Connecting relational mechanisms to performance measurement in a digital service supply chain

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ABSTRACT
This study examines the connection between relational mechanisms and performance measurement. The objective of the paper is to uncover the essential types of relational mechanisms and what factors determine the relational mechanisms of performance measurement in digital service supply chains. The authors conducted a multi-case study at companies that provide digital services. Relational mechanisms refer to mechanisms that initiate and enhance social interactions in performance measurement. The results show that trust between supply chain actors and improvement of knowledge through information sharing are the essential types of relational mechanisms of performance measurement in the digital service supply chain. These relational mechanisms enable performance measurement by engaging actors in providing measurement information. Personalization of services and the criticality of the service, but also compensation, and suppliers’ ability to sell were highlighted to determine the relational mechanisms adopted.

1. Introduction
Supply chain managers are under considerable pressure to contribute more in changing business environments (Weele and Raaij 2014; Bals, Laine, and Mugurusi 2017). Among the biggest categorical changes that create pressure on supply chain and purchasing management in the 21st century are the increase in services, service integration and digitalization (Lusch 2011). An idiosyncrasy of service supply chains is buyers’ roles as resource providers and receivers (Sampson and Froehle 2009; Sengupta, Heiser, and Cook 2006; Sampson and Spring 2012). In digitalized business environments, considering how relationships between suppliers and buyers are developed, maintained and managed is crucial. This is also known as managing buyer–supplier relationships, a critical business process for developing closer relationships with key suppliers to create relationship value (Autry and Golicic 2010; Lambert and Schwieterman 2012; Bals, Laine, and Mugurusi 2017; Bals and Turkulainen 2017). This process also demonstrates the importance of relational mechanisms in relationship activities (Jayaraman et al. 2013; Selviaridis and Normman 2014; Kreye, Roehrich, and Lewis 2015). Relational mechanisms refer to the extent to which relationships are governed by social interactions, such as personal contacts, information sharing, mutual support and teamwork (Jayaraman et al. 2013; Cao and Lumineau 2015). Previous research in operations and supply chain management presented various relational mechanisms for the buyer–supplier relationship, whose existence facilitates relationship value (Prahinski and Benton 2004; Liu, Luo, and Liu 2009; Cheung, Myers, and Mentzer 2010; Li et al. 2010). For example, exchanging information, joint sense making and integrating knowledge have been documented as important relationship mechanisms in the buyer–supplier relationship, especially from the learning perspective (Selnes and Sallis 2003; Cheung, Myers, and Mentzer 2010). Further, Poppo, Zhou, and Ryu (2008) showed that long-lasting cooperation enables partners to share private information, decrease information asymmetries and facilitate the development of trust. It has been shown that when trust and behavioural norms are developed, partners are more effective in improving communication, information flow, knowledge sharing and solidarity (Hult, Ketchen, and Slater 2004). If the company seeks to improve the relationship performance only, inter-company trust and relational norms become an even more important means for this end (Liu, Luo, and Liu 2009). It has also been shown that the relational mechanisms above generate relationship value.

If companies aim to create and sustain competitive advantage through buyer–supplier relationships, the relational mechanisms should be fully understood, measured and managed; otherwise, the objectives will not be achieved, and the relationship will fail (Verdecho, Alfaro, and Rodriguez-Rodriguez 2009; Pekkola and Ukko 2016). Thus, there is a need to address what relational mechanisms initiate and enhance social interactions in performance measurement in a way that benefits all the actors in a supply chain. However, there is minimal
research on this type of relational mechanisms in a digital service supply chain. An example of a digital service supply chain is the acquisition of a product, where the purchasing process for the product, the product itself and the delivery of the service to the customer mainly take place in digital form. A digital service supply chain can be considered a complex entirety (Wu and Chiu 2018), especially in the business-to-business (B2B) context (Saunila, Ukko, and Rantala 2019). Kreye, Roehrich, and Lewis (2015) suggest that increasing levels of service complexity increase the level of relational mechanism development between the provider and the customer and can be realized as positive impacts on relationship performance. Beer and Micheli (2018) further argued that there is a need for qualitative research that focuses not only on performance measurement processes but also on how people’s experiences are created and understood during this process. For this reason, the study focuses on relational mechanisms rather than contractual mechanisms.

The objective of this paper is to fill the research gap by examining the connection between relational mechanisms and performance measurement in digital service supply chains. More specifically, our aim is to explore the relational mechanisms that facilitate closer collaboration in performance measurement. We investigate such mechanisms of the case companies by posing the following interrelated research questions: What are the essential types of relational mechanisms of performance measurement in digital service supply chains? What factors determine the relational mechanisms of performance measurement in digital service supply chains? The research builds on a multiple-case study carried out at companies that provide digital B2B services. Four different-sized IT companies constitute the empirical setting; one company is large, two are small, and one is a micro-company that is expanding. As the main result, the study presents two essential types of relational mechanisms that initiate and enhance social interactions in performance measurement. The results also indicate four determinants may result in relational mechanisms of performance measurement in the digital service supply chain.

