



SUSTAINABILITY AND SUPPLY CHAIN MANAGEMENT: HEALTH CARE SECTOR

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ABSTRACT

Supply chain management has proven effective in other industries; but healthcare has found its adoption to be challenging and the reason behind it can largely be attributed to the level of complexity involved in the network. 'Complexity' has become a dominant feature of the today's supply chain management field, thereby making complexity management a key area of managerial consideration. This paper, in the context of hospital supply chain network, conceptualizes complexity dimensions as quality of relationship, volume and frequency of interactions in the network, number of elements, degree of differentiation among the actors in the network, and extent of interrelationships among network elements. The study investigates the influence of hospital supply-base complexity and customer-base complexity on key Supply Chain Practices (SCPs) using Prahalad and Ramaswamy's (2004) Dialogue-Access-Risk Benefits-Transparency (DART) framework, linking it to dynamic capabilities literature from the value co-creation perspective, using the Service-Dominant Logic (SDL) lens.

INTRODUCTION

'Complexity' has become a dominant feature in the today's supply chain management field. Complexity no longer remains a novel stumbling block, as the supply chain managers, irrespective of their sectors, are facing it increasingly. So understanding the nature and source of the complexity has become very important for the managers, so as to aptly find the means to manage and contain complexity. With the enhancement in technology and sector competitiveness, complexity seems to be ever spiraling up across sectors, and healthcare happens to be one of them. Under the said presence of complexity, decision if and when taken with noncomplex assumptions pose threat to business and thus reiterates the need for understanding the nature and source of complexity for assuring streamlined operations.

The conceptualization of this paper is done in the perspective of the hospital supply chain with the healthcare service provider, i.e., the hospital as the focal entity and its upstream suppliers representing the supply base and downstream customer base represented by the physicians who are representatives of the patients and have immense role in the medication-related orders and in deciding

patient's needs. The hospitals engage in supply relationships with a varied number of suppliers for different hospital supplies (devices, pharmaceutical drugs and products, medical-surgical items, etc.) and thus often induce different working relationships with and among the suppliers. Thus, the healthcare (hospital) supply network offers a plethora of complex interconnections with suppliers and the physicians. Moreover, there has been an increasing trend in the outsourcing activities across sectors and healthcare is no exception, where outsourcing activities are gaining prevalence.

OBJECTIVES

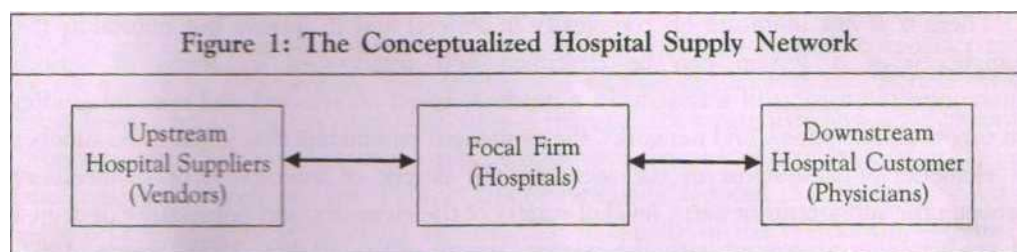
The objectives of this paper are:

first, conceptualizing the complexity dimensions which describe and represent the hospital network environment; specific attention is given to carefully choose the dimensions that are common to both the supply chain's upstream and downstream segments involving its supplier-base (portion of the supply network within managerial purview of the focal firm) and customer-base (portion of the upstream network within managerial purview).

Second, the paper aims at understanding how the conceptualized complexity in the healthcare environment (hospital) influences or rather drives the DART SCPs. These DART SCPs are the generic key upstream and downstream SCPs that fit the connotations of DART framework.

Third, the paper aims at rationally arguing through the existing literature, leading to establishing the proposition linking DART SCPs to the firm's dynamic capability.

The conceptualized hospital supply network that is relevant to this study is



Understanding Complexity

The concept of complexity bears its root to the system's concepts that are difficult to understand, analyze and hence difficult to predict or control. The definition of complexity can be said to be tied deeply and inherently to the details and boundary of the system in discussion. So, at the very first instance, specifying the system's boundaries and justifying it as a complex system becomes the priority before conceptualizing complexity in that perspective. Various studies have highlighted supply chain complexity as a key managerial issue and primary construct linked to performance, justifying its immense relevance in supply chain management .

