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Reshaping Supply Chain Collaboration - The Role of Digital Leadership in a Networked Organization

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Abstract. The article presents a case study of Bossard AG, which is an internationally active Swiss fastener technology and logistics company. The example of Bossard AG shows how, by seeking competitive advantage within existing manufacturing supply chains, the traditional meaning of relationships between supply chain participants is changing. In this new model, by simultaneously building a Collaborative Networked Organization and searching for digital competences in the supply chain, there appears a second leader, who is limited to the part of the supply chain for which they are responsible. This results in reshaping the entire supply chain collaboration.

Key words: supply chain collaboration, digital leadership, digital transformation, supplier, collaborative networked organization

1 Introduction

Nowadays, the economy is described as the VUCA world, which is characterized by volatility, uncertainty, complexity, and ambiguity of general conditions and business situations. In order to better understand the opportunities and risks today, organizations are encouraged to shift their focus from competitive rivalry to mutually beneficial relationships and cooperation [1, 2]. In this sense, the partners within supply chains are supported to align their strategy to be more responsive to the environment, and therefore remain competitive [3]. The growing complexity of relationships between chain partners transforms not only the chain's structure but also ways of cooperation. Thus, many researchers are working on developing the concept of a network-based view of supply chains [4, 5]. Networking has become one of the most important characteristics of the modern economy, which is also reflected in the perception of supply chains [1]. Furthermore, in recent years, there has been a significant increase in the number of appearing collaborative networks, which show either a continuous or temporary collaboration, as well as use information technologies to better respond to tougher market challenges [6]. Supply chain collaboration is one of the forms of Collaborative Networked Organization (CNO) [7]. An increase in the use of information technologies and the coordination of activities have been widely discussed by researchers as a means of overcoming the challenge of the complexity of Supply Chain Collaboration [8].

Nowadays, many supply chains are transforming from traditional, structured, and linear supply chains to an interconnected organization that can more readily incorporate

ecosystem partners and evolve to react more flexibly [9]. Industry 4.0 concepts and technologies bring a new challenge for incumbent firms to anticipate and implement new business models, which are often offered by emerging actors in the digital ecosystem [10]. However, according to Andersson et al. [11], enhancing the competitive digital positioning of firms does not solely depend on technology nor its processes, but has a high component of leadership deployment.

These challenges affect supply chain collaboration in various areas. So far, both the structure of the supply chain and the prevailing relationships have been determined primarily by the focal company. The technological progress and globalization increase the impact of network and digital transformation on the ability to achieve competitive advantage in supply chains. This creates new opportunities for other supply chain members (suppliers, distributors, etc.) who can provide a new type of added value that is based on digital advantage. However, there arises the question of how this change will affect the structure of collaborative relations in the supply chain, particularly between the focal company and the partner company. As a result of literature analysis, research gaps were identified at the intersection of research on networking, digitization and leadership in supply chains. The indicated areas are characterized by high complexity and dynamics, and their recognition is at an early stage of research development. Therefore, the paper primarily focuses on revealing the multidimensional complexity that occurs under the conditions of supply chain operations understood as CNO. The research aims at assessing the role of digital leadership in supply chains, in the context of how it influences the supply chain collaboration relationship structure. The following research questions were formulated:

- Who is the leader in the supply chain operating as CNO?
- How does the arrangement of inter-organizational relations in the supply chain change as a result of the emergence of a digital leader?

In order to answer the questions, a theoretical review and empirical approach were combined. The research methods used were case study with direct observation, document analysis and testing of digital solutions functioning in the supply network. The empirical research is based on Bossard AG Company, which is a first-tier supplier in a manufacturing supply chain.

The paper is organized as follows. Section 2 presents the theoretical background on the different forms of leadership in supply chains and networks in the context of digital transformation. Section 3 provides the research methodology, as well as case analysis of a supplier that became the digital leader in a collaborative supply chain. In section 4 there is presented a discussion on changing relationship patterns in supply chains. In the last section, the authors present conclusions and remarks.

