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Inter-organizational tensions in servitization: A dialectic process model

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ABSTRACT

This study investigates inter-organizational tensions in servitization and develops a dialectic process model to better understand the emergent nature of servitization. Inter-organizational tensions have gained increasing attention in servitization literature recently, but their role in the emergent nature of servitization requires further research. By combining dialectic theory and the ARA framework from the Industrial Marketing and Purchasing (IMP) tradition, we develop a dialectic process model that identifies inter-organizational tensions as generative forces in servitization. We present a single case study about the implementation of a circular service proposition in the construction industry called "Façade-as-a-Service. Our results reveal multiple tensions in a servitization context and how they emerged as a result of contradictory relationship structures in the existing and envisioned situations. We found that the tensions may be either anticipated as a result from direct clash between the status quo and an envisioned situation or unanticipated because they are indirectly as a result of interdepend ARA dimension. Our findings contribute to the existing literature by (i) extending knowledge on servitization tensions to a circular economy context, (ii) portraying servitization as a dialectic process that requires integration of competing interests, and (iii) opening the black box of inter-organizational tensions by adopting the ARA framework.

1. Introduction

"We don't offer Façade-as-a-Service because we think we need a new business model or want to earn more money, no, servitization is a means to reach our goal to become more circular" (Manager, WinCo).

Servitization refers to the integration of product and service offerings by manufacturing firms (Baines, Lightfoot, Benedettini, & Kay, 2009; Vandermerwe & Rada, 1988). It is a widely used response to product commoditization and can lead to enhanced financial and non-financial performance (Matthyssens & Vandenbempt, 2008; Wang, Lai, & Shou, 2018). Offering services is associated with higher profits, more stable revenues, enhanced customer proximity, and increased offering differentiation (Baines et al., 2009). Servitization might enable and incentivize manufacturers to (i) design for longevity, (ii) optimize quality during operations, and (iii) increase the reusability of materials after disposal (Yang & Evans, 2019a). As indicated in the quote above, it is an important means for firms to operate in the circular economy (Centobelli, Cerchione, Chiaroni, Del Vecchio, & Urbinati, 2020). In this sense, it has a role to play in our global quest to reduce the industrial ecological footprint (Tukker, 2015).

Servitization was initially considered a unidirectional and planned process in which firms gradually increase the importance of service offerings and move from add-on services to relationship-based and process-centered services (Mathieu, 2001; Oliva & Kallenberg, 2003). More recently, this view was challenged by conceptualizing servitization as an emergent and unstructured process that requires an adaptive approach (Kowalkowski, Kindström, Alejandro, Brege, & Biggemann, 2012; Matthyssens & Vandenbempt, 2008). Because servitization requires highly specialized resources that are often distant from the core manufacturing knowledge (Paiola, Schiavone, Grandinetti, & Chen, 2021; Ulaga & Reinartz, 2011), firms tend to draw these resources from external actors (Salonen & Jaakkola, 2015). The resulting reconfigurations in business relationships require effort and investments from servitizing firms as well as from their network counterparts (Chakkol, Johnson, Raja, & Raffoni, 2014; Kowalkowski, Witell, & Gustafsson, 2013). In other words, network counterparts have to actively participate in developing and deploying the resources required for servitization (Raddats et al., 2017; Story, Raddats, Burton, Zolkiewski, & Baines, 2017). Therefore, co-evolutionary forces are important drivers of servitization (Martinez, Neely, Velu, Leinster-Evans, & Bisessar, 2017).

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Actively involving network counterparts can lead to inter-organizational tensions which increase the complexity of servitization (Struyf, Galvani, Matthyssens, & Bocconcelli, 2021). Network counterparts may respond defensively to a servitization initiative when it threatens their network position or does not fit with their goals and priorities (Öberg & Shih, 2014; Story et al., 2017). For example, servitizing firms may experience resistance from network counterparts due to the lack of service capabilities or vision, or unfavorable local conditions at intermediaries (Reim, Sjödin, & Parida, 2019). Inter-organizational tensions arise when the envisioned servitization strategy contradicts and collides with the external environment in which servitizing firms operate (Galvani & Bocconcelli, 2022). For example, tensions arise when servitizing firms challenge the expertise, role, or professional identity of network counterparts through their product-service offering (Burton et al., 2016; Tóth et al., 2022). Servitizing firms need to respond adequately to these tensions when they emerge and prevent their potential negative effect on servitization outcomes (Galvani & Bocconcelli, 2022; Tóth et al., 2022).

Research on inter-organizational tensions in servitization has been limited so far and emerged only recently. Most studies that have investigated them focus on tension categories, their causes, and how managers can adequately respond to them (Burton et al., 2016; Galvani & Bocconcelli, 2022; Tóth et al., 2022). The effect of tensions on servitization outcomes requires further research to better understand their role in the emergent and unstructured nature of servitization (Martinez et al., 2017; Tóth et al., 2022). Specifically, the impact of business relationships as an active force that influences servitization outcomes should be investigated more in-depth (Galvani & Bocconcelli, 2022). To respond to these calls, this paper aims to better understand the emergent nature of servitization by investigating how tensions in dyadic inter-organizational business relations drive this transformation. These insights extend our understanding of business relationships as a source of complexity in servitization and how this complexity drives servitization outcomes.

To study the effects of dyadic inter-organizational tensions on servitization outcomes, we integrated dialectic theory and the activity-resource-actor (ARA) framework from the Industrial Purchasing and Marketing (IMP) tradition (Håkansson & Snehota, 1995; Van de Ven & Poole, 1995). Dialectic theory asserts that contradictory values, interests, and goals of different actors lead to tensions, confrontation, and change through thesis, antithesis, and synthesis (Van de Ven & Poole, 1995). Dialectic theory is particularly well-suited for studying process dynamics in relation to tensions (Putnam, Fairhurst, & Banghart, 2016). To conceptualize dialectic processes in business relationships, we adopted the ARA framework. This framework is based on the premise that the business landscape consists of activities, resources, and actors that become mutually adapted and result in observable business relationship structures through ongoing interaction (Håkansson, Ford, Gadde, Waluszewski, & Snehota, 2009). Because ARA dimensions are interdependent and represent the basic micro-layer of business relationships (Håkansson et al., 2009; Kaartemo, Coviello, & Nummela, 2020), they provide a more detailed understanding of the dialectic process in business relationships.

Based on a single case study of a servitization initiative to contribute to the circular economy in the construction industry, we make three contributions. First, we found several inter-organizational tensions that are related to servitization in general as well as specifically to servitization as a strategy to contribute to the circular economy. Second, we increased our understanding of the emergent and unpredictable nature of servitization by portraying it as a dialectic process. Our findings indicate that servitization involves inter-organizational tensions which emerge from contradictions between the thesis and an envisioned antithesis and drive servitization through synthesis. As such, it appears that dialectics is a generative force that drives the course of servitization and requires an iterative and agile management approach. Third, we portray the ARA framework as a micro-foundation of the dialectic process. This means that the ARA dimensions explain the emergence of dialectic tensions on a lower abstraction level (Felin, Foss, & Ployhart, 2015). Involving network counterparts in a servitization strategy leads to contradictions between existing and envisioned activity links, resource ties, and actor bonds. These dimensions are also interrelated, and contradictions within a single dimension may lead to contradictions in other dimensions.

In the rest of this paper, we discuss the contemporary literature on servitization and develop our conceptual model by drawing on dialectic theory and the IMP tradition. We then elaborate on our research approach, case setting, and procedures for data collection and analysis. Finally, we present our case study results as well as our discussion and conclusions.

2. Conceptual background

In this section, we elaborate on the theoretical underpinnings of our research. We start by describing the servitization phenomenon, its network-embedded character, and the role of inter-organizational tensions. This is followed by the development of our conceptual model, for which we drew on dialectic theory (Hegel, 1969; Van de Ven & Poole, 1995) and the Industrial Marketing and Purchasing (IMP) tradition (Håkansson & Snehota, 1995).

2.1. Servitization

Servitization refers to the integration of products and services to offer customers better solutions through more complete market packages (Vandermerwe & Rada, 1988). It involves changes in operational processes, resources, and the organizational culture (Gebauer, Fleisch, & Friedli, 2005; Ulaga & Reinartz, 2011; Vendrell-Herrero, Bustinza, Parry, & Georgantzis, 2017). This process has long been considered unidirectional and linear, with manufacturers gradually shifting from basic product-oriented services to more sophisticated process-oriented services (Lütjen, Tietze, & Schultz, 2017; Oliva & Kallenberg, 2003). However, this linear thinking is problematic as the process appears to be illogical, organic, and unpredictable (Kowalkowski, Windahl, Kindström, & Gebauer, 2015; Martinez et al., 2017). So instead of considering servitization a unidirectional transition taken in a few large steps, the process should be envisaged as incremental and without a clear, predefined direction (Kowalkowski et al., 2012). One reason for the unpredictability of servitization is the need to involve business network partners, which reduces control over the process and therefore increases complexity (Kohtamäki, Parida, Oghazi, Gebauer, & Baines, 2019; Struyf et al., 2021; Visnjic, Neely, & Jovanovic, 2018).

Setting up new value constellations to deliver integrated product-service offerings requires firms to establish new relationships and reconfigure existing ones (Kowalkowski et al., 2013; Spring & Araujo, 2013). Such a business network reconfiguration requires effort from the servitizing firm as well as its network counterparts. Downstream actors such as agents and distributors need to develop service delivery and development capabilities, including identification of local needs, well-trained technicians, and competencies for data analysis (Reim et al., 2019; Story et al., 2017). Upstream actors such as suppliers need to integrate and tailor their resources with those of the servitizing firm (Chakkol et al., 2014). However, such network reconfigurations cannot be expected to always go smoothly. For example, business networks tend to maintain an equilibrium, which implies that the servitization of one firm requires the deservitization of another firm in the business network (Forkmann, Ramos, Henneberg, & Naudé, 2017; Halinen, Salmi, & Havila, 1999). Thus, servitization might threaten the network position of other network actors and trigger defensive attitudes from network counterparts (Story et al., 2017).

