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Fostering Cross-Functional Collaboration in Continuous Digital Service Innovation: Individual and Group-Level Perspectives

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FOSTERING CROSS-FUNCTIONAL COLLABORATION IN CONTINUOUS DIGITAL SERVICE INNOVATION: INDIVIDUAL AND GROUP-LEVEL PERSPECTIVES

Research full-length paper

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Abstract

Continuous digital service innovation (CDSI) represents a shift toward flexible, iterative, and bottom-up approaches to service innovation in today's rapidly evolving, technology-dominated service contexts. This study explores the critical role of cross-functional collaboration in CDSI, shedding light on its enablers and barriers at the individual and group levels. Based on service-dominant (S-D) logic, we conceptualize cross-functional collaboration as a cocreative resource integration process in which actors from different organizational functions combine their specialized knowledge and skills for mutual benefit. Based on semi-structured interviews with 50 informants from four Finnish organizations, our findings show that at the individual level, collaboration is influenced by individuals' willingness and ability to integrate resources. At the group level, actor-to-actor interaction is facilitated by clear roles and responsibilities, shared objectives and practices, effective communication, and shared understanding. This study contributes to both research and practice by advancing our understanding of the emerging CDSI phenomenon, identifying the individual and group-level enablers and barriers to cross-functional collaboration in this context, and providing actionable insights for fostering collaboration to realize the potential of CDSI for organizations.

Keywords: Continuous Digital Service Innovation, Cross-Functional Collaboration, Organizational Actors, Resource Integration, Actor-to-Actor Interaction, Service-Dominant Logic, Collaboration Enablers, Collaboration Barriers, Qualitative Research.

1   Introduction

In response to rapid technological advancements and dynamic market environments, organizations are increasingly adopting agile and continuous approaches to digital service innovation. These approaches foster an end-to-end flow of activities, from customer demand to rapid service delivery and feedback, enabling the continuous refinement of service offerings (Fitzgerald and Stol, 2017; Sjödin et al., 2020; Elo et al., 2023). We term this dynamic process continuous digital service innovation (CDSI). CDSI commonly relies on cross-functional collaboration, where actors from different organizational functions combine their specialized knowledge and skills to achieve common goals (Dussart et al., 2021; Strode et al., 2022; Wiedemann et al., 2023). This breaking down of functional silos enables organizations to remain competitive in today's technology-dominated service contexts (Ostrom et al., 2015) and to propose relevant value to their customers faster without compromising service quality (Elo et al., 2023).

Agile and continuous development approaches provide structured yet flexible frameworks for organizing cross-functional collaboration and are increasingly used by organizations (Fitzgerald and Stol, 2017;

Kane et al., 2017; Wiedemann et al., 2023). For example, DevOps (Debois, 2011) supports close collaboration between diverse experts in IT development and operations functions to ensure flexibility and service quality in rapidly changing environments (Fitzgerald and Stol, 2017; Wiedemann et al., 2023). Another example is information systems development (ISD) teams, which often consist of IT specialists and business domain representatives working together to align business needs with technology solutions (Fisk et al., 2010; Dussart et al., 2021). However, cross-functional collaboration is not without its challenges and often fails to deliver the desired results (Randel and Jaussi, 2003; Olsen et al., 2024). Communication, coordination, and leadership are commonly cited as challenges to collaboration, potentially hindering CDSI (Strode et al., 2022; Olsen et al., 2024). A critical challenge is translating the specialized knowledge and skills of individuals and teams into integrated, cocreated outcomes (Majchrzak et al., 2012). Therefore, a deeper understanding of the enablers and barriers to cross-functional collaboration in organizations is needed to facilitate effective CDSI.

To this end, service-dominant (S-D) logic (Vargo and Lusch, 2004, 2008, 2016) provides our study with a lens for understanding CDSI, with our focus being on cross-functional collaboration in this context. As a metatheoretical lens, S-D logic views all interactions as value cocreation processes among specialized resource-integrating actors (Vargo and Lusch, 2017). Based on S-D logic, we conceptualize CDSI as "the continuous (re)combination of existing resources to create novel resources that are beneficial to actors in a digital or digitally enabled service context" (Lusch and Nambisan, 2015; Elo et al., 2023; Vargo et al., 2024). Furthermore, we understand cross-functional collaboration in this context as a cocreative resource integration process in which actors from different organizational functions combine their specialized skills and knowledge for mutual benefit. Vargo et al. (2024) suggest that the effectiveness of an actor's resources in such a cocreation process "relies on (1) the availability of resources from other actors and (2) the willingness and ability of other actors to engage in exchange and resource integration." Consequently, the success of cross-functional collaboration in CDSI depends on effective actor-to-actor interactions at the group level and actors' willingness and ability to integrate resources at the individual level. Therefore, organizations must foster both individual and group-level engagement and coordination for successful cross-functional collaboration in CDSI.

Against this backdrop, we set out to identify the enablers and barriers of cross-functional collaboration in CDSI from individual and group-level perspectives with the following research question: *How can organizations foster cross-functional collaboration in continuous digital service innovation?* To address this question, we employed a qualitative and inductive research approach (Gioia et al., 2013) and conducted 50 semi-structured interviews with four medium and large-sized organizations engaged in CDSI. In our analysis, we followed the thematic analysis approach (Braun and Clarke, 2006) to systematically identify enablers and barriers of cross-functional collaboration in this context.

