Identification and Root Cause Mapping of Supply Chain Collaboration Resistors

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Abstract

This paper aims to investigate different resistors of supply chain collaboration and gives insights into how these resistors can be overcome. Specific focus is set in behavioral resistors which have been neglected in the past. Behavioral resistors are still not as prominently examined as they should be. This paper follows the call of previous research to examine behavioral resistors. In order to do so an extensive previously missing overview and framework for current collaboration resistors is developed. In a root cause analysis the interrelation of resistors is shown.
Keywords: collaboration; supply chain; behavioral factors;

1. Introduction

Increasing global competition requires today's enterprises to continuously search for efficiency increasing and profit generating measures. When considering the challenges of Supply Chain Management (SCM) in particular, globalization has led to an expansion of the playfield, accompanied by a new variety of strategic threats. Entire supply chains are now directly competing with each other instead of possible rivalry only enduring with companies at the same stage of the chain. Furthermore, significant enhancements in the development of information technology facilitate the exchange of large amounts of data as efficiently as never before.

To increase the competitiveness of individual members but also the supply chain, members of the same chain can initiate collaboration efforts to harmonize the flow of goods and information as well to mutually profit from synergy potentials. The list of possible advantages of supply chain collaboration is long, including mitigation of the infamous bullwhip-effect as well as double marginalization, decreasing lead times and increasing customer value.

However, it appears that failure rates of existing collaborations are reported to be remarkably high and success stories exist but are rare. Expectations exceed by far the reality of supply chain collaboration resulting in a significant gap between theory and practice.

Consequently, despite the great upside potential, there are powerful resistors that prevent collaboration from being implemented on a large scale. This work focuses on the impeding factors as well as on finding strategies to avoid or eliminate resistance to help clear the path for collaboration benefits to unfold.

The work is organized as follows: First, a comprehensive literature review on rationales and benefits behind collaboration and the current state of implementation is provided. Then the research approach of this work is given, followed by an analysis of collaboration resistors by integrating a relatively new research stream called Behavioral Supply Chain Management into the traditional literature on resistors. These resistors are categorized, ending in a conclusion and outlook.

2. Literature Review

Economists have long known of the synergistic potential of inter-organizational collaboration [1]. To generally describe the concept of collaboration in the context of supply chains, the literature offers several definitions. Chan and Prakash (2012) [2] characterize collaboration as "a long-term partnership process where SC partners with common goals work closely together to achieve mutual advantages that are greater than the firms would achieve individually", which is similar to how Simatupang and Sridharan (2002) see it: "Two or more chain members working together to create a competitive advantage through sharing information, making joint decisions, and sharing benefits which result from greater profitability of satisfying end customer needs than acting alone" [3]. Collaboration helps leveraging the resources of suppliers and manufacturers as well as to harmonize the flow of goods and information along the chain [4–6]. To combine these concepts on a more abstract level, supply chain collaboration (SCC) is mostly viewed as a long-

term oriented form of cooperation between two or more autonomous members of the supply chain that involves sharing of some kind of resource, mostly information, to mutually gain from making better use of these resources together than from acting alone.

2.1. Benefits of Supply Chain Collaboration

Inter-organizational collaboration can be rationalized by a great number of different theories. These theories mostly stem from the strategic management literature that studies the strategic behavior of firms with regard to organizing their interrelationships and competitive positioning [7]. The key principle behind collaboration is that working together creates a value surplus in the sense that the value created jointly increases beyond the sum of each value contribution.

Furthermore, there has been a significant effort to mathematically model and simulate the implications of information transparency and cooperation on supply chain performance [2, 8–10]. Agreed results are that cooperative behavior and global supply chain optimization lead to increased performance over individual local optimization in many metrics such as total cost or service time. For example, Sahin and Robinson (2005) achieve a system cost reduction of 47.58% as the result of information sharing and coordinating the physical flow of goods in a make-to-order supply chain scenario [10].

2.2. Practical Realization of SCC

With all these strategic advantages and the advance of information technology as an enabler of collaboration, one might think that SCC should be a large success story.

Although there do exist cases and industries, in which SCC has been rewardingly adapted to a certain degree, such as the example of VMI at Wal-Mart and the grocery sector, SCC has not yet been implemented successfully into practice at a mainstream level [11], at least not to the degree one could expect from seeing the benefits. Barringer and Harrison (2000) [12] call this a “somewhat paradoxical nature” of inter-organizational relationships given the popularity and the high failure rates of 50-70 percent (including joint ventures and strategic alliances) [13]. Fawcett et al. (2015) identify a gap between desired and actual behavior concerning collaboration efforts in interviews with supply chain managers and focus their research on relational resistors, which are factors that impede successful SCC [14]. The literature aiming attention on identifying resistors and the dynamics within happens to be very thin [15, 16] although these factors are preventing benefits from being realized on a large scale.