This paper is organized as follows: The theoretical background of the research is presented by discussing performance measurement in supply chains. The third section presents the connection between relational mechanisms and performance measurement followed by the theoretical framework for the research. The fourth section describes the research design. Finally, the results of the research are presented in terms of the most important relational mechanisms that foster performance measurement.

2. Performance measurement in supply chains

The recognition of trends in inter-organizational working and the increasing number of collaborating organizations (Nudurupati et al. 2011) have resulted in a well-established stream of literature that addresses the process of measuring the performance of a supply chain (Gunasekaran, Patel, and Tirtiroglu 2001; Gunasekaran, Patel, and McGaughey 2004; Papakiriakopoulos and Pramatari 2010; Nollet, Beaulieu, and Fabbe-Costes 2017). Angerhofer and Angelides (2006) define a collaborative supply chain as ‘a system of interlinkages and inter-relations of the stakeholders along with the processes undertaken, its supporting technology and the business strategy employed’. Thus, measuring the performance of a supply chain refers to the collaborative process of quantifying the effectiveness and efficiency of actions in the supply chain. Effectiveness reflects how well buyers’ requirements are met, and efficiency measures how economically resources are allocated within the supply chain when providing a pre-specified level of customer satisfaction (Hofmann and Locker 2009). Thus, similarly to service supply chains, in this type of collaborative setting, buyers embrace a complementary position compared to nonservice supply chains (Sampson and Spring 2012). According to Sengupta, Heiser, and Cook (2006), in service supply chains, people play an essential role in the value creation process, and therefore, the variety and uncertainty in the service outcome depend on employee involvement. They further argued that information flows, the flexibility of resources, management of capacity and service performance determine the efficiency of the service supply chain. These elements provide special features for the performance measurement process as described next.

Papakiriakopoulos and Pramatari (2010) highlight the importance of collaboration in measuring the performance of a supply chain. They consider collaboration the main enabler of performance measurement because collaboration is the common objective of all parties although they all have their own individual mechanisms and identify areas of improvement in different ways (Papakiriakopoulos and Pramatari 2010). In addition, collaboration, enabled by information sharing, can increase the performance of a supply chain (Liang 2015; Papakiriakopoulos and Pramatari 2010). The role of performance measurement is crucial as it influences the dynamics between the two parties (Nollet, Beaulieu, and Fabbe-Costes 2017). Measuring performance can assist collaborating partners in re-evaluating their collaboration objectives, shifting the focus from timely information sharing to improving information quality. Measuring performance then helps the parties re-examine the scope of the collaboration through the incorporation of new business processes (Papakiriakopoulos and Pramatari 2010). Busi and Bititci (2006) emphasize that the difficulties of developing a collaborative culture and appropriate performance measures have been major barriers to the successful implementation of a performance measurement. Thus, the key elements of collaboration, the ways in which these elements interact and the ways in which the elements can be integrated within performance measurement must be determined.

Previous studies emphasize the importance of connecting other actors of the supply chain to measuring collaboration (Bititci et al. 2012; Ukko and Pekkola 2016). Bititci et al. (2012) emphasize that future research on the design of a collaborative performance measurement should focus on understanding collaboration and its mechanisms and on developing theories, methods and techniques that ensure all network partners can define, manage, measure and evaluate common goals and responsibilities. However, performance measurement is often designed to match an individual
company’s objectives instead of focusing on the perspectives of the actors throughout the supply chain. In addition, the focus on delivering services on the product side requires novel approaches for configuring, measuring and managing individual organizations and entire supply chains (Ng and Nudurupati 2010; Bititci et al. 2012). The current notion that the value of a relationship is determined in interactions between the supplier and the buyer highlights the buyer’s (and the customer’s) role in measuring collaboration in a supply chain. Thus far, the majority of supply chain performance measurements focus on activities controlled by the supplier, ignoring buyers’ and customers’ processes (Chenhall 2003; Amir, Nazli Nik Ahmad, and Har Sani Mohamad 2010).

3. Relational mechanisms and performance measurement

3.1. Relational mechanisms

Supply chain scholars have devoted much attention to inter-organizational relationships and have pointed out their critical importance for achieving competitive advantage (Lumineau and Henderson 2012; Cao and Lumineau 2015). In this discussion, two main types of governance mechanisms, contractual and relational mechanisms, have been in play in inter-organizational relationships (Cao and Lumineau 2015). Contractual mechanisms highlight the importance of contracts between firms and formal rules to safeguard against opportunism and conflict (Cao and Lumineau 2015). Relational mechanisms, in turn, refer to the extent to which relationships are governed by social interactions, such as personal contacts, information sharing, mutual support and teamwork (Jayaraman et al. 2013; Cao and Lumineau 2015), and these mechanisms have been considered crucial in managing digital service supply chains (Saunila, Rantala, and Ukkko 2017). Further, contractual and relational mechanisms are positively related to each other, and both have positive impacts on relationship performance and satisfaction, providing strong evidence for the complementarity arguments (Cao and Lumineau 2015). However, Kreye, Roehrich, and Lewis (2015) showed that increasing levels of service complexity increase the level of the development of relational mechanisms between the provider and the customer. Kreye, Roehrich, and Lewis (2015) stated, however, that this was not the case with contractual mechanisms. Thus, developing and maintaining relational mechanisms can be considered a vital distinguishing feature for inter-organizational relationships. Digital service supply chains can be considered a complex entirety, in which, for example, informal sharing of information is highlighted (Saunila, Rantala, and Ukkko 2017). For this reason, digital service supply chain studies emphasize relational mechanisms (over contractual mechanisms) by differentiating the types of relational mechanisms (Sampson and Froehle 2009; Sengupta, Heiser, and Cook 2006; Sampson and Spring 2012) and their determinants (Cao and Lumineau 2015; Ukkko and Pekkola 2016). The types of relational mechanisms and their determinants are discussed next.