The need to involve network counterparts who also pursue their own agendas and priorities increases the complexity of servitization because this can result in inter-organizational tensions (Burton et al., 2016;

Struyf et al., 2021). Tensions emerge when the implementation of a servitization strategy collides with the context in which servitizing firms operate (Galvani & Bocconcelli, 2022). The context can be economic, technological, or legal, or the perceived benefits of service offerings or an actor's existing identity (Reim et al., 2019). For example, digital services may collide with local regulation or with professional identities when a service offering interferes with operator tasks (Reim et al., 2019; Tóth et al., 2022). Different tensions emerge over time, depending on the servitization stage the firm is in (Dmitrijeva, Schroeder, Ziaee Bigdeli, & Baines, 2022; Galvani & Bocconcelli, 2022). Even though tensions in servitization can be categorized in terms of organizing, learning, belonging, and performing (Dmitrijeva et al., 2022; Tóth et al., 2022), their specific form remains unpredictable, and dealing with tensions requires constant contextual evaluation and adaptation (Galvani & Bocconcelli, 2022).

Servitization scholars have mostly studied tensions to explain the challenging and complex nature of servitization. This means that the challenging nature of servitization stems from tensions that are generated by the transition and which require managerial actions to ensure desired servitization outcomes (Dmitrijeva et al., 2022; Kohtamäki, Einola, & Rabetino, 2020). However, we suspect that the relation between servitization and tensions is recurrent, that is, tensions also drive and shape servitization. Hints of such a recurrent relation can be found in the works of Galvani and Bocconcelli (2022) and Tóth et al. (2022). They found that managers respond to tensions by adapting their servitization strategy in terms of service design and service implementation. However, they did not explicitly focus on tensions as a generative force that affects the servitization path. Further investigating the role of tensions as a generative force in servitization increases our understanding of the emergent and unstructured nature of the servitization process (Kowalkowski et al., 2015; Martinez et al., 2017).

2.2. Towards a dialectic process model

So far, inter-organizational tensions in servitization have mostly been studied through a paradox lens (e.g., Galvani & Bocconcelli, 2022; Tóth et al., 2022). The paradox lens focuses on contradictions between opposite yet interrelated elements that exist simultaneously and persist over time (Smith & Lewis, 2011). This focus enables us to study the unity of contradictory elements that are often perceived by actors separately (Lewis, 2000). Scholars and practitioners can make sense of the paradox in its totality and address tensions by balancing opposite elements instead of choosing one element over the other (Lüscher & Lewis, 2008). For example, servitizing firms cannot choose between customization or standardization but need to achieve both (Kohtamäki et al., 2020). The paradox lens assumes that actors accept the co-presence of contradictory elements and engage in the act of balancing them (Hargrave & Van de Ven, 2017). In a network context, this may not always be the case as tensions can also arise from a clash between actors who actively pursue their own goals (Corsaro & Snehota, 2011; Öberg & Shih, 2014).

To study tensions stemming from clashing perspectives, agendas, and priorities between network actors, we draw on dialectic theory (Hegel, 1969). Dialectic theory is rooted in Hegelian and Marxist philosophy and asserts that economic actors are situated in a pluralistic world consisting of actors who have contradictory values, interests, and goals which lead to tensions, confrontation, and change (Van de Ven & Poole, 1995). Because contradictions are inherent to organizational arrangements, clashes between existing and alternatively envisioned arrangements are inevitable (Benson, 1977; Seo & Creed, 2002). This clash between thesis (i.e., status quo) and antithesis (i.e., alternative social arrangement) triggers political struggle between proponents of both sides, which leads to transformation or synthesis that cannot be predicted a priori (Langley & Sloan, 2012; Van de Ven & Poole, 1995). Next to synthesis, which refers to change through integrating thesis and antithesis, contradictions can also be absorbed into existing arrangements or be suppressed by subscribers to the status quo (Farjoun & Fiss, 2022; Hargrave & Van de Ven, 2017). Through the process of confrontation between thesis and antithesis, dialectic theory assumes that innovation cannot be considered in isolation from what previously existed and that innovation outcomes reflect the integration of the old and the new (Bledow, Frese, Anderson, Erez, & Farr, 2009).

The focus of dialectic theory on tensions that drive organizational change complements the paradox lens (Hargrave & Van de Ven, 2017). While process is an important concept in paradox studies (Farjoun, 2010), it has not been its central focus (Putnam et al., 2016). In contrast, dialectic theory focuses on change processes by studying actors whose interests are not being served and therefore engage in a political struggle to change the status quo (Hargrave & Van de Ven, 2017). The focus of dialectic theory on contradictions between interests among actors who have the agency to bring about change through political conflict makes it an approach well-suited to studying strategic change processes (Farjoun & Fiss, 2022).

Furthermore, dialectic theory adopts a wider view of underlying tensions by considering both dualisms and dualities (Smith & Lewis, 2011). This means that the dialectic process entails tensions that can be resolved through integration (i.e., dualisms) as well as ones that are persistent over time (i.e., dualities). To understand tensions in inter-organizational relationships and capture the dialectic process in business relationships, further conceptualization is needed. So far, dialectics have mostly been studied on the organizational level (Putnam et al., 2016), and a detailed framework is lacking to study tensions in complex and dynamic business relationships.

To conceptualize dialectics in business relationships, we draw on the IMP tradition. IMP has studied business relationships and networks for more than four decades and provides a strong theoretical base for understanding inter-organizational dynamics (Håkansson & Gadde, 2018). IMP asserts that business is conducted in long-term business relationships and puts inter-organizational interaction at the center of attention (Håkansson & Snehota, 1989; Waluszewski, Snehota, & La Rocca, 2019). Over time, interaction results in complex network structures that favor stability over change (Håkansson et al., 2009). Because innovation involves the reconfiguration of existing social, technical, and economic relations between business network actors (Hoholm & Olsen, 2012), network tensions are inherently part of innovation (Chou & Zolkiewski, 2018; Vildåsen & Havenvid, 2018). The fierceness of these tensions depends on the combination of structure 'heaviness' and 'variety', which refers to the stickiness of the old and the extent to which the new deviates from the old (Håkansson & Waluszewski, 2002a). The focus on stability and long-term relationships stemming from interaction provides a more detailed understanding of how a thesis emerges in business relationships and how innovations could lead to tensions.

Tensions in business relationships become salient when an actor tries to mobilize other actors by actively developing or changing some aspects of existing relationships or network structures (Ford & Mouzas, 2013; Mouzas & Naudé, 2007). The mobilizing process consists of various management activities ranging from identifying relevant network counterparts to motivating them to commit resources to a change initiative and influencing how resources are integrated across actors (Aarikka-Stenroos, Jaakkola, Harrison, & Mäkitalo-Keinonen, 2017). Network counterparts may not respond to a change initiative as the mobilizer anticipated because they pursue their own interests and priorities (Öberg & Shih, 2014). Consequently, mobilizers need to make compromises that direct innovation in different, unexpected ways (Hoholm & Olsen, 2012). Compromises may entail mutual adaptation within existing business relationships through constructive debate or dissolution of existing relationships to overcome value co-creation impediments (Chou & Zolkiewski, 2012; Fang, Chang, & Peng, 2011; Tidström, 2014). This view on actor mobilization, including the need for compromising, enriches the understanding of the synthesis process in business relationships.

To capture the dialectic process in the context of business relationships, we adopt the ARA framework (Håkansson & Snehota, 1995),

which is a widely used analytical framework to make sense of business relationships (Möller & Halinen, 2022). The ARA framework differentiates between three dimensions that make up business relationships: activity links, resource ties, and actor bonds. As these relationship dimensions represent the basic micro-elements of networks (Kaartemo et al., 2020), they provide a more detailed understanding of the dialectic process in business networks. In other words, thesis and antithesis in a dialectic process can be described in terms of activity links, resource ties, and actor bonds. More specifically, we consider the existing business relationship structure as the thesis situation and the mobilizer's envisioned relationship structure as the antithesis. When these relationship dimensions clash in the dialectic process, inter-organizational tensions emerge and trigger the synthesis process, which is a political process that involves compromising (Hoholm & Olsen, 2012).

Activity links refer to a system of interdependent transformation (i.e., production) and transaction (i.e., exchange) activities carried out by different network actors (Dubois, 1998). Due to the interdependence between activities among network actors, a change in one activity configuration often requires other actors to change their activity configuration as well (Håkansson et al., 2009). However, changing activity configurations at one firm may negatively influence another firm's efficiency and elicit resistance (Dubois, 1998). Resource ties refer to the interfaces between tangible and intangible resources as a result of mutual adaptations and investments (Baraldi, Gressetvold, & Harrison, 2012; Håkansson & Waluszewski, 2002b). While specialized resource interfaces can be valuable to firms, they may also be difficult to change due to their "heaviness" (Håkansson & Waluszewski, 2002a; Prenkert, 2016). Actor bonds refer to cognitive links between network counterparts including inter-personal relations, identity perspectives, norms, and ideas about how business relationships will evolve in the future. Network actors may have different and even contradictory views on relationship structures and how they evolve (Leek & Mason, 2009; Mattsson, Corsaro, & Ramos, 2015).

One of the key features of the ARA framework is the interdependence between the activity, resource, and actor dimensions (Håkansson et al., 2009). Activity links and resource ties are interdependent because resources enable activities (Bankvall, 2014). For example, production activities may require resources such as machinery and process knowledge. Vice versa, innovation activities affect resources as production activities may result in new products and innovation activities in new knowledge (Dubois, 1998; Möller, 2010). Activity links and actor bonds are interdependent because how actors perceive their own and each other's identity and network role determines what behavior and activities are considered appropriate and affect what innovation opportunities are pursued (Tripsas, 2009). Resource ties and actor bonds are interdependent because resource structures can be expressed in activated structures and idea structures (Håkansson & Waluszewski, 2003). Activated structures refer to the existing resource structures whereas idea structures refer to the actor's subjectively held interpretations of resource structures. While idea structures may be the source of resource tie development, they can also result in tensions due to contradictory idea structures among actors (Håkansson & Waluszewski, 2003).