In 2017, Schorsch et al. (2017) still found an underrepresentation of the psychological and sociological field in the overall SCM literature [17]. However, they discovered an increasing number of behavior-related contributions, large enough to call out a separate research stream named Behavioral Supply Chain Management (BSCM). At the core, BSCM studies the intersection between behavioral research, which is concerned with human behavior, and SCM, which is more concerned with system behavior.

2.3. BSCM and the Significance of Soft-Wiring

What gives the BSCM field its high relevance is the issue that traditional SCM research does not predict accurately individual’s or organization’s behavior in the environment of supply chains [18]. In practice, there are behavioral factors in play that are not adequately considered in traditional models, although they are of substantial significance for the actual outcome. Sweeney (2012) argues that there is a strong focus on the „hard-wiring“ of supply chains (technology, information and structures) and too little attention for the „soft-wiring“, such as behavioral components and human decision-making analysis on a micro-level [19]. According to the author, this portrays an imbalance in the literature since both aspects are equally important. These calls for a multi-paradigmatic approach to complement and unfold the potential of the previous SCM research are answered by the efforts of scholars in the field of BSCM.

3. Research Approach

Supply chain collaboration appears to offer immense benefits and can present a source of a competitive advantage in many ways, as shown the literature review. In reality however, the implementation and success rates fall short of expectations. So far, literature has only marginally focused on analyzing the relationships between resistors and not yet on developing a consistent classification scheme. Hence, we assume that because scholars and practitioners lack a transparent overview of resisting factors, some powerful elements have been overlooked and have not been adequately addressed yet. Our approach therefore addresses exactly the issue of analyzing and classifying SCC resistors combining the “soft-wiring” and the “hard-wiring” resulting in a holistic root cause analysis.

4. Classification and Analysis of Collaboration Resistors

SCC obstructing factors shall be identified in a range as expansive as possible, thereby extracting factors from traditional SCM literature and possibly overlooked factors provided by the BSCM literature. A classification scheme will be developed to structure present, but also future knowledge generated in this context. Additionally, the representation of factors in the existing literature shall be examined. Further, the dynamics amongst the resistors shall be analyzed to achieve a better understanding of the issue to effectively develop countermeasures. So, the first step is more about understanding the problem in full before starting to find effective solutions.

First, a clarification of the requirements for a SCC impeding factor is given. In this work, the inclusive criterion

for such a factor will be that the factor may arise in the context and influence the outcome of any stage of a supply chain collaboration initiative in a negative way.

Thus, this criterion includes factors that stem from system or human behavior and that arise in the time between the first assessment of a firm's manager on whether to join a SCC effort and the last moment during a collaboration project before termination.

Over 250 related papers were screened by the authors. 58 studies were finally chosen for this analysis to highlight the resistors in a representative manner because of the high degree of overlapping factors. By following a concept-centric approach [20], the authors sought to identify similar types and parallels between resistors to integrate them into a concept, or rather category of resistors in this case. Many empirical papers were mainly concerned with the identification and merely with connecting the factors or asking for deeper causes. The theoretical works offered more of that, however they were never concerned with the full orbit of resistors spanning and connecting system behavior and human behavior.

The approach now pursues two steps to synthesize and analyze the interrelationships between possible barriers to successful SCC.

1. A classification of the identified factors into resistor categories is suggested and respective representation of the factors mentioned in the core resistor literature consisting of eleven studies is displayed to organize the knowledge. Root causes are underlined.
2. A root cause analysis is provided to expose the hierarchy of causes and the interrelationship between the different factors.

4.1. Classification into Collaboration Resistors

The three main categories for the classification of collaboration resistors were identified as:

- Structural resistors
- Technological resistors
- Behavioral resistors

Two (structural and behavioral) of the three main categories were rather obvious to identify since they were already given by the combination of the two research fields used for this review and are comparable to the categories structural and sociological used by [14]. The third (technological) one was introduced to complement the classification in the manner of an MTO analysis by Strohm and Ulich (1998), who provide a concept for the analysis of sociotechnical system behavior [21]. Thus, as the supply chain can be regarded as a complex socio-technical system [22], this classification scheme is well suited as a foundation. Inside the three main categories different topics can be found. Not all topics are root causes. In anticipation of the root cause analysis all root causes are underlined in the following text.