Our findings contribute to research and practice by advancing the understanding of cross-functional collaboration in the context of CDSI. As a novel perspective, our analysis includes both individual and group-level perspectives, offering improved understanding and explanations of why and how cross-functional collaboration in CDSI may or may not lead to desired outcomes. At the individual level, we find that cross-functional collaboration is influenced by individuals' willingness and ability to integrate resources, with individual motivation and commitment influencing the former and knowledge, skills, and available time resources influencing the latter. At the group level, fostering clear roles and responsibilities, shared objectives and practices, effective communication, and shared understanding is central, with roles that facilitate collaboration, collaboration maturity, trust, and a sense of togetherness having a positive effect and silos and power dynamics being identified as hindrances to these main categories.

The rest of the paper is structured as follows. Next, we present the theoretical background, focusing on CDSI and cross-functional collaboration in this context. Then, we present the methodology with descriptions of data collection and analysis, followed by our findings. We conclude by discussing theoretical and practical implications, limitations, and suggestions for future research.

2   Theoretical Background

2.1   Toward CDSI in organizations

Service innovation processes in most organizations today are increasingly intertwined with digital technologies. The unique properties of these technologies, such as their malleability and generativity—"a technology's overall capacity to produce unprompted change driven by large, varied, and uncoordinated audiences" (Zittrain, 2006, p. 1980)—enable service innovation processes characterized by speed and unpredictability (Yoo et al., 2010, 2012; Nambisan et al., 2017). In addition, these technologies facilitate resource liquefaction, allowing information to be separated and transported independently of physical objects, which supports resource density—the efficient (re)combination of resources regardless of location or time (Normann, 2001; Lusch and Nambisan, 2015; Vargo et al., 2024).

This "technology-dominated service context" (Ostrom et al., 2015, p. 145) has transformed the context of service innovation, presenting organizations with novel opportunities and challenges, such as rapidly changing market demands and the pressure to propose relevant value to customers faster (Osmundsen and Bygstad, 2022). In response, organizations are increasingly adopting flexible, iterative, and bottom-up approaches (e.g., SAFe and DevOps) to digital service innovation (Sjödin et al., 2020; Elo et al., 2023). These approaches represent a significant departure from traditional top-down and stage-gate development approaches like the waterfall model (Paluch et al., 2020; Sjödin et al., 2020; Vargo et al., 2024), and promote rapid service iteration, integration, and feedback, enabling organizations "to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through [their] collective components and relationships with [their] environment" (Conboy, 2009, p. 340). This adaptability enhances organizations' responsiveness to market dynamics and customer needs.

The concept of CDSI has recently been introduced at the intersection of IS, service research, and software engineering (Elo et al., 2023) to provide a unified lens for studying and understanding service innovation in the digital age (Barrett et al., 2015; Lusch and Nambisan, 2015; Rabetino et al., 2023). This unified lens, which integrates digital technologies, continuous and agile development methodologies, and a S-D logic view (Vargo and Lusch, 2016; Sjödin et al., 2020), informs our understanding of CDSI as a process of continuous (re)combination of existing resources to create novel resources that benefit actors in a digital or digitally enabled service context (Lusch and Nambisan, 2015; Elo et al., 2023; Vargo et al., 2024). Organizations often apply a variety and combination of agile and continuous approaches (e.g., SAFe, DevOps) and practices (e.g., continuous planning, continuous integration, continuous deployment, continuous delivery, and continuous improvement) across the organization. Together, these enable CDSI and support establishing an end-to-end flow between customer demand, rapid service delivery, and continuous feedback and learning (Fitzgerald and Stol, 2017).

2.2   Cross-functional collaboration in CDSI

Cross-functional collaboration, which involves actors from different organizational functions combining their specialized skills and knowledge for mutual benefit, is essential for success in CDSI, especially in today's digital environments characterized by unpredictability and rapid technological advancement (Kane et al., 2017). For example, DevOps supports cross-functional collaboration between IT development and operations functions to achieve agility and alignment throughout the software delivery lifecycle (Debois, 2011; Fitzgerald and Stol, 2017; Wiedemann et al., 2023). Similarly, ISD teams often comprise IT specialists and business representatives collaborating to combine their specialized knowledge, facilitating a shared understanding of business needs and corresponding IS solutions (Fisk et al., 2010; Dussart et al., 2021). The companies investigated in this study exemplify this approach, with experts from different organizational functions combining their specialized skills and knowledge to continuously innovate digital and/or digitally enabled service offerings.

Prior research has identified several factors and mechanisms for fostering cross-functional collaboration in organizations. One crucial aspect is the roles that support coordination and collaboration across teams. For example, Berntzen et al. (2023) found that boundary-spanning roles like product managers, development managers, and customer managers are vital for managing business process dependencies. Furthermore, product owners have been found crucial for inter-team coordination, emphasizing the significance of these roles in facilitating collaboration (Olsen et al., 2024). In many organizations, agile coaches are used to mitigate inter-team conflicts by educating the entire organization about agile methods and fostering a collaborative culture. Their understanding of both business and technology perspectives allows them to serve as effective intermediaries for collaboration (Olsen et al., 2024).

