JYU DISSERTATIONS 595

Mengcheng Li

Understanding Value Formation in Digital Services

The Perspective of Value Co-Creation and Co-Destruction

UNIVERSITY OF JYVÄSKYLÄ
FACULTY OF INFORMATION TECHNOLOGY

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ABSTRACT

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As services have revolutionized the global economy and have effects on everyone's life, it is essential to understand value formation in service contexts since value is at the heart of service. Value co-creation (VCC) has attracted increasing attention from companies looking for competitive advantage, and service-dominant (S-D) logic provides a solid foundation to understand VCC. However, most prior studies emphasize the positive outcomes of VCC and neglect the negative one, namely value co-destruction (VCD). VCC and VCD should be studied together to offer holistic insights about value creation in digital services, as information technology (IT) and collaborations can yield not only positive outcomes, but also unwanted results or challenges. However, research investigating VCC and VCD simultaneously is scarce, the interrelationship between the two remains unclear, and the role of IT has been overlooked.

This dissertation aims to conceptualize the VCC and VCD processes and outcomes within service systems and to examine VCC and VCD phenomena within different digital services. First, we conduct a systematic literature review to synthesize and analyze relevant articles concerning IT-enabled VCC and VCD focusing on social interaction and resource integration, which are two fundamental processes of VCC and VCD. We propose a framework of IT-supported VCC and VCD within service systems. Second, by interviewing patients who used gamified exercise for rehabilitation after total knee replacement, we identify seven clusters revealing the main pathways resulting in VCC and VCD in digital health services and different types of perceived value. Lastly, we combine contradiction and VCC and VCD to study how users experience VCC and VCD in geocaching. By analyzing online posts from discussion forums through an interpretive content analysis approach, we identify six types of contradiction manifestations and propose three pairs of contradictory poles in geocaching. By studying the two distinct and interconnected terms of VCC and VCD, this research adds to S-D logic through conceptual and empirical studies in digital services. Our findings provide implications for practitioners regarding service management and system design and development.

Keywords: value co-creation, value co-destruction, service systems, digital services, exergame, geocaching

TIIVISTELMÄ (ABSTRACT IN FINNISH)

Li, Mengcheng
Arvonmuodostuksen ymmärtäminen digitaalisissa palveluissa: arvon yhteisluonnin ja yhteistuhoamisen näkökulma
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Palvelut ovat mullistaneet maailmantalouden ja vaikuttavat jokaisen elämään, joten on olennaista ymmärtää arvonmuodostusta palvelukonteksteissa. Arvo on palveluiden ytimessä. Arvon yhteisluonti on herättänyt lisääntyvästi huomiota kilpailuetua etsivien yritysten keskuudessa, ja palvelukeskeinen logiikka tarjoaa vahvan perustan sen ymmärtämiselle. Useimmat aiemmat tutkimukset korostavat kuitenkin arvon yhteisluonnin positiivisia tuloksia unohtaen negatiivisen puolen eli arvon yhteistuhoamisen. Ilmiöitä tulisi tutkia yhdessä kokonaisvaltaisen näkemyksen tarjoamiseksi digitaalisten palveluiden arvonluontiin, sillä informaatioteknologia (IT) ja yhteistyö voivat tuottaa positiivisten tulosten lisäksi myös epämieluisia tuloksia tai haasteita. Ilmiöitä samanaikaisesti tutkivia tutkimuksia on kuitenkin vähän, konseptien välinen suhde on epäselvä ja IT:n rooli on jätetty huomiotta.

Väitöskirjan tavoitteena on käsitteellistää arvon yhteisluonnin ja -tuhoamisen prosessit ja tulokset palvelujärjestelmissä ja tutkia ilmiöitä digitaalisissa palveluissa. Ensiksi toteutamme systemaattisen kirjallisuuskatsauksen, jossa kokoamme yhteen ja analysoimme tutkimuksia IT:n tukemasta arvon yhteisluonnista ja -tuhoamisesta sosiaalisen vuorovaikutuksen ja resurssien integroinnin näkökulmista. Ehdotamme kehystä IT:n tukemalle arvon yhteisluonnille ja -tuhoamiselle palvelujärjestelmissä. Toiseksi liikuntapeliä polven tekonivelleikkauksen kuntoutukseen hyödyntäneiden potilaiden haastatteluista tunnistamme seitsemän klusteria, jotka paljastavat tärkeimmät digitaalisten terveyspalvelujen arvon yhteisluontiin ja -tuhoamiseen johtavat polut sekä koetun arvon eri tyypit. Viimeiseksi yhdistämme ristiriitateorian arvon yhteisluontiin ja -tuhoamiseen tutkiaksemme, kuinka käyttäjät kokevat näitä geokätköilyssä. Keskustelupalstojen verkkojulkaisuja tulkitsevan sisällönanalyysin avulla tunnistamme kuusi erilaista ristiriidan ilmenemismuotoa ja ehdotamme geokätköilyn kolmea ristiriitaista ääripäätä. Tutkimalla kahta erillistä mutta toisiinsa liittyvää konseptia, arvon yhteisluontia ja -tuhoamista, väitöskirja täydentää palvelukeskeistä logiikkaa digitaalisia palveluja koskevilla käsitteellisillä ja empiirisillä tutkimuksilla. Tuloksistamme on hyötyä palvelujohtamisen sekä järjestelmien suunnittelun ja kehittämisen toimijoille.

Asiasanat: arvon yhteisluonti, arvon yhteistuhoaminen, palvelujärjestelmät, digitaaliset palvelut, liikuntapelit, geokätköily

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LIST OF ACRONYMS

ABDC	Australian Business Deans' Council
AJG	Academic Journal Guide
GPS	Global Positioning System
IT	Information Technology
KOOS	Knee injury and Osteoarthritis Outcome Score
S-D	Service-Dominant (logic)
TKR	Total Knee Replacement
VCC	Value Co-Creation
VCD	Value Co-Destruction

FIGURES

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II Li, M., Aartolahti, E., Janhunen, M., Tuunanen, T., Heinonen, A., Jämsä, T., & Luimula, M. Investigating digital health services from value co-creation and co-destruction perspective: Multi-dimensional value formation processes and outcomes. (Under review)

III Vartiainen, T., Li, M., & Tuunanen, T. Manifestation of structural tensions in using the geocaching artifact: Contradictory poles of value co-creation and value co-destruction. (Under review)

Author contribution

For Articles I and II, the candidate is the leading author and performed most of the work, including study planning, theory development, and article writing. For Article I, the candidate was also in charge of collecting and analyzing data. For Article II, the data were collected by other co-authors as Finnish speakers were required, but the candidate was in charge of coding and analyzing the translated data. As the second author of Article III, the candidate made significant contributions to the article's theoretical development, data coding, and data analysis, as well as to the writing of the article.

1 INTRODUCTION

This chapter introduces the topic of this dissertation by describing the research background and motivation. Next, the dissertation's scope and objectives are described, followed by an overview of its structure.

1.1 Background to and motivation of the research

Service (singular), defined as the process of utilizing one's resources for another's benefit, is the foundation of economic and social exchange (Vargo & Lusch, 2004, 2017). The term "service" emphasizes the serving process rather than an output, such as intangible goods, which we refer to as "services" (plural) (Vargo et al., 2020). According to the World Bank (2020), services account for an average of 65.7% of countries' gross domestic product (GDP) globally. In developing economies, the services sector accounts for a relative lower proportion of the economy, but it still reaches an average of 45% of employment and 55% of GDP (World Bank, 2019). In developed economies, such as the United States and European Union, services account for a larger proportion of the economy, representing 80.1% and 70% of GDP, respectively (World Bank, 2020; European Commission, 2020). Therefore, service has revolutionized the global economy and influenced the market and jobs, which are tightly connected to organizations and individuals (Buera & Kaboski, 2012). Therefore, it is essential to conduct research on service(s) and relevant phenomena. According to Vargo et al. (2008, p. 145), "Value and value creation are at the heart of service and are critical to understanding the dynamics of service systems and to furthering service science." Similarly, Ostrom et al. (2015) argued that the way value is created for actors engaged in service processes, such as customers, service providers, and other stakeholders, is a central question for service researchers and practitioners.

In recent years, Value Co-Creation (VCC) has gained growing attention as a key strategy for organizations seeking a competitive advantage (Zhang & Chen, 2008). Co-creating with customers and treating them as more equal partners may

promote product and market success (Gustafsson et al., 2012), reduce cost (Prahalad & Ramaswamy, 2004), save time (Grönroos & Ravald, 2011), and increase customer satisfaction in the context of service (Oliver, 2006). VCC not only contributes to market innovation and evolution, but also facilitates new knowledge development for academia and practice (Vargo et al., 2008). Therefore, it is essential to gain an in-depth comprehension of the processes and outcomes regarding VCC in order to better manage and benefit from it.

The Service-Dominant (S-D) logic framework has been acknowledged as a theoretical lens for understanding value creation service contexts (Vargo & Lusch, 2017). One distinct difference between S-D logic and the traditional goods-dominant logic is that the former argues that service providers are not able to create value for customers, but merely provide value propositions to them, with value co-created by collaborating with actors participating in the service process (Vargo & Lusch, 2004). Thus, value is co-created when there is an improvement to the wellbeing of at least one of the actors involved in a particular service context (Maglio et al., 2009).

S-D logic has shifted the traditional product orientation to emphasizing a service orientation, changing the perceptions of how value is created across various disciplines, including management, information systems, marketing, service research, and tourism (Lumivalo, 2020). Although S-D logic states that value emerges from the process of VCC (Vargo & Lusch 2004), the concept of Value Co-Destruction (VCD) has been proposed to acknowledge that VCC outcomes can be either positive or negative (Vargo & Lusch, 2017). Some studies argue that value creation and destruction often coexist and are interrelated (e.g., Ostrom et al., 2021; Vartiainen & Tuunanen, 2014; Lumivalo, 2020). Specifically, VCC and VCD are regarded as the integral components of interactions and represent two essential parts of value formation (Echeverri & Skålén, 2011). However, most of the existing literature focuses on VCC. There has been little investigation of VCC and VCD simultaneously, and how the two are interconnected remains largely unstudied despite many research calls (e.g., Echeverri & Skålén, 2011; Quach & Thaichon, 2017; Stieler et al., 2014). Therefore, although it is essential to study VCC and VCD in the same context, such research is currently scarce.

Moreover, current research on VCD, like that on VCC, appears to view it interchangeably as an outcome, a process, or both. For instance, McColl-Kennedy et al. (2012) proposed that VCC refers to benefits (i.e., outcome) resulting from resource integration via collaborative activities and interactions, while VCC is defined as a process where "social and technological resources are integrated" (Russo-Spena, 2012, p. 546). Likewise, VCD is conceptualized as value destruction or diminution (i.e., outcome) during collaboration between providers and customers (Echeverri & Skålén, 2011), while it is also defined as "an interactional process between service systems that results in a decline in at least one of the systems' well-being" (Plé & Cáceres, 2010, p. 431). The literature thus lacks consistency regarding the relevant concepts and phenomena, implying that scientific consensus is yet to be achieved regarding VCC and VCD. Diverse

constructs and a missing consensus on the definitions may lead to confusion. To provide a shared language for the research community and practitioners, construct clarity is required (Suddaby, 2010) when studying VCC and VCD simultaneously in one service setting. Thus, we argue that there is a need to provide clear constructs for VCC and VCD and investigate them together in a variety of service contexts to offer richer insights about collaborative interactions and value formation process in service systems.

"Service systems" refers to VCC as configurations of people, IT, shared information, and value propositions (Akaka & Vargo, 2014). Those who are engaged in service systems, participate in collaborative interactions, and contribute to the creation of value for others are referred to as "actors" (Böhmann et al., 2014; Storbacka et al., 2016; Vargo et al., 2008). The service system perspective has greater power of explanation compared with a singular entity–level viewpoint that concentrates solely on the perspective of one actor, such as customers or service providers, as it emphasizes the value created by increasing connectivity and interoperability among different service systems (Breidbach & Maglio, 2016; Stephanie & Sharma, 2020). Consequently, service systems provide an optimal analytical unit and a holistic perspective for the investigation of value creation (Breidbach & Maglio, 2016).

As an important part of service systems, Information Technology (IT) contributes to the continuous integration of resources and creation of innovation for value creation (Hsiao, 2019). As leveraging technology and improving the customer experience in service have been declared a key service research priority, a deeper understanding is needed of how value can be created or destroyed in digital services (Ostrom et al., 2021). As innovations in technology continuously transform the landscape of digital services (Rust & Huang, 2014), it is essential to investigate the contexts and embedded processes/mechanisms that drive the increase or reduction of actors' wellbeing in the age of technologies (Ostrom et al., 2021). In particular, the discourse concerning how actors experience VCC and VCD in digital service remains rather limited. Deriving insights from S-D logic to understand digital services and value experience is critically important, given that digital technologies facilitate new methods of co-creating value which involve actors via interactions in such services. However, the activities and processes driving the formation of value remains unclear (Akaka & Chandler, 2011), and how IT affects VCC and VCD has been overlooked (Breidbach & Maglio, 2016). Thus, there exists a need for further investigation of IT-supported VCC and VCD in different service contexts to enrich current knowledge (Böhmann et al., 2014; Lusch & Nambisan, 2015).

To gain a comprehensive understanding of value formation in digital services, it is essential to comprehend how different actors experience positive and negative value formation processes and achieve corresponding outcomes. In particular, unfolding the VCC and VCD process and outcome is essential in digital services, since technology can both enable and constrain the interactions of relevant actors (Lumivalo, 2020). Therefore, it is crucial to integrate existing knowledge of VCC and VCD and provide a unified understanding of the

phenomenon through S-D logic. A consistent conceptualization of both VCC and VCD in digital services could provide a shared language for the investigation of relevant phenomena, and a thorough understanding of the process may help prevent unwanted service outcomes (Smith, 2013).

Digital services which involve games offer a good example of where VCC and VCD may occur simultaneously. For example, the gamified exercise ("exergame") designed for remote home rehabilitation contributes to value creation through its potential to improve exercise adherence (Kramer et al., 2014); moreover, such a digital service not only helps rehabilitation, but also saves money and time spent on traveling (Finkelstein et al., 2006). However, VCD may occur when patients and their families lack the knowledge needed to use the provided service or when service providers' resources are misused or insufficient (Robertson et al., 2014). Any collaboration can lead to positive results, negative results, or a mixed outcome whereby some actors experience VCC while others encounter VCD during the same interactions (Frow et al., 2016). Consequently, investigating VCC and VCD concurrently in a digital service involving games may facilitate a critical understanding of collaborative interactions and provide useful insights for system improvement and better service management. Particularly, understanding the main VCC and VCD pathways in digital services and customers' perceived value outcomes could provide a richer comprehension of the service process and customers' experience.

To summarize, this dissertation aims to conceptualize the VCC and VCD processes and outcomes within service systems and to examine VCC and VCD phenomena in the context of different digital services. In particular, this dissertation examines value formation in digital services involving games where several actors create mutual value and experience the co-creation and co-destruction of value. In addition, the dissertation aims to provide new insights for comprehending VCC and VCD, thereby enhancing the current understanding of co-creating value via digital services to improve actors' service experience and prevent negative consequences. By integrating and investigating various insights about the distinct but interconnected concepts of VCC and VCD in two digital services involving games, that is, a digital health service using an exergame and geocaching (a treasure-hunting game), this dissertation is based on studies at the intersection of information systems and the service field. Moreover, our findings provide implications for practitioners regarding the management of service processes as well as service design and development.

1.2 Scope and objectives of the research

To address the abovementioned research gaps, this dissertation attempts to provide answers to the following main research question:

RQ How does value formation occur in digital services from the perspective of VCC and VCD?

Specifically, this dissertation is comprised of three articles that respond to the main research question by addressing three sub research questions. The importance of the three sub research questions, as well as their scope and objectives, are discussed below.

Although VCC and VCD have been conceptualized from different views, the existing literature recognizes social interaction and resource integration as the fundamental processes resulting in both VCC and VCD. Specifically, resource integration provides a novel point of view on service through switching the emphasis from using a company's offerings to utilizing such offerings by combining various other resources (Vargo & Lusch, 2004). Besides, resource integration permits the emergence of intended, unintended, or negative value, determined by whether the network practices are aligned or misaligned (Caridà et al., 2019). Thus, VCC is always triggered by successful resource integration, whereas VCD often results from failed resource integration (Smith, 2013). In addition, VCC is a social process in which social interaction takes place (Vargo & Lusch, 2016), and VCD also happens within social interaction if the elements of practice appear to be incongruent or when unexpected behaviors take place (Quach & Thaichon, 2017). Accordingly, VCC and VCD involve a process of multidirectional resource integration and interaction, which tend to be interdependent and dynamic within service systems (Akaka et al., 2012). According to Gummesson and Mele (2010), it is important to discuss resource integration and social interaction together in a wider context of relationships and networks to investigate the complex process of value formation. An in-depth understanding of social interaction and resource integration may facilitate richer insights about the process and interrelationship between VCC and VCD.

However, little is known about actors' collaborative engagement through social interaction and resource integration in the context of services, especially those concerning the use of IT. In particular, the impact of IT remains unclear, as does which elements of social interaction and resource integration affect value formation (Cabiddu et al., 2019). When this research gap is filled, the findings can offer actionable and practical insights for the design and development of digital service and systems. VCC and VCD do not occur randomly and may be predictable, given the routines of actors' interactions and decisions regarding resource integration (Cabiddu et al., 2019). Therefore, it is crucial to investigate the constructs of IT-enabled VCC and VCD through resource integration and social interaction because they can enable deeper comprehension of the involved actors, relevant practices, and interrelationships.