4.1.1. Structural Resistors

SCC relationships between legally independent firms are characterized by the constant presence of trade-off decisions between collaborative and opportunistic behavior [15]. Structural resistors arise from the nature of this co-opetitive (cooperative and competitive at the same time) relation as well as from supply chain-specific relation characteristics and intra-organizational priority alignment. Fawcett et al. (2015) regard the factors within this category as arising in a top-down style, whereas sociological/behavioral factors are bottom-up kind of resistors[14]. To use an additional illustration, structural resistors together with technological resistors form the issues in "hard-wiring", while behavioral aspects concern the "soft-wiring" of the relationship [19].

Unfair Collaboration Value Distribution

The ability of companies to benefit from SCC varies, depending on their location within the supply chain, as well as natural differences between corporate structures regarding cost and revenue, resulting in an uneven distribution of the created added value: [23–25].

Deliberate Opportunism

Following the idea off the Nash Equilibrium, co-opetitive relationships in SCC are under constant threat of opportunistic behaviour by participants. Here asymmetric power distribution increases the challenge [26–32].

Internal Incentive Misalignment

Describes the discrepancy between the traditional, short-term design of incentives and target values by management and the long-term nature of collaboration initiatives, which often causes managers to hesitate in promoting such SCC initiatives. Especially are short term financial focus can hinder collaboration [3, 14, 31, 33, 34].

Collective Incentive Misalignment

Addresses incompatible goals and collectively misaligned incentives as sources that prevent partners from realizing the potential. Typically, these are symptoms of other causes. [14, 35, 36]

Channel Conflicts

Describes system-inherent resistances, such as conflicting interests of the parties involved and differences in decision-making or goal-setting with regard to the collaboration. Typically, these are symptoms as well [37, 38].

Cost of Collaboration

Includes monitoring costs to control the risk of involuntary misbehavior or an underperforming partner, which can be severe in collaborative initiatives, as well as high setup costs at the beginning of a collaboration: [32, 39–41].

4.1.2. Behavioral Resistors

Behavioral resistors are issues that arise in the context of cognitive and social psychology and are directly linked to the BSCM literature. The results of this research stream were applied to analyze resistors on a behavioral level, thus the issues occurring when "soft-wiring" a collaboration effort.

Distrust

Lack of trust is one of the greatest challenges to collaboration at the interorganizational level and is thus a fundamental prerequisite for successful collaboration: [13, 40, 42–47].

Cognitive Limitations

Cognitive limitations include systematic errors of judgment in decision-making. Particularly with regard to the organizational changes resulting from SCC initiatives, e.g. new IT-systems or processes, can provoke individual bottom-up resistance that impairs the success of a collaboration. [14, 17, 48–51].

Cultural Differences

Culture begins at a micro level with individual perceptions and beliefs and evolves into an organizational culture in which these perceptions and values are enacted by employees in the form of behavioral norms: [17, 40, 52].

4.1.3. Technological Resistors

Technological resistors are rather self-explanatory and refer mainly to issues related to system compatibility and data security.

Incompatible Infrastructure

The complex product organization and development world as well as heterogeneous corporate strategies hinder the industry-wide installation of technology standards, which has a detrimental effect on the compatibility of infrastructures and thus acts as a barrier to potential collaboration: [14, 53–59].

Data Security

Data security comprises a wide variety of different key challenges and data security risks that occur, when a company connects its IT-system to an inter-organizational information system (IOS) in order to exchange resources for collaboration: [60, 61].

4.2. Root Cause Analysis and Mapping

The categorization scheme helps organizing the knowledge, yet it lacks the ability to display the dynamics amongst the factors. Therefore, the second step of this approach is to conduct a root cause analysis and to portray the results in an appropriate and transparent form. A root cause analysis seeks to identify the very cause of a problem, which can be hidden under several layers of symptoms resulting from that cause [62]. Thus, the obstructing factors from the first step of the review are now divided into root causes and symptoms of SCC failure.

The root cause method is used often in a manufacturing and quality management context, however it is well suited to analyze other complex issues as well [63]. An interrelationship diagram shows the logical and causal