Nyaga, Whipple, and Lynch (2010) reveal that for social interactions to succeed, partners must plan and coordinate activities, as well as resolve problems, together. Cousins, Lawson, and Squire (2008) use the term supply chain socialization mechanisms to describe the means by which individuals in a buyer–supplier engagement acquire knowledge of the other company’s social values. The authors found that this mechanism facilitates inter-personal collaboration between the supplier and the buyer and increases the value of the relationship. Wu, Chuang, and Hsu (2014) argue that collaboration (facilitated by information sharing) increases supply chain performance. Exchanging information, joint sense making and integrating knowledge have been documented as important factors in the buyer–supplier relationship, especially from a learning perspective (Cheung, Myers, and Mentzer 2010). Previous literature often presents the length of the cooperation as a proxy for the closeness of social relations between partners (Dyer and Chu 2000; Li et al. 2010). When trust and behavioural norms are developed, partners are more effective in improving communication, information flow, knowledge sharing and solidarity (Hult, Ketchen, and Slater 2004). If the company seeks to improve relationship performance only, inter-company trust and relational norms become even more important means for this end (Liu, Luo, and Liu 2009). If buyers engage in joint efforts, suppliers’ trust in a relationship is likely to increase. Joint activities provide opportunities to share demands of, concerns about and expectations for the relationship (Nyaga, Whipple, and Lynch 2010).

3.2. Relational mechanisms in performance measurement

Min et al. (2005) consider performance measurement a joint effort that is crucial for successful collaborative relationships. The core of performance measurement is providing timely information to suppliers that reveal buyers’ expectations and enables corrective actions (Cousins, Lawson, and Squire 2008). This requires taking into account social aspects of the measurement process parallel with technical aspects (Smith and Bititci 2017), which are realized as implementing organizational routines related to performance measurement, such as different uses of performance information, and the dynamics of important inter-organizational exchanges (Beer and Micheli 2018). Thus, successful measurement of the performance of a supply chain is heavily influenced by the collaboration between the different actors in the supply chain, and this collaboration brings relational mechanisms to the forefront.

Previous studies revealed the challenges and factors that facilitate inter-organizational performance measurement that involve different actors (Busi and Bititci 2006; Mahama 2006; Bititci et al. 2007; Pekkola and Ukkko 2016). According to Maestrini et al. (2018), three factors should be considered in contemporary business environments. First, supply chains are becoming increasingly complex: Instead of being individual exclusive chains, supply chains appear as different types of networks where organizations collaborate in different types of relationships. Second, a reliable and robust information system infrastructure is important for proper implementation
of systems for measuring supply chain performance. Third, organizational skills provide an important element of successful design and implementation. Pekkola and Ukko (2016) explored the important factors in the design process of a network-level performance measurement system. The results revealed that the main process factors are socialization, participation and information sharing. According to Reichers (1987), socialization in the context of performance measurement refers to interactions, both verbal and interpersonal, through which actors unravel roles and identities, and form a common understanding of situations, actions and procedures. Mahama (2006) presents that meetings and seminars are arenas for participation; these interactional settings are also avenues for sharing information. Further, Busi and Bititci (2006) and Bititci et al. (2007) emphasize the complexity of a multi-actor network, relationship issues among the actors, a shortage of commitment and trust, problems in communication and a common understanding of measuring the performance of a collaboration. Pekkola and Ukko (2016) showed that involving different actors in different phases of the measurement process creates a system that successfully measures performance. The authors state that such engagement enabling socialization was perceived to enhance openness, commitment and trust among the participants. In addition, Nudurupati, Tebboune, and Hardman (2016) suggest that in digital economies, companies should refocus their measurement efforts to incorporate evaluation of their performance over a wider network involving various stakeholders. Cousins, Lawson, and Squire (2008) found that performance measurement that assesses the health of the relationship stimulates a climate of collaboration between the buyer and the supplier. This opportunity to participate in the early phases of the measurement process encourages participants to engage in the process. Engagement quickens the learning process concerning target setting, and performance measurement in general, which is considered vital because many engaged actors lack management and financial education (Pekkola and Ukko 2016).