Integrating dialectic theory and the ARA framework results in a dialectic process model to analyze and explain dialectics in business relationships (Fig. 1.). We use this model to study the dialectic process in the context of servitization. Our model asserts that servitizing firms operate in existing business relationships that are characterized by product-focused interaction (Reim et al., 2019; Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019). Because servitization involves network reconfigurations (Kowalkowski et al., 2013), implementing a

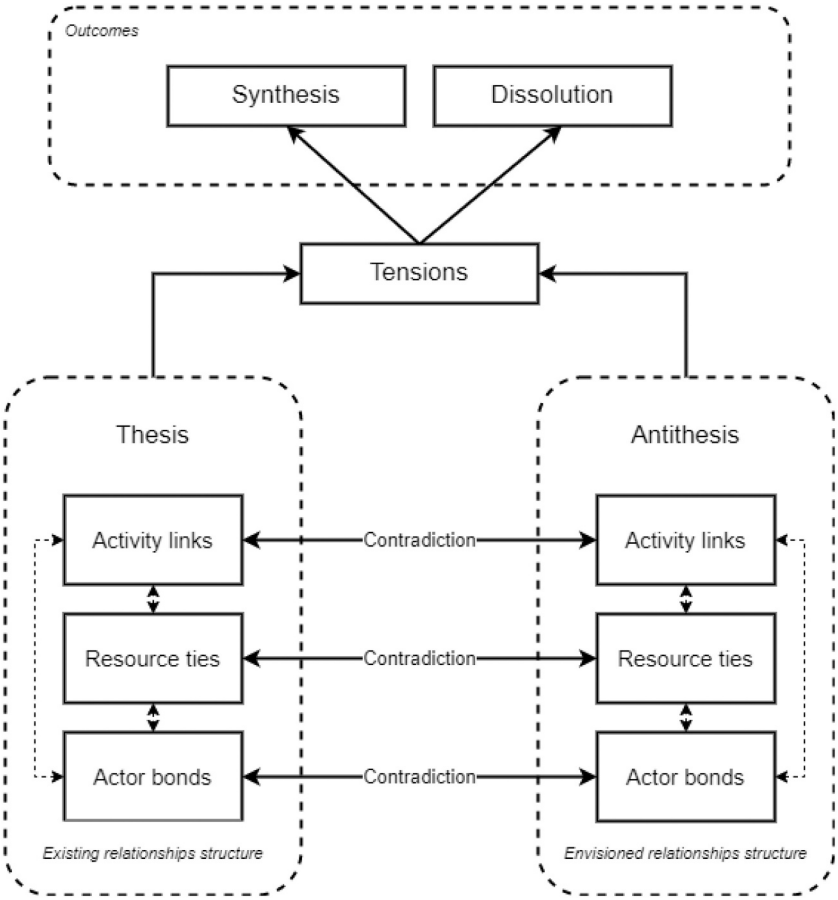


Fig. 1. Dialectic process model.

servitization strategy requires firms to challenge the thesis by envisioning new relationship configurations in accordance with their servitization strategy (i.e., antithesis). Both thesis and antithesis can be described in terms of three interdependent elements, namely, activity links, resource ties, and actor bonds. However, the antithesis envisioned by the servitizing firm may be perceived as a threat by other network actors who will try to defend their network position through a defensive response (Story et al., 2017). Such defensive responses trigger the dialectic process manifested in inter-organizational tensions. Depending on how these tensions play out, they result in synthesis or dissolution.

3. Method

This study presents a case of a Dutch SME in the construction industry that is implementing a servitization strategy to become more circular. We adopted an abductive research approach, which means that we switched between theory building and data collection during the research process. Specifically, we opted for a qualitative research design because it provided us with the required investigational flexibility (Yin, 2009). A qualitative research design allowed us to draw on multiple data sources and different informants and make adjustments in our data collection and analysis to deal with business relationship complexity. We chose to conduct a case study for two reasons. First, it helps us gain an understanding of the uniqueness and embeddedness of the studied phenomenon (Stake, 1995). And second, case studies give a holistic view of a system, including its structure and relations (Halinen & Törnroos, 2005). To thoroughly understand how the clash between current and envisioned business relationship structures resulted in inter-organizational tensions, we preferred a single case study design over a multiple case study design. Given the available time and resources, a single case study provides us with the required depth of analysis, which is preferred over the breadth that can be obtained from multiple case studies (Yin, 2009).

We picked a case from the Dutch construction industry for two reasons. First, the circular economy is a high-priority topic in this industry since construction is responsible for 40% of total energy consumption, 38% of all waste, and 36% of CO_2 emissions in the EU (European Commission, 2018). Along with building design and choice of materials, service business models are expected to play an important role in making the construction industry more adherent to the principles of the circular economy. This makes servitization a highly relevant topic within this industrial context. Second, we expected that studying servitization in the construction industry would increase the quality of our data since the phenomenon of servitization is noticeable in this industry (Visnjic et al., 2018). As a result, we expected informants to be more aware of the topic under investigation, which might encourage them to provide more in-depth and higher-quality insights. To scope this case, we included network actors that play an essential role in the materialization of the service offering under study. This scope emerged during the study, and we relied on references from case informants to identify other relevant informants.

We collected empirical data from a Dutch façade builder (acronym: WinCo) and its surrounding network. A façade is a building's exterior, and its main function is to offer protection against wind, water, and noise while allowing daylight through. Traditionally, this is done by integrating an aluminum system and glass, but recently façades are being equipped with components such as active heating, ventilation, air-conditioning systems, artificial lighting, energy storage, or solar thermal collectors (Prieto, Klein, Knaack, & Auer, 2017). As a result, façades are becoming increasingly complex products that can be augmented with services. To anticipate this trend, WinCo, an SME with approximately 120 employees and yearly revenues between 20 and 30 million euros, is developing and implementing servitization through Façade-as-a-Service (FaaS). With this offering, WinCo targets utility buildings and large residential towers. Offering building components through a service offering is an increasingly observed trend in the construction industry to push the transition to the circular economy. By implementing service business models which involve long-term collaboration between project partners, the construction industry is expected to implement more energy-saving technologies and use sustainable materials (Azcárate-Aguerre, Den Heijer, & Klein, 2018). By implementing a servitization strategy, WinCo follows industry pioneers such as Mitsubishi (M-Use®) that have used servitization to adapt to the circular economy.

In FaaS, WinCo envisions integrating its capital goods with operation and maintenance services in a leasing service. So instead of selling the façade to the end-user, WinCo aims to remain the legal owner of the capital good and becomes responsible for maintaining and redeploying or recycling the capital good during and after its life cycle. This new business model makes sense from both an economic and a circularity perspective. Regarding the economic aspect, WinCo traditionally created value by engineering and producing the capital good; now this is extended by the exploitation and afterlife phases in FaaS. By extending the scope of value creation, WinCo expects to capture some of this value and increase its bottom-line performance. From a circular economy perspective, WinCo becomes economically incentivized to design and maintain the capital good for longevity and circularity, resulting in higher resource utilization. We were mainly interested in the networked character of implementing FaaS and thus in the interaction between WinCo and counterparts. To this end, WinCo was a suitable case because many different network actors got involved with the implementation of FaaS, and many interactions could be studied.

When we got in touch with WinCo, they had already been working on the FaaS proposition for some years. But at this point, they were starting to incorporate FaaS into real projects, which led to multiple tensions in several dyadic relations becoming salient. During the data collection, WinCo continued developing and adapting the FaaS proposition, and they had multiple encounters with several network counterparts, including financiers, suppliers, and project developers. During these interactions, WinCo increasingly realized the importance of adopting a multi-actor perspective on FaaS and how interdependence between them and network counterparts impacted the successful implementation of FaaS. When we ended our data collection in June 2021, FaaS was still in the implementation phase, but negotiations were taking place to implement FaaS in multiple projects. This indicates that WinCo made progress in shaping its FaaS proposition.

3.1. Data collection

We collected data between December 2019 and December 2022 through semi-structured interviews and a workshop. We identified relevant informants who, according to other network actors, have played a significant role in the materialization of FaaS. The majority of our data was collected between December 2019 and June 2021. In this period, we first conducted 25 semi-structured interviews of approximately an hour each, divided into three rounds. The first interview round was executed by the lead author and assisted by a bachelor student who was working on their thesis. Through the interviews, we got acquainted with the case and WinCo's network. Interviewees were identified by asking each one to indicate any important network counterparts for the traditional and FaaS value propositions. We asked general questions about each network counterpart, their role in the network, their relations with network counterparts, and how they envisioned their role in FaaS. The first interview round resulted in a general overview of the actors involved in the network, their roles, and the interrelations between them. The interview guide can be found in Appendix A.

In the second interview round, executed by the lead author, we gathered more detailed data on dyadic network structures in a FaaS context. We collected dyadic business relationship data on activity links, resource ties, and actor bonds between the interviewee's organization and WinCo as well as between their organization and other network partners. By asking questions about resource streams, innovation

activities, product sales, service delivery, and personal relations between organizations, we got a detailed overview of the business relationship structures. This data was collected for both the current context and the envisioned FaaS setting. As a result of the reflective nature of the questions, interviewees often shared concerns and tensions that emerged from the difference between the current business relationship structure and the envisioned FaaS structure. Also, respondents often reflected on firm-level and network-level factors that played a role in these tensions. Even though we focused on the dyadic level, we asked further questions about these different interaction levels when we considered them to be important context information for our research. The interview guide can be found in Appendix B.

After the initial data analysis, the lead author and a master student conducted seven additional interviews to ask about specific developments within FaaS and the relevant network relations. Table 1 gives an overview and additional information about the interviewees in this third round.

The interviews were complemented by a workshop with WinCo and some of its suppliers to identify potential systematic challenges or risks of FaaS. This workshop took place on 28 October 2020, lasted 3.5 h, and was attended by two façade builders, GlassCo and SysCo, a blinds supplier, and a system integrator. The workshop identified general challenges and risks with FaaS network alignment as well as challenges and risks specifically for every participating firm. The outcome was a set of network-wide and company-specific challenges to successfully implement FaaS.

Finally, we collected secondary data, including industrial white papers, practice-oriented research reports, and relevant interviews in trade magazines to complement our primary database. These data sources supplemented the existing database but also allowed for data triangulation to increase the internal validity of our results. In December 2022, we conducted a final interview to collect data about the most recent status concerning the implementation of FaaS.

3.2. Data analysis

The process of data analysis consisted of four phases. First, we started by transcribing all interview recordings verbatim and reading them closely to get acquainted with the data. Whenever we came across potentially interesting chunks of data, we highlighted them and made comments. In the second phase, we coded all chunks of data that reflected the current state of the façade network (i.e., thesis), WinCo's envisioned FaaS network (i.e., antithesis), or results from clashes between both (i.e., tensions). In the third phase, we deepened the analysis by structuring the thesis and antithesis separately in terms of the activity-resource-actor (ARA) framework (Håkansson & Snehota, 1995). Specifically, we categorized all codes which were associated with the business relationship structure in the thesis or antithesis situation to one of the ARA dimensions. In the fourth phase, we compared business relationship structures in the thesis and antithesis to find any contradictions and looked at how these contradictions connected to the observed tensions. We investigated why certain tensions emerged and if and how these tensions related to observed contradictions between the thesis and antithesis. While one of the researchers was actively involved with the case, collecting and coding data, the other authors critically reviewed the emerging codes, categories, and interrelations.