By synthesizing and analyzing relevant prior literature, our aim is to explore VCC and VCD simultaneously through social interaction and resource integration in a service system. In particular, we will investigate the elements of resource integration and social interaction and the impact of IT and define VCC and VCD with congruent constructs. Therefore, the proposed framework provides an answer to the first sub research question of this dissertation (Article I):

RQ1 How do IT-supported VCC and VCD occur in a service system via social interaction and resource integration?

The comprehension of VCC and VCD highlights the significance of context, or "value-in-context" (Vargo et al., 2008, p.149). Depending on a person's perceptions and expectations of the surrounding circumstances, VCC could occur for one actor while VCD is perceived by another within the same interaction (Kim et al., 2020). For instance, some people regard the use of social robots to care for the elderly as VCC because it improves the health condition of the patients and the quality of the healthcare services. However, others view it as VCD due to the robots' constant data collection from the sensors, which raises privacy and security concerns (Laud et al., 2019). VCC and VCD are consequently multidimensional and subjectively determined by individual actors, depending on the context.

The second study investigates, from the patient's perspective, VCC and VCD in digital health services where exergaming is used for home rehabilitation after Total Knee Replacement (TKR). The literature demonstrates that gamified exercise, known as "exergames," increase exercise adherence among various patient populations (Kramer et al., 2014). To date, however, no studies have examined the embedded VCC and VCD process and outcomes that a patient encounters when playing an exergame for rehabilitation. There is a need for a comprehensive understanding of the facilitators and barriers to exercise for individuals with TKR (Dobson et al., 2016). Such an understanding can inform clinical practice and provide healthcare professionals with insights about exercise prescriptions and recommendations (Dobson et al., 2016). Additionally, understanding digital health service from the patient's perspective can be useful for improved rehabilitation and long-term exercise adherence and inspire future system design and development.

Based on the framework of IT-supported VCC and VCD from Article I, we intend to add to the existing body of knowledge by identifying the main pathways leading to VCC and VCD in digital health services and different types of perceived value by customers, thus answering the second sub research question of the dissertation (Article II):

RQ2 How do VCC and VCD occur in the setting of digital health services from the patient's perspective?

Some studies have acknowledged the duality of value creation and destruction in collaborative interactions (e.g., Echeverri & Skålén, 2011; Plé & Cáceres, 2010). For instance, in the setting of creating value in games combining digital and physical activities, Vartiainen and Tuunanen (2016) asserted that VCC and VCD are interconnected and cannot exist independently. Nevertheless, it is unclear how VCC and VCD are interlinked. Contradiction theory has been adopted to investigate VCC and VCD concepts and their relationships in various service contexts (e.g., Lintula et al., 2018; Vartiainen & Tuunanen, 2016). For example, Lintula et al. (2018) argued that it is possible that an actor may encounter VCC for a certain type of value while another value is co-destructed

simultaneously during or after service use, implying that VCC and VCD contradictorily emerge from service use. However, to the best of our knowledge, no study has formally introduced how contradiction theory is suitable for understanding VCC and VCD phenomena, or vice versa. Therefore, a good justification of the applicability of contradiction theory to VCC and VCD is needed, and a suitable empirical context can enrich such insight and comprehension.

Collaboration is a process of becoming in which actors experience dynamic positive and negative outcomes during interactions, as opposed to a unified process that is either successful or unsuccessful (Laamanen & Skålén, 2015). Actors constantly reconcile and balance the tensions of contradictory poles during collective minding (Carlo et al., 2012), which is similar to the coexistence of VCC and VCD in the collaboration process. Karanasios and Allen (2014) adopted a congruency–contradiction lens to comprehend police use of mobile technology, proposing that such technology can constantly resolve some contradictions (VCC) and introduce new ones (VCD). To better understand and manage the process of collaboration, actors should recognize that value can be continuously and dynamically co-created and co-destructed from the perspective of contradiction. However, there is a lack of research on how to identify contradictions from the perspective of VCC and VCD. Examining contradictions in digital service use is crucial because it reveals hidden tensions and opportunities that may explain why value is co-created or co-destructed during the service process.

Geocaching is a treasure-hunting game that involves digital services. Users can create and seek geocaches through the combined use of a mobile device or Global Positioning System (GPS) receiver. Geocaching provides an appropriate context to investigate VCC and VCD because geocachers may experience VCC when they enjoy the activity, by creating geocaches for other users and finding those other users have hidden, but they may also experience VCD when they have conflict perspectives regarding how to play the game and when they encounter negative consequences of geocaching. Identifying contradictions from the viewpoints of VCC and VCD may provide insights into how to balance the benefits of the involved actors and prevent undesirable outcomes. The objective is first, to justify how the contradiction perspective can be combined to comprehend VCC and VCD phenomena; and second, to identify contradictions in geocaching from the perspective of VCC and VCD. By investigating geocachers' VCC and VCD experience, we answer the dissertation's third sub research question (Article III):

RQ3 How do VCC and VCD contradictions occur in geocaching?

1.3 Structure of the dissertation

The remaining sections of this dissertation are organized as follows. Chapter 2 focuses on the research's theoretical foundation, describing existing understandings of S-D logic, VCC, and VCD. In addition, the applications of these concepts within the context of different digital services are discussed. Each article's research approach and the process of data collection and analysis are described in Chapter 3. Chapter 4 provides a summary of the findings derived from the three articles. Lastly, Chapter 5 describes the dissertation's contribution to theory and practice. The paper concludes with a discussion of the research's limitations and gives recommendations for future research directions. Figure 1 depicts the dissertation's organizational structure.

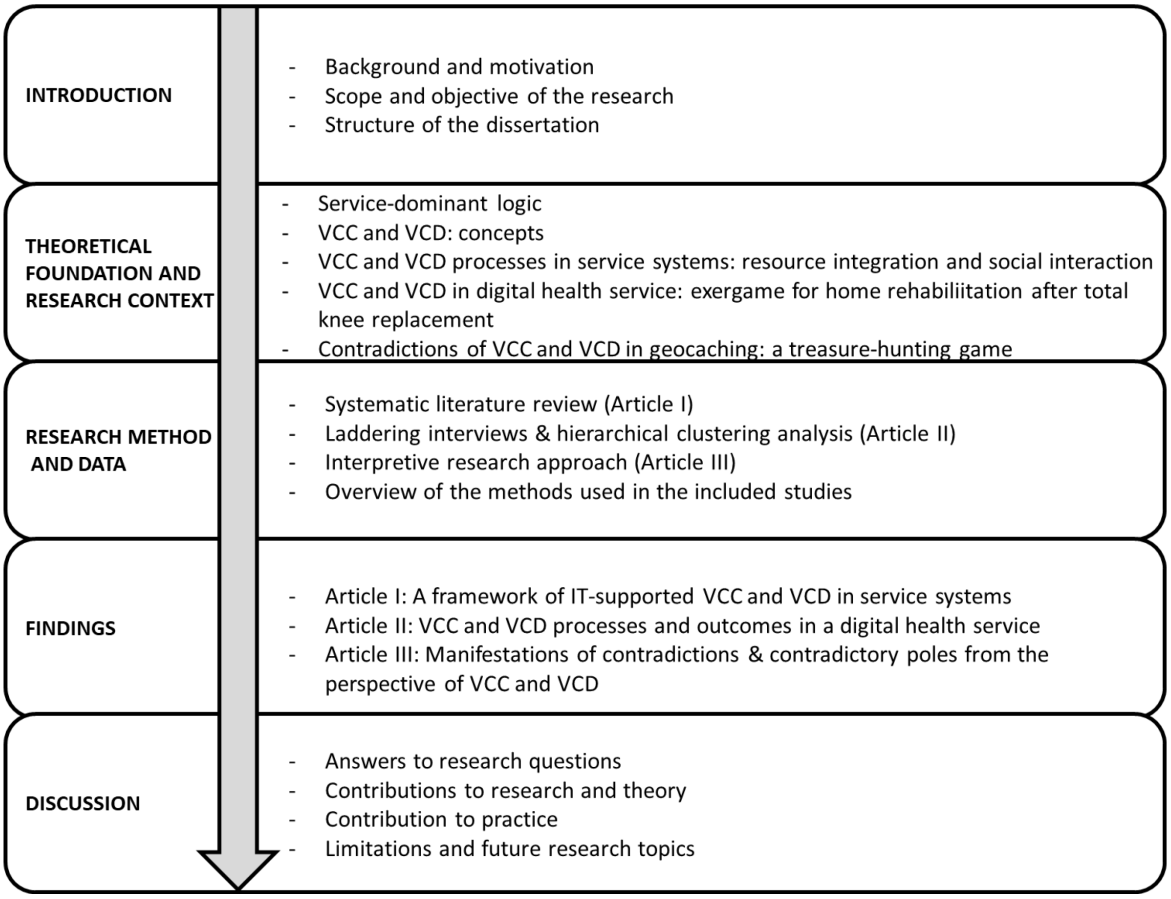

FIGURE 1 Structure of the dissertation

2 THEORETICAL FOUNDATION AND RESEARCH CONTEXT

This chapter begins with a discussion of S-D logic, which serves as the theoretical foundation for comprehending VCC. Subsequently, we present the current understanding of VCC and the emerging concept of VCD. Next, we discuss the concepts of social interaction and resource integration, which are the integral and fundamental processes of VCC and VCD in service systems. Thereafter, we present the foundations of VCC and VCD in two particular digital service contexts: 1) digital health services where exergames are used for home rehabilitation after TKR and patients' proactivity is essential for co-creating value; and 2) geocaching, which is a treasure-hunting game where contradictions may occur.

2.1 Service-dominant logic

Academic research has increasingly acknowledged that an organization's competitive advantage is obtained via service or service-related activities as opposed to mere product performance (Grönroos, 2006; Ostrom et al., 2021; Vargo et al., 2008; Vargo & Lusch, 2004). The first scholars to formally introduce S-D logic, Vargo and Lusch (2004), put forward a new dominant logic for marketing which suggested that service is fundamental to economic exchange, in which the co-creation of value, operant resources, and relationships are central. The evolution of S-D logic concepts was facilitated by an international community of scholars from a growing array of disciplines (Grönroos, 2011; Leclercq et al., 2016; Plé & Cáceres, 2010; Prahalad & Ramaswamy, 2004; Vargo & Lusch, 2016). Initially, Vargo and Lusch (2004) articulated an integrated framework for thinking about VCC regarding service-for-service exchange and proposed the foundational premises of S-D logic. With further consolidations, extensions, and elaborations over several years, eleven premises and a set of five axioms have been derived from the foundational premises, resulting in a more

compact framework (Vargo & Lusch, 2016). Specifically, because the five axioms of S-D logic are broader than the foundational premises, a number of the latter have been omitted. The updated axioms facilitate a more comprehensive understanding of dynamic service ecosystems and relevant institutions for co-creating value (Vargo & Lusch, 2016, 2017). Table 1 presents the axioms and descriptions.

TABLE 1 Axioms of S-D logic by Vargo and Lusch (2016)

Axiom	**Description**
Axiom 1	Service is the fundamental basis of exchange.
Axiom 2	Value is cocreated by multiple actors, always including the beneficiary.
Axiom 3	All social and economic actors are resource integrators.
Axiom 4	Value is always uniquely and phenomenologically determined by the beneficiary.
Axiom 5	Value cocreation is coordinated through actor-generated institutions and institutional arrangements.

Unlike the traditional goods-dominant logic, which focuses on the exchange of goods for money, the original foundational premise of Axiom 1 of S-D logic argues that service forms the basis for economic exchange, through the application of specialized skills and knowledge and with the main purpose of creating value (Vargo and Lusch, 2004). In contrast to S-D logic, goods-dominant logic stresses that the transfer of ownership of goods and the output of production remain the center of exchange (Vargo et al., 2008). This idea emphasizes operational efficiency via goods whose embedded value is delivered in customers' processes (Grönroos, 2011). S-D logic, in contrast, views goods merely as the transmitters or carriers of intangible resources, such as knowledge and skills, and enablers for the distribution of services in which customers can obtain value from the firm's offerings (Vargo & Lusch, 2004; Vargo et al., 2008). Similarly, Grönroos (2006) recognized that goods provide a platform for services. According to S-D logic, the primary sources of competitive advantage are operant resources such as knowledge and skills (Vargo et al., 2008).

Axiom 2 of S-D logic stresses that "value is co-created by multiple actors, always including the beneficiary" (Vargo & Lusch, 2016, p. 8). Instead of creating or delivering value, service providers can merely offer value propositions to customers through the application of resources or competences (Vargo & Lusch, 2008). Value propositions are a predefined constellation of the service, and they are an essential part of sharing how service providers intend to convey value to customers (Payne et al., 2017). In other words, rather than being created individually or dyadically, value is created via resource integration from a variety of sources, including a vast array of market-facing actors. Co-creation of value is a multi-actor phenomenon, representing the aim of exchange and is, consequently, the basis of markets and marketing (Vargo & Lusch, 2016).

There have been many debates within the area of S-D logic about the statement that value is always co-created. For instance, the traditional marketing

management perspective, which is directly related to goods-dominant logic, views the firm as the only value creator and treats interactions as merely the mechanism facilitating exchange (Håkansson et al., 2009). Similarly, Grönroos and Voima (2013) argued that co-creating value is only possible during direct interaction which involves the engaged actors in each other's practices. However, Vargo and Lusch (2016) argued, in relation to such debates, that such perspectives on customer orientation and interaction should not be limited to face-to-face encounters, but refer to "mutual or reciprocal action or influence" (Merriam Webster, 2015). In such interactions, the beneficiary is always an involved actor creating its own value and plays a core and evaluative role. The value varies for each actor and should be evaluated individually, as indicated by axiom 4.

Axiom 3 of S-D logic argues that all actors involved in social and economic activities are resource integrators (Vargo & Lusch, 2016). Service is the application of one's competences, such as skills and knowledge, for another's benefit or support (Grönroos, 2011). One essential activity of co-creating value in service is to coordinate via service exchange and resource integration to obtain mutual benefits. In particular, operant resources, such as mental competences and knowledge, represent the primary source of maintaining a superior position, economic growth, and strategic advantage (Vargo & Lusch, 2004, 2016). Economic and social actors are defined as those parties involved in exchange relationships (Vargo & Lusch, 2016). Originally, Vargo and Lusch (2004) only recognized organizations as those which transform and integrate specialized competences into complex services. Soon after, they realized that individuals and households can also be understood as resource integrators (Lusch & Vargo, 2006). Simply put, the term "actors" has been adopted to refer to involved parties, and the term "service system" has also been frequently used in S-D logic in recent years (Chandler & Lusch, 2015; Vargo & Akaka, 2012; Vargo & Lusch, 2008), providing a system perspective of markets.

Axiom 4 of S-D logic states that the value is decided by the beneficiary (Vargo & Lusch, 2016). Value concerns the outcomes that an actor perceives (Vargo & Lusch, 2006), and it differs according to the capability of individuals to integrate resources during collaboration (Akaka et al., 2012). It is the individual's own interpretation or evaluation of value in a certain context that determines whether a collaborative process is positive or negative. Consequently, value can be positive or negative, is uniquely and phenomenologically determined, and must be evaluated dynamically by the beneficiary (Vargo & Lusch, 2016). Typically, the customer is the beneficiary and able to determine value according to their own experience of co-creation during the service process. Based on the relational perspective, value is experiential and relational; thus, value can only be co-created: It does not exist in the product, service, or manufacturing process, but depends on its utilization (Vargo & Lusch, 2004; Chandler & Lusch, 2015). In other words, value-in-use is essential in the relational service process, implying that value is related to the beneficiary's experience and the contextualization (Chandler & Vargo, 2011; Vargo & Lusch, 2011).

VCC is coordinated and achieved via institutions and institutional arrangements generated by actors, according to the Axiom 5 of S-D logic (Vargo & Lusch, 2017). Institutions are human-created norms, rules, and beliefs that facilitate and constrain actors' behavior, while institutional arrangements are sets of interrelated institutions (Vargo & Lusch, 2016; Siltaloppi et al., 2016). Institutionalization plays a critical role in understanding human systems and social activities, such as VCC (Vargo & Lusch, 2016). In line with Scott (2013), Siltaloppi et al. (2016) stated that institutions provide stability and meaning to social life through elements of regulation, norms, and culture, jointly with related activities and resources. Institutions can be formal, such as laws and legislation, and informal, such as values, social expectations, and moral codes which define appropriate behaviors. Both types regulate services and service processes and embody the fundamental beliefs and assumptions that make life more comprehensible. Instead of existing in isolation, individual institutions are parts of a larger and more complex system that consists of interconnected institutions, which serves as the foundation for collective action (Siltaloppi et al., 2016).

With the contribution of an increasing number of scholars from a variety of disciplines, S-D logic is a dynamic, ongoing narrative of VCC via service exchange and resource integration (Vargo & Lusch, 2017). S-D logic plays an essential role in, and lays the foundation for, understanding VCC in service ecosystems. As the axioms are encompassing, the influence of S-D logic may extend beyond marketing to fields such as IT, management, and human resources (Gummesson & Mele, 2010; Vargo & Lusch, 2017). Vargo and Lusch (2017) are positive that S-D logic will be developed into a general theory of VCC, although it still needs further extension and examination. Additionally, to give S-D logic a higher level of generalizability, Vargo and Lusch (2017) argued that further investigation is needed through collaboration across different disciplines and that thoughts from different theories, such as midrange theory and complexity theories, should be brought together. More evidence-based research is also needed to investigate S-D logic or VCC in practice (Chandler & Vargo, 2011; Vargo & Lusch, 2017).