Conceptualizing Complexity

Different studies in supply chain complexity literature conceptualized complexity in terms of various parameters from generic viewpoint. However, the choice of parameters in this paper is based on specific objectives. The parameters are chosen carefully based on the common relevance, appropriate to the healthcare domain and effective in the hospital supply chain perspective, both along the upstream supplier-base and downstream customer-base.

In the hospital perspective, on the one hand, the hospital supply network managers have to deal with various suppliers supporting various relationship patterns (characterized by different levels of information sharing, frequency of interaction and collaborative linkages), while on the other hand, they also have to deal with the customers (physicians who represent the patients' needs) with different levels of attachment to the specific hospital (may be an in-house physician dedicated to that hospital or a visiting physician) and with different levels of involvement (highly involved in the hospitals purchase and quality' planning or may be working as an independent physician as per the available hospital resources). Thus, the relationship with these distinct yet integral sets of network actors poses a dynamic and challenging situation which contributes to the understanding and conceptualization of complexity in the hospital's network environment.

There is a vast literature on complexity in general and it appears but natural as the complexity of a system can be described and intertwined in terms of various interconnected aspects of a system. In a nutshell, based on selected and relevant studies on supply chain systems and networks, the prominent parameters that surface are: number of elements or subsystems in the scenario, the degree of interaction or connectivity between the subsystems or parts, level of variety of the elements, and uncertainty or degree of predictability associated with the system,. Here, we however focus on highlighting and relevantly linking those parameters essential to justify our standpoint and support our propositions.

Number of Elements or Subsystems

The number of elements or subsystems is indicated to be profoundly acknowledged. As one of the mandatory complexity parameters indicated that fewer suppliers were indicative of less complexity and thus prescribed supply base reduction. However, that is not always feasible in networks, especially in the healthcare scenario where assurance and backup aspects are more relevant than cost containment. Relevance of this parameter in the hospital scenario depends on the fact that hospitals in general use thousands of items (Stock Keeping Units, SKUs) that are procured from equally high number of suppliers and even have backup supply partners for key items in their systems. In a similar note, on the customer side, various departments have various physicians who may be attached to the hospital or may be external and patient-preferred. Thus, the number of elements or actors in typical upstream and downstream hospital network environment is quite high, and involving this parameter appears to be extremely necessary to truly reflect the hospital network's complexity.

Quality and Nature of Relationship

However, one of the parameters that has not generally been looked at in the healthcare sector, particularly interests this conceptualization. The parameter is that of quality and nature of relationship. Many focal firms conduct various improvement and reorganization activities and developmental programs with their supplier and customer base with the aim of streamlining operations and removing sudden hiccups. Thus, it can be rationally deduced that there is a need to have a deep understanding about the nature and quality of the relationship—terms of contract, level of linkage and trust. In the healthcare sector, where the supplies are often critical and coordination of the physicians is vital for optimized service delivery, this quality aspect of complexity becomes relevant.

Interrelationships Among the Network Elements or Subsystems

Another set of studies has indicated that the extent of interrelationships among the network elements or subsystems is a vital complexity parameter. In the context of hospital supply network, this

parameter is highly relevant as the hospitals fall in that specific service sector which depends largely on buying the necessary items and utilities or services, essential for creating the unique value proposition of patient care, from myriad suppliers. Under these circumstances, the hospitals often have a purchase relationship on the supply side with several suppliers of same or different items, and also on the customer side, there are various physicians, who may be in-house, contracted or external patient-preferred physicians using the hospital facilities. So, obviously the hospital's interaction and nature of relationship with these elements in the network are instrumental. But more interestingly, the way these elements are linked with each other, connected through business tie-ups and interacting among themselves in sub-groups, possesses significant importance when analyzed from the operational complexity standpoint.