2 Traditional, Collaborative and Digital Leadership in a Supply Chain

Considerable effort in research and practice is devoted to leadership development. The formal study of leadership, i.e. influencing one or more individuals towards achieving a shared goal, began 150 years ago [12]. Traditional leadership theories are based on the intra-organizational view stating that when someone is in charge, there is a

supervisor-subordinate relationship [13]. This perception is quite typical, even for the most recent approaches that focus on cross-organizational leadership. It is assumed that in the supply chain structure, leadership is usually taken by the focal company [14]. Managers in supply chains have to collaborate, given the complex nature of cross-organizational, professional, and geographical environments. The literature suggests that the leadership of the core organization has a positive effect on maintaining the cross-sectoral cooperation as it has a positive impact on information sharing, joint decisions, relationship establishment and maintenance in the cooperative network [15]. It is described as integrative leadership, which applies to the core organization and its cooperative network that has no obvious direct administrative affiliation among enterprises. One sees leadership as part of a set of managerial capabilities at mainly individual, as well as organizational and inter-organizational (network) levels necessary for ensuring supply chain effectiveness and superior performance [16, 8]. From this perspective, it is not limited to coordination, collaboration, and integration alone, but also includes management and control of supply activities, whether it is within individual organizations, internal and external supply chains, or supply chain networks [17].

These characteristics do not fully correspond to the specifics of network collaboration. The traditional use of the terms 'leader' or 'leadership' is not appropriate in collaborative networks as there are no 'followers' or supervisor-subordinate relations within. Instead, there are equal horizontal relationships that are not focused on delivering system changes [13]. In the new approach, the conductor (orchestra leader) is put in opposition to the partner [18]. The difference between management and leadership of a networked organization consists of using the resources of member organizations that do not belong only to the leader [19]. Reconceptualization of the traditional leadership theories into the new leadership paradigm based on the Complexity Leadership Theory [20] directed the research on leadership in the networks. In this paper, network leadership is defined as a process of influencing one or more co-members of a collective to advance towards one or more shared goals [21]. It enables and enhances the emergent collective action that produces learning and adaptive outcomes [22].

There can be observed shifts from the importance of achieving tasks to the importance of being able to reach agreements, take the risks needed to build a new whole and make changes to existing systems [23]. Complexity Leadership Theory, with its focus on actors that interact in networks in ways that produce new patterns of behaviour or new modes of operating, lends itself well to the distributed model of leadership that values communicating with multiple modes through multiple networks [20].

Undoubtedly, this is a significant challenge for collaborative supply chains. Increasing the number of linkages through the distributed model of leadership increases the possibility of a multidimensional change [24]. As leadership in a collaborative network (supply chain) is based on communication and sharing knowledge between actors, it can be said that it is impossible without the use of IT-enabled tools and digital transformation. However, even the biggest organizations lack the power, knowledge, or capability to design or deploy end-to-end information integration through the supply network and manage it themselves [25]. This is the reason why companies collaborate under the concept of the Digital supply chain (DSC).

Nowadays, the context of leadership in collaborative networks became Industry 4.0 environment. Information integration introduces new systemic value elements. In today's connected world, it is not possible to achieve strategic success independently of the business ecosystem [26] and without IT-enabled tools. Enterprises and entire networks are gradually forming digital business ecosystem architecture which is a framework for designing requirements and functionalities for digital supply chain integration [27].

An enterprise that takes the leadership role in a CNO (supply network) must develop digital leadership, which can be described as the capability and capacity to manage the volatility, uncertainty, complexity, and ambiguity (VUCA) in order to create common and dynamic challenges in digital transformation (DT) [28, 29]. The combination of sophisticated connectivity and proficiency in composing with multiple modes promises to be a powerful tool for leadership [24]. However, studies of successful firms indicate that DT does not depend on technology adoption but the leadership mindset and its strategies [30]. The studies conducted among American management professionals prove that the keys to successful digital transformation are more concerned with strategy, culture and talent development than with technology issues [31, 32]. The effect of digital technology challenges requires leaders to proactively respond to the "new normal" [33], where new business environments require a new leadership paradigm that moves from egocentric towards altocentric leadership [34]. Leadership in the digital era requires the exercise of influence rather than excessive force and power [16].

The above considerations lead to two conclusions. First, a focal company needs to become a digital leader to maintain leadership in its collaborative supply chain. Secondly, it is a very difficult task to perform, as it covers many aspects, which include, among others, developing and implementing a business strategy, business models, enterprise platform or corporate IT function [31]. Therefore, in the period of development of cloud computing, blockchain or IoT technologies and the growth of enterprise maturity, temporary solutions are sought to conduct DT, corresponding to the capabilities of the supply chain partners.