4. Results

In this section, we present our findings on the business relationships between WinCo, financier, architect, SysCo, and GlassCo. These business relationships were chosen because we found the most notable tensions there that affected the development of the FaaS offering. Table 2 summarizes our findings. We identified several tensions that resulted from envisioned activity links, resource ties, and actor bonds which contradicted the status quo. We also found that tensions resulted from first- or second-order contradictions. First-order contradictions refer to a clash between WinCo's purposefully envisioned antithesis and the thesis. Second-order contradictions are unintended ones that result from the interdependence among ARA dimensions. Finally, we found that tensions drove WinCo's servitization process and the development of its FaaS proposition. The remainder of this section discusses each tension and its effect on the FaaS proposition in depth. We also provide visual representations of the dialectic processes through our conceptual dialectic process model.

Table 1
Overview of interview informants.*

#	Company description (acronym)	Role of informant	Date	Duration
Interview round 1				
1	Façade builder 1* (WinCo)	Manager	09–12-19	01:17:23
2	Façade builder 1* (WinCo)	Manager	03–02-20	01:08:04
3	Façade builder 1* (WinCo)	Technical director	03–02-20	00:25:19
4	Façade builder 1* (WinCo)	Executive director	03–02-20	00:36:18
5	Glass supplier (GlassCo)	Product manager	13–02-20	00:54:06
6	System supplier 1* (SysCo)	Product manager	18–03-20	00:45:00 (+/−)
7	System integrator	Engineer	31–03-20	00:54:15
8	Sunscreen supplier	Head of digital transformation	17–04-20	00:56:15
9	Developer 1*	Project developer	27–05-20	01:15:11
10	Architecture firm 1*	Architect	15–06-20	00:39:08
11	Contractor	Project developer	25–06-20	00:48:38
Interview round 2				
12	System supplier 1*	Product manager	13–08-20	01:04:32
13	Glass supplier (GlassCo)	Product manager	20–08-20	00:54:41
14	System integrator	Engineer	01–09-20	01:04:13
15	Developer 1*	Project developer	25–09-20	00:56:19
16	Architecture firm 2*	Architect	14–10-20	00:56:02
17	Financier	Banker	15–10-20	00:30:33
18	Façade builder (WinCo)	Manager	16–10-20	01:03:31
Interview round 3				
19	Façade builder 1* (WinCo)	Manager	07–05-21	00:35:39
20	Façade builder 2*	Technical director	19–05-21	00:47:30
21	Façade builder 1 (WinCo)	Manager	21–05-21	00:41:56
22	Glass supplier (GlassCo)	Product manager	21–05-21	00:44:22
23	Developer 2*	Project developer	21–05-21	00:22:56
24	Façade builder 1* (WinCo)	Manager	25–05-21	00:55:28
25	System supplier 2*	Product manager	04–06-21	00:47:30

* Numbers differentiate between different informant organizations with the same role in the network.

Table 2
Summary of inter-organizational tensions.

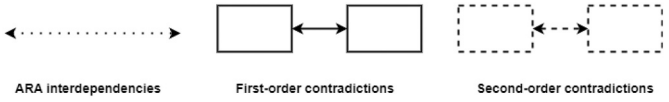
Figure	Counterpart	Observed tension	Contradiction (ARA)	Contradiction (first/second-order)	Tension outcome(s)
2.1	Financier	Lack of trust	Actor bonds	Second-order	Synthesis
2.2	Financier	Pricing process rigidity	Activity links	Second-order	Synthesis
2.2	Financier	Regulative barriers	Activity links	Second-order	Synthesis
3.1	SysCo	Reactive attitude	Activity links	Second-order	Dissolution
3.2	SysCo	Organizational rigidity	Actor bonds	Second-order	Dissolution
4.1	Architect	Professional identity threat	Actor bonds	Second-order	Synthesis
4.2	Architect	Limited control over façade measures	Resource ties	First-order	Synthesis
4.3	Architect	Greenwashing concerns	Actor bonds	First-order	Synthesis
5	GlassCo	Risk distribution	Actor bonds	Second-order	Synthesis

4.1. WinCo - Financier

When offering FaaS, WinCo needs to pre-finance the physical façade, which is earned back through cash flows from the service contract. Because WinCo does not have the financial resources to pre-finance the physical façade themselves, they need to draw funds from external sources. When engaging financiers for FaaS, two tensions appeared in the relationship between WinCo and the financier. These tensions are a lack of trust (Fig. 2) and pricing process rigidity (Fig. 3).

4.1.1. Lack of trust (Fig. 2)

To finance FaaS, WinCo looked for novel financing structures and thereby directly contradicted existing resource ties and indirectly, actor bonds. Resource ties in the thesis situation are characterized by mortgage-based loans. Mortgage-based loans stem from the financier's perception of real estate as a trustworthy security that can be seized and resold in case of debt default. Because mortgage-based loans enable a



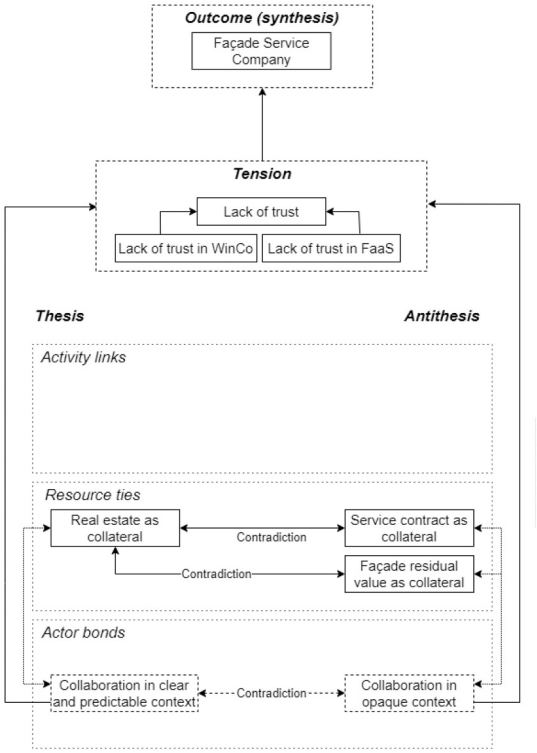


Fig. 2. Trust tensions WinCo – Financier dyad.

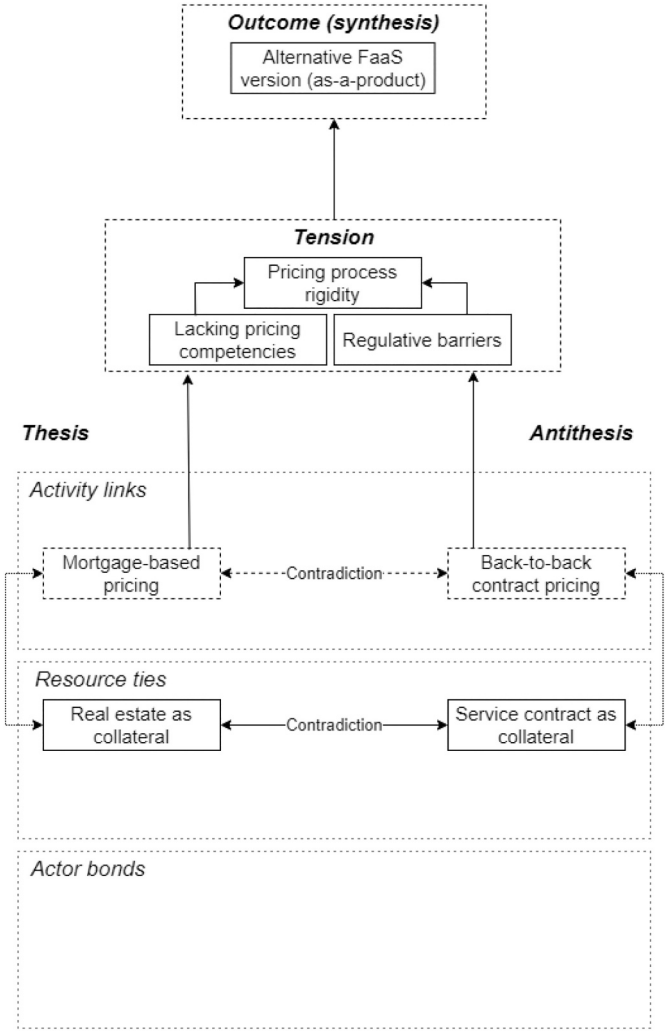


Fig. 3. Process rigidity tensions WinCo – Financier dyad.

predictable interaction context between WinCo and the financier, resource ties and actor bonds are interrelated in this case. WinCo's envisioned FaaS antithesis directly challenged resource ties and actor bonds indirectly in the thesis situation. Instead of using real estate as collateral, WinCo envisioned that the service contract and façade residual value would serve as collateral. WinCo envisioned this antithetical resource tie because the façade has no intrinsic value in FaaS since façade ownership is separated from the rest of the building and cannot be easily seized in case of debt default. Therefore, mortgage-based loans were not an option. WinCo considered contract-based financing a suitable alternative because cash flows stemming from service contracts are predictable and quantifiable. However, even though WinCo's

envisioned resource ties are used by financiers in different contexts (e.g., automotive), they normally provide such financing based on transparent and predictable market conditions, as illustrated in the following quotes:

"Car leasing companies know exactly what a car will be worth in five years with 250,000 km on the counter" (Banker, Financier).

"Companies like Mitsubishi [M-Use ®] or Phillips [Light-as-a-Service] can pre-finance some projects from their own resources […] and at some point when the market sees "okay, this works" (Banker, Financier).

In contrast to using the envisioned financing structures as mentioned above, using contract-based financing for FaaS is associated with many unknowns such as customer readiness, façade residual value, or WinCo's long-term survivability. In other words, WinCo's envisioned antithesis implies collaboration with financiers in an opaque market situation. Therefore, WinCo's envisioned antithesis led not only to first-order contradictions in the resource layer but to second-order contradictions in the actor layer as well.