Thus, exploring what relational mechanisms enable performance measurement by engaging actors in providing measurement information is essential (Bititci et al. 2012; Ukko and Pekkola 2016). Such interest in the use of and effects of performance measurement systems and frameworks, rather than just in their existence, has begun to illuminate the ‘behavioral assumption’ (de Leeuw and van den Berg 2011). This idea presupposes that performance measurement systems directly influence people’s behaviours (Bititci et al. 2012; Beer and Micheli 2018). However, few studies have focused on relational mechanisms.

3.3. Summary

Previous researchers have shown that if companies aim to create and sustain a competitive advantage through collaboration, their organizational routines should be understood (Beer and Micheli, 2018); otherwise, the objectives will not be achieved, and the collaboration will fail (Verdecho, Alfaro, and Rodriguez-Rodriguez 2009; Pekkola and Ukko 2016). Although many frameworks for measuring the performance of the supply chain have been developed, little is known about the mechanisms that initiate and enhance social interactions in performance measurement (Smith and Bititci 2017; Beer and Micheli 2018). Successful supply chain relationships require firms work independently and in collaboration with other supply chain actors, by encouraging, for example, exchanging information in a trusting manner, joint sense making and integrating knowledge (Poppo, Zhou, and Ryu 2008; Cheung, Myers, and Mentzer 2010; Papakiriakopoulos and Pramatari 2010; Liang 2015; Nollet, Beaulieu, and Fabbe-Costes 2017). Therefore, the relational mechanisms in performance measurement are vital for the well-functioning delivery of digital services. However, investigations of relational mechanisms in the context of the digital service supply chain have been minimal. This study fills this research gap by examining the connection between relational mechanisms and performance measurement in digital service supply chains.

Figure 1 shows the theoretical framework that guides this research. The model suggests that relational mechanisms initiate and enhance social interactions in performance measurement by engaging supply chain actors in providing measurement information, which offers the potential to measure the production of digital services. However, we argue that this potential becomes reality only when collaboration mechanisms are also encouraged. Thus, a firm lacking relational mechanisms throughout the supply chain may not be able to gain proper information about the functioning of the supply chain relationships. As a response to this gap in the current understanding, the types of relational mechanisms that facilitate closer collaboration in performance measurement and their determinants are revealed as a result of the research.

4. Research design

4.1. Case selection

As the current literature reveals little practical-level understanding of the relational mechanisms related to performance measurement in digital service supply chains, this study utilizes the case study method to explore the phenomenon in practice. A multiple-case study was carried out at
companies that provide digital B2B services. A case study method was selected because it can be used to understand a phenomenon that includes complex and multiple processes and variables (Yin 2003). In addition, case studies gather in-depth information about the collaboration mechanisms related to performance measurement in digital service supply chains (Gummesson 2000). A case study, which can use various data collection methods, together with a participatory approach to data collection, provides a solid setting for examining the relational mechanisms of performance measurement. In this study, the participatory approach refers to a situation in which researchers assisted the performance measurement process but did not actively participate in decision-making concerning the content.

As presented above, four different-sized cases were selected not to discover and analyse differences in the explored phenomenon but to gain understanding from different perspectives and different-sized companies. To get understanding and perspectives from different viewpoints, four different-sized IT companies were selected; one company is large, two are small, and one is a micro-company that is expanding. Cases were selected based on (1) the digital services provided and (2) the level and maturity of collaboration at the companies because such collaboration plays a crucial role in measuring performance (Bititci et al. 2012). Therefore, in cases where the provided services are classified as advanced, and thus, the need for collaboration is high, it can be reasoned that the relational mechanisms of performance measurement should be emphasized. Furthermore, different-sized cases were chosen to analyses prevailing practices across contexts (Yin 2003). Voss, Tsikriktsis, and Frohlich (2002) state that observing and understanding the actual practice of a phenomenon in its natural settings can contribute to relevant theory. The nature of digitality in service and solution production is similar in the case companies. The service (or product) construction process is partly digital and partly physical, reflecting the front-end phase of production. In the back-end phase, the complete services and solutions are provided in a digital format. The companies have strived for long-term buyer-supplier relationships and do not want to play the role of a one-time supplier. In addition to the digital nature of the services and solutions, the case companies operate in B2B contexts where the firms’ offerings are implemented in digital service supply chains. New types of offered and delivered digital services and solutions make it possible to gather and analyze data from the digital service supply chains more comprehensively than the buyer companies are used to. The delivered services and solutions can automatically gather data from different operations of these supply chains. Although the services and solutions provided by the suppliers make it possible to gather data effectively and comprehensively from the supply chains, effective utilization of the performance measurement requires collaboration between operators. Thus, these new possibilities for measuring performance in digital service supply chains need engagement by the actors. For example, operators of digital service supply chains must be willing to share and utilize the gathered information to take advantage of it.

4.2. Descriptions of the cases

Case A is an IT company that employs 20 people. It supports its customers’ operations and businesses in a digital environment. A fast-growing company, case A offers a wide range of digital services, including customer relationship management (CRM) and enterprise resource planning (ERP) software, application development, e-commerce solutions, design services and data center services. The company’s digital services and solutions are strongly based on customization and versatility because case A aims to build long-term buyer-supplier relationships instead of one-time deliveries.