2.2 Value co-creation and value co-destruction: Concepts

As a concept describing collaboration among multiple actors, VCC has garnered increasing attention from practitioners and academics (Prahalad & Ramaswamy, 2004). Several authors have defined VCC from a variety of perspectives since the term "value co-creation" was coined by Kambil et al. (1996) to emphasize the importance of customer engagement in marketing and business strategy. For example, VCC was defined by McColl-Kennedy et al. (2012) as the benefits resulting from resources integration via collaborative interactions and activities in the service network of customers. Grönroos and Voima (2013) stated that VCC refers to value-in-use with interactions taking place, while, according to Barile and Saviano (2013), VCC indicates that multiple parties are involved in the same

collaborative process for their mutual benefit. McColl-Kennedy et al. (2012) cataloged 27 different definitions of VCC found in the literature, and Ranjan and Read (2016) concluded that those definitions can be generally categorized into two elements of VCC: value-in-use and co-production. Grönroos (2011) argued that actors participating in the VCC process must collaborate and can engage actively with, learn from, and influence one another through interactions. The numerous definitions of co-creating value basically agree that actors must be engaged and active, relating to each other during the collaborative process (Barile & Saviano, 2013).

In S-D logic, value relates to enhanced system wellbeing and reflects actors' capacity to adapt to the environment (Vargo et al., 2008). As a result of activities and interactions during resource integration, value is co-created and evaluated in use (Grönroos & Voima, 2013). Actors participate in the VCC process with the fundamental aim of improving system wellbeing, which can be driven by different purposes and motivations. For example, Oreg and Nov (2008) stated that reputation and altruism are essential factors driving actors to participate in the collaboration process. Similarly, Nambisan and Baron (2009) found four types of benefits which actors pursue while co-creating, namely hedonic, cognitive, personal integrative, and social integrative. However, S-D logic has been criticized for being too optimistic on services and value creation (Echeverri & Skålén, 2011; Plé & Cáceres, 2010). As collaboration in service involves interactions, it not only results in beneficial outcomes, but may also lead to destruction of wellbeing for the actors involved (Plé & Cáceres, 2010). Considering the possibility of negative value outcome provides a holistic comprehension of value formation since collaboration does not guarantee VCC.

The development of technology makes it easier for actors from different backgrounds to collaborate by providing platforms for VCC. When actors are involved in a network where their performance is related to other stakeholders, the network shifts from creating value via sole products and service to co-creating value with other networked actors through collaboration (Kim et al., 2019). IT usage helps organizations to better engage in collaboration, since it facilitates the flow of information, products, and money within interaction, which contributes to VCC (Rai et al., 2012). Additionally, IT has been leveraged to generate co-created value and enable effective and efficient interaction among actors during the process of VCC (Grover & Kohli, 2012). For instance, customers can involve themselves in the VCC process by making their ideas and opinions heard through internet-based communities and widespread social interaction technologies (Ramaswamy, 2008). Companies can also gain a competitive advantage through engagement platforms by interacting with customers and using global network resources to identify and develop innovative ideas (Ramaswamy, 2008). Furthermore, IT can contribute to information integration by providing platforms where resource matching is facilitated. For instance, Amazon provides customers with an online interface where they can search, order, pay for, and review various products (Grover & Kohli, 2012). However, the use of IT can also bring unexpected outcomes that actors do not desire. For

example, using such functions in online crowdsourcing communities can contribute to VCC by motivating contestants. However, the immoderate use of such functions among friends can also threaten the business model of the platform providers (Faullant & Dolfus, 2017). Therefore, a balanced comprehension of value formation in digital services is required, with consideration of both positive and negative value outcomes.

The duality of value outcome has been acknowledged in the extant literature, which recognizes VCD as an opposing phenomenon to VCC in interactive value creation (Echeverri & Skålén, 2011; Lintula et al., 2017; Plé & Cáceres, 2010; Vartiainen & Tuunanen, 2016). Plé and Cáceres (2010, p. 431) defined VCD as "an interactional process between service systems that declines the wellbeing of at least one of the systems, which, given the nature of a service system, can be individual or organizational." Some researchers argue that VCC and VCD can occur simultaneously in complicated and dynamic service processes, indicating that they are distinct phenomena that can co-exist (Chowdhury et al., 2016; Plé, 2017). A single actor might experience VCC regarding one value dimension while simultaneously encountering VCD with respect to another (Stieler et al., 2014; Vartiainen & Tuunanen, 2016). Additionally, the same collaborative interaction may lead to VCC for some actors while resulting in VCD for others involved in the process (Kim et al., 2020). Therefore, VCD should be investigated together with VCC, instead of being viewed as merely its opposite (Stieler et al., 2014).

Although the theoretical understandings of VCC regarding concepts and processes may not be applied directly to VCD, the foundations of S-D logic may be useful when attempting to investigate VCD in relation to actors' engagement in an interactive resource integration process (Lintula et al. 2017). Resource integration occurs in VCC as a continuous process facilitated by interactions between actors and resources (Caridà et al., 2015, 2019). Resources can be successfully integrated or misused, implying that value resulting from resource integration can be positive or negative. According to Plé and Cáceres (2010), resources are misused if actors cannot apply or integrate their own available resources or those of another system in what another interaction service system believes to be an expected or appropriate manner. VCD behavior by resource misuse can be intentional or unintentional. For example, while co-innovating with a firm, customers may accidentally misuse resources since they lack a reference frame to use them as expected by the firm (Plé & Cáceres, 2010). Four cases of intentional resource misuse were identified by Plé and Cáceres (2010): misbehavior of employees, conflict of actors' roles, management of distribution channels, and customers' misbehavior, when they seek their own benefit at the expense of the company's interests.

There are some distinctive streams in the current research related to VCD. For example, based on a review of existing VCD research, Echeverri and Skålén (2021) identified two categories of research: One emphasizes service systems and resources, and the other highlights the role of practices. The former stream suggests that actors' wellbeing is diminished during interactions within or

between service systems and VCD stems from resource misuse (Echeverri & Skålén, 2021). The latter stream focuses on analyzing and conceptualizing VCD using practice theory (Echeverri & Skålén, 2021), which is a set of diverse theoretical perspectives for understanding practices that humans enact as a framework of organized actions with the purpose of implementing concrete actions (Nicolini, 2012). For example, based on an empirical study, Echeverri and Skålén (2011) argued that VCC occurs when the interacting service systems enact practices congruently and VCD results from incongruent practices among interacting parties. The concept of interactive value formation was outlined by this analysis, which contributes to the understanding of the reciprocal relationship between VCC and VCD (Echeverri & Skålén, 2021).

The use of IT can also hinder the improvement of systems' wellbeing. For example, in their study of augmented reality mobile games, Lintula et al. (2018) found that VCD may result from constant mobile use and technical challenges. Specifically, users may experience frustration if they encounter technical failures, damage, or deficiencies when playing games on their mobiles (Lintula et al., 2018). In addition, VCD may happen when actors experience privacy violation while using an IT-enabled service. For instance, some users feel that their life is intruded upon and their privacy is violated when using a service robot to care for the elderly because of the continuous monitoring (Čaić et al., 2019).

Recent research on VCD has provided rich insights about the downside of VCC in digital services. However, further understanding of the processual nature of VCD is needed, especially given that a vast body of research focuses on VCC (Kuppelwieser & Finsterwalder, 2016; Plé, 2017). Therefore, the VCD phenomenon should be further studied to gain a relatively equal understanding (Kuppelwieser & Finsterwalder, 2016; Plé, 2017). Besides, there is a lack of conceptual clarification or unified understanding about studying VCD together with VCC, as they are two distinct yet interconnected phenomena (Stieler et al., 2014).

2.3 VCC and VCD processes in service systems: Resource integration and social interaction

Resources can be categorized from various perspectives. In S-D logic, two kinds of resources are observed, namely operand and operant (Vargo & Lusch, 2004). Specifically, operand resources refer to resources which require an operation or act to be performed to generate an impact, while operant resources concern combining knowledge, competencies, and skills that can act on other resources (e.g., goods) to create value for actors, such as the ability to act on technology (Vargo & Lusch, 2004). In another vein, Arnould et al. (2014) divided resources into physical, cultural, and social resources from the viewpoint of customers' experiences and cultural perspectives. Based on the similarity or dissimilarity of actors' resources, resource integration can be described as complementary

(resources differ regarding quality and quantity), redundant (resources are similar and result in an increase in the joint volume), or a mixture of the two (Gummesson & Mele, 2010). The integration process not only enables creating new resources, but also facilitates the modification of available resources which may have potential for subsequent resource integration (Paredes et al., 2014).

According to Caridà et al. (2019), resource integration is at the center of the interactive value-formation process. Companies can gain competitive advantages within their networks by effectively integrating resources and capabilities (Kim et al., 2015). Gummesson and Mele (2010) conceptualized resource integration as the process of incorporating one actor's resources into those of others. To make VCC occur, it is necessary to achieve a delicate match between actors' resources, activities, and processes (Singaraju et al., 2016). According to Lusch and Nambisan (2015), resources will never have value unless they are used by being combined or bundled with other resources. In a similar vein, Plé (2016) stated that resource integration is continuously facilitated by diverse actions and activities of combining and mixing the resources of networked actors.

The process of resource integration may be complex in service settings, in which actors interact and iteratively affect others' value processes and experiences (Ng et al., 2016). According to Caridà et al. (2015, 2019), resource integration can be viewed as an integral part of the VCC process that emerges from three parts: the operations on resources, resource mixes/combinations, and value assessment. Similarly, based on the network perspective, Akaka et al. (2012) stated that value is determined by actors' ability to access, adapt, and apply resources via practices taking place in the networks. Therefore, resource integration is a key predictor of VCC through its significant influence on actors' participation in the collaboration process (Kaur et al., 2015).

However, VCD may also occur due to resource misintegration and non-integration, which can be influenced by actors' feelings, perceptions, and operations while integrating resources (Plé, 2016). In such circumstances, actors' resources may be either intentionally or unintentionally misaligned, differing from initial expectations (Plé, 2016). Value can thus be co-created or co-destructed and is evaluated in use, resulting from the interactions and activities where resources are integrated (Laamanen & Skålén, 2015). Therefore, a thorough understanding of the resource integration process could provide knowledge of different forms of collaboration that co-create or co-destruct a system's wellbeing, either expectedly or unexpectedly (Laud et al., 2019).

Social interaction is a concurrent and two-way conversation between actors in collaborations (Akman, 2016; Tajvidi et al., 2017). In the same vein, Grönroos (2009) emphasized that interaction is a reciprocal or mutual action in which the involved parties have an influence on each other. Social interaction is a generator of experience, and it is an important driver for VCC in service systems (Ballantyne & Varey, 2006; Diffley & McCole, 2015). In particular, social interaction makes it possible for actors to participate in, support, and benefit from collaborating with other actors and co-creating value (Gummesson & Mele, 2010).

Through social interaction, the value-creation processes of the company and customers are occurring simultaneously (Grönroos, 2009), so they are able to quickly exchange pertinent information, which is essential for maintaining customer relationships (Diffley & McCole, 2019). Moreover, social interaction may empower individuals and promote better decision-making in collaborative communities (Akman, 2016). For example, via social interaction, members of the community may feel more comfortable providing feedback and sharing information, resulting in rational decision-making (Akman, 2016). Similarly, customers are able to share experiences and produce social value in business relationships through customer-to-customer interaction (Blasco-Arcas et al., 2014).

Social interactions can take various forms and be divided into different categories from various perspectives. For example, Karpen et al. (2012) recognized six kinds of VCC interactions between actors: relating, ethical, individuating, developmental, empowering, and concerted. These classifications are based on the notion that actors collaborate for the purpose of obtaining different reciprocal benefits (Karpen et al., 2012). In another vein, Baumann and Le Meunier-FitzHugh (2015) identified two distinct levels of interaction between sellers and buyers while co-creating value, namely relational interaction and transactional interaction, which correspond to long-term and short-term relationships, respectively.

Nonetheless, some academics argue that VCD might also occur through social interaction. Järvi et al. (2018) identified eight antecedents for VCD to emerge before, during, or after interactions, namely absence of information, absence of clear expectations, mistakes, customer misbehavior, inability to change, inability to serve, insufficient level of trust, and blaming. Makkonen and Olkkonen (2017) found that actors may experience misunderstanding in the absence of sufficient communication during interactions, resulting in potential problems. For instance, doctors may give an incorrect diagnosis and patients may have an unsatisfactory experience if misunderstanding exists in the interactions between doctors and patients (Osei-Frimpong et al., 2015). The VCC process requires continuous adjustment and reformulation if the interaction appears to be inconsistent or disorderly; otherwise, value may be co-destructed (Fyrberg Yngfalk, 2013). Additionally, the development of IT makes interactions through the internet easier and can thus lead to unexpected experiences. For example, in a study on communities of crowdsourcing competitions, Faullant and Dolfus (2017) found that actors may experience personal attacks or even bullying through online social interactions. Therefore, it is essential to understand how value can be co-created and co-destructed through social interactions so that unexpected processes and outcomes can be recognized, analyzed, and potentially avoided.

2.4 VCC and VCD in digital health service: Exergame for home rehabilitation after total knee replacement

Users of health services have traditionally been considered a separate entity from the service provider, acting as passive recipients of service offerings (Payne et al., 2008). This perspective has been pervasive in the healthcare setting (Berry & Bendapudi, 2007). However, the emergence of S-D logic and consumer culture theory literature offers an alternative viewpoint which states that customers co-create value with service providers and other actors (Vargo & Lusch, 2004; Witell et al., 2011); thus, customers are active participants in the process of value creation (McColl-Kennedy et al., 2017). It has now been acknowledged in healthcare that disease management and rehabilitation closely relate to patients' active engagement and collaborative interactions with others (Holman & Lorig, 2000). Furthermore, the development of healthcare technology facilitates new ways of interacting through digital platforms, transforming the role of customers into that of responsible and active value co-creators rather than mere passive patients or treatment recipients (Botti & Monda, 2020; Rantala & Karjaluoto, 2016). For instance, monitoring sensors and wearable devices empower patients to think critically with real-time data so they can better manage their daily care and make rational decisions (Botti & Monda, 2020).

However, little is yet known about how VCC occurs in the context of digital health services from the perspective of patients. Previous studies have found that patients' involvement in VCC can improve anticipated service outcomes and have a positive effect on patients' life quality (Vieresjoki et al., 2021). In healthcare, the terms "patient engagement" and "digitally engaged patient" have been adopted, indicating that patients should play a more proactive role in self-care by utilizing digital health services (Lupton, 2013). With a digital device, patients are found to be more motivated and activated to co-create value through interactions and sharing resources; in this case, value is determined by patients regarding their own experience related to the improvement of wellbeing (Windasari et al., 2021). Patients' will is essential for co-creating value; therefore, it is crucial to understand how value is co-created and perceived within a digital health service from the patient's perspective.

Although patients may gain significant benefits from VCC in healthcare services, such as saving time and cost (Finch et al., 2008), they may also encounter negative consequences during collaborative interactions. Online forums, for instance, can provide patients with valuable suggestions and inspiration for meal ideas. However, they include commercial content and peer-shared information that may mislead and confuse patients, resulting in VCD (Holmberg et al., 2019). Therefore, it is essential to study VCC and VCD together to gain a thorough understanding of the value formation process in practical service contexts. Li and Tuunanen (2022) argued that the key embedded and interrelated processes leading to both VCC and VCD, namely resource integration and social interaction, provide useful insights in the simultaneous investigation of VCC and VCD. In

particular, actors utilize their own and other actors' resources to enhance their own and other service systems' wellbeing via resource integration (Vargo & Lusch, 2017). Resource integration involves actors' accessing, matching, and using the available resources in service systems, resulting in an intended or unintended value (Caridà et al., 2019; Peters et al., 2014). Moreover, value is co-created by actors through interactions (Quach & Thaichon, 2017), and VCD might also occur when elements of a practice are not congruent during interactions (Plé, 2017; Quach & Thaichon, 2017). Thus, investigating VCC and VCD through resource integration and social interaction can enable a comprehensive understanding of the value formation process. However, little is known about how patients experience VCC and VCD processes and outcomes in digital health service settings. Based on the findings of Li and Tuunanen (2022) (Article I), Article II uses the identified constructs or dimensions of resource integration and social interaction in IT-supported VCC and VCD as a theoretical framework. Then, we examine how patients encounter VCC and VCD in the case of digital health services using exergaming for home rehabilitation.

Hip and knee osteoarthritis are among the world's leading causes of disability in older adults (Dobson et al., 2016). Surgical intervention to provide TKR can be very effective in reducing patients' pain (Harding et al., 2014). However, it is the patients' responsibility to undergo rehabilitation and improve their physical function after being discharged from the hospital (Christensen et al., 2020). Traditionally, patients receive written instructions as a reminder and guide for the recommended home exercise for rehabilitation (Janhunen et al., 2021). Today, the development of IT has enabled the digitalization of rehabilitation services. Exergames, computer-based video games played for nonrecreational purposes such as physical rehabilitation, are found to be helpful in enhancing people's motivation and enjoyment during rehabilitation exercise (Bower et al., 2014). Gamification is the practice of using elements of game design in non-game contexts (Deterding et al., 2011), serving as an incentive mechanism for behavioral change and motivational support (Blohm & Leimeister, 2013). Exercising with exergames may boost training volume and improve the efficacy of physical rehabilitation (Janhunen et al., 2021). As other actors, such as service providers and healthcare professionals, also engage in the digital health service, value can be co-created and co-destructed during the process.

Patients' engagement in VCC is vital due to the nature of healthcare, and a patient's service system is an essential place for value configuration where VCC takes place (Kaartemo & Känsäkoski, 2018). Patients interact with digital health devices, service providers, and healthcare professionals in the patient service system (Windasari et al., 2021). When a service system seeks to improve health, it should aim not only to eliminate disease or infirmity, but also to improve a person's complete wellbeing, including physical, mental, and social health (Kaartemo & Känsäkoski, 2018). In order to gain a comprehensive understanding of VCC and VCD in digital health services, Article II of this dissertation investigates the value of exergames in enhancing patients' physical wellbeing as well as other values or goals deemed important for their overall wellbeing.

