

# ACTOR ROLES IN MANAGING SERVICE VALUE RISK IN MULTIMODAL SUPPLY CHAINS

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## **Introduction**

The dominant role of services in value produced in the global economy has raised the attention both the managers as well as the academics. The estimates of services in the US which state that the value produced by alone services will increase to close to 90 per cent of the total value production in the USA by 2050. Historically, the value has increased from the less than 40 per cent of the 1950 to the 84 per cent in the 2001, and the development seems to follow still similar trend (Spohrer, 2010). Although the value of services have been a popular topic in the scientific literature for several decades studying the value of them has mainly concentrated on macro level economies or organizational and process level while the network perspective has received only limited attention.

When considering the network perspective and supply chain studies, it becomes obvious that the focus in the previous literature has mainly been on traditional manufacturing rather than services. Indeed, several authors have identified this gap and also discussed about the differing natures between products and services (e.g. Vilko and Ritala, 2014; Sampson and Spring, 2012; Niranja and Weaver, 2011; Sengupta et al., 2006). The calls for more research starting from a decade ago have however received only little attention when comparing to the extensity of the traditional manufacturing supply chains research (e.g. Ellram et al., 2004; Demirkan and Cheng, 2008).

Risks have increased in the international supply chains and supply chain disruptions have become a critical issue for many companies. As logistic operations are getting divided between an increasing number of operators, organizational responsibilities relating to risk management are becoming hazier. The ability to identify risks decreases as the visibility of the supply chain diminishes beyond the organization's own functions. The risks and their visibility and impact depend on the position of the companies in the supply chain and on the level of analysis they are able to carry out. Events that affect one supply chain entity or process may interrupt the operations of other supply chain members. In a service value network this means that the right connections must work in risk event to ensure the undisrupted production of value to the customer.

On the other hand the demands for service value are increasing. In logistics for example the demands for better transportation performance, higher on-time delivery performance, and reduced damage-in-transit, require a high level of flexibility and ability to adapt to changes. Considering that the functions in the service supply chains are also highly dispersed among outside service providers, companies' dependency on the right network connections is crucial. A good example of how vulnerable the value provision in supply chains can be seen from the study of Hencricks et al. (2009) where companies admitting to major supply-chain difficulties lost 10 percent of their shareholder value on average.

Yet, little research about the customer value creation have been done from the risk management perspective. Especially the supply network perspective in managing the vulnerability of customer value has been neglected. Therefore, the purpose of this study is to analyze the value production process of logistics service sales from network perspective. A network analysis is conducted to illustrate the relationships and roles of different actors in logistics service network. The study is based on the existing literature on supply chain risk management and the findings of case study of a newly launched logistics services sales process.

The paper begins by describing the concepts of supply chain risk management. Next, the empirical part of the study is introduced by describing the study methods and the process of the case supply chain. Thereafter, the case network analysis between supply chain actors presented and finally the results are discussed in the conclusions.

## **Theory**

### *Service value in supply chains*

Logistics companies have become increasingly concerned about the value that the offered service brings to the customer. While the importance of recognizing the attributes related to logistics service value have been discussed in the scientific literature for two decades (e.g. Mentzer et al. 1997), the network perspective of the value creation has been received attention only more recently (e.g. Yazdanparast et al. 2010; Lusch et al. 2010). Nowadays, managers and scholars have woken to the issues related to the complexity of networked value production. Basole and Rouse, (2008) defined the service value networks to comprise from consumers, service providers, multi-tier and auxiliary enablers.

Indeed, the network perspective of is identified as one of the most challenging aspects to service systems (Basole and Rouse, 2008). The recent contributions in logistics field, scholar have presented visions of the service value networks (see e.g. Bose et al. 2014), links to the know philosophies and measurements of service value to logistics (see. e.g. Chao and Anantana, 2014).

