two supply chain types. The key insight here is that service supply chain risk management is a systemic, rather than purely systematic

activity. This means that service supply chain risk management must deal with intangible, highly interdependent supply chain elements, which requires more intuitive and proactive approach to risk identification, analysis and control (using the categories of e.g. Waters, 2007; Vilko, 2012). Based on this preliminary insight, we will build a service-supply-chain specific perspective to risk management.

Table 1. Contrasting Traditional (Product) Supply Chains and Service Supply Chains

	<i>Traditional production supply chain</i>	<i>Service supply chain</i>
Risk management emphasis	Tangible, potentially separable supply chains; emphasis on pre-risk-event activities	Intangible, highly interdependent, multi-actor supply chains; emphasis on real-time and activities
Key risk management inputs	Information; systematic process understanding	Knowledge; systemic process understanding
Key risk management activities	Hierarchical, statistical approach to risk identification, analysis and control	Intuitive and proactive approach to risk identification, analysis and control

2.3 IHIP Attributes and Service Supply Chain Risk Management

To gain insight into the distinctive features of service supply chain risk management, we refer to the classic IHIP discussion related to services. Service literature has suggested that the distinctive nature of services—in contrast to products—can be connected to the so-called IHIP attributes (intangibility, heterogeneity, inseparability of production and consumption, and perishability) (e.g., Zeithaml et al., 1985; Fitzsimmons & Fitzsimmons, 2000; Nijssen et al., 2006). Some criticism and debate has been posed towards the generic IHIP attributes, mainly because all services can be claimed to be as different from each other as they are from products (see Lovelock & Gummesson, 2004; Homburg & Fuerst, 2005). However, for the sake of argument and simplicity, we use these attributes in building a conceptual model for service supply chain risk management.

The first distinctive attribute in services is intangibility, which refers to the fact that services do not need to have a physical existence at all (Flipo, 1988; Zeithaml & Bitner, 1996; Bebko, 2000; Grönroos, 2000). The service-delivery process can include tangible elements (as in airlines and hotels), while other services, especially knowledge based ones such as consulting and teaching, are completely intangible (Flipo, 1988; Ritala et al., 2013). This is also reflected in how service-oriented firms utilize many more intangible resources than product-oriented firms (Kianto et al., 2010), and in the fact that their key assets are the diverse expertise among service personnel and decision makers (Von Nordenflycht, 2010; Jansen et al., 2011). Therefore, both the inputs and outputs of service firms and service supply chains can be considered more intangible than in the case of product-oriented firms and supply chains.

The second attribute which distinguishes services from products is heterogeneity, which shows in both service

processes between different firms, and in the variation in the service personnel, customers, and customer needs (Edvardsson et al., 2005). In fact, it has been traditionally suggested that service industries are always quite different from each other due to the inherent heterogeneity issues (Lovelock, 1983; Silvestro et al., 1992). Therefore, in service supply chains both the individual actors (and their personnel) as well as the supply chain processes are much more heterogeneous than in product-dominated supply chains. This means that there are no standard inputs or outputs in the supply chain, and therefore, there is major variance in terms of quality, risks, and management processes in general. The higher the number of actors throughout the service supply system, the greater such heterogeneity becomes since there are not only heterogeneous actors, but also more idiosyncratic linkages between them.

The third distinctive service attribute is inseparability, which refers to the fact that in services, consumption and production take place at the same time due to the dynamic and activity-based nature of services (Edvardsson et al., 2005). Thus, there is a need for collaboration between the provider and the customer in all services, at least to some extent (Tether & Hipp, 2002; Edvardsson et al., 2005). In the service and marketing literature, this has been taken into account in an accumulating discussion on co-creation, which refers to the interactive, joint-value creation between customers and providers (Bettencourt et al., 2002; Vargo & Lusch, 2008; Grönroos & Ravald, 2011). Furthermore, the more knowledge-intensive and complex the services are, the greater the need is for co-creation to take place (Jaakkola & Halinen, 2006; Ritala et al., 2013). In the service supply chain context, the analysis should take into account the multi-actor value creation system, where co-creation takes place between customers, providers, and third-party actors such as logistics operators (Maull et al., 2012; Oflaç et al., 2012; Mena et al., 2013).