This creates new opportunities for collaboration in supply chains, which are a multi-stakeholder environment involving different needs, goals, and digital capabilities. So far, focal companies have been seen as hub organizations that lead the integration work, along with their main suppliers. Digital technology ecosystems are an open environment used to build and model interoperable system integration. It has been noticed that suppliers (small and medium enterprises) take digital leadership in business process integration. As a result, they can cooperate more and more often with core enterprises and actively create their role as a collaborative network integrator. Questions remain: how will this change the relationship in the supply chain between partners, what benefits will it bring, and will it not cause leadership problems?

3 Methodology and Research Results

The research aims at assessing the role of digital leadership in supply chains, in the context of how it influences the supply chain collaboration relationship structure. The

main premise is the necessity to reveal multi-dimensional complexity that occurs under the conditions of supply chain operations, understood as Collaborative Networked Organization. Thus, the choice of research method must take into account high complexity and dynamics of the research area, which is located at the intersection of research on networking, digitization, and leadership in supply chains. Analysis of the literature proves that research in this area is still an initial stage.

The research methods used were case study with direct observation, document analysis and testing of digital solutions functioning in the supply network. According to Yin [35], a case study design should be considered when: (a) the focus of the study is to answer “how” and “why” questions; (b) one cannot manipulate the behaviour of those involved in the study; (c) one wants to cover contextual conditions because one believes they are relevant to the phenomenon under study; or (d) the boundaries are not clear between the phenomenon and context. Following Walsham [36], Siggelkow [37] and Yin [35], a “revelatory” case study founded on the interpretive paradigm has been conducted in Bossard AG company, which is a first-tier supplier in a manufacturing supply chain.

Bossard Group AG is a Swiss company (based in Zug), which was founded as a small hardware store in 1831. Currently, the company is still shaped by members of the founding family, but in the meantime, it has become a global corporation driven by a specific strategy for business development and digital leadership. The beginning of this intensive development took place in the 1950s, as a result of the growing industrial demand for high-quality nuts, bolts and screws. Along with the increase in sales, the company expanded its operations to other parts of Europe, raising additional funds through the Swiss stock exchange. In 1999, Bossard AG entered the Chinese market and opened offices for Bossard Industrial Fasteners International Trading (Shanghai) in several locations, and eventually also established itself on the North American market. At the same time, the company experienced a crisis in the competitiveness of fasteners in both new and current markets. This was the first impulse for reflection on the implementation of a new business strategy based on digital solutions.

Work on the digital transformation strategy in Bossard Group began in 2015. During this period, it was particularly important for the company not to neglect its operations and build on existing strengths while developing additional competences. Developing its digital competences, the company also began to provide engineering and logistics services related to the products delivered, as well as used social media in its operations. These activities are identified with business models for products and services that take advantage of both the physical and digital world as appropriate. The finally adopted and ongoing transformation strategy has been included in the three horizons model, where the company assumed the following goals: extend and defend the core business, build emerging businesses and create viable options [38].

The company has achieved global reach with 80 service locations, 41 warehouses and 14 application engineering laboratories around the world, employing 2,500 employees and becoming the leading supplier in the supply chain of fasteners, which helps manufacturing companies use technological progress in their favour.

The building of digital leadership at Bossard AG was based on a change in the product sales model. Currently, instead of selling fasteners, the company offers a digital solution (ARIMS platform as part of the Smart Factory Logistics solution) that allows improving the supply chain and, at the same time, provides warehouse and transport

support for fasteners used by the core company within its production process (last mile management). The platform remains under the management of Bossard AG throughout the entire period of cooperation, the company's employees introduce new suppliers and set system parameters (e.g. in terms of re-ordering points or orders size). As a result, Bossard AG does not lose control over this part of the supply chain regardless of its increasing bargaining power.

The interactive ARIMS platform provides full control over material flow, order tracking, interactive inventory management and access to intelligent analysis. These features improve the predictability and efficiency of the supply chain. It also ensures transparency in terms of information about delivered parts at any time and place. ARIMS is based on a cloud solution with a user-friendly interface and intuitive functions. The digital platform is the foundation of the Bossard Smart Factory Logistics methodology. The ARIMS platform can be integrated with B2B ERP and enables M2M communication.