Case B is an IT startup that employs about 10 people. It offers Internet of Things (IoT)-based solutions and services to clients to support their sales and industrial plans. The company provides a digital sales solution, which helps customers understand buyer processes and challenges, for example, by integrating the company’s own products in customers’ processes. Case B also provides administrative support services to buyers to help them control and manage their industrial plans. By utilizing this solution, the physical environment turns into a virtual model in which processes, documentation and related machinery can be explored. The company also aims to support and develop its buyers’ operations over the long term.

Case C is a small company that employs about 50 people and provides services related to measuring the customer experience. The company utilizes big data and analytics platforms to deliver business value to buyers. Case C was founded in 2007 but has grown rapidly and has large buyers around the world. The company’s goal is to compete in quality and manage the details of the service experience and in that way, provide value elements that are missing from large operators.

Case D produces a broad range of digital and IT services. The company is large and international, but this study focused on two Finnish units that employ more than 1000 people. The company’s services include system deliveries (e.g. ERP), software solutions and data center services. The solutions are not heavily customized, but the value is to provide comprehensive solutions so that buyers get all services in the same place. To better meet buyers’ needs, case D now tracks the mechanism for successful product, service and delivery and value elements in the delivery process.

Participants with different backgrounds at each case company were selected because they had actively collaborated with buyer companies in different phases of digital service and solution production: designing, constructing, delivering and following up. As the most important part of this study, to ensure the rigour of the data, all participants understood performance measurement of the digital service supply chains and how relational mechanisms can support these activities.
4.3. Data gathering and sources

The data collection methods included individual interviews with participants, group interviews and discussions with focus groups of participants from all case companies and research observations in meetings with a focus group. Table 1 summarizes the overall data collection process.

The aim of the interviews was to achieve an overview of the explored phenomenon. To acquire a comprehensive view of the relational mechanisms at different levels, the participants were drawn from different hierarchical levels and job descriptions. The interview data consisted of semi-structured face-to-face interviews with eight managers and eight employees for approximately one hour each. Interviews with participants with an operations role were conducted in all four case organizations to capture different perspectives on the topic. All interviews were recorded and transcribed to aid in in-depth analysis. In addition, documentation related to the focus groups was analyzed in each company. Researchers also made observations and field notes during the focus group meetings. An observational method was used to collect data on the process of developing relational mechanisms. The data were analyzed case by case with content analysis. As our goal was not to achieve scientific generalization, we used theoretical concepts as templates with which to compare the empirical results (Yin 2003). The data were analyzed in two dimensions: first, perceptions of the types of relational mechanisms realized in the relationships (supplier, buyer and customer perspectives in terms of gathering and exploiting measurement information and the motivation to share the information) and second, the determining factors in the realization of the mechanisms. Next, the interconnections of these two dimensions in the context of performance measurement were discussed. This process was conducted iteratively. To avoid observer bias and to support the trustworthiness of the findings, three researchers were included in the research triangulation and data triangulation. Each data transcript was coded individually; then the authors discussed the coding results to ensure agreement regarding the relational mechanisms in performance measurement.

The data were analyzed with two coding rounds. In the first round, patterns of common aspects of performance measurement in digital service supply chains were found. The patterns were classified from the perspectives of suppliers, buyers and customers. The aim of the second coding round was to find and classify patterns related to relational mechanisms that support the performance measurement activities and motivate companies to collaborate and share information. Common and diverse patterns among the companies were analysed during both coding rounds and discussed in light of the literature.
5. Case analysis

In this section, the results of the empirical analysis are presented case by case. The key results for each case are presented in Table 2.

5.1. Findings from the cases

Case A

The results from case A show that the most important motivating factor for the buyer to share information regarding performance measurement is how critical the service is for the buyer. Criticality of the service, in this context, is strongly correlated with loss of revenue. If the service does not work, customers will move on to services from other similar suppliers. A software specialist at case A said, ‘Quite often, if the problem is acute, they are really motivated (to share information).’ In general, as soon as it involves their activity or equals where to get money, they will be immediately motivated.

The majority of the information case A receives comes from the buyer’s initiative, and relationships are seen as an important factor, particularly for competing against larger competitors. First, if buyers feel that their opinion is valued and they are contacted personally, they are more motivated to share measurement information than if they are asked to fill out a general satisfaction survey on the Internet. Second, the personal relationship between the supplier’s representative and the buyer’s representative motivates sharing information. In this situation, the buyer is engaged in the performance measurement of the digital service supply chain in a way that is motivational and enhances the buyer’s independent initiative to measure services. An operations services expert stated, ‘The majority of it is direct feedback from the buyer, for example, in the design phase. So, it, of course, relies very much on the buyer’s own initiative and communication’.

Case A has already reached the mature phase of business operations, and the company’s main emphasis for gaining understanding of their buyers’ performance measurement is to develop existing services and plan complementary features for existing services. Thus, information from buyers and customers plays a crucial role in the development of new services. More could be done if relevant information could be collected from buyers. The managing director stated:

Perhaps we should first know how to sell and tell them (buyers) that we will be able to refine it (information). They need to understand the value of the information they have and that we have expertise and the technical capability to collect and refine the information.