Second-order contradictions in the actor layer resulted in trust-related tensions. One part of this tension was related to the ability of WinCo to secure the collateral and generate long-term cash-flow from the service contract. Financiers were concerned with cash-flow instability stemming from volatile resource prices and risks associated with WinCo's long-term ability to meet service-level agreements. The latter could be jeopardized by bankruptcy, for example. Another part of this tension was related to uncertainty regarding the FaaS concept itself. Because the adoption rate of FaaS and façade residual value development were highly uncertain, financiers were not able to calculate risks. This uncertainty resulted in a hesitant attitude from financiers to provide financing as envisioned by WinCo. WinCo responded to these tensions by establishing 'Façade Service Company', a joint venture with another façade builder and one of its main suppliers. Because WinCo made multiple agreements with joint venture partners that reduced uncertainties associated with cash-flow stability and façade residual value, financiers were more willing to provide WinCo's envisioned financing. This situation illustrates how second-order contradictions resulted in trust-related issues that influenced WinCo's servitization in the form of establishing a joint venture to offer FaaS.

4.1.2. Pricing process rigidity (Fig. 3)

The first-order contradiction between existing and envisioned resource ties also led to second-order contradictions in the activity layer. In a traditional product setting, activity links in which financiers determine appropriate interest rates through sophisticated pricing models are based on real estate as collateral (i.e., resource ties). WinCo's vision to use service contracts as collateral indirectly contradicted activity links. Instead of using mortgage-based pricing models, financiers must calculate the risks of back-to-back contract structures. These are contractual forms in which agreements between the financier and the Façade Service Company also apply to subcontracting firms participating in this joint venture. By using such legal constructions, financiers reduce risks of cost overruns and loan charges by assigning some financial liability to the firms, including WinCo, that back the joint venture.

Second-order contradictions in the activity layer led to pricing process rigidity-related tensions. As seen in the following quote, financiers have trouble effectively assessing the risks associated with such contracts:

"To obtain financing [based on back-to-back contracts], colleagues from the risk department must also give their approval. This is a bottleneck because the models used for calculations are now based on mortgage rights. […] In addition, the question is which return and risk model this product should be placed in." (Financier whitepaper).

In addition to lacking pricing competencies, the banking sector is also heavily regulated. This regulation prevents them from freely experimenting with new financing products that suit FaaS. This is reflected in the following quote:

"One can value them [service cash-flows] in the same way [as bonds], by discounting future cash flows. […]. Only the banking sector has its own rules, which are agreed upon internationally" (Banker, Financier).

Tensions related to the lack of pricing competencies and industry regulation have prevented financiers so far from providing WinCo with a suitable financing product. This situation illustrates how a contradiction in resource ties can indirectly result in tensions due to the interdependence between resource ties and activity links. As a result of these tensions, financiers could only provide unsecured loans. Because these loans include high-interest rates, they drastically increase WinCo's cost of capital and jeopardize the FaaS business case. As a response to this tension, WinCo decided to also offer a FaaS version in which they would sell the façade with a separate service contract. In this case, ownership is still transferred to the end-user but WinCo remained in touch with their products through a long-term service contract.

4.2. WinCo – SysCo

SysCo is a multinational company that sells high-quality aluminum profile systems at a premium price point. SysCo's product is the most important component of WinCo's façades. Because WinCo has worked with SysCo for a long time and has had good experiences with their products and services, they wanted to involve them in the development of FaaS. However, when interacting with SysCo about FaaS, WinCo experienced a reactive attitude (Fig. 4) and organizational rigidity as tensions with SysCo (Fig. 5).

4.2.1. Reactive attitude (Fig. 4)

In the thesis situation, SysCo strongly focuses on pre-sales support in the tendering and engineering phases to justify its premium prices. Furthermore, SysCo aims to maintain its brand as a premium profile

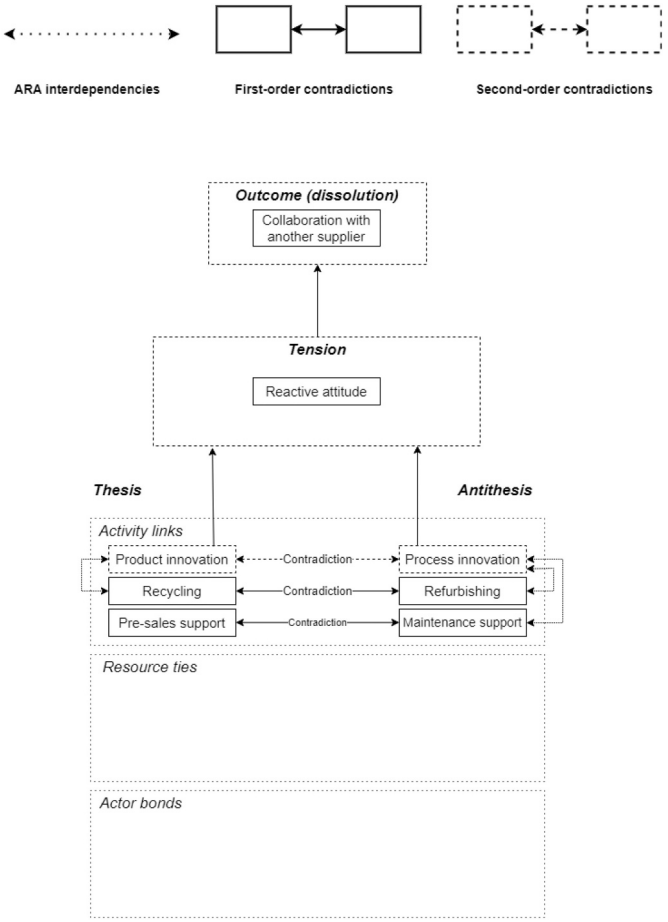


Fig. 4. Reactive attitude tensions WinCo – SysCo dyad.

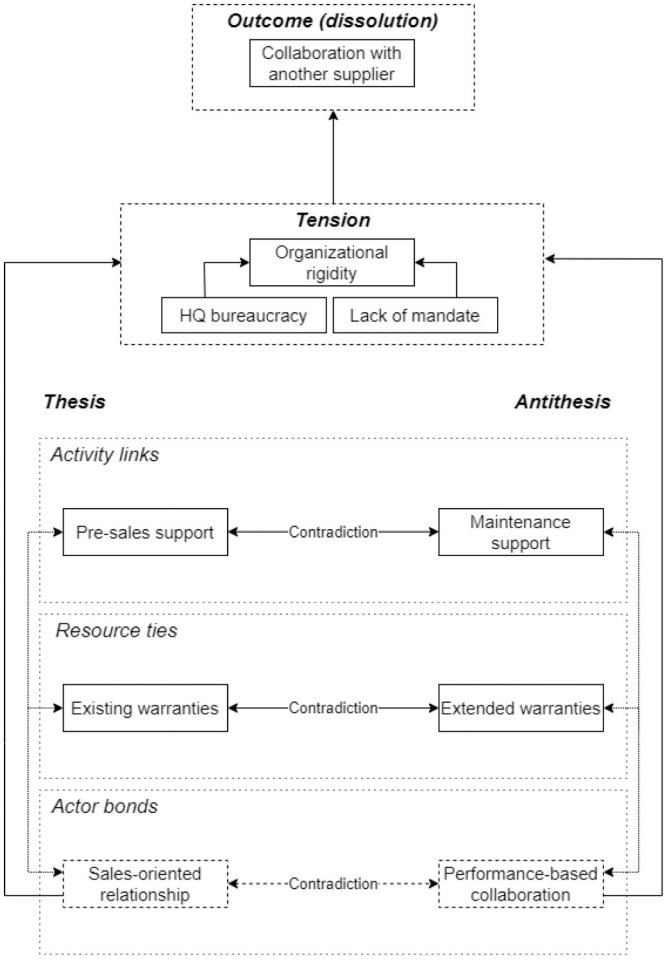


Fig. 5. Rigidity tensions WinCo – SysCo dyad.

supplier by offering products that contain state-of-the-art technology that fits with industry requirements. Therefore, SysCo significantly invests in product innovation to improve the thermal performance and energy consumption of its products. To respond to industry trends regarding ecological sustainability, SysCo aims to improve product recyclability through product innovation. Because both recycling and pre-sales support activities are driven by product innovation, these activity links are interdependent. By envisioning activity links in which SysCo provides maintenance support during the façade exploitation phase and engages in façade refurbishing when the façade returns, WinCo directly contradicts existing activity links. Also, these first-order contradictions imply second-order contradictions because maintenance support and refurbishing require process innovation on the part of SysCo while they are traditionally focused on product innovation.

This second-order contradiction led to tension between WinCo and SysCo, which was characterized by a reactive attitude from SysCo towards FaaS. This tension is illustrated in the following quotes:

"SysCo has existing business processes and a certain strategy, which is why it is difficult to roll out a different business concept. We try to support WinCo's servitization within our existing processes" (Product manager, SysCo).

"We thought [SysCo] innovated a lot, but it appeared that it was not the innovation we needed" (Manager, WinCo).

It appeared that SysCo lacked the capacity and knowledge to implement WinCo's requirements. This situation illustrates how contradictions within the activity layer can be interdependent as transactional activities (i.e., maintenance involvement and refurbishing) were associated with transformational activities (i.e., process innovation activities). SysCo's reactive attitude ultimately led to the dissolution of the business relationship. After interacting for more than a year, WinCo realized that SysCo would not implement its requests and dissolved the relation with SysCo in the FaaS context. Instead, WinCo partnered with one of SysCo's competitors to support FaaS. This new supplier was included in the joint venture, and they have also collaboratively developed an innovative and modular façade. In this instance, second-order contradictions within the activity layer and SysCo's reactive attitude affected WinCo's servitization in terms of network configuration. So instead of partnering with its main supplier, the tensions made WinCo approach a different supplier to offer FaaS.

4.2.2. *Organizational rigidity (Fig. 5)*

In addition to extensive pre-sales support, SysCo's products came with ten years of warranty on the profile system and one year on peripherals such as locks, hinges, and electronic components. Pre-sales support and existing warranties were based on a sales-oriented relationship in which SysCo was mainly focused on optimizing product sales. WinCo directly contradicted existing activity links and resource ties by envisioning an antithesis in which SysCo would get involved in maintenance activities and provide extended warranties of fifteen years on all components. These first-order contradictions in the activity and resource layers also resulted in second-order contradictions in the actor layer. By requiring SysCo to get involved with maintenance activities and provide extended warranties, WinCo assumed a performance-based collaboration with SysCo. This performance-based collaboration also assumed a new role for SysCo to become a "resource financier" instead of a company that sells kilograms of aluminum. Such a collaboration contradicted the sales-oriented actor bond.