2.5 Contradictions of VCC and VCD in geo-caching: A treasure-hunting game

In activity theory, contradictions are central drivers of change and development, representing structural tensions accumulated between and within activity systems (Engeström, 2001). A dialectic lens can be applied to analyze a social system, which can be viewed as a "unity of opposites," where the dialectic relationships jointly contribute to the social system as a whole and contradictions exist at multiple and interrelated levels (Carlo et al., 2012). A set of opposite poles embedded in a dialectic process provides frames of interpretations for contradictions (Carlo et al., 2012). Previous research has attempted to apply contradiction theory to understand VCC and VCD phenomena and their relationships within service settings (e.g., Lintula et al., 2018; Vartiainen & Tuunanen 2016). However, it remains unclear how and why the concept of contradiction can fit the context of VCC and VCD.

To fill the identified research gap, we argue that it is reasonable to view VCC and VCD from the perspective of contradictions. Firstly, and consistently with the dialectic lens that a social system always consists of dynamic outcomes generated by tensions between underlying contradictory poles (Carlo et al., 2012), VCC and VCD occur dynamically as outcomes of interactions in a collaborative service system. Carlo et al. (2012) applied the dialectic perceptive to understand collective minding, highlighting that the mindful and the mindless form contradictory poles in IT use. Mindfulness is usually associated with positive outcomes and mindlessness with failure (Weick & Sutcliffe, 2006), just as VCC and VCD are regarded as service value outcomes when actors collaborate to create value.

Second, contradictions are found to involve complementary, mutually implicating, and polarizing relationships (Carlo et al., 2012), which also exist between VCC and VCD. To begin with, in the same way that contradictions are complementary in the sense that both sides of the opposition are required for a joint result, VCC and VCD are complementary for interactive value formation. Previous research assumes that the occurrence of VCC and VCD frames two opposite poles of a continuum (Robertson et al., 2014) or flipsides (Neuhofer, 2016), existing as integral and complementary parts of collaborative interactions (Echeverri & Skålén, 2011). Furthermore, just as contradictions are mutually implicating in the sense that the opposites imply one another, VCC and VCD also have mutual effects. Actors' participation in others' practices can have a mutual influence when value is co-created during interactions (Echeverri & Skålén, 2011). Often, actors hold contradictory viewpoints about value, which can spark new meanings and interpretations as well as innovation (Fyrberg Yngfalk, 2013). For example, VCD occurs when a manifestation of contradictions arises, such as resistance, which may stimulate the adjustment and reformulation of the collaborative process and ultimately contribute to VCC (Fyrberg Yngfalk, 2013). Finally, contradictions are polarizing in that emphasizing only one pole may

result in bringing the whole to a halt (Carlo et al., 2012). Similarly, focusing solely on VCC may lead to an underestimation of VCD, which could render the process uncontrollable if an unexpected event occurs (Plé & Cáceres, 2010). In contrast, focusing merely on VCD may discourage actors from taking action due to potential risk, danger, or failure.

Thirdly, VCC and VCD provide a new perspective for identifying the contradictory poles which exist in a dialectic. Dialectic theory implies that it is important to study the interplay of contradictory poles as they jointly contribute to the formation of a social system (Carlo et al., 2012). Thus, it is crucial to analyze both VCC and VCD when investigating collaborative value formation, since collaboration not only brings beneficial outcomes, but can also diminish the value of involved actors (Plé & Cáceres, 2010). As the purpose of understanding contradictions is intrinsically to create value for the entire service ecosystem and facilitate better management, examining factors contributing to VCC and VCD may offer a systemic perspective to identify contradictions. For instance, Oliveros et al. (2010) examined contradictions in service encounters by investigating how cracks and conflicts for power and control can affect the interactive value actualization in collaboration (i.e., VCC and VCD). Additionally, contradictions may exist in different actors' views regarding VCC and VCD. Contradictions may emerge when different actors' interests, that is, perceived value, are in conflict (Engeström & Sannino, 2011). Actors engaged in the same collaborative process interpret their experience differently in terms of value. For example, according to Marwan and Sweeney's (2019) research on the contradictions in technology integration, technology use in the classroom may motivate students, making their learning experience more engaging (VCC), while simultaneously increasing teachers' workload, particularly in planning and preparation (VCD).

Lastly, examining contradictions can, in turn, provide insights into the factors that contribute to VCC and VCD. For instance, Uppström and Lönn (2017) emphasized contradictions to identify various possible interpretations of VCC and VCD in the setting of e-government collaboration. Similarly, Forsgren and Byström (2018) assert that identifying congruencies and contradictions gives actors greater knowledge of what happens when they are investigating how social media implementation in a workplace can bring about changes and developments. Contradictions are considered to be one source of tension and change that contributes to the occurrence of a variety of activities, including VCC and VCD (Allen et al., 2013). Therefore, examining contradictions can provide potential interpretations about why things succeed, stagnate, or fail by revealing hidden tensions and unnoticed opportunities (Allen et al., 2013; Uppström & Lönn, 2017). Being latent and not directly observable, contradiction can be visible via manifestations, such as conflicts, problems, dilemmas, and ruptures (Engeström, 2000; Engeström & Sannino, 2011). Recognition of these manifestations enables identification and further investigation of the contradictions underlying them (Helle, 2000).

The case of geocaching is an appropriate example to show how contradictions exist in digital services from the perspective of VCC and VCD.

Geocaching, an outdoor treasure-hunting or hide-and-seek game that combines technology and physical activity, has become an increasingly popular hobby worldwide (Gentry, 2006; Schlatter & Hurd, 2005). There were around five million active geocachers in the community in 2021 across 191 different countries (https://www.geocaching.com). GPS-enabled devices are utilized to locate the specific coordinates where the geocache (container) is hidden. The flexibility of IT has enabled geocaching to become popular due to its ease of use. Combining competition, cooperation, and communication, geocaching has motivated participants to co-create value with others involved in the service (Fornasini et al., 2020). Additionally, we chose geocaching as the study subject because, from our own experiences as geocachers, we know that, while geocachers co-create value through creating/hiding geocaches for each other and also enjoy the activity by finding geocaches, discussion in geocachers' forums indicates that VCD may occur when some geocachers are not satisfied with how others play the game and when some negative consequences of geocaching, such as erosion, occur. Therefore, identifying contradictions in the context of geocaching from the perspective of VCC and VCD could provide insights into how to balance the benefits of the involved actors and prevent unwanted outcomes.

3 RESEARCH METHOD AND DATA

This chapter describes the research methods employed for each article and the data collected and analyzed to better answer the research questions.

3.1 Systematic literature review (Article I)

The aim of Article I is to evaluate carefully chosen articles concerning IT-supported VCC and VCD via social interaction and resource integration. The method of a literature review is regarded as appropriate because it enables the summary and analysis of research about the same topic and may shed light on how to extend the work (Webster & Watson, 2002). Following Wolfswinkel et al.'s (2013) five-stage grounded theory method to review literature in a systematic and rigorous manner, we conducted a systematic literature review which started in August 2020 and progressed through the stages of defining, searching, selecting, analyzing, and presenting.

Table 2 presents the process and results of the systematic literature review based on Wolfswinkel et al.'s (2013) five-stage model. For the defining stage, we first defined the four criteria for inclusion and/or exclusion (c.f. Table 2), which mainly concerned the research content.

TABLE 2 Systematic literature review process and results

Stage	Explanation	Results from Article I
Defining	Defining criteria for inclusion and exclusion of an article in the data set, identifying the fields of research, determining appropriate sources, and deciding on specific search terms	**Inclusion criteria:** 1. The focus of the article must be on studying VCC and/or VCD; that is, the main idea must concern VCC/VCD. 2. Having met 1, the research must address social interaction and/or resource integration. 3. Having met 1 and 2, the article must discuss IT-related issues (digital artifacts, online platforms/communities, artificial intelligence (AI), etc.). 4. Meeting 1 and 2, non-IT-related articles that contribute to our understanding of the relationships between VCC and VCD (i.e., articles discussing both VCC and VCD simultaneously) should be included. **Keywords for searching:** `Value co-creation OR value co-creation OR value co-destruction OR value co-destruction) AND (resource integration OR integrate resource OR resource combination OR combine resource OR rebundle resource OR social interaction OR social connection` **Fields of research:** Marketing, management, and information systems **Publication year of research:** Since 2010 **Databases for searching:** ProQuest, Science Direct, and Web of Science **Rank of the publications:** Listed in the Australian Business Deans' Council (ABDC) list or the Academic Journal Guide (AJG), rank ≥ 2, to ensure higher quality
Searching	Actually navigating databases by searching preselected databases with pre-defined keywords	A total of 517, 83, and 170 papers were retrieved from Web of Science, Science Direct, and ProQuest respectively, using the defined keywords. Of these, 186 articles were excluded for not being in the fields of management, marketing, or information systems.
Selecting	Refining and reviewing the sample based on the inclusion and exclusion criteria	1. A total of 112 papers was excluded because they did not meet the criteria regarding the rank on the ABDC list or AJG, as mentioned above. 2. A total of 88 articles was omitted due to duplication, leaving 384 articles for later checking. 3. Ninety-two articles remained after the titles and abstracts of papers were checked using the pre-defined inclusion and exclusion criteria. 4. After the full texts were assessed using the same predefined inclusion and exclusion criteria, 81 papers were included. 5. We went backward, by examining the citations of the included articles, and forward, through Google Scholar, to find papers that cite the included articles to identify extra research using the same inclusion criteria. The final total of articles considered was 103.

Stage	Explanation	Results from Article I
Analyzing	Extracting genuine value from the chosen articles using open coding, axial coding, and selective coding	The qualitative data analysis software ATLAS.ti was used for open, axial, and selective coding. Ultimately, we obtained 958 open codes and created groups and subcategories for them, then used the "network" function in ATLAS.ti to compare, relate, and link identified categories.
Presenting	Writing a coherent overview paper to present the findings and associated insights of an area	A framework of the IT-supported VCC and VCD in service systems was proposed and was published in a top information system journal: The Journal of Strategic Information Systems.

Subsequently, we defined marketing, management, and information systems as fields of research because they have led the discussion on VCC and VCD in recent years, and the topic has been extensively and primarily discussed in these three fields.

Meanwhile, we limited the review to English-language articles published after 2010 (including 2010) whose full text was available online. We set this time limit because Plé and Cáceres (2010) formally introduced the concept of VCD in 2010 and we intended to simultaneously study VCC and VCD. Consequently, we were interested in learning about IT-supported VCC and VCD within the last ten years.

Three interdisciplinary and complementary journal databases, Web of Science, ProQuest, and Science Direct, were searched with keywords. These databases were deemed reliable sources because they include a broad range of literature and have often been utilized by academics (e.g., Singh & Sahu, 2020; Mehraeen et al., 2017).

To ensure that the included papers were of relatively good quality, we checked each against the AJG and ABDC list, which are widely accepted as objective measures of the quality of scholarly journals (Krueger & Shorter, 2019). Therefore, we omitted articles not on the ABDC or AJG lists (rank ≥ 2), resulting in the loss of some papers at the expense of choosing literature of higher quality for in-depth analysis.

Various terms are used by researchers to describe VCC, VCD, social interaction, and resource integration. For example, the term "value cocreation" can replace "value co-creation and resource combination," while "resource rebundle" or corresponding verbs may describe phenomena related to resource integration. "Social interactions" can also be indicated by "social connections." Therefore, the keywords used for searching the databases were as follows:

```
(Value co-creation OR value cocreation OR value co-destruction OR
value codestruction) AND (resource integration OR integrate
resource OR resource combination OR combine resource OR rebundle
resource OR social interaction OR social connection)
```

Figure 2 presents the searching and selecting stages. A total of 770 papers was retrieved from the three databases using the defined search terms, and 584 papers were left with constraints to the field of management, marketing, or information system. A total of 112 papers was omitted as they were not on the ABDC or AJG list. Subsequently, a total of 88 articles was eliminated due to duplication, leaving 384 papers for further review.

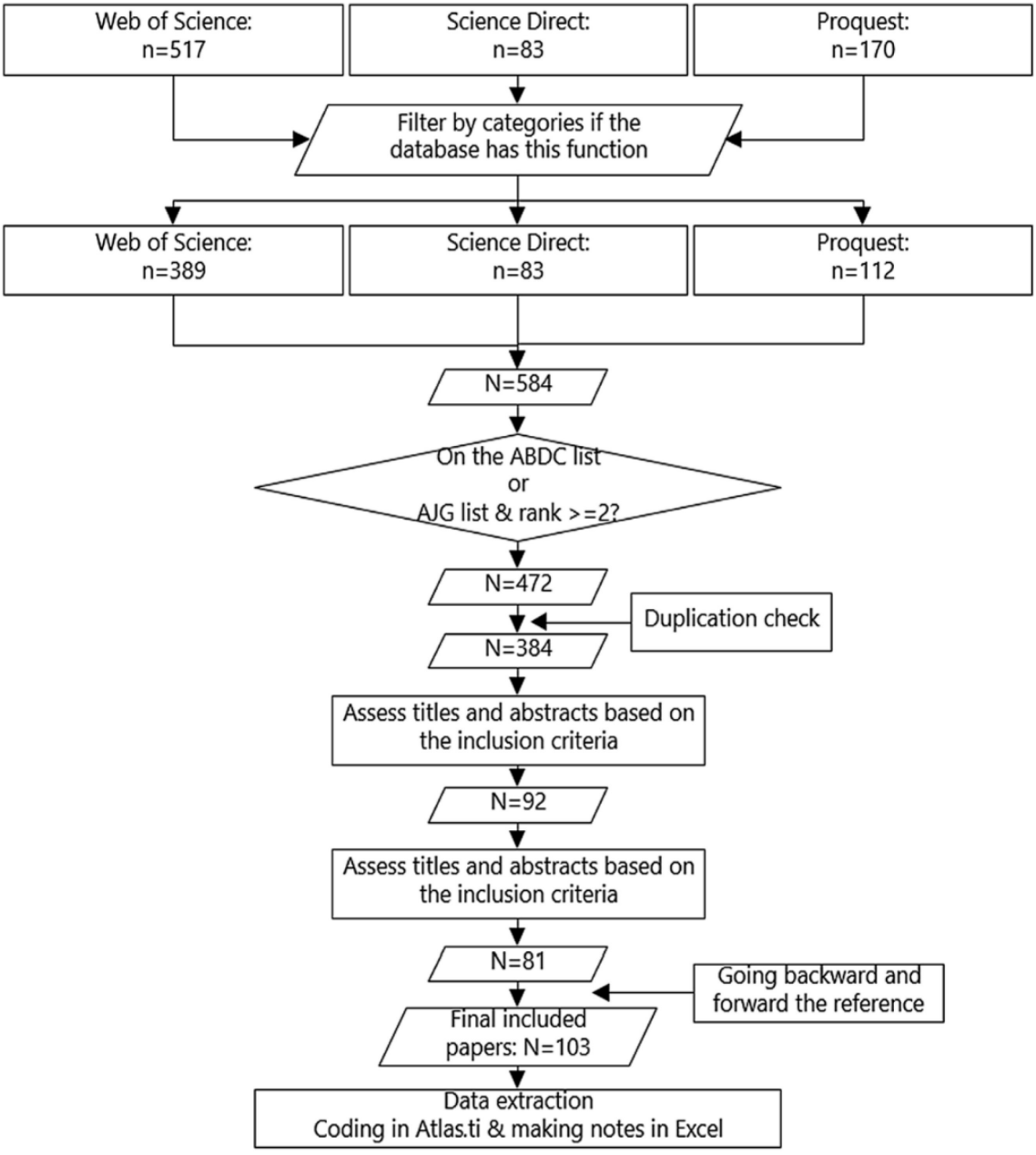

FIGURE 2 Searching and selecting stage of the systematic literature review

Then, we selected papers by looking at the titles and abstracts, using the pre-defined inclusion and exclusion criteria. A total of 92 papers remained. Thereafter, we evaluated the full texts using the same inclusion and exclusion criteria, leaving 81 articles. Next, we went backward and forward between the references of the included papers to identify extra research using the same criteria. Finally, 103 articles were included for further analysis (see Appendix 1 of Article I for a full list of the included articles). During this phase, we coded all included articles in the qualitative data analysis software ATLAS.ti.

ATLAS.ti was utilized in open coding, axial coding, and selective coding during the analysis phase (Wolfswinkel et al., 2013). Specifically, by open coding, we extracted and labeled excerpts that may help address RQ1. In total, we created 821 open codes for the included articles. While doing so, we performed axial coding through grouping the codes and developing subcategories based on their interrelationships. Lastly. ATLAS.ti's "network" function, which makes it easier to compare, relate, and link identified groups, was used to conduct selective coding.

3.2 Laddering interviews and hierarchical clustering analysis (Article II)

In this section, we first present the design of the research and data collection for Article II. Then we describe how data is analyzed using hierarchical clustering analysis.

3.2.1 Design of the research and data collection

To examine the main pathways leading to VCC and VCD in digital health services, Article II studies a case study of digital exergames being used for home rehabilitation. A consortium of technology companies and universities in Finland has developed a set of digital exergames to facilitate standard post-operative TKR rehabilitation (c.f. Figure 3). The system consists of 11 mini-games, which are played using a motion sensor (Kinect 2.0, Microsoft) connected to a laptop and controlled with a tablet. All these mini-games use training software (GoodLife Kiosk Trainer, GoodLife Technology, Kotka, Finland) and a television screen to offer user-friendly implementation in the homes of study participants. The initial aim was to include 100 patients who have undergone unilateral TKR (60–75 years old, equal gender distribution) in two regional hospitals in Finland. The inclusion criteria were chosen according to professional advice and included the following: a) 60–75 years of age, b) first primary, unilateral TKR operation, c) some other diseases or disorders checked by healthcare professionals (c.f. Article II for full list).