Bossard AG also offers its customers the Assembly Technology Expert service, under which it supports technical knowledge in the field of fasteners as part of fastener design tool containing engineering applications required by design engineers. Both Bossard AG digital solutions, Assembly Technology Expert and Smart Factory Logistics, allow in particular:

- consolidation of the supplier base, which eliminates discrepancies in the supplier base and fixed costs in the scope of ordering fasteners,
- increasing the quality and reliability of the product, processes and production safety, which translates into a smaller number of shortcomings and complaints, and the number of product recalls to rectify defects,
- globalizing manufacturing operations by introducing a strategic supplier that provides manufacturing sites with consistent global quality and reliable services at the local level,
- saving resources, including time through the use of lean methodology in production management, which allows reducing total production costs,
- providing faster delivery of products to the market ensuring competitive advantage,
- adapting the applied solutions to the client's needs, strengthening competitiveness and innovation,
- providing access to the latest technology and know-how in various fields, thanks to the support of experts in the field of design and logistics of fasteners.

As part of cooperation with clients, the company provides process design and optimization services that focus on increasing production efficiency and lowering the total cost of acquisition (TCO), using value stream analysis. The opportunity to reduce costs and simplify processes is the first impulse to join the Bossard digital strategy, followed by its expansion with the entire supply network. The first incentive to start cooperation is the possibility of using an online calculator estimating the potential profits from running a collaborative chain in the field of fasteners.

The next step in the strengthening position within supply chain collaboration is the currently strongly supported and exposed element of supplier consolidation. As part of this solution, Bossard AG incorporates its client's other suppliers into the digital platform by predefining delivery terms. In practice, the procedure boils down to four main steps:

1. Partially or fully automated intelligent Kanban systems monitor stock levels and trigger replenishment requests.
2. The ARIMS platform that works with them sends orders directly to suppliers or forwards them to ERP system.
3. Suppliers prepare ordered materials and mark individual batches of details with labels of their location.
4. According to predefined arrangements, ordered materials are consolidated into one shipment and delivered either to the dock or directly to the points of consumption.

The solution is an important step in the development of the company as a network integrator, in which the functions of the chain coordinator and cooperation architect are strongly exposed.

Bossard AG supports the digitization strategy with a high-quality product strategy in line with international standards, along with testing and confirmation processes for this quality. It has ten accredited Bossard research laboratories in Europe, America and Asia, thanks to which, together with their equipment for measuring and testing cutting edges, it guarantees reliable quality assurance and the quality of error-free production. This is an additional value that is transmitted along with digital competences, becoming a necessary condition for the success of the entire company strategy.

4 Discussion

The identified requirements for the transformation of digital business systems indicate that the basis for successful implementation of this process is the development of a business model, the use of an information platform, the introduction of business process standards in the field of supply chain connectivity and the introduction of an intermediary in the field of data transfer between actors [25, 31]. These conditions were specifically met by Bossard AG. The business model developed for product development with additional inventory management services and lean processes support was based on a digital platform. The new digital ecosystem uses cloud computing as the leading technology. As a consequence of the gradually introduced changes, Bossard AG achieved the fourth level of digital transformation, referred to as business network redesign [26, 39]. This required the introduction of new processes and combining them with existing ones that resulted in redesigning of the scope of the exchange between Bossard AG and its customers (manufacturing companies). The implemented solutions go beyond the organizational boundaries by leveraging information technology to transform the value activities with external stakeholders to improve firm and supply chain performance.

Bossard AG took over the role of the operator of the services provided, without transferring neither know-how nor control in the operation of the platform. Thus, despite being a supplier of B and C components, it allowed him to maintain the role of a digital leader in a relevant part of the supply chain.

Based on the analysis of the literature and the case of Bossard AG, the key elements in creating the role of a digital leader in supply chain collaboration can be considered:

- network based supply chain view (CNO),

- IT-enabled and digital transformation supporting communication efficiency and interoperable systems integration,
- leadership in implementation of IT-enabled solutions in the supply chain, understood as the ability and capacity to control the introduced solutions, and simultaneously to create a new structure of supply chain relationships.

These statements reveal the difference in supplier and focal company approach to supply chain collaboration within the digital ecosystem.

Table 2. Approach to the supply chain collaboration in the perspective of focal company and supplier (Bossard)

	Focal company's perspective	Supplier's perspective
Context	Railway industry, automotive, others with dominant machining and assembly processes	
Supply chain specificity	Supply chains of final goods and type A elements	Supply chains of B and C elements
Collaborative networks	An extensive supplier base	Mainly binary relations with focal company Ultimately integration of the supplier base of the focal company
Digital transformation	Disjoined DT within the supply chain Partial solutions implemented at various levels by the focal company and supply chain partners	Business network redesign Digital platforms supporting supply management processes
Leadership	Focal company is a supply chain leader	The supplier is a digital leader Upstream supply chain integrator

Source: own elaboration.