This second-order contradiction in the actor layer led to tensions in terms of a lacking mandate and HQ bureaucracy. Because WinCo was traditionally in contact with a sales representative, this person lacked the mandate to implement WinCo's requirements. Consequently, this person had to steer FaaS requirements through HQ, but this was complicated, as illustrated in the following quote:

"But you have to deal with the [national] mentality, and that can be difficult at times. I now have a person, [SysCo manager], who shifts up a bit faster there. But gosh, that's all so bureaucratic, awful." (Manager, WinCo).

So, despite WinCo's contact person being enthusiastic about FaaS and willing to implement WinCo's envisioned changes, he lacked the mandate to implement those innovations himself and failed to steer the initiative through the organization. In this instance, the envisioned resource ties and activity links also involved a newly envisioned actor bond. The contradiction between actor bonds in the thesis and antithesis resulted in organizational rigidity to adapt to FaaS. This tension exacerbated the reactive attitude identified earlier and contributed to the demise of the business relationship between WinCo and SysCo in the FaaS setting.

4.3. *WinCo - Architect*

Architects have an important role in the early stages of a construction project. Because they are involved in design and engineering activities and are responsible for the visual appearance of buildings, they greatly influence the adoption of FaaS. Therefore, they are important counterparts to be taken into account by WinCo. When WinCo engaged architects in FaaS, tensions regarding professional identity threat (Fig. 6), limited control over façade components (Fig. 7), and greenwashing concerns emerged (Fig. 8).

4.3.1. *Professional identity threat (Fig. 6)*

By increasing the standardization and modularity of the façade, WinCo directly contradicted existing resource ties and indirectly, existing activity links and actor bonds. In the thesis situation, actor bonds are characterized by architects considering themselves artists because they have been educated as such. A good architect is considered

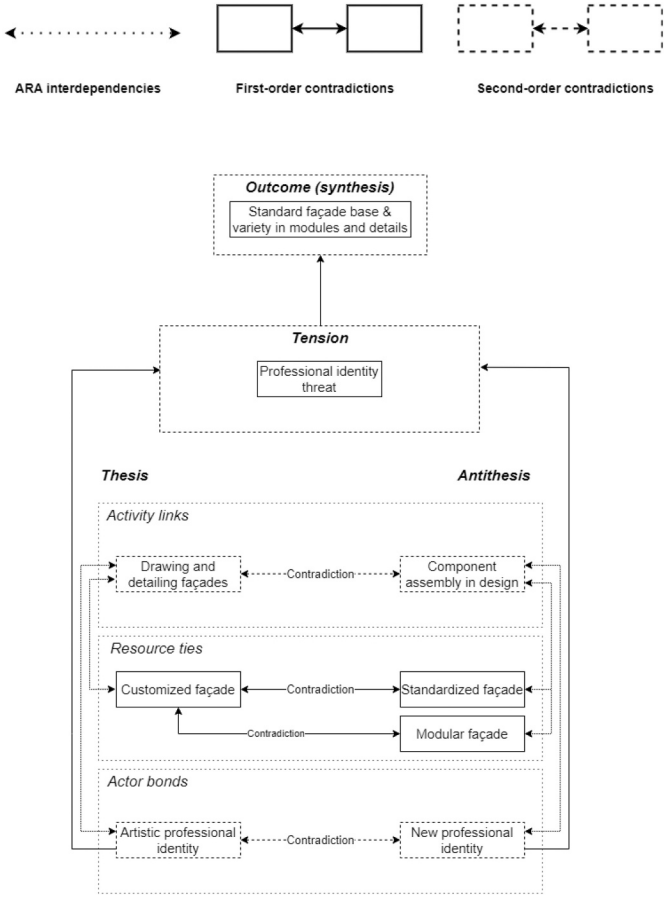


Fig. 6. Identity tensions WinCo – Architect dyad.

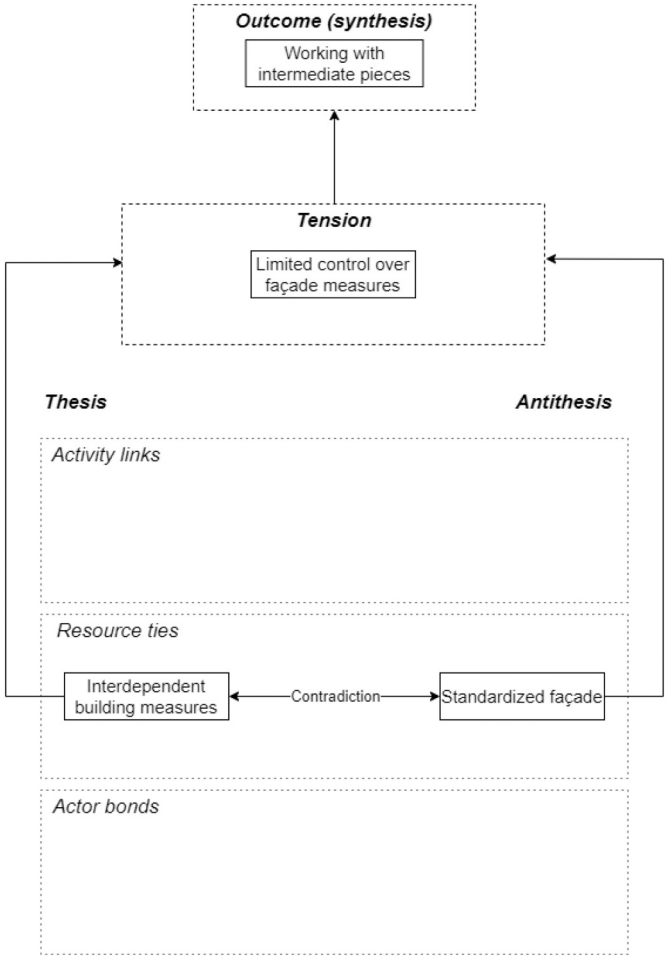


Fig. 7. Control tensions WinCo – Architect dyad.

one who can express artistic freedom within the given cultural and geographical context of the assignment. This actor bond is interdependent with activity links because architects used to draw and detail façades themselves to express their artistic identity. Because the façade has a great influence on the visual appearance of a building, architects relied on customized façades to express their artistic freedom (i.e., resource ties).

WinCo directly challenges these resource ties by envisioning standardized and modular façade design in FaaS. Standardized and modular façades enable WinCo to minimize maintenance costs and maximize façade reusability. The first-order contradiction in terms of resource ties created second-order contradictions in the activity and actor layers. Enhanced façade standardization and modularity required architects to adapt their design activities to component assembly-based design. Because drawing activities are strongly related to an architect's professional identity as an artist, these alternative activity links had consequences for actor bonds as well. By contradicting existing resource ties, WinCo indirectly contradicted the professional identity of architects as well.

This second-order contraction resulted in tensions related to professional identity threats by architects as illustrated in the following quote:

"That whole view [of the architect profession] is changing considerably because some form of component assembly has crept into our profession […]. We work with a catalog of façade systems. […], it has become a different kind of profession but many architects do not yet accept that" (Architect, Architecture firm 1).

This situation illustrates how a contradiction in the resource layer (i.e., standardized façades) resulted in other contradictions in the activity layer (i.e., component assembly design) and actor layers (i.e., different professional identity). As a response to this tension, WinCo decided to use standardized base systems with equal measures but still allow a high variety in detail such as color, style, and peripherals. This enabled WinCo to standardize maintenance activities and easily redeploy façades while reducing the impact of FaaS on the artistic identity of architects by providing room for customization. They realized this balance between standardization and customization by developing a modular façade concept and a digital "module library" that architects could use in their engineering processes. This library consisted of modules that fitted in the standardized base of the façade but enabled many different combinations so that architects could still design a custom façade. Thus, the second-order contradictions in the actor layer and the resulting identity threat tensions drove FaaS development to balance standardization and modularization.

4.3.2. *Limited control over façade measures (Fig. 7)*

WinCo's envisioned façade standardization also contradicted thesis resource ties in terms of various building components. For example, the engineering of the building skeleton, interior layout, and façade measures are interdependent. However, these elements have their own requirements such as safety norms, customer requirements, and aesthetical requirements, which may conflict at times. So, in the thesis situation, architects must balance these competing requirements in their design activities and adapt façade measures to other building components. This interdependence between building components and the need to adjust them accordingly contradicted WinCo's envisioned standardized façade measures. Because of component interdependence, architects could not always adopt the standardized measure envisioned by

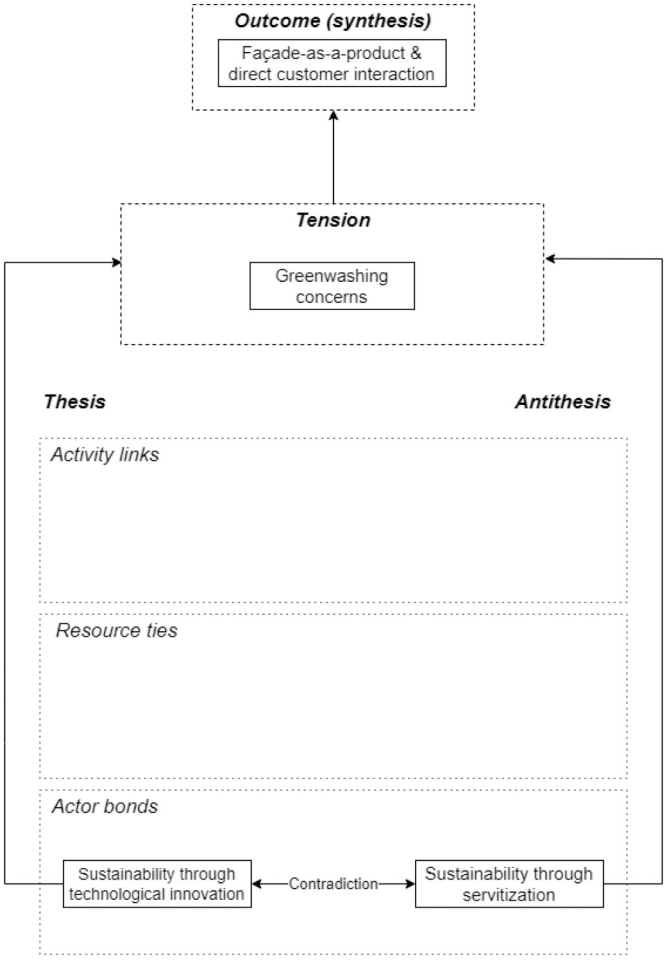


Fig. 8. Greenwashing tensions WinCo – Architect dyad.