### *Service supply chain risk management*

The research on traditional manufacturing is well represented in the current supply chain risk management literature whereas the work on services is still quite sparse. The limited amount of work that considers the service nature of supply chains has defined service supply chain management 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 management models used for traditional manufacturing supply chains do not necessarily work well on services. More importantly for our case, even less work has been done to investigate service supply chain risk management.

Previously, studies have concentrated mainly on product-based manufacturing supply chain (Chen et al. 2013). 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), 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.

The benefits of taking into special nature services have been argued to provide, for example, better coordination of processes, improved performance through process integration and improvement of the customer interface (Giannakis, 2011). Considering the distinctive attributes of services, namely intangibility, heterogeneity, inseparability of production and consumption, and perishability (see e.g. Vilko & Ritala, 2014, Zeithaml et al., 1985; Fitzsimmons & Fitzsimmons, 2000; Nijssen et al., 2006) it is no wonder that scholars have highlighted the importance of differentiating the tasks in service supply chain management (Arlbjørn et al. 2011). According to Cho et al. (2012) this can be done through different types of relationships between the supply chain actors.

## **Research design**

The qualitative and explorative case research approach was considered appropriate to gain theoretical and empirical insight into the topic because it had received only limited research attention in the past (Yin, 2008). The case study form was considered well-founded in serving the information-oriented focus of the research and discovering causalities of the phenomenon (Yin, 2008, Jensen and Rodgers, 2001).

### Research Process and Data Collection

The empirical part of the study is based on the empirical data mainly received from the interviews and the questionnaire posted. The experience and insights of the executive and managerial level informants were utilized to build up the case study process and secondly to identify the relevant actor roles in creating customer value in the service network. The knowledge of the informants was considered essential in order to make in-depth sense of the phenomena (Eisenhardt, 1989), as the experiences and first-hand knowledge of the value creation in the case were the base for the study. The informants interviewed were selected on the basis that they would have the best knowledge about their organization and value network.

The interviews were analysed by researchers from two different disciplines, namely economics, and industrial engineering. As a conclusion a process map of the value chain process was build and the most essential actors of the value network identified. The accuracy of the researcher analysis conclusions were verified with the informants. After identifying the roles and the value process a network analysis based on questionnaire to the most essential actors were posted. An email request to participate on electronic survey was send to ten actors (i.e. data from customer viewpoint was not collected even if the relationship to customer was evaluated from company actor to customer point of view). By the end of data collection period, six out of ten actors answered, resulting 60 percent response rate. The research process is illustrated in Figure 1.

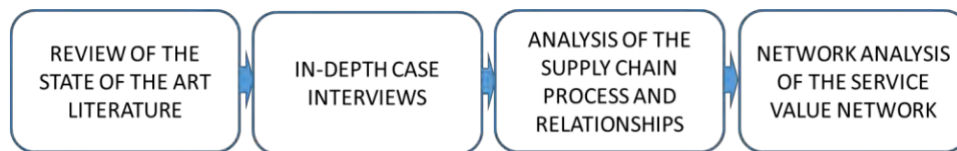


Figure 1 Research process

The main goal of this case study was to describe and compare the importance of communication between known actors in a multimodal supply chain during the normal and risk situations. Each network node is referring to an individual person which are having different roles and hierarchical status within the network. In this study we are especially interested on individual actors role regardless their formal hierarchical status. By utilizing social network analysis (SNA) method (Wasserman and Faust 1994), each actor within our case company example was asked to evaluate the perceived importance of communication between other known actors in the network. The proper selection of network questions and scale is a critical success factor to all network studies (Borgatti et al. 2013, p. 45).

To amplify the importance differences with the network of actors, the perceived importance of communication was measured similarly to Six Sigma approach. More precisely the connection importance scale ranged from 0 to 9 where 0 denotes not relevant connection, 1 denotes a weak connection, 3 denotes a somewhat important connection and 9 denoted highly important connection.

To avoid recall errors (Johnson et al. 2003), the closed-ended question format was used and a roster of actors was presented to respondents, asking them to evaluate the other supply chain actors with the respect of their importance on communication issues. The roster of actors included eleven individual actors and seven different roles. Although some of the actors had similar job title such as product captain, their actual job description and formal status with the organization hierarchy was varying as presented in Table 1.