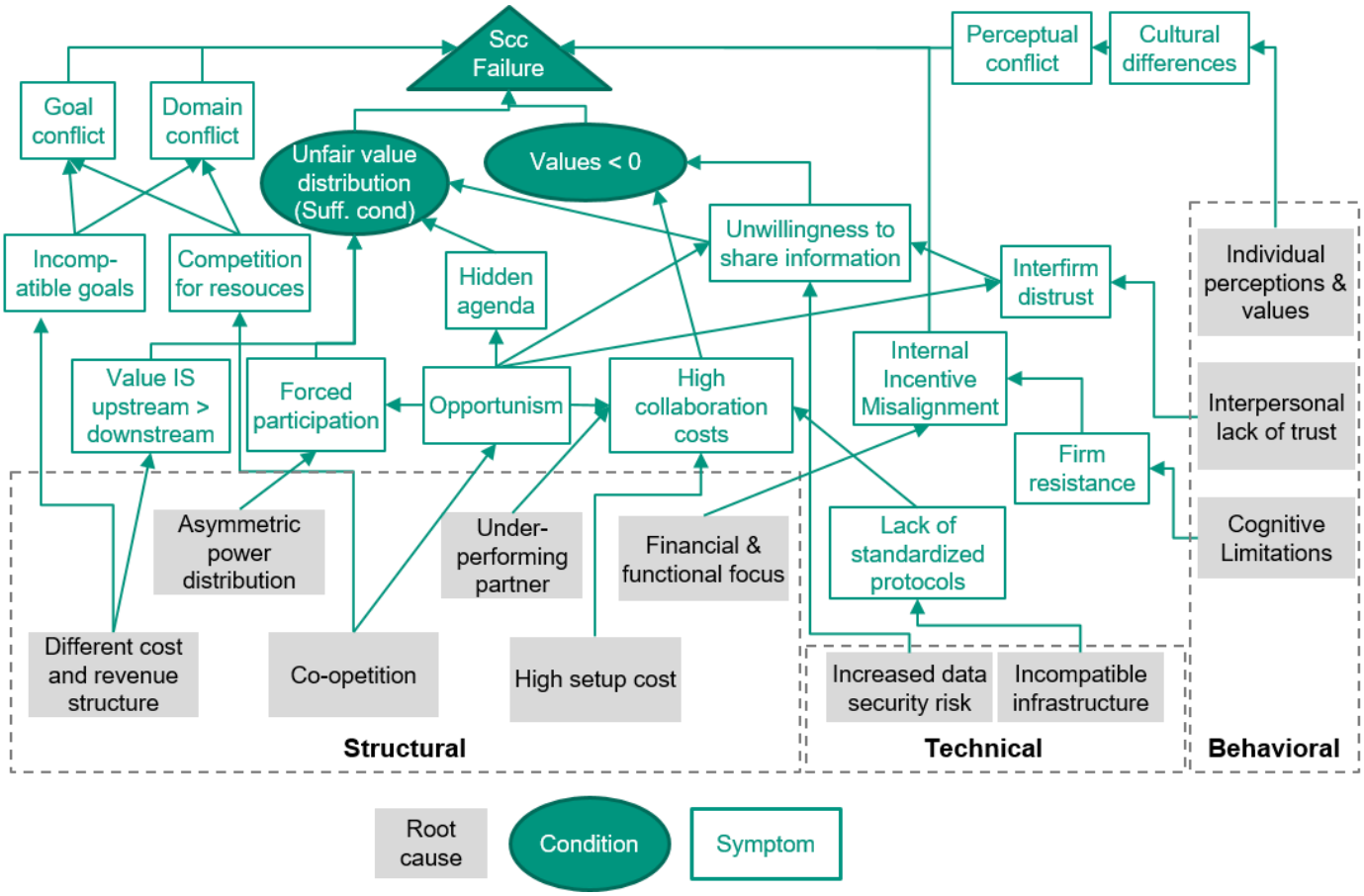

Figure 1 Root Cause Mapping

relationships between the factors of a multivariable problem [63] and can be effectively applied to the issue of SCC failure, whose obstructing factors are well interconnected. Combined together with a current reality tree, which suggests that factors of a problem are interdependent and result from underlying root causes and portrays the issue in a tree style [64], the complex problem of SCC resistance can be illustrated appropriately.

By analyzing the causal dependencies of the factors, that are partly described in the literature and for the other part can be derived by using an "if-then" logic [63], several root causes for SCC failure at any stage can be identified and associated with the categories from step one (underlined words). Figure 1 represents the resulting root cause graph.

5. Summary and Outlook

This work contributed to the research on supply chain collaboration by offering a comprehensive literature review and analysis of the factors responsible for the hesitant implementation in practice. Since the behavioral aspects are generally overlooked in SCM literature this work set particular focus on them resulting in three main resistor categories structural, technical and behavioral. Using the three categories a classification framework was provided and the interrelation between resistors was illustrated in a root cause diagram.

The literature on behavioral aspects in SCM is relatively young offering great potential to advance research and serve as an explanation for the gap between theory and practice. As this paper focused on shedding light on the barriers, succeeding work could be concerned with holistic strategies to help overcome the resistors and to further unlock the potentials of supply chain collaboration optimizing network rather than individual node performance.

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