WinCo in the FaaS antithesis.

This first-order contradiction in the resource layer led to tensions between WinCo and architects. Even if architects were willing to implement FaaS and the standard measure, resources from other actors sometimes prevented them from doing so:

"It is not a rejection but there are other factors that determine the sizing of the façade. At [project] it was also removed; we first had a nice modular size but then for some reason [architect] deviated from that pattern" (Manager, WinCo).

This case illustrates how tensions emerged from the first-order contradiction between envisioned and existing resource ties. By using fitting pieces, WinCo was still able to implement standardized façades and mitigate tensions with architects. However, WinCo indicated that this is a suboptimal outcome as these fitting pieces cannot be reused and will end up as landfill after the façade is deconstructed. This instance shows that WinCo's servitization was driven by first-order contradictions in the resource layer and the resulting tensions. The tension required WinCo to adapt the technical design of the façade by using fitting pieces to work around the tension.

4.3.3. Greenwashing concerns (Fig. 8)

The third contradiction between the thesis and WinCo's envisioned antithesis was observed in the actor layer. Like many actors in the construction industry, architects also actively focused on implementing a circular strategy and adapting their business accordingly. In the thesis situation, architects envisioned that a circular construction industry is achieved through enhanced building flexibility and detachability. Ideas of future developments regarding the circular economy were focused on technological developments. These actor bonds in the thesis partially contradicted WinCo's envisioned antithesis of circularity through service contracts. While improving flexibility and detachability through technological innovation is inherently part of FaaS, WinCo also considered new contractual forms to be important. According to WinCo, these contractual forms are essential to creating proper incentives for a circular supply chain in the construction industry. Thus, WinCo's view on how to implement a circular economy in the construction industry partially contradicted those of architects.

This clash between thesis and antithesis resulted in greenwashing concerns on the part of architects. Architects were skeptical about the effectiveness of the new contract forms to improve circularity. The following quote illustrates an architect's perception of the circularity potential of FaaS:

"The incentives to adopt service concepts are mainly financially driven as far as I am concerned […], they are too often framed as sustainable and circular and I just have my doubts about that" (Architect, Architecture firm 2).

The architect is exhibiting a lack of trust in WinCo's incentives. Also, architects indicated that they doubted whether WinCo would be able to ensure the circular process given the long-term character of its service contract. As the industry and the entire world will change significantly in fifteen years (i.e., duration of the service contract), they were skeptical about a detailed refurbishing strategy in FaaS. Tensions emerged because of contradictory actor bonds in the thesis and antithesis. WinCo responded to this tension by offering their circular façade as a product and directly contacting end-users after the circular façade was integrated into the building. The option to sell the façade as a product and negotiate a service contract afterward was enabled by the design principles of WinCo's circular façade because they were of high quality and based on principles of modularity. As such, the product design enabled WinCo to circumvent architects when they did not want to adopt façade-as-a-service.

4.4. WinCo - GlassCo

GlassCo provides WinCo with several types of glass, which is another important component of WinCo's façades. Because GlassCo was one of WinCo's main glass suppliers and in close geographical proximity, WinCo decided to involve GlassCo in the development of FaaS. We identified one tension related to risk distribution in the relation between WinCo and GlassCo (Fig. 9).

4.4.1. Risk distribution (Fig. 9)

In the thesis situation, GlassCo strongly focuses on extending its pre-sales support services by offering e-learning modules or tracking services. Also, GlassCo provides its glass products with ten years of warranty on the glass and two years on peripheral products. However, without specifically referring to WinCo, GlassCo was frustrated about opportunistic behavior concerning these warranties. GlassCo indicated that many malfunctions, for which they were held accountable, were not caused by GlassCo's wrongdoings but by other actors instead. For example, electrical components may not work because wires are accidentally cut in the production process of the façade builders or windows are not installed according to the prescribed standards. For FaaS, WinCo envisions an antithesis in which GlassCo gets involved in the maintenance activities and provides extended warranties. This antithesis involves first-order contradictions in the activity and resource layers by contradicting existing warranties and pre-sales support activities. It also created a second-order contradiction in the actor layer. By requiring maintenance support and extended warranties, WinCo implicitly envisioned actor bonds to become characterized by long-term interdependence beyond the sales phase. Such long-term relationships contradicted existing actor bonds characterized by opportunistic behavior because long-term interdependence would make GlassCo more vulnerable to opportunism.

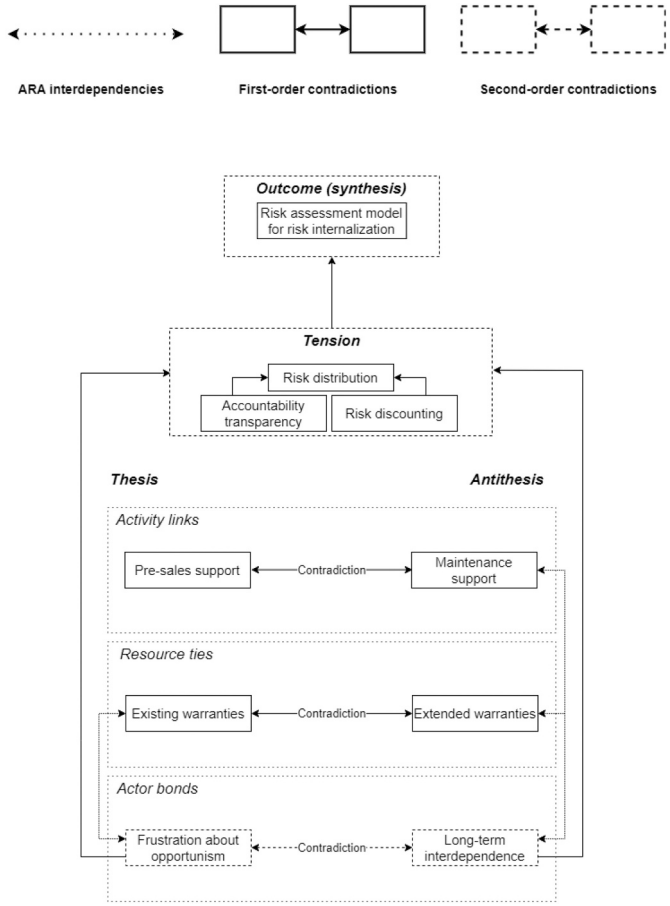


Fig. 9. Risk distribution tensions WinCo – GlassCo dyad.

The second-order contradiction in the actor layer resulted in risk distribution tensions, despite GlassCo's insistence that they trusted WinCo not to take advantage of them. The first part of this tension was related to accountability transparency. GlassCo indicated that they would only provide extended warranties if the transparency regarding malfunction accountability was improved. In other words, the responsible actor can be pointed out and held accountable in case of a malfunction. Along with enhanced accountability transparency, another tension related to risk discounting is illustrated in the following quote:

"If they want to implement their products, the business case has to be right. The benefits must be very clear, including the financials. And they do think along with it, but they still discount risks and that makes it expensive and less interesting for my customers" (Manager, WinCo).

The second part of this tension was related to risk discounting. To mitigate the risks associated with extended warranties, GlassCo made very conservative estimates about the potential breakdowns of their products. Consequently, their offer was unattractive for WinCo concerning their FaaS business case. This situation illustrates how first-order contradictions in the activity and resource layers can indirectly lead to tensions through second-order contradictions in the actor layer. Because it did not seem that GlassCo would internalize the operational risks of their products in FaaS, WinCo opted for a compromise. The outcome of this tension is that WinCo continued working with GlassCo's existing support activities and warranties but asked them for an elaborate risk model of their product. This model enabled WinCo to better manage risks associated with GlassCo's products. So instead of internalizing the risks, WinCo required GlassCo to actively support them in managing risks.

5. Discussion and conclusion

This paper sets out to better understand the emergent nature of servitization by investigating how tensions in inter-organizational business relations drive this transformation. By integrating dialectic theory and the ARA framework from the IMP tradition, we developed a conceptual model to study the emergence of inter-organizational tensions. Drawing on a single case study in the construction industry, we found that servitization in a circular economy setting is associated with multiple inter-organizational tensions. These tensions had a driving effect on the course of servitization as they influenced the content and implementation of the strategy. Tensions resulted from the clash between contradictory activity links, resource ties, and actor bonds in the thesis and antithesis. Furthermore, we identified first-order and second-order contradictions. These contradictions differentiate anticipated outcomes (from the clash between the status quo and the envisioned situation) from unintended outcomes (stemming from tensions that are indirectly triggered through the interdependence of ARA dimensions). This finding implies that firms cannot fully predict upfront what inter-organizational tensions will arise and how these tensions will play out in terms of their effect on the envisioned servitization strategy. As such, inter-organizational tensions are an important mechanism to understand the emergent and unstructured nature of servitization.

Our findings have multiple implications for the servitization literature. Our first contribution is that we studied servitization-related network tensions in a circular economy context and found that they partly overlap with servitization-related network tensions in other settings. Tensions have previously been studied in a servitization context (Reim et al., 2019) and a technological and digital innovation context (Burton et al., 2016; Galvani & Bocconcelli, 2022; Tóth et al., 2022). Our findings overlap with these works because we also found inter-organizational tensions associated with an entrenched organizational culture, identity threats, and diverging priorities among network actors. Also, we found that implementing a servitization strategy to adapt to the circular economy can be hindered by regulatory frameworks, lack of service provision capabilities, and contact persons with limited influence within their organization. These findings specifically overlap with the tensions found by Burton et al. (2016) and Reim et al. (2019). As such, these inter-organizational tensions may be generalized to a setting in which servitization is applied for enhanced circularity.