FIGURE 3 Exergame intervention: Setup and example of exergames

Nonetheless, the recruitment of participants was suspended in March 2020 due to the COVID-19 pandemic, when university laboratories were closed and TKR operations were suspended in hospitals. Ultimately, 52 participants were included and assigned randomly into two groups: the intervention group (n=25) and the control group (n=27).

Printed standard exercise instructions were given to both the intervention and control groups (c.f. Figure 4, for example). The intervention group also received the device to play the digital exergame and a 16-week schedule recommending patients play different exergames during each rehabilitation period, with a variety of functions and difficulty levels, immediately following hospital discharge. The intervention group was instructed to follow the standard post-operative home exercise program when they were not using exergames, such as when they were on vacations or traveling abroad.

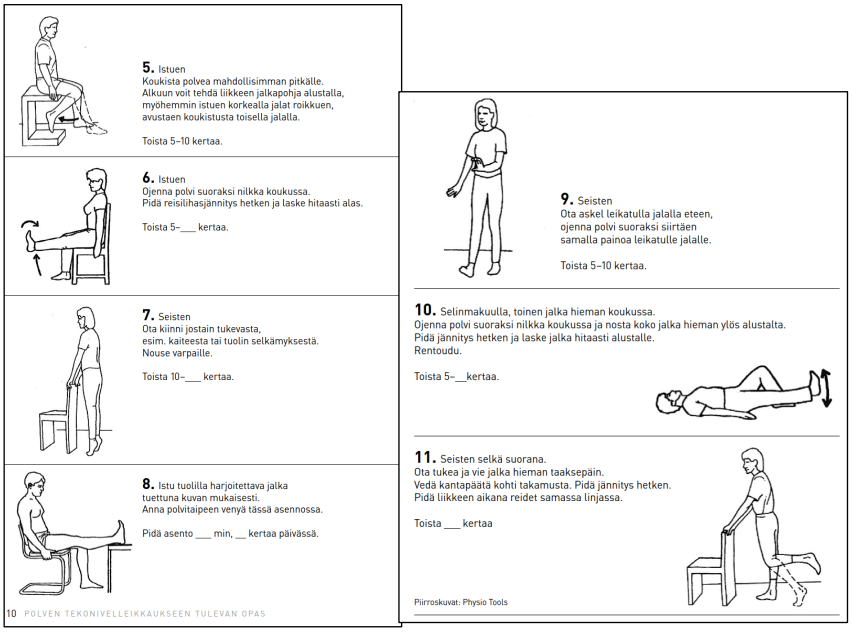

FIGURE 4 Control intervention: Standard home-exercise program printed on paper

To determine any difference between the control and intervention groups regarding exercise adherence, we measured exercise adherence from baseline to the end of the four-month intervention period using an exercise diary that participants filled in daily. Both groups recorded the number and duration of standard exercise sessions following the printed instructions in the exercise diary. Additionally, participants in the intervention group recorded their exergaming time in the exercise diary. Eventually, valid data were extracted from 46 diaries (control group n=25; intervention group n=21).

In exercise laboratories, participants were evaluated preoperatively (as a baseline) and two and four months after surgery to assess the perceived improvement in physical function and symptoms, as well as its progression. The Knee injury and Osteoarthritis Outcome Score (KOOS) questionnaire (http://www.koos.nu/), which is widely used to evaluate patients' opinions regarding their knees and associated problems, was used to measure the progression of perceived improvement in physical function and symptoms. Specifically, the KOOS questionnaire is comprised of five subscales: Pain, knee-related quality of life, function in sport and recreation, function in daily living, and other symptoms. On a 5-point Likert scale, a normalized score (0 indicating extreme symptoms and 100 indicating no symptoms) is calculated for each subscale. The KOOS data of 46 participants were analyzed in total.

In addition, interview data regarding the patients' perspective on exergaming, home exercise, physical activity, and rehabilitation-related experiences were collected four months after the operation. This study analyzed interview data from the intervention group to gain an in-depth understanding of VCC and VCD in the digital health service from the patients' perspective. The laddering interview technique was applied to comprehend the user's perspective, which is the result of individuals' observations and interpretations of events (Peffers et al., 2003). Based on personal construct theory (Kelly, 1955), the technique imitates human mental models and provides tools for analyzing the relationships between service or system features/experience, the reasons that users consider these aspects to be important, and the values or goals that motivate the use (Peffers et al., 2003; Tuunanen & Kuo, 2015; Tuunanen & Peffers, 2018).

Participants were first given a list of stimuli designed to elicit ideas for potential service experiences that they might encounter to facilitate brainstorming (Peffers et al., 2003). The interviewees were then asked to select two stimuli which they deemed the most important. Next, the interviewer proceeded by continually asking participants questions such as "why" and "why would that be essential" in determining certain end values or goals expected by the participants (Reynolds & Gutman, 1988). Following the example of Tuunanen and Peffers (2018), the data were marked down as attribute–consequence–value chains (laddering chains). Ultimately, we recorded 684 chains from the 20 interviews for use in further data analysis. Table 3 summarizes the data collection processes and results.

TABLE 3 Used measures, timing of interventions, and data collection for Article II

		Baseline	Intervention	
TIMEPOINT (months from baseline)		**0**	**2**	**4**
ENROLMENT:	***Informed consent and allocation***	X		
Groups	***Intervention group: Exergame training at home N1= 25***			
	Control group: Standard home exercise N2=27			
ASSESSMENTS:				
Inclusion Assessment	Demographics N=52	X		
Physical function and symptoms	KOOS score: N=46	X	X	X
Exercise activity	Intervention group: Exergaming exercise & standard exercise (exercise diary) N1=21 Control group: Standard exercise (exercise diary) N2=25			
INTERVIEWS: Laddering interview N1=20				X
N: Number of valid cases collected from both groups; N1: Number of valid cases collected from the intervention group; N2: Number of valid cases collected from the control group				

3.2.2 Data analysis

We evaluated the effect of digital exergames on the rehabilitation of patients who underwent TKR by comparing the difference in exercise adherence and perceived improvement on physical function and symptoms between the intervention group and control group. Specifically, exercise adherence is represented by the average amount of time participants spent engaging in exergames and standard exercise. We calculated and compared the average total session time (as well as time per week) participants spent on exercises two and four months after TKR surgery. In addition, the change in the average KOOS score for the five subscales reflects the participants' perception of change in physical function and symptoms. We compared the average changes in KOOS subscale scores at two and four months after surgery to those at baseline.

Within two and four months of TKR, participants in the intervention group spent 35 to 50 minutes more per week exercising than those in the control group (Table 4). In other words, exergames for TKR rehabilitation improved exercise adherence marginally compared to those who did not use the digital health service.

TABLE 4 Average exercise time for intervention and control groups

	Intervention group (n1=21)						Control group (n2=25)	
	Exergaming		Standard exercise		Total (exergaming + standard)		Standard exercise	
Time	**mins**	**mins/week**	**mins**	**mins/week**	**mins**	**mins/week**	**mins**	**mins/week**
2-month	1194	149	344	43	1538	192	1140	142
4-month	2131	133	618	38.6	2749	171	2185	136

TABLE 5 KOOS scores for intervention and control groups

	Intervention group (n=21)				Control group (n=25)			
	Minimum	**Maximum**	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
S_score_Baseline	21.4	78.6	47.6	20.1	18.0	100.0	54.0	20.4
P_score_Baseline	13.9	75.0	44.9	17.8	25.0	75.0	46.8	14.9
A_score_Baseline	13.2	94.1	53.2	20.5	31.0	91.0	58.6	16.1
SP_score Baseline	0.0	90.0	28.3	24.9	0.0	65.0	21.0	16.5
Q_score_Baseline	0.0	43.8	25.9	13.9	0.0	56.0	28.8	16.5
S_score_2month	32.1	100.0	63.6	17.1	32.0	75.0	53.9	13.4
P_score_2month	36.1	97.2	67.5	17.8	17.0	89.0	61.0	15.7
A_score_2month	51.5	100.0	75.5	15.0	41.0	90.0	72.9	11.8
SP_score 2month	10.0	100.0	47.6	25.4	0.0	95.0	32.3	26.6
Q_score_2month	18.8	100.0	57.7	20.8	0.0	81.0	49.0	19.7
S_score_4month	39.3	96.4	72.3	15.4	36.0	93.0	66.7	17.3
P_score_4month	55.6	100.0	78.2	14.0	25.0	97.0	72.0	16.9
A_score_4month	52.9	100.0	85.1	13.7	44.0	99.0	80.8	12.4
SP_score 4month	15.0	100.0	63.2	25.9	5.0	80.0	51.7	22.5
Q_score_4month	25.0	100.0	68.2	21.2	6.0	100.0	56.3	25.8

P: pain; S: other symptoms; A: function in daily living; SP: function in sport and recreation; Q: knee-related quality of life

For the KOOS score, there was no significant difference between the two groups regarding the five different subscales at baseline, but participants in the intervention group obtained slightly higher KOOS subscale scores than those in the control group two and four months after the surgery (c.f. Table 5), indicating that individuals who played exergames had greater improvement in physical function and symptoms.

Tables 4 and 5 suggest that the use of digital exergames for TKR rehabilitation did not cause huge or significant difference to participants' exercise adherence or perceived improvement of physical function and symptoms. To gain a deeper understanding of the value creation process in digital health services, supplementary perspectives are needed to facilitate a more comprehensive understanding of the process and how it affects patients' overall wellbeing during rehabilitation. The interview data can thus provide a different and complementary perspective and offer richer insights.

Interview data analysis consisted of two steps: data coding and cluster analysis. First, we went through all the texts in the laddering chains and determined which were relevant and could be used for the cluster analysis. Two researchers coded and categorized the laddering data. The coding was revised and checked multiple times until the two researchers reached complete agreement. In order to further analyze the laddering data, two iterations of data coding were performed as part of the interpretation process.

During the initial data coding iterations, descriptive codes were assigned to service attributes, experience consequences, and values, depending on the original expressions of the participant. The ladders were duplicated to form a sub-chain if more than one code could be extracted from one laddering chain. In addition, we added "outcome" for each laddering chain to indicate whether the mentioned description had led to VCC (numbered "1"), VCD (numbered "2"), or no-creation of value (numbered "0"). From the initial 684 chains, the first iteration yielded 60 unique codes for attributes, 258 unique codes for consequences, and 10 unique codes for values. In the second data-coding iteration, similar codes for attributes, consequences, and values were classified by comparison and aggregation. We examined the similarity of these consequence codes, classified them into small groups, and assigned one identical code to each small group. Then, the two researchers cross-checked identical codes by going through the original texts to ensure consensus.

The second phase was to conduct a hierarchical cluster analysis with Ward's method to discover the main pathways towards VCC and VCD in digital health service (Peffers et al., 2003). To apply hierarchical cluster analysis, we had to convert the previously encoded data from text format to binary format. Thus, we converted the codes of 31 attributes, 71 consequences, and 10 values into binary number columns (0 and 1). We added two columns, labeled C0 and V0, for laddering chains without an applicable consequence or value code (each chain has an attribute code). Specifically, the binary columns contained either 0 or 1, where 0 indicated that the code did not exist in the laddering chain, and 1 indicated the opposite. The interview ID, chain number, and outcome (positive, negative, or neutral) were extracted from the original laddering chains for each column. Consequently, a binary matrix table consisting of 117 columns and 680 rows of data was ready for the cluster analysis.

Next, an initial cluster solution with two to 10 clusters was generated, and the laddering chains served as the unit of analysis for the hierarchical analysis. As the data were in binary metric format for a hierarchical clustering analysis, it was appropriate to square the Euclidean distance to determine the degree of similarity between laddering chains (Hair et al., 2006). Using Ward's method as the clustering algorithm and following an evaluation of various clustering solutions, we finally selected a seven-cluster solution because it described thematically cohesive clusters. Then, we chose the most emphatic constructions within each cluster according to their occurrence frequency in the data.

Next, a network map was created for each cluster to illustrate how attributes and consequences lead to varying values. To represent the main pathways of

VCC and VCD for each cluster, we set the cut-off point for "value" occurrence at 15%. In other words, where a particular "value" type accounted for more than 15% of the whole occurrence of all "values" in the cluster, it was kept for further analysis. For the retained "values," we traced back the "consequences" column using the laddering chains and grouped their occurrences according to the sub-dimensions of social interaction, resource integration, and IT (constructs identified from the systematic literature review, Article I). Then, we summarized their occurrences by tracing the "attribute" column through the laddering chains. Finally, we connected each cluster's "attribute," "consequence," and "value" to create its network map.

3.3 Interpretive research approach (Article III)

To investigate contradictions from the perspective of VCC and VCD in geocaching, an interpretive approach was applied. In an interpretive worldview, reality consists of people's interpretations of their activities and the evolution of intersubjective meanings as they interact with the external environment (Lacity & Janson, 1994; Orlikowski & Baroudi, 1991; Prasad & Prasad, 2002; Walsham, 2006). Interpretive research may provide rich insights for the development of new concepts and theories (Orlikowski & Baroudi, 1991). Specifically, content analysis has been traditionally viewed as a quantitative analysis method, where scholars code concepts into categories and calculate the frequencies of occurrences within each category (Ahuvia, 2001). However, with an increasing number of studies aiming to understand texts, such as consumers' opinions, the latent meanings underlying the text should be interpreted and the context of the text should be considered when making interpretations (Ahuvia, 2001). To better understand how users experience VCC and VCD in geocaching, it is important to analyze users' comments and opinions based on content analysis, and online posts are good sources for analysis. Following the traditional three stages of content analysis, we conducted the interpretive content analysis through selection of focal texts, coding, and interpretation of the coding results (Ahuvia, 2001).

For the selection of focal texts, two sources of data were chosen for analysis because they hold promise for identifying contradictory manifestations. One was the discussion forum of a Finnish geocaching community (http://www.geocache.fi), where discussions were active and community members did not hesitate to bring up geocaching-related issues. Discussion threads were selected via their title and context, based on the possibility of identifying manifestations of contradictions from the discussions with expressions that might indicate conflicts, problems, clashes, and ruptures (Engeström, 2000; Engeström & Sannino, 2011; Kuutti, 1999). The analysis did not include threads discussing purely technical issues, such as purchasing new devices. In total, 52 threads of discussion were included spanning the period April 2008 through February 2018. The second source was a discussion forum

from the international geocaching website discussion forum (http://www.geocaching.com). The discussion thread "What irks me" addresses issues that bother geocachers worldwide. This thread began in May 2013, and we chose to analyze all posts published through the end of January 2018, yielding 2,043 posts in total.

Next, the coding stage consisted of two iterative phases: data naming and categorization (Moghaddam, 2006). Throughout the entire coding procedure, the qualitative data analysis tool ATLAS.ti was used. In our study, there were three text coders, one of whom (Coder 1) was actively involved in geocaching, well-versed in the phenomenon under study, and able to fully comprehend textual meanings. Coder 1 initially labeled text sections that described a potential manifestation. The coder examined the textual meanings to determine if a manifestation was latently present in the text. Ultimately, 109 and 347 codes were created for relevant extracts from the Finnish discussion forum and the geocaching website discussion forum, respectively.

Coder 2 and Coder 3 then examined these 456 labels (i.e., codes), comparing them to the original texts in order to reach a final consensus that all labels adequately summarized the extracted texts following multiple rounds of discussion and modification. Specifically, it was determined that three codes could not accurately summarize the extracted texts and that two codes were unrelated to a possible manifestation and could therefore be removed. Examining the selected discussion threads and posts yielded a total of 451 codes for further examination.

Then, using the code group functionality of the ATLAS.ti software, Coder 3 reorganized the codes into larger overlapping categories. The categories were determined by the manifestations of contradictions encountered by geocachers. By renaming and merging codes that referred to the same problems, the number of codes was decreased, and, of the 422 remaining codes, 22 groups were created. Then, the remaining two coders examined each code's corresponding group. On 43 codes pertaining to the coders' respective groups, Coder 1 formed divergent opinions, resulting in an initial level of coder agreement of 94.1%. After several rounds of discussion involving the deletion, addition, and renaming of groups, a total of 19 groups was identified and divided into six types of contradiction manifestations for final discussion by consensus among the three coders. Finally, three pairs of contradictory poles were identified based on the contradiction manifestations. Figure 5 shows the process of data collection and analysis for Article III.