Effective communication between actors is also essential, as poor communication can lead to significant delays and operational challenges. For example, regular meetings (e.g., stand-ups and retrospectives) have been shown useful as they facilitate cross-functional discussions and reduce silo thinking, creating a collaborative environment for actors from different functional backgrounds and diminishing the "us versus them" mentality (Berntzen et al., 2023; Olsen et al., 2024). Scaling frameworks such as SAFe propose mechanisms to address dependencies arising in the service innovation process, further supporting inter-team coordination (Berntzen et al., 2023). Earlier research also emphasizes the importance of developing a shared understanding among team members regarding their joint tasks and approaches (Dussart et al., 2021). Studies on cross-functional knowledge integration have highlighted various mechanisms, such as creating boundary-spanning roles, increasing the IS competence of business personnel, and vice versa, and fostering cultural integration within teams (Fisk et al., 2010). These mechanisms are crucial for overcoming the knowledge boundaries between different functional units and fostering cross-functional collaboration (Lyytinen et al., 2010; Fisk et al., 2010).

However, cross-functional collaboration presents several challenges. One of the primary barriers to collaboration is ineffective communication, leading to misunderstandings (Azad, 2024) and making the coordination of collaboration challenging (Olsen et al., 2024). These communication barriers often result in delays, inefficiencies, and reduced collaboration effectiveness. Another identified barrier is the lack of role clarity within cross-functional teams, as differing understandings of roles and responsibilities can lead to alignment issues (Olsen et al., 2024).

While beneficial for bringing varied expertise together, functional diversity of actors often leads to integration, coordination, and cooperation challenges. Differences in perspectives and backgrounds can hinder communication and information sharing, leading to tension and conflicts (Dussart et al., 2021). The challenges of integrating diverse knowledge and achieving a shared understanding are intensified when actors come from different functional backgrounds with different practices, knowledge bases, and languages and can hinder the achievement of shared mental models necessary for effective cross-functional collaboration (Fisk et al., 2010).

Misalignment in goals and prioritizations between different functional units poses another significant challenge. For example, a recent study from Wiedemann et al. (2023) on DevOps teams found that developers often prioritize innovation to achieve strategic objectives, while IT operations focus on stability and daily business operations. The lack of shared objectives and processes can lead to inefficiencies and conflicts, undermining the overall success of cross-functional collaboration. Overall, integrating the specialized knowledge and skills of diverse actors into a cohesive view is a critical challenge for cross-functional collaboration. These challenges are often intensified by the temporary and ad hoc nature of cross-functional collaboration, which lacks the deep ties and shared experiences necessary for effective resource integration (Majchrzak et al., 2012).

While previous research has highlighted the importance of cross-functional collaboration in today's organizations and identified various enablers and challenges, there remains a need for a deeper understanding of how these processes unfold in the context of CDSI. Cross-functional collaboration relies on the collective and cocreative contribution of (often temporary) team members to bring multiple perspectives and knowledge bases to the process. Therefore, while supporting actor-to-actor interaction is

essential, an individual's role as a resource integrator should also be considered. However, this role has not received adequate attention (Randel and Jaussi, 2003). Our study contributes to this understanding by examining both the individual and group-level enablers and barriers of cross-functional collaboration in organizations implementing CDSI with the S-D logic lens.

3 Methodology

We employed a qualitative and inductive research approach (Gioia et al., 2013) and collected data via semi-structured interviews with four medium and large-sized organizations implementing CDSI (see Table 1). The companies and informants were selected by purposive sampling (Patton, 2002), targeting organizations and individuals most likely to provide meaningful insights into the phenomenon. The companies were recruited for the study as part of a broader research project, with the inclusion criteria being that the companies (1) were pursuing continuity in their service development and innovation activities, (2) were middle-sized or large organizations, and (3) were operating in the context of digital or digitally enabled services.

Industry	Size	No. of interviews	Informant roles (interview rounds)
A. Digitally enabled HR service solutions	300+ employees	15	Development Director (1&2), Business Development Manager (1&2), 2 x Development Manager (1&2), Development Manager (1&2), HR Manager (1&2), Director (1&2), Product Development Manager (2), Senior Technology Consultant (2), Software Developer (2)
B. Digitally enabled textile rental service	4000+ employees (global; 24 countries)	18	Development Manager (1), Service Owner (1), Director (Service Concepts) (1), Head of Delivery Services (2), Service Owner (2), 3 x Director (2), Head of Customer Experience and Customer Service (2), Head of Fast Track (2), SVP (Strategy) (2), Vice President (Marketing, Sales and Customer Engagement) (2), Solution Architect (2), Service Owner (Digital Solutions) (2), Service Concepts Designer (2), Head of Industry (2), Head of Continuous Services (2)
C. Language services and language management solutions for digital environments	150+ employees; 2 000+ freelance experts	10	Service Manager (1&2), Account Manager (1&2), Solution Architect (1&2), Chief Solutions Business Officer (2), Solution Architect (2), Software Developer (2), Project Manager (2)
D. Telecommunications, IT, and online services	5,000+ employees	7	5G Development Director (1), Startup Analyst (1), Data Scientist (2), Development Manager (2), Lead Architect (2), Automation Manager (2), Business Manager (2)