When analysing the supplier's digital leadership, it can be seen that by responding to the needs of the focal company, the value chain is modified to some extent. Interestingly, in this case, digital leadership does not mean collaborative leadership. From Bossard AG's perspective, it includes coordination, collaboration, integration, as well as management and control of supply activities, which proves the integrative approach. Therefore, the classic approach to leadership in the supply chain is revealed [17]. As already mentioned, even the biggest organizations lack the power, knowledge, or capability to design or deploy end-to-end information integration through the supply network and manage it themselves [25]. Thus, the focal company adopts the supplier's innovative digital solutions and accepts its leadership in a given part of the supply chain. The example of Bossard AG shows how, by seeking competitive advantage within existing supply chain, the traditional picture of collaborative relationships between supply chain members is changing (Figure 1). In this approach, there is an interweaving of processes resulting from the desire to gain the advantage of cooperation and digital advantage in the supply chain. They manifest themselves in the form of networking the supply chain (CNO) and its digital transformation. As a result, a second leader in the supply chain appears. Its operation is limited to a specific part of the supply

chain. However, thanks to his digital skills and solutions, the efficiency of the entire supply chain increases, which can be described as achieving a digital advantage.

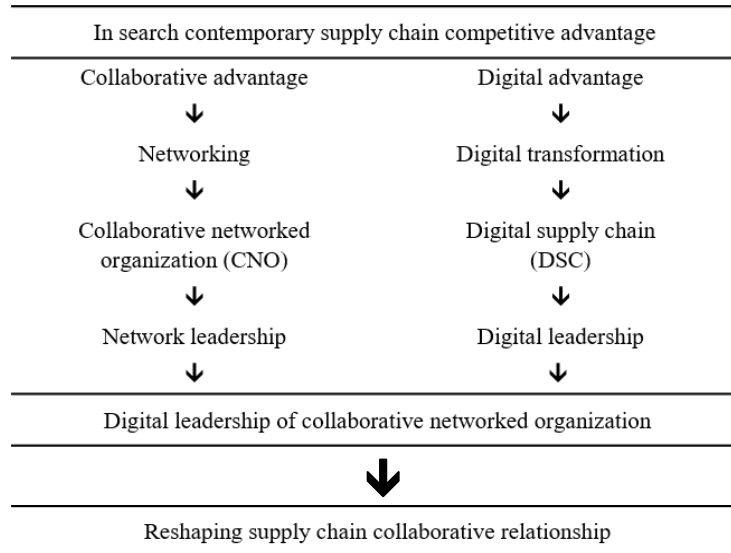


Fig. 1. Reshaping supply chain collaboration due to the construction of the CNO based on digital leadership

Source: own elaboration.

Questions remain, how many leaders can there be in the supply chain, and is there a risk of conflict as a result of a changed relationship structure in supply chain? In fact, in the traditional approach to leadership, there can be just one leader. Contemporary supply chains, on the other hand, are becoming a CNO with a different leadership approach. When looking for competitive advantage, they probably unknowingly implement a model called distributed leadership. It is surprising that the described example of Bossard AG indicates the adaptation of this model by several focal companies. According to the Complexity Leadership Theory, the CNO lends well to the distributed model of leadership, which focuses on actors that interact in networks in ways that produce new patterns of behaviour or new modes of operating [20]. This is a contribution to a better understanding of supply chain collaboration development. Due to the initial nature of the research, it is difficult to determine whether two leaders, i.e. the main leader (focal company) and digital leader (supplier) can be considered a hybrid and temporary solution, or whether the introduced leadership model will be widely used.

Attention should be paid to the limitations of the presented conclusions. This particularly applies to the scope of the study, which covered only one company. The fact is that Bossard AG, being a global supplier of B and C components, is successfully implementing digital leadership in supply chains. Nevertheless, further companies should be included in subsequent studies to deepen the research scope. Although only a single case study was analysed, it can be used for further elaboration of the model of

building and maintaining relationships (including leadership) within the supply chain. It would be justified to use game theory as a tool to study the preferences and strengths of individual participants in the supply chain in building a new type of relationship.

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