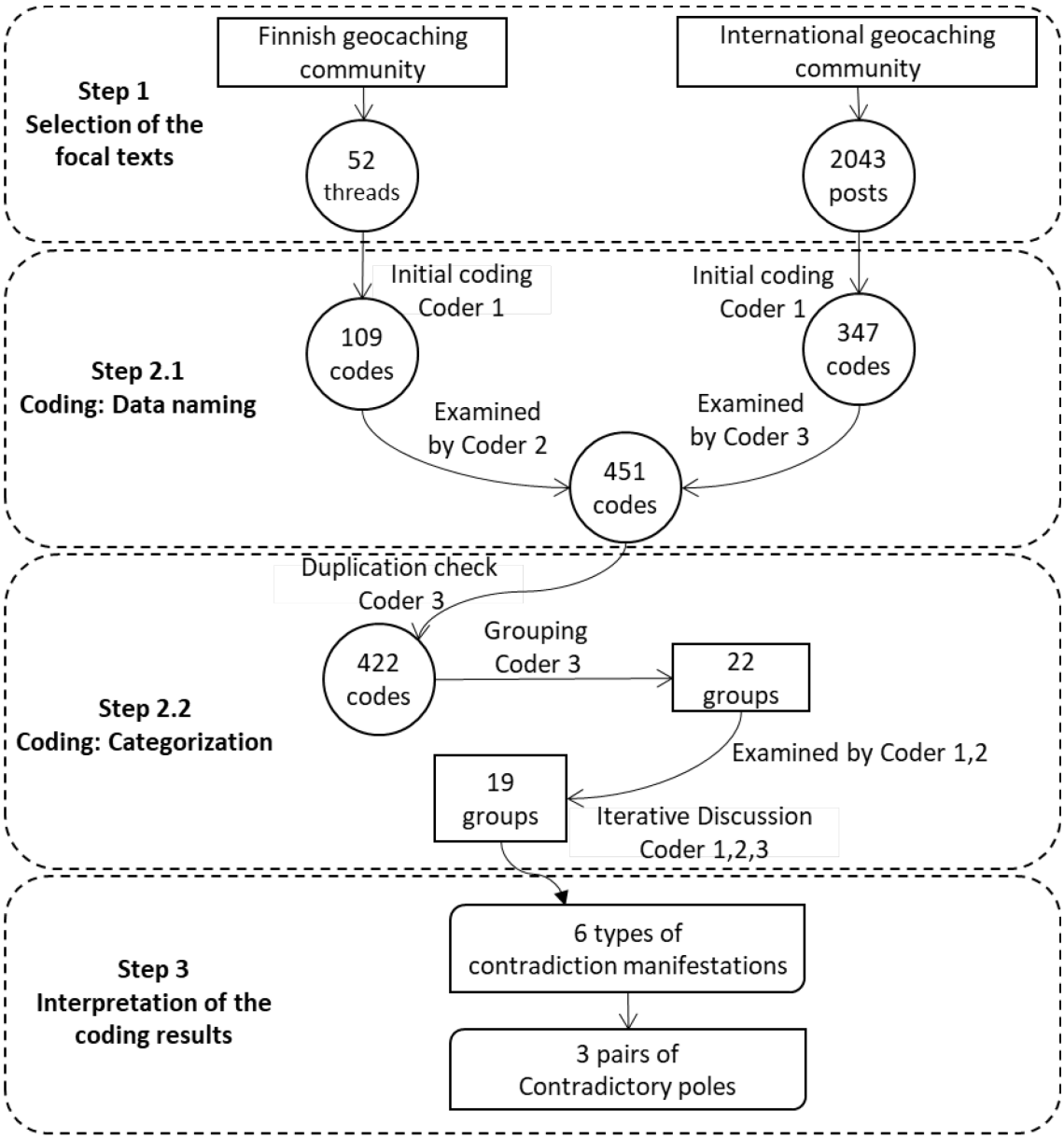

FIGURE 5 Data collection and analysis in the case of geocaching

3.4 Overview of the methods used in the included studies

Table 6 describes the main data collection and analysis methods employed in the three articles of this dissertation. As demonstrated in Table 6, the research and data collection methods of this dissertation vary based on the research questions posed for each study.

TABLE 6 An overview of the research methods used in each article

Article	Research question	Research method & data collection	Data analysis	Data unit
Article I	How do IT-supported VCC and VCD occur in a service system via social interaction and resource integration?	Systematic literature review	Wolfswinkel et al.'s (2013) five-stage grounded theory method	103 included papers for analysis
Article II	How do VCC and VCD occur in the setting of DHS from patients' perspectives?	Case study; Questionnaire, laddering interviews	Laddering coding (Reynolds & Gutman, 1988) Hierarchical clustering analysis, Ward's method (Aldenderfer & Blashfield, 1984)	52 participants, 20 interviews; 684 chains of interview data
Article III	How do VCC and VCD contradictions occur in geocaching artifacts?	Case study; Online discussion forum data	Interpretive content analysis (Orlikowski & Baroudi, 1991)	52 discussion threads from one forum and 2,043 posts from another; 422 codes for final analysis

All three articles involved qualitative research methods. Specifically, Article I employed a systematic literature review to conceptualize the IT-supported VCC and VCD process in service systems and identify the elements of social interaction and resource integration embedded in VCC and VCD. Wolfswinkel et al.'s (2013) five-stage grounded theory method for conducting a rigorous literature review provides a solid foundation for Article I, and a total of 103 relevant articles was ultimately included for analysis. Article II investigated the main pathways of the VCC and VCD process in the use of a digital exergame for home rehabilitation after TKR in the setting of a digital health service. Data from questionnaires measuring patients' physical function and symptoms suggest that there is no significant difference in patients' exercise adherence and rehabilitation between the control group and intervention group. The interview data thus provide richer insights into the patients' VCC and VCD process while they play exergames for rehabilitation. Laddering coding and hierarchical clustering analysis enabled the identification of the main pathways of VCC and VCD from the patients' perspective, a construct inspired by the framework of IT-supported VCC and VCD in service systems from Article I. Article III used interpretive content analysis to investigate VCC and VCD in the setting of geocaching from the perspective of contradiction theory. By first identifying the contradiction manifestations indicated in the geocaching community posts, users' VCC and VCD experience was revealed from the contradiction perspective. Articles I and III both employed the qualitative data analysis software ATLAS.ti for coding, while laddering techniques were used to analyze interview data in Article II.

4 FINDINGS

This dissertation consists of three articles, which contribute in different ways to understanding VCC and VCD in digital services. This chapter describes the key findings from each article, answering the research questions presented earlier in Section 1.2., followed by a brief discussion of how each study contributes to the overall research question of this dissertation.

4.1 Article I: A framework of IT-supported VCC and VCD in service systems

Article I presented a systematic literature review to provide an overview of scholarly insights on IT-supported VCC and VCD in service systems through social interaction and resource integration. Figure 6 depicts the framework that emerged from the literature review and demonstrates that IT-supported VCC and VCD involve both process and outcome. Specifically, the process entails social interaction and resource integration, which are influenced by IT and engrained in VCC and VCD practices. The outcome concerns an improvement or deterioration in the wellbeing of at least one of the service systems, as determined by particular actors and contexts.

In addition, the results indicate that social interaction entails communication, dialogue, and trust. Resource integration includes elements of access, matching, and resourcing. Furthermore, IT is found to facilitate or impede social interaction and resource integration in diverse ways, as presented in Figure 6 and elaborated in Sections 3.2 and 3.4 of Article I. The outcomes of these processes are multidimensional and are subjectively and dynamically determined by the actors. The concepts and explanations of the framework's key constructs are summarized in Table 7.

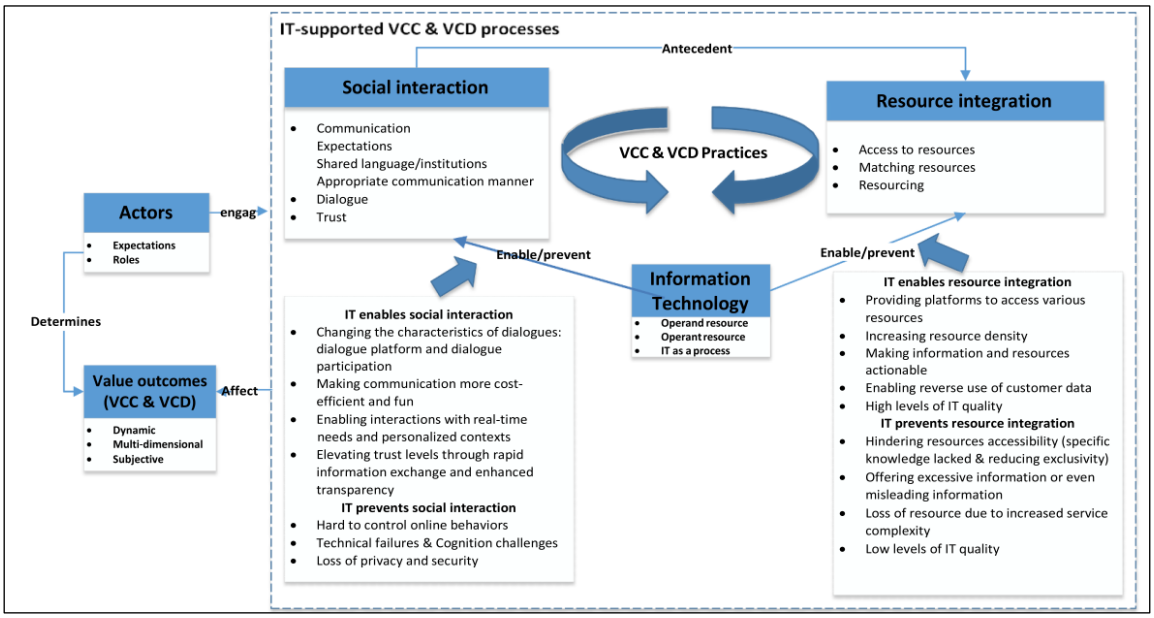

FIGURE 6 IT-supported VCC and VCD in a service system

TABLE 7 Definitions and clarifications of the key constructs

Concepts	Definition / clarification	Sources
IT-supported value co-creation (VCC) and value co-destruction (VCD)	IT-supported VCC and VCD entail both process (including social interaction and resource integration, which are affected by IT and embedded in VCC and VCD practices) and outcome (an increase or decline in at least one of the systems' wellbeing, determined by actors in specific contexts)	This paper
Service system	"Value-co-creation configurations of people, technology, value propositions connecting internal and external service systems, and shared information (e.g., language, laws, measures, and methods)"	Maglio & Spohrer (2008, p. 18)
Social interaction	"Mutual or reciprocal action where two or more parties have an effect upon one another"	Grönroos (2009, p. 14)
Communication	"An act of transmitting or broadcasting content by an organization that is meant to inform an audience"	Abeza et al. (2020, p. 473).
Communicating expectations	Informing and calibrating expectations and goals with other actors accurately and interactively	This paper
Shared language/ institutions	Shared language: Adopting common terms, symbols, and understanding during communications Institutions: characterized by shared rules and social norms	Vargo & Akaka (2012) Akaka & Vargo (2014)
Communication styles	Communication styles include exchanging information in a timely and accurate manner and communicating with positive emotions and communicative skills	Diffley & McCole (2015) Vafeas et al. (2016)

Concepts	Definition / clarification	Sources
Dialogue	"Interactions, deep engagement and the willingness to act on both sides"	Prahalad & Ramaswamy (2004, p.9)
Trust	Trust is equivalent to "confidence in an exchange partner's reliability and integrity"	Morgan & Hunt (1994, p. 23)
Resource integration	"The incorporation of an actor's resources into the processes of other actors'"	Gummesson & Mele (2010, p. 192)
Access	Access relates to the existence of potential resources and their accessibility for actors	Caridà et al. (2018)
Matching	The fitness of available resources to create higher resource density and strategic interactions	Gummesson & Mele (2010)
Resourcing	The operation of available resources to transform and reinforce them for mutual benefit based on shared meanings and purposes	Caridà et al. (2018)
Operand resource	An operand resource requires some action to be performed on it to have value	Vargo & Akaka (2012)
Operant resource	An operant resource can act on other resources	Vargo & Akaka (2012)
Practice	Practices can be understood as "doings and sayings" that actors routinely perform in a given social context	Echeverri & Skålén (2011)
Value outcomes	Value outcomes refer to an increase or decline in at least one of the systems' wellbeing resulting from the IT-supported VCC and VCD process. They are multidimensional, subjective, and dynamically determined by actors in specific contexts	This paper

This dissertation presents some highlights of the findings below. For complete justification and explanation of the findings, please refer to Article I.

4.1.1 Social interaction

Communication, dialogue, and trust were identified as the elements of social interaction that can simultaneously lead to VCC and VCD based on a literature review and synthesis. Specifically, three communication dimensions were identified: shared language/institutions, communicating expectations, and communication styles.

It is essential to communicate actors' expectations related to collaboration during interaction (Säwe & Thelander, 2015), as doing so ensures that actors have consistent expectations regarding resource utilization (Plé & Cáceres, 2010) and project stage (Järvi et al., 2018) and contributes to obtaining a mutual comprehension and shared vision (Zhao et al., 2015). VCD, on the other hand, occurs when actors are unable to clearly communicate their needs or expectations, when they have inappropriate expectations based solely on prior experiences without adequate communication (Järvi et al., 2018), and when they face inconsistent expectations due to role conflicts and ambiguity (Chowdhury et al., 2016).

The viability of VCC may be improved via communication in a shared language/institution. Using common terms, symbols, and shared social norms and rules, effective communication is facilitated, and shared understanding is achieved between actors via established codes of conduct (Zhao et al., 2015). In contrast, incorrect assumptions and divergent understandings may occur when actors adopt words that others might feel are difficult to understand (Canhoto et al., 2016; Järvi et al., 2018) or when actors are unable to adopt new institutions (Vargo & Lusch, 2016).

Communication styles that are timely and accurate (Diffley & McCole, 2015; Vafeas et al., 2016), with positive emotions (Faullant & Dolfus, 2017) and communicative skills (Osei-Frimpong et al., 2018), are essential for VCC, as they facilitate coordination among actors. In contrast, VCD may result from untimely communication (Vafeas et al., 2016), the spread of bad word of mouth or negative emotions (e.g., complaining or blaming) (Järvi et al., 2018), and power exertion (Chowdhury et al., 2016), leading to increased expenses, delayed progress, and diminished value (Vafeas et al., 2016).

Dialogue facilitates information exchange (Diffley & McCole, 2015) and the strategic involvement of actors in VCC without either party taking control of the interaction (Alimamy et al., 2018), indicating a two-way interaction and a process of mutual learning, as opposed to simply listening, permitting, and encouraging (Okazaki et al., 2020). VCD may take place, however, if the dialogue platforms are unavailable or improperly utilized (Keeling et al., 2021), resulting in a greater power imbalance or information asymmetry (Vafeas et al., 2016).

Trust is an essential factor driving collaborative value formation (Alalwan et al., 2019), facilitating improved relationships and faithfulness (Hajli et al., 2017), reducing risk (Alimamy et al., 2018), and increasing motivation to share information with others (Osei-Frimpong et al., 2015). VCD takes place, however, if trust is not present during an interaction, if trust is "blind," or if actors behave opportunistically (Chowdhury et al., 2016; Wang et al., 2019). Without trust, actors are less likely to open up to one another and share relevant resources. On the other hand, when trust is "blind" or excessive, actors may commit to resources that they do not need and integrate resources ineffectively (Wang et al., 2019).

Resource integration is preceded by social interaction in VCC (Bruce et al., 2019). Interaction enables actors within the network to access particular types and amounts of resources (Plé, 2016) and generates diverse resources for value formation (Diffley & McCole, 2015). In other words, actors can possess physical or intangible resources, but they are not able to leverage resources or convert them into cooperative assets without interactions, which is the basis of resource exchange (Truong et al., 2012).

4.1.2 The role of IT in social interaction

IT alters dialogue characteristics via two angles: dialogue platform and dialogue participation (Jurietti et al., 2017). Specifically, IT enables dialogues by enhancing media richness, offering touchpoints for interactions, and enabling actors to

reveal opinions and share beliefs and information via digital platforms (Jurietti et al., 2017; Luo et al., 2019), such as augmented reality (Alimamy et al., 2018), tools for live communication (Zhang et al., 2018), and social media (Okazaki et al., 2020). Consequently, IT enables greater participation in decision making through the platforms it provides (Osei-Frimpong et al., 2018). Additionally, IT influences dialogue participation by allowing actors to interact freely and express themselves autonomically (Cheung et al., 2020; Zwass, 2010) and by making dialogues exclusive in order to preserve a community's uniqueness and increase social identification (Jurietti et al., 2017; Zhao et al., 2015). Therefore, IT has an effect on dialogue participation regarding autonomy and exclusivity, indicating a multidimensional impact on interaction and thereby increasing the likelihood of VCC.

Moreover, IT can make communication more convenient and cost-effective (Bugshan, 2015) through digital services such as virtual communities (Bugshan, 2015) and chatbots (Riikkinen et al., 2018), and IT-based gamified approaches make communication more enjoyable (Nobre & Ferreira, 2017). In addition, IT enables interactions concerning real-time needs and facilitates customization with the utilization of big data technology and cognitive technology (Laud et al., 2019; Mele et al., 2021; Mingione et al., 2020), contextualizing and customizing the interactions between actors (Storbacka et al., 2016).

Through rapid information exchange, IT can increase the level of trust in social interactions (Alimamy et al., 2018) and transparency (Hein et al., 2019; Lusch & Nambisan, 2015; Tajvidi et al., 2017) in digital environments, whereby actors can disclose, view, or exchange relevant experiences and knowledge.

However, IT may result in negative interactions due to the ease with which negative comments can be disseminated (Castillo et al., 2021; Järvi et al., 2018; Rosenthal & Zamith Briton, 2017; Zhang et al., 2018), technical failure (Zhang et al., 2018), and cognition challenges (Castillo et al., 2021). In addition, IT can compromise privacy and security within social interactions (Čaić et al., 2019; Hsiao, 2019; Jayashankar et al., 2019), as a result of conflicting interests, data ownership issues, and the vulnerable nature of networks.

4.1.3 Resource integration

Access, matching, and resourcing were found to be the three elements of resource integration which lead to both VCC and VCD, according to a review of the relevant literature.

To co-create value, actors should be aware of the existence of relevant resources and have access to them (Caridà et al., 2019). The development of technology facilitates approaching outside resources and creates opportunities for deeper co-creation (e.g., Alimamy et al., 2018; Diffley & McCole, 2015; Zwass, 2010). VCD may occur if actors do not have access to resources due to a lack of awareness (Plé, 2016) or an objective lack of resources (Smith, 2013).

Actors must have the ability to match and adapt resources to their specific needs to improve service systems' wellbeing (Laud et al., 2019; Plé, 2016). Actors can fail to match resources due to unclear communication (Wang et al., 2019),

inaccurate information (Laud et al., 2019), or conflicts regarding actors' resources, expectations, and practices (Osei-Frimpong et al., 2015).