Table 1.   Companies and informants

An organization was considered to implement CDSI if it reported developing and innovating its digital or digitally enabled service offerings by integrating continuous and agile approaches to ensure a seamless flow between customer demand, rapid service delivery, and continuous feedback and learning. In all organizations, these processes involved cross-functional collaboration, where actors from different organizational functions were brought together to combine their specialized skills and knowledge for mutual benefit. The informants from each organization were selected with assistance from the company representatives based on their suitability for the study. In some organizations, the company representatives themselves served as informants. The informants held various roles, but a common expectation was knowledge of both the strategic and operational aspects of CDSI in the organization.

3.1 Data collection

We collected the data through 50 semi-structured interviews, which were chosen for their adaptability and ability to facilitate in-depth discussions. This allowed us to gain rich insights into the real-world experiences of the informants. We conducted the interviews in two rounds, with some informants participating in both rounds, covering a range of roles from technical to administrative and across different organizational levels, as summarized in Table 1. Nineteen informants were female, and fourteen were male, with one preferring not to disclose their gender. Their ages ranged from 23 to 59 years, with an average age of 42 years. Their experience in the company ranged from 0.5 to 28 years, with an average of 7 years. The first round of interviews was conducted between August and October 2021, involving 14 informants. The primary goal of this round was to explore the companies' approaches to CDSI. Given the limited existing knowledge in this area, the interviews sought to uncover the strategic drivers, principles, and practices underlying CDSI. Themes of discussion included the current state of service innovation, perceptions of continuity in service innovation, key stakeholders involved, and the role of digital technologies in driving CDSI.

The second round of data collection took place between April and June 2022, aiming to deepen our understanding of operational-level perspectives on CDSI. This round focused on the practical implementation of CDSI, exploring factors that enabled or hindered the process (incl. collaboration) and gathering examples of both successful and challenging experiences in practice. All interviews were conducted remotely by the first author using a virtual meeting tool. The interviews were conducted in Finnish and English, voice recorded with the consent of each informant, and transcribed for analysis. Interview durations ranged from 40 to 80 minutes, with an average duration of 62 minutes.

3.2 Data analysis

We employed thematic analysis (Braun and Clarke, 2006) to systematically identify the enablers and barriers of cross-functional collaboration in CDSI, focusing on both individual (resource integration) and group-level (actor-to-actor interaction) perspectives. The first author was responsible for coding and analysis. To support the trustworthiness of the analysis (Nowell et al., 2017), coding and interpretations were carefully discussed and evaluated with the second author. Following Braun and Clarke's (2006) step-by-step guide, the analysis began with thoroughly reading each interview transcript to understand its context and content. The first author completed the coding process in three stages. In the first stage, initial codes were open coded using the qualitative data analysis tool Atlas.ti. We identified 135 codes with 380 quotations representing enabling conditions and 60 codes with 210 quotations representing hindering conditions.

In the second stage, each code and its associated interview excerpts were carefully examined. Similar codes were merged, and some were renamed to reflect their meaning better. Based on their reported enabling or hindering role of cross-functional collaboration in CDSI, the developed first-order concepts were classified as positive (+) or negative (-). This stage also initiated the thematic development process, where codes were iteratively organized into second-order themes. This required several rounds of organizing and evaluation to ensure accurate representation and alignment with the research objectives. After the second stage, 41 codes with 324 quotations for enabling conditions and 30 codes with 212 quotations for hindering conditions remained.