Case B

According to the results for case B, buyers are not sufficiently motivated by external factors, such as money and cost reductions, to measure performance. Buyers need to have internal motivation to measure services throughout the service’s life. The products and services that case B provides depend on the company’s buyers. The buyer’s involvement in the development and implementation phase of the delivered services determines the quality of the final product and supports the performance measurement activities.

The products and services offered by case B enable data collection, allocation and sharing from many different places and at different levels. Therefore, it is important that the buyer is involved in deciding where and how information is collected. In this way, the buyer benefits the most from the collected information and can exploit it in communicating with customers. Thus, buyer involvement is strongly correlated to the fluency of future operations and acts as a strong motivation to share information. The challenge in disseminating information is that there is a long tradition of disguising information. Although the motivation to share information exists, the culture hinders putting this behaviour into practice. Thus, creating relational mechanisms to share and collect tacit knowledge from people at all levels of a company is critical. As the chief operating officer (COO) of the company stated, these mechanisms act as important relational factors between the supplier and the buyer: ‘The buyers are very interested in how their own personnel behave and use these digital tools. The idea is to capture tacit knowledge about units around the world and utilize it elsewhere’. Thus, employees see sharing information as important if the information can be transformed to learn and develop buyers’ knowledge regarding their personnel’s tacit knowledge. For example, the company is a startup, and locating information and measures that can be used to support sales not only to gain new buyers but also to increase sales from existing buyers is crucial. Thus, buyers need to understand that by sharing information, the company can improve its products and services.

Case C

The results for case C indicate that buyers are very willing to share measurement information if the product or service is critical to the customer (in addition to the buyers’ own perspective). In this case, case C measures the customer and customer experience and the technical functioning of the service. Case C is a small company and competes in agile operations, which is one reason buyers choose the company’s services. It can make fast adjustments and react quickly if enough relevant information is provided. Thus, buyers are motivated to share information because they acknowledge that actions are performed based on that information. According to the results for case C, the benefits of sharing information must be clear to the buyer in terms of the business benefits at the end. This requires concrete and clearly articulated information or benefits that the buyers are aware of. This can be due to the service that is critical to customers. An R&D engineer stated, ‘It motivates if it produces business, better margins, new customers or something else that benefits business. But, in the end, there needs to be some monetary benefit’.
| Practices of measurement | Supplier | Perspectives | Customer |
|--------------------------|----------|--------------|----------|
| Measurement in digital service supply chains | | | |
| Case A | Buyer profitability; Buyer’s workload; Buyer liquidity | Meeting schedule targets; Response time; Communication frequency; Frequent orders from customers; Reasoning based on interaction | Number of users compared to goals; Sales through digital service; The number of users reached |
| Case B | Buyer profitability; Buyer satisfaction; Buyer activity on use of digital services; Profitability of digital services offered to buyers | Sales through digital service; Changes in maintenance time and costs; Increased work safety; Increased customer contacts; Increased offerings; Increased sales; Increased knowledge sharing; Activity in use of digital services | Increased quality of services and devices purchased; Decreased costs of products/services |
| Case C | Buyer profitability | Savings; Return on investment; Customer-specific evaluations; Reported errors | End-user loss; New end users; Technical functioning of service; Satisfaction/ experience surveys |
| Case D | Buyer profitability; Buyer investments; Expansions of buyer product portfolio; Sales data; Service capability; Workload | Satisfaction survey; Customer interviews; Achievement of project goals; Frequent orders from customers; Reasoning based on interaction | Number of users reached; Comparison to set goals |
| Information gathering | | | |
| Case A | Actively from own operations; Subjective assessment based on buyer interaction; Objective data of end-user behaviour | Unknowingly based on communication with supplier; Customer behaviour based on its own initiative | Unknowingly based on usage behaviour; Based on error messages |
| Case B | Actively from own operations; Actively from buyers while designing and developing digital services with buyers; Objective data of buyer use and behaviour through analytics | In plan managing solution actively from own operations at all organization levels; In sales solution actively from own operation and actively from customers’ operation during the sales and after-sales processes | Mainly based on error messages; Based on the user experiences of purchased services and devices |
| Case C | Objective data about technical functioning from customer; Comparative data from other actors; Subjectively based on buyer interaction | Qualitative and quantitative data from customer interaction; Based on communication with the supplier | Based on error messages |
| Case D | Actively from own operations; Actively from selected buyers through interviews; Through buyer satisfaction surveys; Objective data of customer behaviour through analytics | Unknowingly based on communication with supplier (through interviews and steering groups); Customer behaviour based on its own initiative | Unknowingly based on usage behaviour |
| Information exploitation | | | |
| Case A | Possibilities for new products, services, business | Not independently; Benefits from supplier exploitation | Not independently; Benefits from supplier exploitation |
| Case B | Possibilities for product development and new products; Possibilities for increased user experience; Possibilities for new business and business areas | Possibilities for plan management development; Possibilities for education of employees; Possibilities for work safety development; Possibilities for product development; Possibilities for development of sale processes; Possibilities for education of salespeople | Not independently; Benefits from supplier exploitation; Benefits from buyer exploitation |
| Case C | For improving the product/service; Increasing customer satisfaction | Independently to marketing; Prioritizing error solving and investments | Benefits from supplier exploitation; Benefits from buyer exploitation |
| Case D | Possibilities for improved buyer satisfaction | Mainly independently (web analytics data); Benefits from supplier exploitation | Not independently; Benefits from supplier exploitation; Benefits from buyer exploitation |
| Motivation to share information | | | |
| Case A | Satisfied buyers; Incomes; Lower costs | Critical product or service; Possibility of speeding up sales; Possibilities to gather, store and share information from different levels and different operations; Important for buyer to define the critical and necessary targets; Level of involvement of buyer in designing and development phase of the digital services | Possibility for improvements in user experience of the digital product/service |
| Case B | Necessary for offered digital solutions and services; Satisfied buyers; Product development; Incomes | Critical product or service; Possibility of speeding up sales; Possibilities to gather, store and share information from different levels and different operations; Important for buyer to define the critical and necessary targets; Level of involvement of buyer in designing and development phase of the digital services | Possibility to improve the quality of products/services |
| Case C | Satisfied buyers; Incomes | Possibilities of speeding up sales; Possibilities to gather, store and share information from different levels and different operations; Important for buyer to define the critical and necessary targets; Level of involvement of buyer in designing and development phase of the digital services | Better functioning of the product/service |
| Case D | Satisfied buyers and customers; Incomes | Possibility to share personal knowledge; Concrete benefits (e.g. price reductions or speeding up sales); Co-development and deepening the relationship; Who receives the information (tech vs. sales); Possibility to influence; Criticality of product/service; Benefits until the customer (improved satisfaction or business); Cost reductions | Criticality of product/service; Personal interest from supplier/buyer |
Table 3. Results for the cross-case analysis.