The final generic attribute is perishability. It refers to the fact that services are time dependent (Zeithaml et al., 1985; Onkvisit & Shaw, 1991; Grönroos, 2000) and cannot therefore be stored in inventories for later use in a similar sense to products. From a customer perspective, however, service value can be stored in terms of, for example, experiences and other types of value (e.g., Vargo & Lusch, 2004; Edvardsson et al., 2005). This should be recognized in service supply chains, where the customer perspective is highlighted (Ellram et al., 2004). However, perishability remains a relevant issue, especially from a risk management perspective. This is because both information and the services themselves are perishable, since knowledge regarding, for example, the operational environment of the service supply chain, is constantly changing and is context- and actor-dependent. This raises challenges in managing and mitigating service supply chain risks.

3. CONCEPTUAL FRAMEWORK OF SERVICE SUPPLY CHAIN RISK MANAGEMENT

In their study, de Waart and Kemper (2004) highlight the lack of understanding about service supply chains as one of the key issues to master to be able to successfully manage

service supply chains. To this end, understanding the core processes' effects on the overall service supply chain performance is essential (de Waart & Kemper, 2004). Indeed, without understanding the processes, it is practically impossible to understand the risks involved. However, most of the studies focus on the service-oriented manufacturing supply chain, where the nature of services is typically not fully taken into account. Thus, in order to better distinguish the key features regarding the sources and nature of risks in service supply chains we will develop a framework combining the specific features of service production and

supply chain risk management (Table 2). To this end, we utilize the discussion in the earlier section about the IHIP attributes of services.

In order to gain a holistic view of the service supply chain, the analysis of the risk features is conducted from three perspectives: service process, service offering, and service system. These correspond to the often used levels of analysis in supply chain management in general, regarding activities/individual risks, actors, and the overall supply chain system (see Jüttner et al., 2003).

Table 2. Key Risk Features in Service Supply Chains

	<i>Intangibility</i>	<i>Heterogeneity</i>	<i>Inseparability</i>	<i>Perishability</i>
Service process (supply chain activity)	Activities utilizing knowledge and information	Heterogeneity in risks related to unique service activities	Service value co-creation processes taking place in the customer interface	The unique, non-repeatable, and time-dependent nature of the process
Service offering (supply chain actor)	Intangibility and ambiguity of service offering	Heterogeneity of risks related to the unique service offerings	Customer-specific offerings and value co-creation	The non-standardizable nature of service offerings
Service system (supply chain/network)	Combined risks of the network due to intangible nature of interlinkages	Heterogeneity of risks related to the network actors, processes, and their inter-linkages	Co-creation complexity in multi-actor service supply chains	The perishability of the value creation at the service system level

The service process level becomes important in terms of managing the risks involved in service supply chains. When considering the service activity and the interactions, the risks involved can escalate further to the offering and network levels. Therefore, to manage risks in service supply chains, the risks in the process level have to be identified, analyzed, and controlled, but also the larger context of service offering and service system must be taken into account.

When considering, for example, elevator maintenance, the specific features of services should be taken into account in the supply chain risk management at the process, offering, and system levels. At the process level, the maintenance activity itself takes place within a certain time, place, and context, which has unique customer value implications for a specific customer (see e.g., Rintamäki et al., 2007), and which poses a challenge for risk management. At the offering level, this shows in the non-standardized nature of service supply chain risk management, which goes against the traditional top-down risk management approach in manufacturing. Thus, at the offering level, the risk management should identify and analyze the heterogeneity, customer-specificity, and the potential ambiguity of how customer value is created. The risks are not as easily quantifiable and assessable, which calls for more context- and contingency-dependent understanding and sharing of risk-related knowledge with different stakeholders (see e.g., Vilko et al., 2012). This approach is also important for the risk management at the service system level, where the service value is co-created in interactions between different stakeholders (Bettencourt et al., 2002). In elevator maintenance services, the system can include the customers (e.g., housing companies), the end users (individuals using elevators), the maintenance service firm (outsourced maintenance company, e.g., a small firm), the manufacturer of the elevators, as well as the second-tier actors such as electricity distributors, infrastructure operators, and so on. From a risk management perspective, this calls for a holistic

and coherent approach towards the customer, taking into account the intangible nature of a system's linkages, the heterogeneity of the actors and their processes, and the complexity and uniqueness (perishability) of the service offering.