In the third stage, following the notion of a hermeneutic circle (Klein and Myers, 1999), the first author moved back from the established understanding of the whole to understand better each collaboration enabler or barrier and its meaning in the data. This involved revisiting the codes and related quotations within each theme. At this stage, the author team discussed the themes relevant to the study and grouped them into third-order dimensions to complete our data structure (see Figure 1), which informs the framework of the study presented in Figure 2.
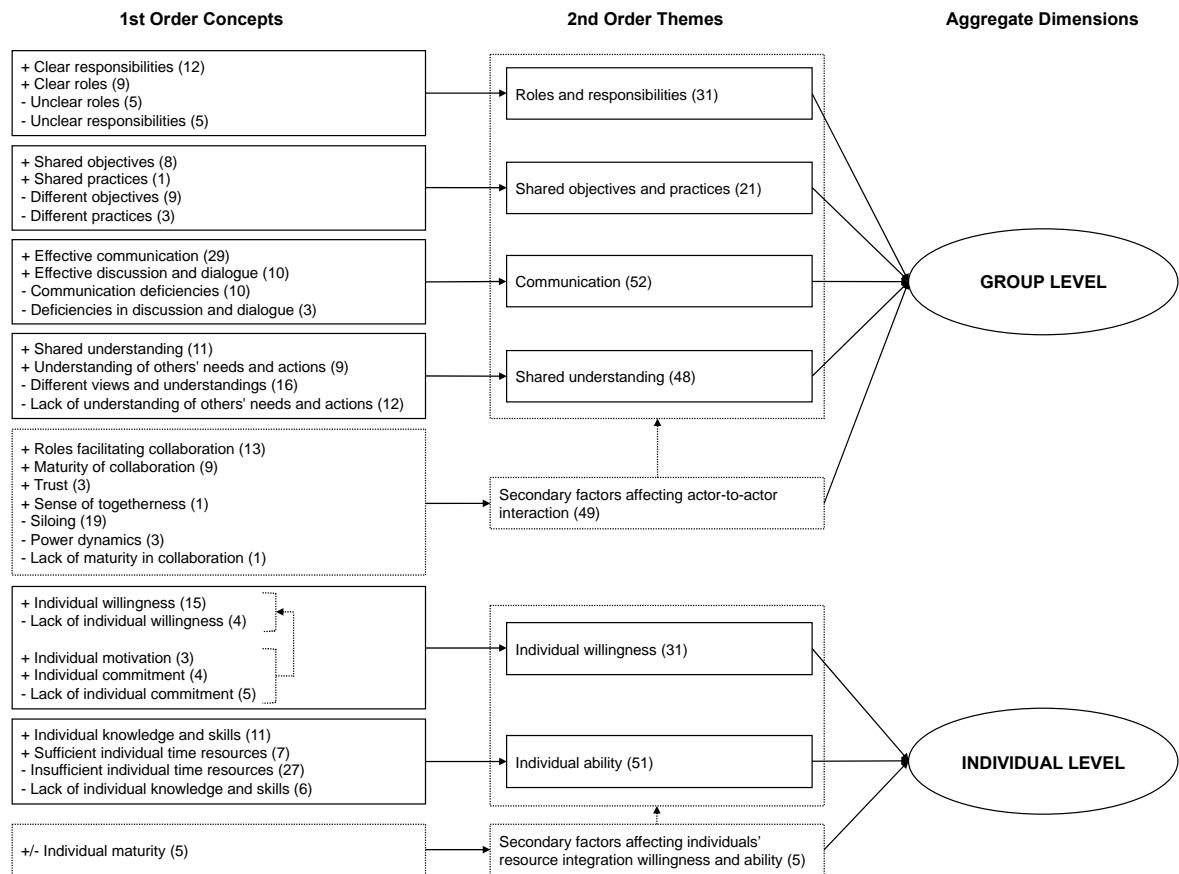
Figure 1.   *Data structure (adapted from Gioia et al., 2013)*

4   Findings

Figure 2 outlines the key individual and group-level enablers for fostering cross-functional collaboration in CDSI and the secondary factors that were found to support (+) and/or hinder (-) them. These findings are discussed in detail in the following subsections. In addition, Table 2 at the end of subsection 4.2 summarizes the key findings, including representative quotations from the interviews to substantiate the findings and the conclusions drawn.

Figure 2.   *Individual and group-level enablers of cross-functional collaboration in CDSI*

4.1   Individual-level enablers and barriers of cross-functional collaboration

Our findings at the individual level highlight the importance of actors' *ability* and *willingness* to engage in resource integration. Regarding the latter, for example, one informant shared that their team members not only have the necessary resources and skills but also the right attitude to collaborate (see Table 2). Such a willingness to engage is considered vital for successful collaboration. In addition, a willingness to learn and adapt is found important, as it allows for the introduction of new perspectives and practices in collaboration. Regarding the lack of individual willingness to integrate resources as a barrier to cross-functional collaboration, we found that resistance to change and adherence to established routines posed challenges. For example, one informant shared their experience with experienced employees who were reluctant to adopt new methods and solve problems in innovative ways, preferring to stick to what they knew (see Table 2).

In terms of individuals' ability to integrate resources, our findings emphasize the role of individuals' knowledge, skills, and time resources in cross-functional collaboration. For example, individuals' broad understanding and experience with CDSI processes enabled them to ask relevant questions and understand responses at a deeper level, supporting their participation in cross-functional collaboration. While the previous examples highlighted how individual maturity could hinder the willingness to collaborate, in this case experience supported the ability to collaborate. This illustrates the dual role (+/-) of individual-level maturity in our findings.

Building a cross-functional team with complementary skills and knowledge is another critical enabler found, as integrating the necessary competencies and profiles sets the foundation for successful collaboration (see Table 2). Further, individuals' abilities, such as communication skills, are found to be important. In contrast, insufficient individual knowledge and skills are barriers to cross-functional collaboration. For example, individuals' inability to communicate effectively about their work can lead to misunderstandings and incomplete information sharing. In addition, a lack of technical skills and knowledge can become a bottleneck when, for example, business representatives fail to understand the technical demands of their requests. Such a mismatch between business expectations and technical capabilities was found to hinder collaboration between business and IT functions (see Table 2).

Lastly, individual time resources were found critical to enabling cross-functional collaboration in CDSI, and the lack thereof as the most critical individual-level barrier to collaboration. Having sufficient time for activities enhances collaboration and enables agility (see Table 2). Therefore, effective prioritization and time management within teams, such as ensuring an adequate number of tasks for team members and preventing overload, are found to contribute to successful collaboration. Regarding the experienced lack of time resources, informants reported that overworked schedules, high workloads, and excessive multitasking prevented them from devoting sufficient time and focus to collaboration (see Table 2). Such a lack of time resources was also reported to hinder effective collaboration by leaving critical issues unidentified and unaddressed.