Table 1 Descriptive profile of network actors

Actor	Code	Role in case process	Hierarchical status	Response
Product Captain 1	PC 1	Sales director	Member of management team	Yes
Product Captain 2	PC 2	Technical support	Operative	No
Product Captain 3	PC 3	Freight manager	Member of the extended	Yes

3			management team	
Product Captain 4	PC 4	Technical support	Operative	Yes
Product and Freight Manager	PFM	Regional manager	Regional management of services	No
Product Manager	PM	Customer information manager	Operational	Yes
Sales Manager 1	SM 1	Sales	Operational	Yes
Sales Manager 2	SM 2	Sales	Operational	No
Key Account Manager	KAM	Sales	Operational	No
Manager NBSS	M NBSS	Customer solutions manager	Member of the extended management team	Yes
Customer	C	Service purchaser		No

### Analysis and Results

#### Overview of the case process

The analysis for the study was conducted in two separate phases: First, the network process was discovered, recorded and verified based on the personal interviews. The process revealed the organizations customer interface to occur with three different methods, namely telephone, Internet and email. While this case concentrated on the on the logistics services sales process through the organizations newly launched Internet platform also the email and telephone connections played an important role – especially in the events of risk realization. The case process is illustrated below.

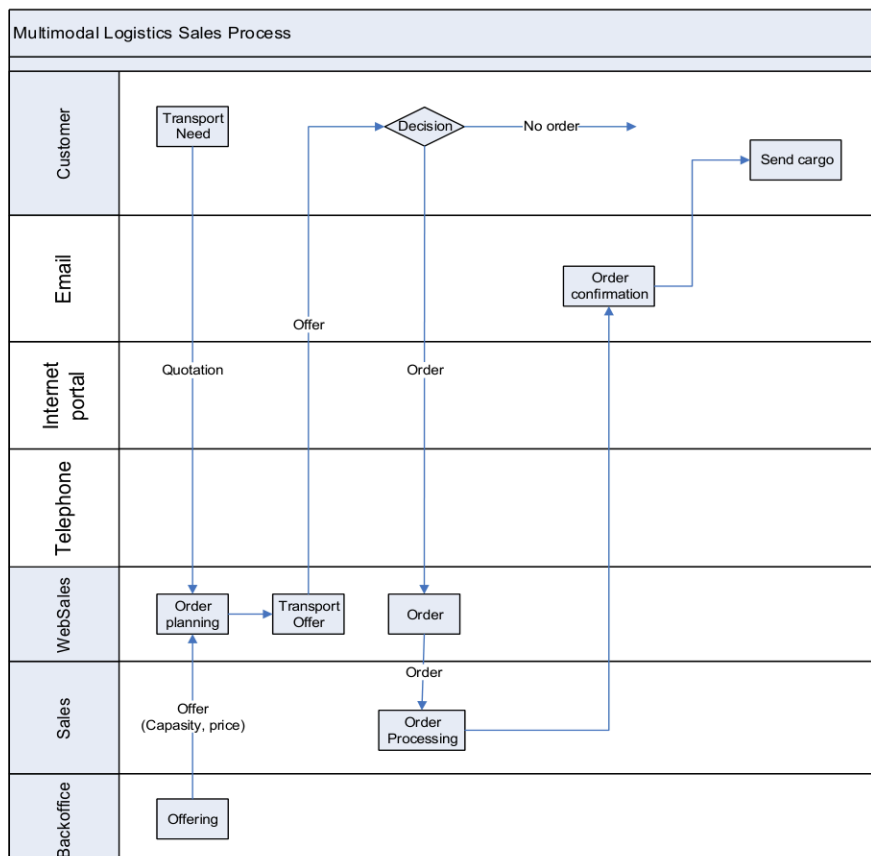


Figure 2 Value chain process

#### Service value network connections analysis

Based on the survey instrument results, the connections between the actors were analysed in two different occasions. Firstly, a normal value creation scenario was used where the actors evaluated the importance of their connections within the network. The results of the analysis are shown in Table 2. The table role codes are presented in Table 1 previously. The analysis