Without integration or application through interactions, resources have no value (Robertson et al., 2014). With resourcing, higher-order resources are formed based on the transformation of basic operant resources, thereby maintaining a company's superior position and resulting in VCC (Paredes et al., 2014). However, VCD may occur if actors misuse resources intentionally or unintentionally or if resources are inadequate (Farquhar & Robson, 2017; Plé & Cáceres, 2010), such as when actors do not have the necessary skills, knowledge, or time for resource integration (Castillo et al., 2020; Farquhar & Robson, 2017).

4.1.4 The role of IT in resource integration

IT can facilitate resource integration by providing access to a variety of resources. E-health services, for instance, can address some healthcare issues concerning unaffordable and inaccessible relevant resources (Robertson et al., 2014), while self-service and social media platforms provide actors with access to other interacting actors' resources (Du & Chou, 2020). Additionally, IT may facilitate VCC by enabling resource matching and resourcing through customer data analysis and enhanced resource density. Reverse using customer data via analyzing massive data and multiple interactions is a novel approach to exploring resource potential and contributing to VCC (Riikkinen et al., 2018). Furthermore, IT enables the search for and combination of resources and facilitates the matching of resources across various platforms (Paschen et al., 2020), thereby enhancing resource density.

However, VCD may occur when a lack of specialized IT knowledge obstructs resource accessibility (Diffley & McCole, 2015; Park & Lee, 2018) or when IT facilitates resource access for the masses, thereby reducing exclusivity (Quach & Thaichon, 2017). Additionally, IT can result in VCD during matching and resourcing because it often involves platforms with excessive data or information that may mislead people (Bruce et al., 2019) and frequently requires the participation of customers (Castillo et al., 2020), resulting in additional effort to obtain the correct information or a loss of resources such as time and patience (Castillo et al., 2020). Besides, VCD may take place if the quality of the technology is insufficient to meet customer requirements, fails to provide additional resources, or inefficiently delivers resources (Riikkinen et al., 2018).

4.1.5 VCC and VCD practices and value outcomes

By synthesizing and analyzing the literature, our findings indicate that practice is crucial for understanding VCC and VCD (Du & Chou, 2020; Russo-Spena & Mele, 2012). Echeverri and Skålén (2021) define practices as "doings and sayings" which actors perform routinely within a certain context. Specifically, practice occurs dynamically; therefore, outlining various interaction routes may facilitate the transitions between VCC and VCD (von Becker et al., 2015). Some studies argue that value does not exist prior to the integration of resources via social

practices (Frow et al., 2016; Korkman et al., 2010; Skålén et al., 2015; Vargo et al., 2015). Moreover, the observability of interactional practice is the starting point for the study of interactions among actors (Echeverri & Skålén, 2011). Practices concerning social interaction and resource integration provide useful clues for understanding VCC or VCD (e.g., Cabiddu et al., 2019). Thus, value realization is driven by practices (Frow et al., 2016), offering processual insights and a new lens for comprehending VCC and VCD and their situated contexts (Korkman et al., 2010; Russo-Spena & Mele, 2012).

Value outcomes concern an improvement or deterioration in the wellbeing of at least one service system as a result of IT-supported VCC and VCD processes. Value is dynamic because an actor's role can alter over time, interactions occur sequentially, and individuals perceive value and act interdependently (Pinho et al., 2014). Consequently, VCC outcomes are interdependent, and service system actors encounter them dynamically (Beiro et al., 2017; Laamanen & Sklén, 2015). In addition, value as an outcome is multidimensional and is evaluated by actors subjectively. Value outcome in VCC and VCD can be discussed according to distinct categories in different contexts, for example emotional, social, economic, and epistemic value (Kim et al., 2020) as well as value of esteem, excellence, and efficiency (Keeling et al., 2021). Relying on what actors expect and perceive regarding the context, the same collaborative process may result in VCC or VCD (Kim et al., 2020). Consequently, value is a sense of the preferences articulated by actors (Echeverri & Skålén, 2021), and it is created collectively but evaluated subjectively (Säwe & Thelander, 2015).

Therefore, Article I provides an answer to

RQ1 How do IT-supported VCC and VCD occur in a service system via social interaction and resource integration?

Article I contributes to this dissertation by proposing a framework of IT-supported VCC and VCD which provides a shared language to study and communicate VCC and VCD simultaneously. In addition, the findings from Article I provide a solid theoretical foundation for the investigation in Article II; in particular, the constructs of resource integration and social interaction are used as a lens to analyze the interview data.

4.2 Article II: VCC and VCD processes and outcomes in a digital health service

Article II explains in detail, from the patient's perspective, how VCC and VCD occur in digital health services. Figure 7 illustrates how patients and other relevant actors participate in the VCC and VCD process through social interaction and resource integration, which are embedded in VCC and VCD practices in the context of digital health services, producing multidimensional value outcomes.

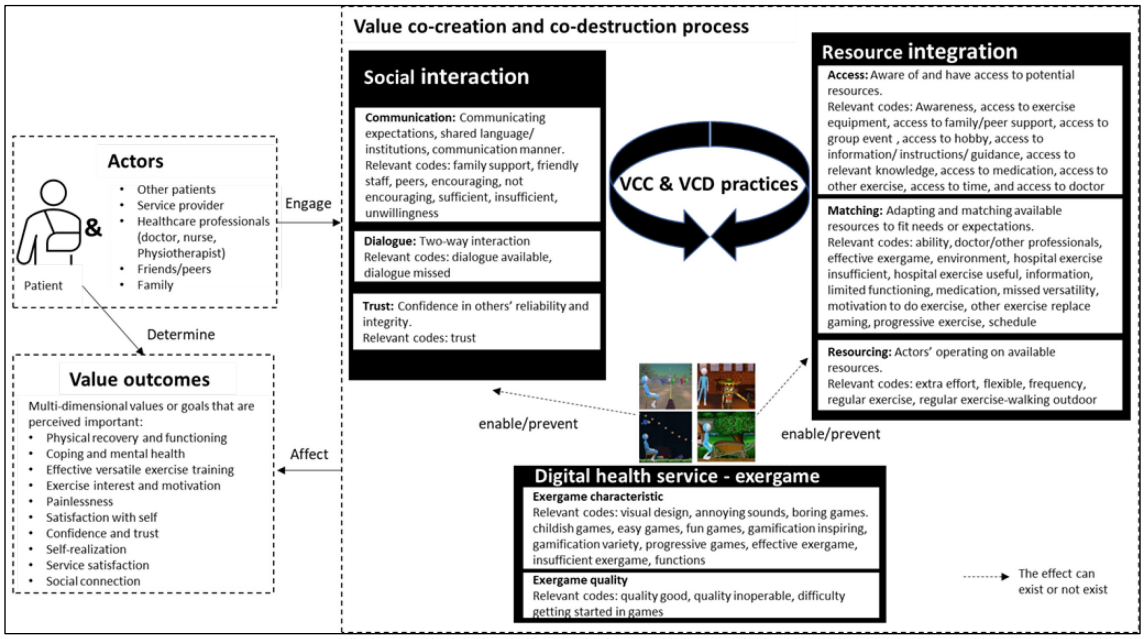

FIGURE 7 VCC and VCD in digital health services from the patients' perspective

Based on the coding of laddering data, we summarized practices that can lead to VCC and VCD via resource integration from three dimensions (access, matching, and resourcing) and that of social interaction from three dimensions (communication, dialogue, and trust). In addition, IT-related factors are grouped into two categories, namely exergame characteristics and exergame quality. Table 8 presents an overview of the relevant constructs and their groupings as well as the number of relevant codes. Relevant groups of sub-codes are listed in Figure 7 to reveal factors related to the dimensions of social interaction, resource integration, and exergames that can contribute to VCC and VCD. Online appendices 3—5 of Article II present all codes as well as their categorization.

TABLE 8 Summary of relevant codes from the interview data

Category of codes	Groups of sub-codes	Total numbers of codes
Access	11	54
Matching	14	55
Resourcing	5	27
Communication	8	30
Dialogue	2	7
Trust	1	2
Exergame characteristics	12	23
Exergame quality	3	12

TABLE 9 The identified value categories and examples of relevant description

Value categories	**Examples of relevant description**
Coping and mental health	Coping /vitality / cheerfulness/ mental health / mental alertness / good mind / pleasure / satisfaction / joy of rehabilitation
Effective and versatile exercise training	Effective training / versatile exercise / feel that it is working / reasonable to do the exercise / exercise is worth doing
Exercise interest and motivation	Interestingness / encouragement / fun / ease / engaging/ pleasure to move / suitable for oneself
Painlessness	Asymptomatic / painlessness / exclusion of analgesics
Physical recovery and functioning	Physical functioning / recovery status
Satisfaction with self	Satisfaction with self (in training / following instructions / regularity) / perseverance / satisfaction with one's own performance / own attitude
Confidence and trust	Trust / confidence in rehabilitation / self-confidence / getting feedback /courage /sense of security / fearlessness
Self-realization	Enabling hobbies /self-realization / self-knowledge / knowledge and behavior manageable
Service satisfaction	Reliability of service / satisfaction with service
Social connection	Maintaining friendships / feeling connected with others

On the basis of the laddering data, 10 distinct patient-perceived values were subsequently identified. Table 9 outlines the 10 value categories and provides examples of pertinent descriptors to facilitate comprehension of the concept. Based on the analysis, seven clusters (Cluster 1-7) were formed, and a network map was created for each cluster in order to comprehend the various pathways that lead to VCC and VCD. The constructs from each cluster illustrate the main pathways that lead to VCC and VCD in a digital health service. According to the findings, value is multidimensional and subjectively determined by individuals, confirming previous research. The central theme in each cluster can be represented by the primary value perceived by the participants, illustrating how various "consequences" lead to the co-creation or co-destruction of the respective value.

As an example, Figure 8 represents the network map for Cluster 1. The numbers in the network map represent the frequency of occurrence for relevant codes in the interview data. The negative number in the brackets represents the frequency of VCD-related descriptions, while the positive number represents VCC-related descriptions. Cluster 1 suggests that the three dimensions of resource integration and exergame-related factors have contributed to VCC and VCD regarding value of physical recovery and functioning. Specifically, resource access is the primary contributor to VCC, while resource matching is the primary contributor to VCD.

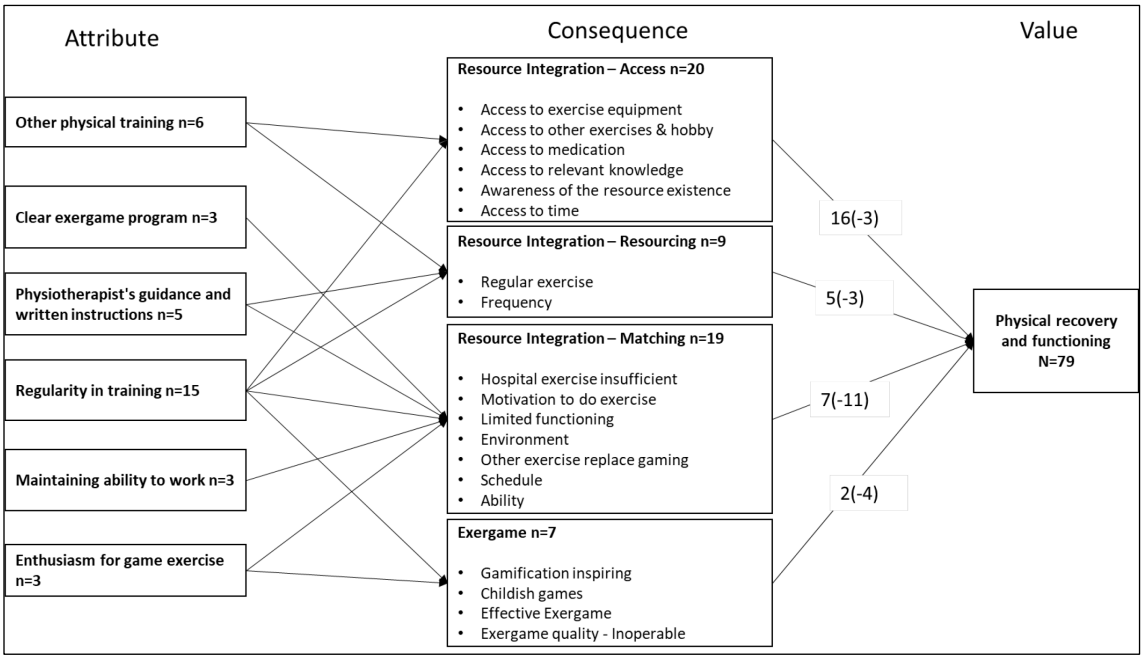

FIGURE 8 Network map for Cluster 1: Physical recovery and functioning

Online appendices 6 and 7 of Article II contain all the network maps and pertinent codes for the seven clusters. A detailed illustration of each cluster can be found in Section 4.2 of Article II. Table 10 summarizes the seven clusters and gives some highlights for each cluster.

In conclusion, the pathways toward VCC and VCD regarding different values via social interaction and resource integration reflect the strengths and weaknesses ingrained in the digital health service, indicating potential solutions for service improvement and enhanced wellbeing. Our findings indicate that social interaction primarily affects the mental health of patients, including coping and mental health, confidence, and trust. Consequently, it is vital to facilitate effective communication and dialogue for human interactions. For instance, service providers can embed features within the exergame system or create an online community for customers where they can seek guidance or feedback from the physiotherapist, share their experiences with peers, or even schedule a quick appointment with a nurse or doctor to receive straightforward advice.

TABLE 10 The seven clusters and corresponding highlights

Cluster	Highlights
Cluster 1: Physical recovery and functioning	All three dimensions of resource integration (access, matching, and resourcing) and information technology (exergame characteristics and exergame quality) have contributed to the co-destructed and co-created value of physical recovery and functioning. In this cluster, resource access is the primary contributor to VCC, while resource matching is the primary contributor to VCD.
Cluster 2: Confidence and trust	Resource access, resource matching, communication, and dialogue are the main contributors to VCC and VCD in this cluster.
Cluster 3: Painlessness and self-realization	The main contributors to VCC regarding self-realization are resource access and matching, while resource matching contributes most towards VCD regarding painlessness.
Cluster 4: Effective and versatile exercise training	Resource access, matching, and exergaming are the main factors leading to VCC and VCD in this cluster.
Cluster 5: Satisfaction with self	All three dimensions of resource integration (access, matching, and resourcing) and information technology (exergame characteristics and exergame quality) are the main contributors to VCC and VCD regarding the value satisfaction with self.
Cluster 6: Exercise interest and motivation	Practices related to the three dimensions of resource integration (access, matching, and resourcing) and information technology (exergame characteristics and exergame quality) are VCC contributors, while exergame-related factors are the main factors leading to VCD in this cluster.
Cluster 7: Coping and mental health	Practices related to the three dimensions of resource integration (access, matching, and resourcing) and communication are contributors to VCC, and limited resource access is the main factor leading to VCD in this cluster.

It has been found that resource access and matching influence nearly every identified value in patients' physical and mental health. Notably, our findings indicate that access to relevant resources is crucial, and there are several ways that service system actors can contribute to the co-creation of value. For instance, hospital staff should ensure that patients have access to adequate pain medication, pain guidance and monitoring, information about the joints and surgery, and healthcare professionals when necessary. Even though the COVID-19 pandemic has restricted patients' access to exercise equipment for indoor activities, they can explore access to other exercises or hobbies, such as walking in nature or practicing yoga at home, to enhance their physical and mental health.

The exergame has the greatest effect on VCC and VCD in terms of effective and versatile exercise training, exercise interest and motivation, and self-satisfaction. Some participants view the exergame as entertaining, simple, motivating, effective, and reasonably progressive, resulting in VCC. However, some statements about the exergame may result in VCD and warrant the service provider's attention to enable service enhancements. As some patients perceive exergames to be monotonous and childish, developers can add more game

options and make the game environment richer and more challenging, for instance.

Therefore, Article II provides an answer to

RQ2 How do VCC and VCD occur in the setting of digital health services from patients' perspectives?

Article II contributes to this dissertation by examining the applicability of the IT-supported VCC and VCD framework from Article I and showcasing that the framework is a suitable lens for studying the phenomenon of VCC and VCD in a specific service context, such as digital health services. This study offers an in-depth comprehension of VCC and VCD processes and outcomes through the main pathways and multi-dimensional value outcomes in a specific digital service context.

4.3 Article III: Manifestations of contradictions and contradictory poles from the perspective of VCC and VCD

Article III investigates how VCC and VCD occur in geocaching from the contradiction perspective. By analyzing online discussion forum posts indicating possible manifestations of contradiction, six types of manifestations were identified based on interpretive content analysis, yielding 422 codes for final analysis. Table 11 describes the six identified types of manifestations as well as the relevant groups of codes.

We take the manifestation M1 "doing geocaching with its harmful effects" as an example. M1 describes the dilemma faced by geocachers who are aware that hiding and seeking caches have negative consequences but continue to participate in the activity for its positive outcomes, such as the joy of finding and exercise. This dilemma appears unsolvable, as avoiding negative effects would require them to stop geocaching. This dilemma represents the interaction between VCC and VCD, as geocaching has both positive and negative effects. Our data indicate that there are three types of negative effects associated with geocaching: erosion and damage, vandalism and sabotage, and geocaching-related dangers. Erosion and damage are caused, for instance, when geocachers walk the same routes in forests and create new paths or when they mistake real birdhouses for fake ones, destroying the incubation of birds. Vandalism and sabotage occur when geocachers intentionally destroy, harm, or obstruct things while geocaching, such as by hammering nails into a living tree or leaving garbage in caches or the surrounding area. Geocaching may also put geocachers in danger, such as when cache owners hide containers in tick-infested or high-traffic areas or among poisonous plants.