4.2   Group-level enablers and barriers of cross-functional collaboration

Our findings at the group level emphasize *clear roles and responsibilities*, *shared objectives and practices*, *effective communication*, and *shared understanding* as key enablers of actor-to-actor interaction. First, informants shared that a sufficient understanding of other's roles and responsibilities is important to minimize confusion and ensure that tasks are appropriately assigned and executed. Clear role definitions were shared to help manage workloads and avoid overlap, inefficiency, and confusion (see Table 2). We found that dynamically assigning roles based on specialized skills can improve the efficiency and effectiveness of collaboration by enabling an improved focus on one's areas of expertise without overstepping into others' areas. This approach ensures that the right skills are applied to the right tasks, fostering a more streamlined and productive workflow. However, while specialized roles are beneficial, ensuring that there is enough overlap in responsibilities allows for continuity and prevents activities

from stalling when certain individuals are unavailable. To this end, cross-training team members to handle overlapping responsibilities was suggested to support continuity and flexibility in collaboration, as team members stepping in during absences enables preventing disruptions. In contrast, overlapping and ambiguous roles were found to hinder cross-functional collaboration, as team members may experience confusion about their tasks, leading to inefficiencies and delays. Unclear roles and responsibilities within teams were shared to result in team members being uncertain about their priorities and expectations, potentially hindering collaboration. In this regard, our analysis connected overly diffused responsibilities among team members with perceptions of unaccountability and lack of action (see Table 2).

Second, we found that establishing shared objectives enables effective cross-functional collaboration, with all team members working toward the same goals regardless of their functional background. Such alignment encourages team members to contribute ideas and solutions toward common goals, which drives the CDSI process and outcomes (see Table 2). Furthermore, shared and standardized practices, such as the use of tags and logical structures for CDSI management, were found to reduce misunderstandings and inefficiencies, facilitating smoother collaboration. In contrast, the misalignment of objectives and priorities between different functions was reported to hinder collaboration. In addition, inconsistent practices, such as utilizing varied development approaches and tools, can lead to misalignment and inefficiency.

Third, effective communication was found to be one of the most prominent enablers of cross-functional collaboration. Effective communication ensures that everyone is on the same page regarding development goals, progress, and responsibilities. One informant emphasized the importance of active and continuous communication, stating that keeping each other updated on tasks and deadlines was crucial for successful collaboration (see Table 2). This regular interaction helps prevent misunderstandings and ensures that all team members are aligned with the CDSI objectives. Using appropriate tools and practices for communication ensures that information is effectively shared without overwhelming team members. An informant discussed the challenge of managing information overload and emphasized the need to use the proper channels to reach the necessary individuals without spamming the entire organization (see Table 2). Structured meetings and forums where actors can regularly discuss progress, share updates, and address issues were suggested as beneficial in maintaining effective communication. Regular, open meetings allow for the transparent exchange of information and foster a collaborative environment.

Information overload and communication silos can be significant barriers to effective collaboration. When there is too much information or when communication is fragmented across different channels and silos, it becomes challenging to keep track of progress. One informant noted the difficulty of managing information in a large organization with multiple communication platforms, resulting in important information being lost in the noise. Furthermore, the shift to remote work has introduced new challenges in maintaining effective communication. The informal, spontaneous interactions that used to occur in physical office spaces are sometimes missing, which can lead to a loss of incidental knowledge sharing. One informant shared that the lack of face-to-face interactions due to remote work made it harder to stay updated on ongoing activities, affecting overall collaboration (see Table 2). In addition, hierarchical communication gaps, where information does not flow freely between different levels of the organization, can create bottlenecks and hinder collaboration. One informant pointed out that sometimes support functions and business units are on different communication networks, leading to gaps in information sharing and understanding.

Lastly, shared understanding, including the understanding of the needs and actions of others, was found to be important in fostering cross-functional collaboration in CDSI. As one informant noted, being on the same page about the concrete challenge at hand makes collaboration more straightforward (see Table 2). In addition, team members shared understanding of the task's importance is likely to reduce friction and support collaboration. When team members are closely connected, it fosters a deeper understanding of each other's needs and facilitates collaborative problem solving. Regular meetings and transparent

discussions about work in progress help maintain a shared understanding and visibility of roles and contributions. When actors interpret goals differently, it can lead to misalignment and activities going off-track. Conflicting perspectives and understandings between individuals and teams can hinder collaboration and lead to inefficiencies. In addition, a lack of understanding from the business side about the technical development can create collaboration barriers and vice versa (see Table 2).