revealed that the actors had clear differences in how they saw the importance of the network connections. The right hand column of the table illustrate the average result of how the respondents evaluated the importance of their own connections to the network, whereas the last row of the table illustrates the importance evaluated by other actors in the network of the connection to the respondent. For example, considering the role of M NBSS, the connections of his position to the network seem relatively important (6.1 / 18.2% of the six respondents) whereas the other respondents evaluate the connection with the role of M NBSS as clearly less important (3.4 / 5.1 % of the eleven roles)

Table 2 Importance of service value network connections in normal situation

	PC 1	PC 2	PC 3	PC 4	PFM	PM	SM 1	SM 2	KAM	M NBSS	C	AVG	%
PC 1	0	1	9	1	9	3	9	9	9	1	9	6	17.9
PC 3	9	9	0	9	9	3	9	9	3	3	9	7.2	21.5
PC 4	9	3	9	0	9	3	9	0	0	3	3	4.8	14.3
PM	3	3	3	3	1	0	9	9	9	9	3	5.2	15.5
SM 1	9	3	9	3	3	3	0	1	1	1	9	4.2	12.5
M NBSS	9	9	9	9	3	3	9	0	1	0	9	6.1	18.2
AVG	7.8	5.6	7.8	5	6.8	3	9	5.6	4.6	3.4	8.4		
%	11.6	8.4	11.6	7.5	10.1	4.5	13.4	8.4	6.9	5.1	12.5	100	

In the second connection analysis we concentrate on the event of risk realization in the service value network process (see Table 3). Overall the important connections in the network lessen. This can be seen for example in the number of the connections that the respondents considered as highly important. Overall the network structure seems to change to a bit denser form as some of the connections lose their importance. Overall it can be noticed that even though the network connections importance lessens cumulatively, some of the network roles see the importance of the connections growing.

Table 3 Importance of service value network connection in risk events

	PC 1	PC 2	PC 3	PC 4	PFM	PM	SM 1	SM 2	KAM	M NBSS	C	AVG	%
PC 1	0	4	9	4	3	3	3	3	3	4	3	3.9	13.1
PC 3	9	5	0	7	9	2	3	3	3	2	9	5.2	17.5
PC 4	3	3	9	0	9	1	7	0	0	2	3	3.7	12.5
PM	5	5	5	5	1	0	9	9	9	9	3	6	20.2
SM 1	9	3	9	3	2	3	0	1	2	1	9	4.2	14.1
M NBSS	9	9	9	9	9	3	7	0	3	0	9	6.7	22.6
AVG	7	5.8	8.2	5.6	6.6	2.4	5.8	3.2	4	3.6	7.2		
%	11.8	9.6	13.8	9.3	11.1	4.3	9.9	5.4	6.7	6.2	12	100	

To better illustrate the difference between the connections in Table 2 and 3, Table 4 was created. It illustrates well the changes between individual connections. It is important to notice that the table does not distinguish if direction of the change in the importance, but only the change in strength. It can be noticed that for example in the role of PC 1's connections importance lessens for most of the other roles while to PC3 and to PM they remain as equally

important compared to the normal value production. Also the difference of perspective is clearly visible in the differences of role PC 3: Where PC 3 sees the importance of his connections weakening other actors of the network do not report a great difference in their connections to PC 3.