Frequency and Volume of Interaction

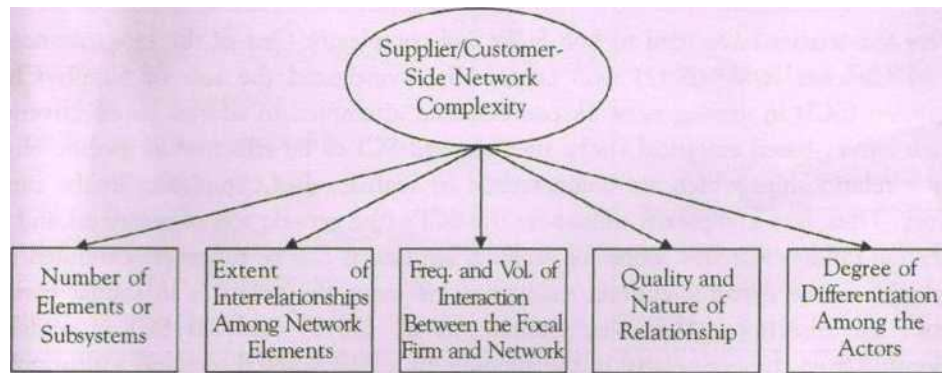
Another aspect which might be considered as rather an indirect approach or parameter to understand complexity, as discussed by some studies, is that of frequency and volume of interaction between the focal firm and the elements in the network. Studies from collaborative communication literature in the healthcare domain. The relevance of this in the hospital context can be well imagined depending on the nature and number of actors both up and down the network and the various demand patterns for different SKUs and different Physician Preference Articles (PFAs). Thus, frequency and volume of interaction should be considered as a vital parameter that defines hospital's supply chain complexity.

Degree of Differentiation Among the Actors

One of the parameters, which is less discussed in complexity literature yet important and relevant for understanding supply chain complexity, is the degree of differentiation among the actors (suppliers and customers). Differentiation entails various connotations starting from the different organizational structure and culture of the elements to that of operational practices and technology levels and expertise (Choi and Krause, 2006). Differentiation may also be thought of in terms of their product offer. Suppliers or customer elements that belong to and use similar patterns of practices, or belong to similar organizational culture are easier to manage (Burt and Doyle, 1993) and reduce complications. However, in the healthcare perspective, the supplier and customer elements vary along all the characteristics of the differentiation parameter, thereby necessitating an in-depth consideration of this aspect while understanding complexity.

In healthcare, where supply risk needs to be reduced, the practice of high level interrelationship should often be welcomed. However, rational arguments can be also be established that as such it complicates the complexity situation because differential relationships and transaction patterns (which might be needed in the interest of the hospitals) cannot be carried out in such situations both in the up and downstream where not only the suppliers, specialists and general physicians linked with the hospital might remain connected within the related groups but also between the up and downstream sides across the groups.

The conceptualized complexity parameters are presented in Figure 2.



Complexity and the Supply Chain Practices

Increase in uncertainty of information and material flow in the supplier-customer system and a large number of firms operating simultaneously with many supply partners are often the prerequisites that define supply chain complexity. Looked from such perspective, hospital supply network well qualifies as a complex system. Thus, studying the evolving system from the complexity dimension becomes meaningful.

Supply chains are ideal examples of complex interactions as many supply chain entities operate and interact simultaneously through information and material flows and the involved environment is often uncertain. Thus rationally interpreting the operational complexity of supplier-customer systems to be the associated uncertainty at that level of control, monitoring becomes obvious. Studies represented supplier-customer operational complexity to be associated with "uncertainty of information and material flows within and across organizations". Thus the volatility of demand, reliability of material, predictability of performance and effectiveness lead to the variation of the operational complexity of supplier-customer system.

The SCPs are influenced might be worth investigating. Moreover studies on complexity have often been carried out in dynamic environment with static assumptions. This has strengthened the indications to study the other way round keeping the context indifferent and examining how the SCPs on two sides of the focal firm behave under similar context and complexity level, for gaining a comprehensive understanding.

When viewed from the value co-creation perspective, the understanding of how the complexity dimensions influence SCPs needs to fall along a particular framework which can be rationally linked to the Service-Dominant Logic (SDL) principles.

DART Supply Chain Practices

DART is the acronym for key activities—dialogue, access, understanding of risk-benefits and transparency—which enable collaborative value creation (Prahalad and Ramaswamy, 2004; and Callaway and Dobrzykowski, 2009). It provides a logical framework to segregate the upstream and downstream supply chain practices/processes. In the current study perspective for a meaningful understanding, the DART framework has been adapted. The four components of DART are defined based on the extant literature support, rational arguments and convenience, so as to fit the scope and objective of the study.