| Supplier characteristics affecting relational mechanisms | Size | Maturity of relationship | Variety of customers/services |
|-----------------------------------------------------------|------|--------------------------|------------------------------|
| What are the essential types of relational mechanisms of performance measurement in digital service supply chains? | Trust between the actors | Small companies highlight building trust | Trust is necessary for long-lasting relationships | Variety of customers require building trust and close relationships because preferences vary; With a uniform customer base, this is not highlighted as much |
| Improvement in knowledge (through information sharing) | Important in companies of all sizes | Important in relationships with different maturity levels | Important in companies of variety of customers/services |
| What factors determine relational mechanisms of performance measurement in digital service supply chains? | Personalization of service | Small companies serve personally from front to back end of service production; In larger companies, personalization is highlighted only in selected customers used as references to other cases | Personalization of service increases with the maturity of the relationship | A greater variety of customers usually means more personalized service production; Depends on the type of service |
| Criticality of service | Important in companies of all sizes | Important in relationships with different maturity levels | Important in companies of variety of customers/services |
| Compensation | Small companies do not see importance, but large companies do | Used in the early phases of a relationship | Beneficial to uniform customer base; More valued if general (not highly customized) service |
| Suppliers’ ability to sell | Crucial for small companies; Important in companies of all sizes | Crucial for startups; Important in relationships with different maturity levels | More crucial when highly customized services |

Case D

The case D data revealed that because the digital service business environment is changing constantly, the supplier and the buyer must create added value for customers all the time. This requires involvement in buyers’ everyday operations and performance measurement. Thus, it is easier to motivate a buyer to share information, especially when the service is usually critical to the buyer when doing business. The results for case D also indicate that buyers are very willing to measure digital services and share measurement information if the benefits are clear. These benefits can be related to buyers’ operations or inter-organizational relationships. This requires that the benefits are reflected until the customer. A business executive from case D stated, ‘If the buyer sees it [is] useful, whether it benefits the buyer’s operations to deal with us, the buyer’s activities with third parties, the buyer’s internal operations or adds to their knowledge and know-how considering their customers’.

Buyers in the business can be very aware of service or product and supplier options. Thus, the personalization behind the product and service plays a crucial role in keeping buyers and in motivating them to collaboratively measure performance and to share information. A user experience executive stated, ‘It already has some value if a person feels that this is somehow a personal service to [him or her].’ As the company is big, the interviewees also saw compensation and cost reductions as one way to motivate buyers to measure performance and to share information. As the company provides products and services that many other companies provide, the interviewees considered compensation meaningful because the company cannot compete with customization.

5.2. Summary of the findings

These findings for relational mechanisms, that is, mechanisms that initiate and enhance social interactions in performance measurement in digital service supply chains, are presented in Table 3 where a distinction is made between the types of relational mechanisms and the factors that determine relational mechanisms. In addition, the results are classified and analyzed based on supplier characteristics.