Table 4 Importance of service value network connection in risk events

	PC 1	PC 2	PC 3	PC 4	PFM	PM	SM 1	SM 2	KAM	M NBSS	C	AVG	%
PC 1	0	3	0	3	6	0	6	6	6	3	6	39	43.3
PC 3	0	4	0	2	0	1	6	6	0	1	0	20	22.2
PC 4	6	0	0	0	0	2	2	0	0	1	0	11	12.2
PM	2	2	2	2	0	0	0	0	0	0	0	8	8.9
SM 1	0	0	0	0	1	0	0	0	1	0	0	2	2.2
M NBSS	0	0	0	0	6	0	2	0	2	0	0	10	11.1
AVG	8	9	2	7	13	3	16	12	9	5	6		
%	8.9	10.0	2.2	7.8	14.4	3.3	17.8	13.3	10.0	5.6	6.7	100	

#### Social Network Analysis

The second part of the connections analysis included the illustrative social network mapping. A visual presentation of the network connections was considered a good way to illustrate the dynamics of the network connections.

Due to the fact that the response rate of the questionnaire data was 60%, we had to carry out some special measures to improve the quality of the results. More precisely, missing data creates a row of missing values in the network adjacency matrix. This is a problem when illustrating the connections between network actors. Many SNA procedures which are derived from graph-theory are treating the missing values as non-ties, which is an incorrect interpretation (Borgatti et al. 2013, p. 73). In SNA methodology there are multiple options to manipulate missing data including deleting those node altogether from analysis, and filling the missing row data from corresponding column when possible. The dichotomizing and symmetrizing of data process was utilized (Borgatti et al. 2013, p. 77).

In this study we are focusing only the most important communication relationships. Therefore, the normal and risk matrixes were first dichotomizing by setting threshold value to 9 (Highly important connection). All the cells that passed the threshold value were set to 1 indicating relationship between actors, while setting the remaining cells to 0 (i.e. no relationship). Next, the both matrixes were symmetrized by utilizing union rule and taking the larger of the two entries. This procedure helps to fill out some of the missing data by assuming that all ties reciprocated and undirected. An illustration how the network connection changes between a risk situation and in a normal situation and in case of a risk event can be seen from the Figure 3. Those actor's nodes who responded to our survey, are indicated by gray colored square, whereas non-responded actor nodes are indicated by red colored triangles. The black and blue lines are the connections in a normal situation, while the blue and red lines are those in a risk situations (connections dynamics are the black and red lines).