The above-mentioned example is quite analogous to other service industries as well, at least from risk management perspective. For example, in logistics industry the IHIP features of services make the process of risk management a systemic phenomenon with specific implications for its effectiveness. Intangibility means that concrete, hierarchical tools for risk management are not as useful, but it is required to understand the underlying principles of how logistic service-related knowledge is shared and created in the multi-actor service supply chain. Heterogeneity means that different logistics customers have extremely varied needs and processes, and thus the risks are also widely dispersed. Inseparability in logistics services means that service offering execution takes place at the same time as the possible risks and their management. This requires a real-time approach – rather than only pre-planned one – to be effective. Perishability in logistics services means that each service encounter is potentially unique and therefore risk management should develop flexible heuristics-type approaches rather than standardized ones.

Based on the discussion so far, we suggest a set of propositions regarding service supply chain risk management effectiveness in connection to each IHIP feature.

Proposition 1: *Intangibility as a risk feature of service supply chains requires intuitive, knowledge-based approach to risk management activities*

Proposition 2: *Heterogeneity as a risk feature of service supply chains requires unique, customer-specific approach to risk management activities*

Proposition 3: *Inseparability as a risk feature of service supply chains requires simultaneous, real-time execution of risk management activities, namely risk identification, analysis and control*

Proposition 4: *Perishability as a risk feature of service supply chains requires flexible, heuristics-type approaches to risk management activities, rather than standardized ones*

4. CONCLUSIONS

Services are becoming an increasing proportion of supply chain operations. The aim of service supply chain risk management is to holistically mitigate the risks to the supply chain. Although it has been acknowledged that the traditional supply chain management literature has not been able to answer the challenges regarding service supply chain management, the current literature still lacks clear definitions of the special attributes that distinguish service supply chains from traditional manufacturing supply chains. In fact, there is very little research focused explicitly on this area, as the literature has mainly discussed supply chain risk management from the product- or provider-oriented perspective (e.g., de Waart & Kemper, 2004; Ellram, 2007; Arlbjørn et al., 2011). Thus, the aim of this paper was to instigate a conceptual discussion for the development of service supply chain risk management. We argue that as services are different from products, the approach to risk management should differ as well.

We have proposed an analytical framework for key risk features in service supply chains and a related set of propositions. In doing this, we have combined the literature from various disciplines, including supply chain risk management (Jüttner et al., 2003; Ellram et al., 2004), logistics (Leuschner et al., 2013; Oflaç et al., 2012), and services management and marketing (e.g., Grönroos, 2000; Edvardsson et al., 2005; Jaakkola & Halinen, 2006; Ritala et al., 2013).

4.1 Theoretical Implications

The theoretical contribution of this study can be considered twofold. First, service supply chain risk management should be understood at different levels (process, offering, and system) in order to better take into account the risks that can hinder the successful delivery of the services. Because the operations of service supply chains are more interlinked than those in the traditional supply chain, the risks can more easily affect more than one level of the service system. For example, some operational risks may be more damaging to the service supply chain because of the inability to store services.

Second, our recognition regarding IHIP attributes provides the initial idea of the distinctiveness of service supply chain risk management decision making. Previous studies in the field (e.g., de Waart & Kemper, 2004; Ellram, 2007) have highlighted the need for a better understanding of service supply chains in order to better manage them. This study addresses this gap in the literature by illustrating the special features of services as they relate to supply chain risk management. This understanding can be further used in conceptual and empirical analyses of risk management in service supply chains.

The two above-mentioned implications highlight the need to develop new academic and practical approaches to service supply chain risk management. Traditional risk management models with risk calculated according to the probability and impact (e.g. Norrman & Lindroth, 2002) do not work as well in the service supply chain context. In this study, we have formulated a set of preliminary propositions for the effectiveness implications of service supply chain risk management using IHIP features, and we believe that this can be helpful in future efforts of risk management tool development and instigating further scholarly discussion on the topic.

4.2 Practical Implications

The results of this study enhance the practitioner's understanding about the nature of the service supply chain by describing the attributes of service supply chains. Furthermore, by using the developed framework in decision making and risk analysis, practitioners are able to focus their efforts more accurately, and are thus able to build better performance and resilience into service supply chains. In addition, the distinction between service process, offering, and system can help practitioners to better identify and analyze risks in relation to customer value creation and the stakeholders involved.

4.3 Limitations and Suggestions for Future Research

The most obvious limitation is in the conceptual nature of the study. There is a need for empirical studies, as well as for the further refinement of the framework from several viewpoints. For instance, one approach could be the utilization of identified risk features in building a larger theoretical and practical model for service supply chain risk management. In addition, the empirical studies could test the impact and level of the proposed risk features in different contexts with both qualitative and quantitative approaches.

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