Our analysis also identified secondary factors supporting and hindering the identified main categories of actor-to-actor interaction, namely roles facilitating collaboration, collaboration maturity, trust, sense of togetherness, siloing, and power dynamics. Among these, roles facilitating collaboration and collaboration maturity emerged as the most prominent supporters. *Roles facilitating collaboration*, embodied, for example, by service owners and product managers, were found to bridge communication gaps between business and technical teams, ensuring mutual understanding and alignment of goals. As facilitators, they translated technical requirements into business needs and vice versa, fostering collaboration. They also promoted a collaborative culture by bringing team members together to discuss, streamline, and prioritize processes. In addition, these roles supported and motivated teams through recognition and feedback, which enhanced team morale and continuous improvement. By integrating specialized resources from various functions, these facilitators helped ensure that relevant expertise is included in the CDSI process.

Collaboration maturity was marked by team members knowing each other well, understanding their responsibilities, and building trust through consistent and effective teamwork. Regular meetings and informal communication channels, such as active group chats, facilitated open discussions and the sharing of ideas. This helped team members feel comfortable and encouraged the free flow of information without the need for formal requests. Familiarity and long-term collaboration between business and technical teams were found to support efficient workflows. Individuals and teams that have worked together for a long time have a deeper understanding of each other's roles and processes, reducing misunderstandings and fostering collaboration.

From a hindrance perspective, *siloing* was identified as the most prominent factor negatively affecting the key enablers of actor-to-actor interaction. For example, siloed structures created communication barriers between different functions and teams, making it difficult to understand each other's work processes and objectives. For example, one informant described past experiences of working in silos, where team members had to explain basic concepts repeatedly, leading to delays, misunderstandings, and frustration at the individual level. As the implementation of agile practices for CDSI has matured within the company, these silos have gradually been broken down, fostering collaboration.

Category (Dimension)	Example quotations
Individual willingness (Individual level)	*It depends on the people. Some are more **willing** to work together and develop, while others prefer to focus on different things, and that affects things quite a lot.* (A3)
	*If we think about our team where the development takes place, I believe...I think our strength is that we have allocated resources, we have a reasonably sized team to do this, and we also have the skills and **attitude**. So, all the basic requirements are in place.* (B6)
	*Often the Devil is in the detail...and that's key that there is a person that knows this detail, and a person that is **willing** and able to communicate that.* (C4)
	*One of the most important things is that when people have personal goals, if those goals are related to the project or task, then people are more **committed**.* (D4)
	*When a developer is more experienced, certain ways of working become established, and **they want to operate in a specific way**...When you tell a long-time employee that there's a problem and ask if they can solve it, their first response is often that there's no point in doing it that way.* (A7)

Table 2 (continued)

Category (Dimension)	Example quotations
Individual ability (Individual level)	*Then, whenever we go to the individual level, we look at how we have staffed these roles, meaning the kind of profile, **skills**, expectations, and goals they have…we want our service development team to be a cross-functional…We need to look at the whole team end-to-end to ensure that we have people with the **skills** to operate in the direction we want to go.* (B10) *We do see that here sometimes. People are **competent**. But whether they can always **convey all the essential information**, that **doesn't always work**.* (C2) *Maybe the **technical expertise** is often the **bottleneck**…it's perhaps the hardest thing for the business side to grasp what it really takes to fulfill even some of our ambitious requests.* (A6) *Then, of course, there's the resourcing issue—whether you have the **time** to use or if you're just following emails and running from one fire to another.* (D3) *Of course, **you need to have only a few things going on at once** to focus on them effectively in an agile manner.* (C2) *The resource challenge is probably the first thing many would mention…people are deeply engaged in their daily work and tasks, making it hard to find **time** for additional activities.* (A3)
Roles and responsibilities (Group level)	*It definitely starts with the people and perhaps starts with having clear **roles and responsibilities** in the development process. It is clear that our different teams and people know what their responsibilities are in the overall picture, and getting the development team to work with different stakeholders has required this.* (B7) *The main **responsibilities and roles** in the project are well known. If a problem arises and it can be pinpointed to a specific area, we know who can handle it from there.* (C5) *If the team's **roles and responsibilities** are not clearly defined or are ambiguous, it leads to hesitation and uncertainty among team members. Everyone starts to wait and wonder about what needs to be done and who should do it. This situation falls into the classic scenario where someone needs to do something, but that "someone" is always a vague, elusive person who remains hidden.* (C5) *We had an agile development team for another service, and there were too many things happening at the same time... Additionally, there were assumptions about the **roles—who is responsible for what**. This is another issue if the **roles** are not clear.* (B18)
Shared objectives and practices (Group level)	*When everyone has the **same goals**, everyone is interested in achieving them and wants to participate in the work. That definitely makes it easier.* (B6) *When it's working, I would say is that when people, when there is a **common goal**.* (C4) ***Business thinks more about what they want**, not necessarily what is possible and what can be done. And on the other hand, **development sometimes goes off track**, thinking about all the wonderful possibilities, which might not be that necessary.* (A4) *-- something as simple as **using consistent tags** and **organizing tickets with the same logic** as much as possible…People might not find the information they need. It can be hard to understand that if someone only has two tickets, they might be massive tasks, leading to misunderstandings.* (C1)

Table 2 (continued)