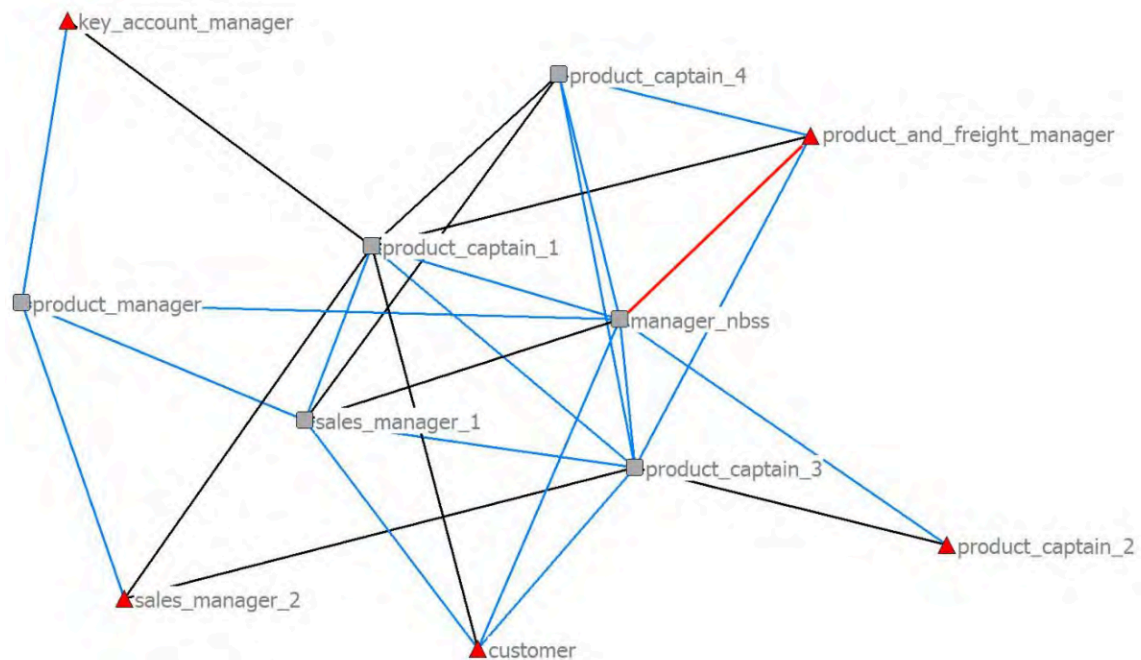


Figure 3 Normal and Risk situation relationships

When normal and risk management networks are compared, it appears that in risk management situations, some of the actors are decreasing their communication relationships whereas some are keeping all their relationships. For example product captain 1 who is a sales director and a member of management team, is reducing his/hers connection from 8 to 3. Instead manager nbss who is a member of extended management team and responsible for customer solutions and systems, is keeping all his/hers relationships (red line in the Figure).

### Discussions and conclusions

Service value networks' profitability depends on its actors' collaborative ability to identify and mitigate the risks that they face. The more the complexity of the network increases, the more they require to identify the relevant connections between the roles to ensure an undisrupted flow of value (Mentzer 2001). Although the awareness of supply chain vulnerability and risk management has increased among practitioners during the last decades, many of related concepts are still in their infancy and there is a lack of conceptual frameworks and empirical findings to provide a clear meaning of the phenomenon of supply chain risk management (Jüttner 2005; Manuj & Mentzer 2008). In their studies Harland et al. (2003) came to the conclusion that in the supply chains examined, less than 50% of the risk was visible to the focal company.

In this paper, we analysed the logistics service value network process and the connections of its actors. More precisely, we analysed the logistics sales processes in two scenarios, namely in a normal situation where the service value is being delivered and in an event of risk realization. The main aim of the study was to provide new insights to the logistics services from both the value provision perspective as well as from the value vulnerability perspective in terms of the actor role connectivity. The study has both theoretical and managerial implications which are discussed below.

#### *The theoretical implications*

The theoretical implications of this study can be considered threefold. Firstly, the service supply chain management should be understood as a network which both creates and protects the value. While most of the academic studies encompassing service value have so far failed to take into account the inherent vulnerability of the value, this study takes more holistic approach to value production by looking both the production and protection of the value. Because services are by their nature more challenging to manage compared to traditional products the understanding of the vulnerability aspects is essential.

Secondly, our research takes into account network nature of service system and helps to form a comprehensive picture about the links which are essential in different levels in both creating the value and managing the risk against it. Scholars have found social network analysis to be an appropriate way to investigate supply chains (e.g. Borgatti and Li, 2009, Kim et al. 2011), however it is still little used for studying the formation or protection of value in service supply chains. The method seemed to work well for studying the network nature in different levels and thus our study confirms the results of earlier studies and further adds that it works well in studying different scenarios and aspects.

Finally, the results of this study imply that different network members have different opinions about the importance of their connections. As such this confirms the results of previous network analysis research, however, discovering the causalities behind these differences should be further investigated in the future research.

#### *Managerial implications*

The results of this study enhance the practitioners' awareness on the nature of connectivity that is needed in the service networks in order to ensure the delivery of value. The results of the study reveal that in a risk situations, the connection priorities change and number of the most important connections is reduced. By taking this into account the service network connections practitioners can improve understanding of what is required to manage the value in the service networks in the most efficient way.

#### *Limitations and future research*

This study has obvious limitations due to its case research design. Further research is needed to develop explicit methods for analyzing the causalities behind the phenomenon. The fact that the empirical part of the study relies on the two informants' interviews and that the SNA questionnaire had 60% response rate do oppose some limitations in terms of generalizability and furthermore includes risks in misjudging the representativeness of the case. Future research should be conducted with more complete data in different cases in order to gain more evidence on the phenomenon.

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