6. Discussion

6.1. Theoretical implications

This study focused on the connection between relational mechanisms and performance measurement in the context of digital service supply chains. First, this study contributes to performance measurement theory by detailing the mechanisms through which buyers and customers should be included in the measurement process, and by examining measurement practices across supply chains, rather than within companies, which is the focus in the majority of performance measurement research. In the management of digital service supply chains, buyers and customers play a crucial role (Sampson and Spring 2012) in the performance measurement process, which makes understanding relational mechanisms an essential part of the measurement process. The results demonstrate that trust between supply chain actors and improvement of knowledge through information sharing (Kreye, Roehrich, and Lewis 2015) are the essential types of relational mechanisms of performance measurement in digital service supply chains. Personalization of service and criticality of service, but also compensation, and suppliers’
ability to sell were highlighted to determine the relational mechanisms adopted. Thus, this study complements supply chain performance measurement research that concentrates on evaluating suppliers or on presenting shared measures for suppliers and buyers.

Second, the study contributes to the discussion on social controls as current performance measurement research has emphasized the need to consider social and behavioural aspects parallel to technical aspects (Smith and Bititci 2017). The most recent studies in the field of performance measurement suggested that measurement processes should focus not only on designing measurement systems and analyzing the data but also on recognizing and including subjects’ engagement in and experience of the process (Beer and Micheli 2018). Beer and Micheli (2018) further argue that researchers in performance measurement and management have called for increased understanding of social controls, the cultural and behavioural aspects of performance measurement, that enable measurement in different contexts and types of organizations.

By presenting the essential types of relational mechanisms, these findings support previous arguments that highlighted relationship challenges among actors, such as lack of trust and commitment, communication quality problems and information-sharing problems (Busi and Bititci 2006; Poppo, Zhou, and Ryu 2008; Liu, Luo, and Liu 2009; Cheung, Myers, and Mentzer 2010). The present results, however, indicate that involving the actors in different phases of digital service delivery increases the actors’ willingness to develop trust and to share their knowledge and information. These results support the results of Busi and Bititci (2006) and Pekkola and Ukko (2016) who conclude that relational mechanisms aid socialization that increases trust, openness and commitment among actors. Shared information can be very specific and provides additional possibilities for relationship learning and business in terms of joint sense making and integrating knowledge (Selnes and Sallis 2003; Cheung, Myers, and Mentzer 2010).

Related to factors that determine the relational mechanisms of performance measurement in digital services, the results indicated that if information is collected in a personalized way instead of through general and anonymous tools, for example, a general supplier/buyer satisfaction survey, then buyers share their knowledge more. This was the case whether the supplier company was small or large, or a startup or a more mature company. This result is in line with Beer and Michelli’s (2018) findings that the way in which performance measurement processes are designed should focus not only on the objects being measured (e.g. cost or quality) but also on the mechanisms that are developed and utilized by the subjects involved in the measurement. Further, the results show that the more critical the service is for buyers, the more willing they are to share measurement information. This result is important, because it is documented that collaboration enabled by information sharing can increase the performance of a supply chain, enhance information quality and assist in a reexamination of the scope of collaboration through the incorporation of new business processes (Papakiriakopoulos and Pramatari 2010; Liang 2015; Nollet, Beaulieu, and Fabbe-Costes 2017).

6.2. Practical implications

From a practical perspective, the paper provides guidance for how suppliers might engage the actors of digital service supply chains to provide measurement information. This is particularly relevant when aiming to understand the relational mechanisms of measuring and managing buyer–supplier relationships in digital business environments. The results suggest that suppliers can concentrate on building trust between supply chain actors because it engages the other actors of supply chains in performance measurement. Suppliers can also work on improving knowledge through formal and informal information sharing (Kreye, Roehrich, and Lewis 2015), an element that the interviewees also considered an essential relational mechanism that facilitates the development of performance measurement in a digital service supply chain. Based on the study results, practitioners should focus on promoting trust building and information sharing as they increase learning from relationships, as well as valuable knowledge acquisition. These elements can, in turn, affect buyers’ and customers’ willingness to evaluate suppliers, as well as to construct and use shared performance measures for the development and the benefit of the entire supply chain.

6.3. Limitations and further research

As the results are based on four case studies, this study has limitations. The case evidence is based on empirical findings from western economies, which limits the generalizability of the results. Taking into account the nature of the research objective, a case study is an appropriate method for researching and increasing understanding of the studied issue. However, additional in-depth longitudinal research is needed to fully understand the relational mechanisms that foster performance measurement. As digital service supply chains differ from traditional supply chains, there is a need for further research on mechanisms that enhance collaboration in performance measurement and wider supply chain management.

7. Conclusions

The study contributes to performance measurement theory by examining the connection between relational mechanisms and performance measurement. Relational mechanisms refer to mechanisms that initiate and enhance social interactions in performance measurement. The results show that trust between supply chain actors and improvement of knowledge through information sharing are the essential types of relational mechanisms of performance measurement in digital service supply chains. These types of relational mechanisms enable performance measurement by engaging actors in providing measurement information. Personalization of services and criticality of service, but also compensation, and suppliers’ ability to sell were highlighted to determine the relational mechanisms adopted.
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