However, we also identified two inter-organizational tensions that have not been observed before and may become more salient when servitization is implemented for circular economy purposes. One of them relates to a lack of confidence in the economic feasibility of a service proposition and little trust in the circularity incentives driving the implementation of a servitization strategy. The former is especially troublesome for smaller firms that strongly rely on external financiers for prefinancing the service business. In contrast to large firms, smaller firms do not have the financial means to cover risks associated with new service concepts that have not been proven, and they need financiers to internalize these risks. The latter reflects the mixed results about the effect of servitization on ecological sustainability. On the one hand, servitization could incentivize firms to design more durable and reusable products (Yang & Evans, 2019b). On the other, it may create a rebound effect with increased and more reckless use of resources (Herring & Sorrel, 2009; Tukker, 2004). The ambiguity regarding the effect of servitization on circular performance creates suspicion about the "real" incentives of firms that predicate implementing servitization because of its circular character.

The other inter-organizational tension we found relates to risk distribution among the servitizing firm and its counterparts. By retaining ownership of the product, servitizing firms internalize more operational risks related to the proper functioning of the product and its disposal. Our findings showed that firms may need to externalize some of these operational risks to suppliers to balance the increased internalized risks and decreased control over their underlying activities due to reliance on

external actors (Visnjic et al., 2018). However, when suppliers are not yet organized to maintain their components or take them back after their lifecycle, they may refuse to take on these risks. Alternatively, suppliers estimate these risks very conservatively and make offers to internalize these risks that are economically infeasible for the service business case. Consequently, servitizing firms may be overexposed to operational risks they cannot control or influence. Failing to effectively deal with these tensions may endanger the servitization initiative.

Our second contribution is the development of a dialectic process model to explain the emergent nature of servitization. We extend the works of Tóth et al. (2022) and Galvani and Bocconcelli (2022) by explicitly linking inter-organizational tensions with servitization progress. Tensions can indeed be a source of complexity, but this complexity also influences the course of servitization by affecting the content and implementation of the servitization strategy. We found that some tensions can be overcome by synthesizing the underlying contradictions while others resulted in the dissolution of existing business relationships and establishment of new ones. Thus, we portray servitization as a political process that involves negotiation, integration, and confrontation to work through or around inter-organizational tensions (Mørk, Masovic, Greig, Nicolini, & Hanseth, 2018).

This view on servitization implies that servitizing firms must match their offering with the goals and preferences not only of the customer but also of counterparts in the wider network (Mikhailova & Olsen, 2018). The iterative dialectic process of thesis, antithesis, and synthesis opposes the view that servitization is a linear and rather predictable process (Oliva & Kallenberg, 2003). Instead, servitization is driven by clashes between different and opposing agendas in the networked environment. Because interdependencies between agendas and priorities are too complex for firms to fully comprehend (Henneberg, Mouzas, & Naudé, 2006; Mouzas, Henneberg, & Naudé, 2008), servitization appears as an unstructured and incremental process that should be approached with an agile mindset (Kowalkowski et al., 2012; Martinez et al., 2017; Sjödin, Parida, Kohtamäki, & Wincent, 2020).

Our third contribution is opening the black box of inter-organizational tensions by adopting the activity-resource-actor (ARA) framework. Because the ARA dimensions constitute the basic micro-elements of business relationships (Kaartemo et al., 2020), they operate at a lower aggregation level than the dialectic process and constitute the thesis and antithesis. We consider the ARA dimensions as micro-foundations of the dialectic process (Felin et al., 2015). Our findings illustrate that the implementation of a servitization strategy can lead to inter-organizational tensions through contradictions in various business relationship dimensions. The ARA dimensions correspond with the micro-foundation categories of Felin, Foss, Heimeriks, and Madsen (2012), which include individuals, processes, and structure. Based on our findings, we state that inter-organizational tensions can result from contradictions in terms of (i) value creation activities (i.e., activity links – processes), (ii) technical and offering structures (i.e., resource ties – structures), and (iii) cognitions and personal relations (i.e., actor bonds – individuals). Using the ARA framework as a micro-foundation for inter-organizational tensions may pave the way for a better understanding of why some tensions are functional while others lead to business relationship dissolution (Fang et al., 2011; Mele, 2011; Vaaland & Håkansson, 2003).

Also, the interdependence between ARA dimensions enabled us to increase our understanding of the unpredictable and emergent nature of servitization (Kowalkowski et al., 2015; Martinez et al., 2017). In some instances, the interdependence between ARA dimensions led to second-order contradictions. That is, by contradicting one ARA dimension that is interdependent with another dimension, a servitizing firm may indirectly contradict multiple relationship dimensions by directly contradicting a single one. For example, a change in product design directly contradicts existing resource ties but may indirectly challenge existing professional identities (i.e., actor bonds) because actor bonds and resource ties are interdependent. This finding implies that multiple micro-foundations of inter-organizational tensions (i.e., ARA dimensions) are interdependent, as described by Felin et al. (2012). The interdependence among ARA dimensions explains why firms encounter unforeseen problems when innovating in a networked context (Mørk et al., 2018). Because these problems are often not recognized until actors engage with network counterparts, developing network insight through heedful interaction with counterparts is essential in the synthesis process (Mouzas et al., 2008).

6. Practical implications

Our findings have multiple implications for practitioners. First, when managers implement a servitization strategy to adapt to the circular economy and need to mobilize external actors, they must anticipate several tensions. Some tensions are associated with servitization in a general sense, such as established product culture, identity threats, risk distribution, and conflicting priorities among network actors. When managers use servitization as a means to become circular, they must anticipate potential skepticism regarding their incentives and the economic feasibility of the initiative by being clear and transparent about how servitization will improve circularity KPIs.

Second, managers should consider servitization as a dialectic process that involves the synthesis of the existing business relationship structure and an envisioned structure in a servitization context. This iterative process implies that managers must continuously adapt their offering not only to customer needs (Sjödin et al., 2020) but also to those of other counterparts. Managers can use our dialectic process model to map existing network configurations and their envisioned network configurations to identify contradictions and spot potential inter-organizational tensions. However, because networks are complex and understanding of one's business network is in a constant state of evolution (Mouzas et al., 2008), managers should adopt an agile approach towards servitization. Our dialectic process model can aid them in explicitly formulating their underlying assumptions concerning servitization and engaging in focused experimentation accordingly.

Third, managers should understand that business relationships with network counterparts have multiple dimensions and that these dimensions are interdependent. Consequently, they should be aware that challenging a single relationship dimension (e.g., product design) may indirectly contradict other relationship dimensions and result in inter-organizational tensions. They should engage in multiple episodes of heedful and fact-based interaction with counterparts to understand these network complexities and be able to effectively counter them in the synthesizing process.

7. Limitations and future research

Our research has some limitations that pose opportunities for further research. First, generalizability is one of the main limitations of case studies, and future research could investigate network tensions in other contexts. We have studied servitization in the Dutch construction industry because circularity and servitization are important topics in that context. However, the construction industry is characterized by project-based collaboration and may therefore yield different results compared to manufacturing machinery or transportation settings.

Second, the abductive and exploratory research design limited the formulation of specific and focused interview questions before engaging with the case study. This limitation affected the strength of our conclusions, which require validation through a deductive research design. For example, future research can assess the validity of our process model in different case contexts or adopt our process model to shape servitization in an action research design.

Third, future research may adopt a network perspective when studying dialectic tensions in servitization. While we found some indications that firm-level and network-level dimensions played a role in the emergence of tensions, we have not systematically included these

analysis levels in our research. Öberg, Dahlin, and Pesämaa (2020) demonstrated that resolved tensions within a dyad may resurface somewhere else in the network. Adopting a longer timeframe in combination with a network perspective might shed light on the interrelation of dialectic tensions across network relations. Also, a longer timeframe might increase our understanding of dialectics as a cyclical process in which the outcome of one dialectic cycle may be the start of another one (Farjoun & Fiss, 2022; Raisch, Hargrave, & van de Ven, 2018).

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Data availability

The data that has been used is confidential.

Appendix A. Interview outline round 1

A.1. Introduction

1. Can you briefly tell us about your organization in terms of product/service, annual turnover, number of employees?
2. Can you briefly tell us about your position within the organization?

A.2. Value proposition

3. Can you describe how a façade supports the core business of the customer? Be as specific as possible.
4. What are the requirements (most frequently mentioned) that customers place on a façade for carrying out their core business and achieving KPIs?

A.3. Network structure

5. What is your role in the process of producing and/or installing a façade?
6. What are other roles in the network that are important to realize a façade?
7. Who are the main actors performing these roles?
8. What does the flow of input and output look like in the network? Who supplies what to whom? Think of components, information, knowledge, etc.

A.4. Relationships and collaboration

9. Can you describe your relationship with [WinCo]?
10. Can you describe your relationship with other organizations involved in the production and installation of a façade?
11. Can you say something about the relationship with the most important actors in your network in terms of:

a. Power relations
b. Commitment
c. Trust
d. Mutual understanding
e. History of the collaboration
f. Future expectations

A.5. Façade-as-a-service

12. To what extent are you already involved in [WinCo's] FaaS idea?
13. What implications would FaaS have for your role or position in the network?
14. What implications would FaaS have for the network and the collaboration between parties?
15. What implications would FaaS have for the customer's role throughout the process?

Appendix B. Interview outline round 2

In the first interview round, we got a global picture of the network around the "façade-as-a-service" proposition. This interview round aimed to systematically inventory all possible relationships within this network using the activities, resources, and actors framework.

Based on the previous interview round, we identified the following actors.

Façade builder	System integrator	Bank/financier
Glass supplier	Installer	Government/legislator
Profile system supplier	Architect	End-user/owner/facility manager
Sunscreen supplier	Project developer	Urban mining organizations
Manufacturers of other systems (e.g., ventilation or heating systems)	Service suppliers – property maintenance	

1. Of the above actors, can you indicate which actors you have a relationship with?
2. Can you describe (and/or validate existing data) per direct relation and in the context of Façade-as-a-Service:

a. The relationship in general
b. Resource ties
   i. What does the value stream look like, for example, the exchange of products, services, information, knowledge, and/or money?
   ii. Total volume purchased/sold in relation to the total.
c. Activity links
   i. To what extent is the way you sell products or services influenced by the other party, and/or vice versa?
   ii. To what extent is the way you produce products influenced by the other party, and/or vice versa?
   iii. To what extent is the way you perform services influenced by the other party, and/or vice versa?
   iv. To what extent are you involved in the other party's innovation and to what extent is the other party involved with yours?
d. Actor bonds
   i. What does the typical interaction look like (e.g., purely business, informal, what kind of things are discussed, under what circumstances, etc.)?
   ii. How do you see the identity of this actor?
   iii. Can you say something about trust and commitment in the relationship?

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