- First, 'dialogue' refers to the extent to which network actors show their manifested willingness to communicate and in the process create a favorable discussion platform for the network. In the hospital supply network perspective, the communication practices that the network actors

(suppliers, physicians and the hospital procurement and materials management divisions) engage in constitute this dimension (herein referred to as 'dialogue'). Until and unless the actors show signs of willingness to communicate (which might be initiated by either party), it does not create the ambience for the subsequent value creation platform to be set up. However, the complexity parameters like the number of network elements (suppliers or customers), the differentiation among them, the type of relationship they share with the focal firm (whether they are used to clearly communicating each other's position and needs), and how frequently they communicate and what type of complexity level drives such actions, can be rationally linked to the successful implementation of communication practices in the supply chain.

- Second, 'access' refers to the extent to which network actors share information in the network that is instrumental to the process of value creation thus provision of not only timely and accurate information, but also the key information which is vital for the network's success and usable by the organizational decision makers, is the main highlight. In the hospital's perspective the type of relationship between the firm and the network elements have much to contribute. The SCPs involving information sharing, cooperation, coordination and collaboration which may have direct or indirect influence on this DART dimension ought to be vital and in a multi-actor perspective ought to be dependent on the key complexity dimensions. How the hospitals allow the flow of demand information to the vendors and also access of the supply information to the physicians involve various such aforesaid practices implemented at various degrees.
- Third, 'risk and benefit' dimension indicates the extent to which network actors possess the necessary information which is sufficient for them to assess the consequences of their transaction decisions as well as their decisions to participate in any particular network relationship. The level of communication and access thus creates the necessary platform for analyzing the risk- benefit scenario between the actors and the focal firm. In the hospital scenario, this should be of particular importance because until and unless the network elements have a precise understanding of the risk and benefits in the decision-making loop and transactional practices involving outsourcing decisions, participation in group purchasing consortiums, etc., the true value co-creation process gets hampered. All the complexity dimensions involving interaction frequency and volume, differentiation, relationship quality and most importantly the interrelationships across sub-groups of elements in the focal network can be rationally linked to it and also from the practitioners' literature perspective.
- Fourth, 'transparency' indicates the extent to which network actors exhibit trust and reveal their true agenda at a network-wide level, thereby minimizing the scope of misunderstanding and speculations. SCPs like integration largely contribute to this particular DART dimension. In the healthcare perspective, in particular the supplier and customer relationship quality and interrelationship among the network elements affect this aspect. The clarity and coherence of decisions and transactions among the actors have much to do with creation of the necessary ambience that fosters value co- creation and optimized performance. However, the ever increasing complexity situation in a dynamic and constantly evolving supply environment in the absence of transparency might lose the value creation focus. Thus, the literature and logic discussed establish that complexity parameters influence all of the DART dimensions, collectively enhancing value co-creation and interaction among actors, and leading to higher-level capability development, in line with SDL principles.

CONCLUSION

The parameters used for conceptualization of complexity form the inevitable aspects of a dynamic hospital supply network, and as evident from the practitioners' literature, the complexity parameters considered in this paper ought to be along the incremental path. This is however not unexpected, rather unavoidable considering the success and growth aspect of the network itself. The incremental of complexity, when viewed in terms of those parameters, gives the true essence of the constantly evolving nature of the sector. The network dynamicity, manifested through the conceptualized complexity parameters, might be rationally visualized as the drivers influencing the implementation (intensity of application, choice of practice and the destined actor to be impacted upon) of SCPs for the overall success of the focal firm and its network. The SDL theoretical support and the value co-creation platform offer the necessary ambience for exchange of relevant competences between the network actors which play a key role in the management of increasing complexity in the dynamic network environment. Thus the relevance of DART and dynamic capabilities rests on two very important aspects that determine the network environment. While DART segregates the ongoing supply chain processes into coherent and logical linkage, the dynamic capabilities literature finds which highlights dynamic capabilities as "difficult-to-replicate enterprise capabilities required to adapt to changing customer and technological opportunities." This makes the study highly promising.

As part of our investigation of antecedents to DART-based SCPs up and downstream, we examined the conceptualization of network complexity in the theoretical backdrop of SDLs value co-creation aspect. The dynamic capabilities perspective provides an important sense-making process that purchase and procurement managers face in the evolving business context as part of their procurement decision process.

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