Category (Dimension)	Example quotations
Communication (Group level)	*We prefer to **communicate** more rather than less.* (D7)
	*I would still say the enabler is **regular communication** no matter what channel you are using. It's just you need to consistently **communicate**.* (B3)
	*The information overflow is immense nowadays. It's crucial to **ensure that the necessary people are aware of what is happening** and can contribute without spamming the entire organization constantly.* (B7)
	*-- the pandemic complicated things...**information simply doesn't get transferred** if people are working remotely. And it still affects us, even though we've returned to the office, it's not the same.* (C1)
	*Another issue is that our different industries or functions can become siloed. We might be thinking about the same issues as another department, both coming up with good ideas, but these **ideas don't get shared** across the organization.* (A3)
Shared understanding (Group level)	*-- I think that one went really smoothly, because **everyone was on the same page** that this is an important customer, this is an important case.* (C6)
	*-- **understanding** that it's almost never that simple on the IT side is difficult. On the IT side, they need precise specifications, while the business side might just say, 'Just get the report done.' **These are two very different perspectives**.* (A1)
	*You have worked in environment A, and the other person in environment B, and they likely haven't intersected. Recognizing and **understanding the logic of the other environment** can be challenging, not always, but there are such examples.* (A1)
	*The most concrete issue is when there isn't a shared goal for service development or a **clear understanding** of what the services are meant to achieve. This lack of clarity is a significant obstacle.* (A2)

Table 2.   Summary of key findings and example quotations

5   Discussion and Conclusion

This study addressed the research question: *How can organizations foster cross-functional collaboration in continuous digital service innovation?* Specifically, we examined individual and group-level enablers and barriers to such collaboration. At the individual level, our findings highlight the importance of individuals' willingness and ability to integrate resources into the process. At the group level, key factors include clear roles and responsibilities, shared objectives and practices, effective communication, and shared understanding. For all of these, informants reported both enabling and hindering aspects in their CDSI contexts. For example, lack of time resources was identified as a significant barrier at the individual level, while challenges at the group level included differing understandings, lack of awareness of each other's needs and actions, and persistent functional silos. In turn, roles that facilitate collaboration and collaboration maturity emerged as critical to supporting the key enablers of collaboration.

Our findings are consistent with and complement previous studies on cross-functional collaboration. For example, in line with recent studies by Berntzen et al. (2023) and Olsen et al. (2024), we found that common tools and effective communication channels are crucial for managing dependencies and fostering inter-team coordination. In addition, our findings align with Fisk et al. (2010), who emphasize the challenges posed by functional diversity and the need for boundary-spanning roles to integrate knowledge across different organizational functions. Previous research (e.g., Dussart et al., 2021; Azad, 2024; Olsen et al., 2024) similarly highlights poor communication, unclear roles and responsibilities, and lack of shared understanding as significant barriers to effective collaboration. While most existing studies focus on group or organizational-level factors and mechanisms, our findings from the individual

perspective provide novel insights into the enablers and barriers that may help explain why collaboration sometimes fails despite effective coordination efforts. For example, the highlighted lack of time for collaboration underscores the critical need for adequate resources and resourcing at the organizational level to support individuals' ability to integrate their specialized knowledge and skills for CDSI.

Our study contributes to the information systems literature by advancing the understanding of cross-functional collaboration in CDSI. It extends the existing, multidisciplinary body of knowledge through a detailed examination of individual and group-level factors that influence cross-functional collaboration in this context. Our findings and the proposed conceptual framework can guide future research on CDSI and cross-functional collaboration, emphasizing the importance of resource integration and actor-to-actor interaction (Vargo et al., 2024). Moreover, our study reinforces the S-D logic framework (Vargo and Lusch, 2004, 2008, 2016, 2017), which views interactions as value cocreation processes among resource-integrating actors (Vargo and Lusch, 2016; Lusch and Nambisan, 2015), and demonstrates its suitability for explaining cross-functional collaboration in CDSI by organizational actors.

For practitioners, our study provides actionable insights for fostering cross-functional collaboration in CDSI. Managers can use our findings to identify and address individual and group-level factors that support or hinder cross-functional collaboration in their organization to achieve desired CDSI outcomes. Our findings suggest fostering collaboration by clarifying roles and responsibilities, aligning objectives and practices, promoting effective communication, and ensuring a shared understanding. In addition, providing dedicated time for collaborative activities and reducing workload pressures can significantly improve individuals' ability and willingness to engage in resource integration.

This study also has limitations. First, we focused on interviews primarily with middle managers, which may not fully capture the perspectives of frontline employees and may result in a partial view of the barriers and enablers of cross-functional collaboration. In addition, we did not focus on specific teams or collaborative processes, which limits our understanding of how these processes unfold in practice. Future studies could address these gaps by examining specific contexts and collaborations to provide a more dynamic understanding of the individual and group-level factors, their interrelationships, and the evolution of collaboration over time.

Furthermore, our study did not consider the impact of organizational-level factors, such as culture and leadership, on cross-functional collaboration, which are known to significantly influence it. Future research could examine how different organizational factors affect the effectiveness of cross-functional collaboration and, more importantly, how they interact with individual and group-level factors. In addition, quantitative studies could complement our qualitative insights by validating the identified enablers and barriers and their relationships. Finally, exploring the role and impact of collaborative technologies on cross-functional collaboration within CDSI is also a potential area for future research.

6   Acknowledgments

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