Detailed justifications as well as examples of posts extracted for each manifestation can be found in Section 4 of Article III. Highlights of the rest of the findings regarding manifestations are below.

TABLE 11 Manifestation types

Acronym	Manifestation types	Description	Relevant code group (s)*
M1	Doing geocaching with its harmful effects	Geocachers recognize the hobby's negative consequences, but as there are positive consequences, geocachers do not stop caching	Dangers during caching Erosion, damage Vandalism and sabotage
M2	Geocachers break the rules that safeguard geocaching's characteristics	Geocaching is perceived as a valued hobby with genuine characteristics, but geocachers are acting in a way that is causing the original characteristics to vanish	Stealing Faking, lying, cheating Shortcutting in caching deteriorates rules
M3	Caching the wrong way (individuals have different expectations)	Caching-it-wrong relates to the perceptions of those who claim that other geocachers should change their behavior concerning how to play geocaching	Different views on statistics Individuals have different opinions about decoys (containers, not real caches, but point out that the search should continue) Inappropriate behavior with trades Different opinions on logs Individuals have different expectations of geocaching Different opinions on the maintenance of caches (cache owners and other cachers) Inappropriate behavior: returning cache to its location
M4	Conflicts with outsiders	Conflicts between geocachers and outsiders emerge concerning disturbances and harmful effects, for example	Relations with outsiders: caches exposed to muggles Relations with outsiders: violating one's private property/area
M5	Conflicts with the management	Conflicts and disagreements between geocachers and reviewers regarding reviewing and administration	Conflicts with reviewing Conflicts with administration
M6	Poor quality of caches	Geocachers played the game to have fun but sometimes they are annoyed because of the poor quality of geocaches	Quality of caches Technical issues

The manifestation M2 represents the conflict that, although geocaching is perceived as a valuable hobby with genuine characteristics, geocachers may break the rules, causing the original characteristics to vanish. Examples of rule-breaking are faking, lying, cheating, stealing, and shortcutting in caching, based on the codes.

The manifestation M3 describes a conflict involving arguments and differing opinions/expectations on proper practices, which is embedded in the perceptions of those who assert that other geocachers should modify their behavior regarding how they hide and seek caches. Based on our data, perceptions relate to opinions on logs, geocaching expectations, opinions on decoys, cache maintenance responsibility, appropriate behavior with trades and returning caches to their original location, and opinions on statistical viewpoints.

The manifestation M4 represents conflicts between geocachers and outsiders regarding disturbances and harmful effects, such as when geocaching disturbs landowners by invading their private property or when caches are exposed to "muggles," thereby violating the secrecy of the activity.

The manifestation M5 describes conflicts or disagreements between geocachers and reviewers regarding reviewing and administration, such as when a submitted geocache is rejected, reviewers demand changes that the geocacher perceives as unfair, or the administrator fails to stop irresponsible geocachers.

The manifestation M6 describes the situation in which geocachers play the game for fun but are occasionally frustrated by the poor quality of geocaches, such as when low-quality caches are created or when technical issues arise.

By identifying the manifestations of contradictions, it is possible to comprehend the behavioral patterns that may result in the deterioration or even destruction of the activity, in this case geocaching. Next, based on the identified manifestations, the essentials of the activity, which serve as poles of contradictions that interact and produce manifestations, are interpreted and discussed. Specifically, the poles that interact with one another in such a way that a unity or joint result could be derived from their interactions were identified (cf. Carlo et al., 2012; Allen et al., 2013), and VCC and VCD were given particular consideration in this case. While the poles of contradictions represent the essence of the activity, their interaction produces phenomena aiming to destroy the activity (Allen et al., 2013). Table 12 provides a summary of the contradictions, detailing their poles and manifestation in geocaching and how they relate to VCC and VCD.

TABLE 12 Summary of contradictions in geocaching

Contradictory poles	**Instantiation of the contradictory poles in geocaching**	**Relevant manifestation types**	**VCC behavior of geocachers**	**VCD behavior of geocachers**
Hedonic behavior versus societal norms	Self-actualization versus quality of the locations: Contradiction spans from information subsystem (upholding hedonism) to social subsystem (societal norm) (Lee et al., 2015).	M1, M4	Geocachers self-actualize themselves by creating, hiding, and seeking caches in high-quality locations	While creating, hiding, and seeking caches, geocachers spoil the quality of the locations (self-actualization destroys the quality of locations). If they withdraw from geocaching in certain locations to protect them, for example, they prevent their own self-actualization (the quality of the location destroys self-actualization)
Closed system versus open system	Secret society versus engagement with surrounding society: Contradiction spans from the information subsystem (upholding secrecy) to the social subsystem (engagement with society) (Lee et al., 2015)	M4, M6	The surrounding society (e.g., GPS technology, traffic systems, and population) makes it possible for geocachers to play their game as a secret society	When geocachers enter the locations to search for the caches (e.g., appearing suspicious, disturbing local traffic), they may cause concerns among members of the surrounding society (secret society destroys engagement with surrounding society) Engagement with the surrounding society (e.g., making geocaching known, not engaging with stealth activity) spoils the secret nature of the activity (engagement with surrounding society destroys secret society)
Autonomy versus interdependence	Autonomous caching versus interdependence between geocachers: Contradiction spans from information subsystem (upholding autonomy) to social subsystem (interdependence) (Lee et al., 2015).	M2, M3, M4, M5, M6	Autonomous geocachers use their creativity in creating and hiding caches so that the other geocachers can find them	VCD occurs when geocachers engage with or refrain from activities entailing violation of relationships between geocachers VCD occurs when the relationships between geocachers entail violation of the geocacher's autonomy. Caching rules entail situations in which geocachers' geocache ideas may not be accepted by the reviewer, leading to disappointment. The competitive nature of geocaching is experienced by some geocachers as disturbing

Three pairs of contradictory poles have been identified from the perspective of VCC and VCD. Detailed explanation as well as instantiation of the contradictory poles in geocaching can be found in Section 5 of Article III. The highlights of the findings are listed below.

The first pair of contradictory poles is hedonic behavior versus societal norms, which, in geocaching, corresponds to self-actualization versus location quality. VCC occurs when geocachers experience fulfillment while creating and searching for caches (Pole 1) in locations that provide geocachers with hedonic experiences that are dependent on the quality of the location (Pole 2). VCD contradicts this when geocachers who seek self-actualization leave negative impacts on the quality of the locations as a result of their actions (Pole 1 destroys Pole 2). If outsiders or geocachers themselves prohibit or restrict caching behavior due to the potential damage to a location, geocaching is less likely to occur (protecting the quality of locations destroys the possibilities for self-actualization; Pole 2 destroys Pole 1). Therefore, there is a contradiction between self-actualization and location quality, both of which are essential in geocaching, given that people join geocaching to actualize themselves by creating and seeking caches in various locations. The interaction between these poles produces effects that can degrade the entire activity. Consequently, hedonic behavior and societal norms represent contradictory poles.

The second pair of contradictory poles is closed system versus open system, corresponding to secret society versus engagement with surrounding society in geocaching. VCC occurs when geocachers go geocaching in the surrounding society (Pole 2), engage in stealth activity, and experience the excitement of a secret society (Pole 1). The existence of the surrounding society and the notion that caches should be well hidden provide the opportunity to engage in stealth activity. Concurrently, geocachers receive hedonic experiences that promote their wellbeing and health, which also benefit the surrounding society, given that geocachers are a part of it. VCD occurs when geocachers enter a location in search of caches and may cause concern among the local populace (Pole 1 destroys Pole 2). When geocaching becomes increasingly popular, caching will lose its secretive nature. When geocachers disregard the rules of stealth activity and search for caches openly, they also violate the caching code of secrecy (Pole 2 destroys Pole 1). Geocaching must maintain contact with the community to attract new participants to make this activity alive. Therefore, we contend that there are contradictory poles between closed and open systems.

The third pair of contradictory poles corresponds to autonomous geocaching versus interdependence between geocachers. VCC occurs when individual geocachers contribute to the entire activity by placing new caches and abiding by the rules while caching, thereby preserving good relations between geocachers. Geocaching would not exist without the collaboration of autonomous actors. VCD occurs when geocachers engage in or refrain from activities that violate relationships between geocachers. A geocacher may choose to disobey the rules and thereby cause harm to other geocachers. Individual geocachers have their own perceptions of the proper way to participate in

geocaching, and they may criticize the behaviors of other geocachers, thereby fostering a negative atmosphere (Pole 1 destroys Pole 2). VCD occurs when the autonomy of individual geocachers is violated, such as when a reviewer rejects a geocacher's idea or when the competitive nature of geocaching is disturbing (Pole 2 destroys Pole 1). Therefore, there are two poles interacting regarding the interaction of geocachers: autonomy and interdependence. Both autonomy and interdependence are essential to geocaching; without either, geocaching loses its distinguishing features.

Therefore, Article III provides an answer to

RQ3 How do value co-creation and co-destruction contradictions occur in geocaching?

Article III contributes to this dissertation by providing a new perspective to understand VCC and VCD as well as their relationship and justifying the appropriateness of adopting contradiction theory to understand relevant phenomena. In addition, like Article II, Article III offers a rich understanding of VCC and VCD from a users' perspective in a specific digital service context, where games are essential elements enabling interactions.

5 DISCUSSION

This dissertation addressed the research question

RQ How does value formation occur in digital services from the perspective of VCC and VCD?

by providing answers to three sub research questions across Article I to III. This chapter begins by illustrating the answers to each research question. Following that, we discuss the dissertation's contributions. The primary contributions to research and theory are presented first, followed by the practical contributions. We conclude with a discussion of the research's limitations and provide an avenue for future research.

5.1 Answers to research questions

First, based on a systematic literature review, Article I developed a conceptual framework illustrating the constructs of IT-supported VCC and VCD in a service system, proposing that social interaction and resource integration are two interdependent processes in IT-supported VCC and VCD, enabled or constrained by IT and embedded in practices, resulting in VCC and VCD outcomes. Social interaction is concerned with communication, dialogue, and trust, and resource integration relates to access, matching, and resourcing. According to our findings, IT has a substantial impact on resource integration and social interaction in the process of VCC and VCD. Specifically, IT facilitates social interaction by offering touchpoints for communication and dialogue and altering the characteristics of dialogue through increased autonomy and media richness. Besides, IT enables communication with less cost and more customization to actors' needs in real time and boosts trust by enables information to be exchanged rapidly and transparently. Moreover, IT contributes to resource integration by offering platforms for approaching and matching a variety of resources and by analyzing and reusing the data produced by customers. Nevertheless, companies should

give thought to the negative impact of IT, for instance that it facilitates the spread of negative word-of-month, poor IT quality, system complexity, issues related to security and privacy, and technical failures. Therefore, Article I answered the following sub research question:

RQ1 How do IT-supported VCC and VCD occur in a service system via social interaction and resource integration?

Second, Article II investigated VCC and VCD in a digital health service where patients used exergames for home rehabilitation after TKR. Seven clusters were formed based on laddering interviews with patients and hierarchical clustering analysis, illustrating the main pathways that lead to VCC and VCD through resource integration and social interaction with exergames. The central theme in each cluster can be represented by the primary value perceived by the patients, exemplifying how diverse activities or experiences can lead to the co-creation or co-destruction of each value. Our findings indicate that social interaction primarily influences VCC and VCD in relation to the mental health of patients, including coping and mental health, confidence, and trust. Resource access and matching contribute to VCC and VCD regarding nearly all identified values. Exergames primarily influence VCC and VCD in terms of patients' perceptions of effective and versatile exercise training, exercise interest and motivation, and self-satisfaction. Consistent with previous research, Article II demonstrated that value is multidimensional and subjectively determined by the actor based on their service expectations and experiences. Therefore, Article II answered the following sub research question:

RQ2 How do VCC and VCD occur in the setting of digital health services from the patient's perspective?

Article III showed that the concept of contradiction can be used to reveal the interconnection between VCC and VCD, and vice versa. In the case of geocaching, our findings show that geocachers obtained various values, such as hedonistic values, while seeking and hiding caches during the game, while value can also be co-destructed within the process. Based on interpretive content analysis of posts that may indicate contradictions among members of the international and Finnish geocaching online communities, six types of contradiction manifestations were identified concerning VCC and VCD activities in geocaching: 1) doing geocaching with its harmful effects, 2) breaking the rules that safeguard geocaching's characteristics, 3) caching the wrong way (individuals have different expectations), 4) conflicts with outsiders, 5) conflicts with the management, and 6) poor quality of caches. Based on the six manifestations, we then proposed three contradictory poles of VCC and VCD behavior: 1) hedonic behavior versus social norms, 2) closed system versus open system, and 3) autonomy versus interdependence. Accordingly, Article III answered the following sub research question:

RQ3 How do VCC and VCD contradictions occur in geocaching?

5.2 Contributions to research and theory

This dissertation contributes to the body of knowledge by shedding new light on the concepts of VCC and VCD and relevant phenomena in digital services. Specifically, the distinct and interconnected concepts of VCC and VCD have been investigated within S-D logic and two different cases of digital service. Next, we discuss the contribution made to the research literature by this dissertation by providing a comprehensive understanding of the IT-supported VCC and VCD process and outcomes. In addition, we discuss the implications for existing research of our conceptually and empirically derived findings regarding VCC and VCD. Finally, we discuss the contribution to existing research by examining the connection between contradictions and VCC and VCD.

This dissertation contributes to the service and information system literature by investigating VCC and VCD simultaneously in IT-enabled services. The existing literature has primarily explored VCC-related issues, such as concepts, drivers, activities, and effects (Galvagno & Dalli, 2014; Leclercq et al., 2016). However, research on VCD is still inadequate, and combined research on both VCC and VCD is scarce. It is essential to also consider VCD as it can provide a holistic and critical comprehension of value formation and prevent what is called "co-creation myopia," as our study demonstrates. Our study adds to emerging studies which suggest that VCC and VCD can co-occur (e.g., Cabiddu et al., 2019; Makkonen & Olkkonen, 2017), but we provide additional insights by conceptualizing the embedded constructs and factoring practices resulting in associated outcome variations in the context of digital services.

Notably, Article I is the first study to simultaneously investigate IT-supported VCC and VCD in a service system, providing congruent constructs and a shared language for discussion of relevant phenomena. The constructs describe the fundamental elements supporting IT-supported VCC and VCD through social interaction and resource integration, as well as their interrelationships. This is significant because it can facilitate further empirical analysis via well-defined constructs with actionable and observable elements that are easier to test and operationalize (Suddaby, 2010), differing from latent concepts such as VCC and VCD. Besides, our findings from the systematic literature review suggest that investigating VCC and VCD should involve the perspective of both process and outcome, providing a holistic view of the value formation in a service ecosystem. Different outcomes may result from the same collaborative process via social interaction and resource integration for different actors, and a single actor may experience both VCC and VCD during the course of a collaboration. Our study thus responds to research calls for a deeper understanding of value formation by paying particular attention to the antecedents and consequences of the resource integration and interaction processes (Mele et al., 2010). The empirical findings from Articles II and III add to the literature by showing how customers in digital health services and geocaching games experience the dynamic VCC and VCD process resulting in

various types of value outcomes. The practices experienced and perceived by the actors provide clues for comprehending value formation in a service context. By interviewing patients in digital health services and analyzing posts in geocaching online communities, our study provides additional insights into VCC and VCD pathways and the corresponding outcomes from the customers' perspective.

Furthermore, this dissertation adds to current research by conceptually and empirically investigating the impact of IT in the process of value formation, an overlooked topic since most prior research has emphasized the perspectives of management or business. This study is a response to a research call for more studies of IT-related value formation (Blasco-Arcas et al., 2014) as technology development has significantly reshaped value formation regarding its nature and process (Akaka & Vargo, 2014). In particular, Article I identifies and explains how IT influences VCC and VCD, indicating that IT may both facilitate and impede the process of value formation from diverse dimensions, which is empirically confirmed by findings from Article II in the setting of a digital health service and Article III about user experience in geocaching. By studying the role of IT in VCC and VCD, it is possible to comprehend how the development of digital technology can spark innovation and cause problems. Such comprehension is especially helpful for understanding information system phenomena such as IT innovation and system design since the application of IT does not guarantee benefits. Therefore, this dissertation supplements the current literature by investigating the negative impact of IT in addition to its positive influence.

In addition, this dissertation expands the existing body of knowledge regarding value formation by employing the perspective of service systems, in response to a research call to employ approaches with a network/system view to investigate VCC and VCD and how they occur within a service system (e.g., Farquhar & Robson, 2017; Smith, 2013). Engagement of a diverse range of actors and collaborative activities is a crucial aspect of services (Frow et al., 2016). For instance, the findings of Article II indicate that resource integration and social interaction processes between physiotherapists, nursing staff, patients, and service providers contribute to a holistic approach to patient care. Involvement of family and friends is also essential in improving health outcomes because they serve as sources of advice and support (McColl-Kennedy et al., 2012). Findings from Article III also indicate that other geocachers, reviewers, and outsiders are essential factors that may affect a user's experience in geocaching. Although the focus of our research is on the customer service experience, the nature of VCC and VCD necessitates knowledge about other involved actors and collaborative practices. Consequently, our dissertation adds to the existing body of knowledge on service research by explicating how actors, processes, IT, and value outcomes are interconnected in service systems, providing a network- and system-level perspective to understand VCC and VCD and their interrelationship.

Our research contributes to the understanding of value formation with respect to multidimensionality by demonstrating how actors' participation in collaborative interactions can affect their wellbeing in various ways. Emerging evidence from Articles I and II suggests that resource integration and social

interaction practices can result in both positive and negative outcomes, transforming across both ends of value formation processes. Consequently, this dissertation demonstrates how multidimensional values form in different service contexts, addressing Keeling et al.'s (2021, p.255) call to comprehend how different "value forming pathways" are "disrupted and/or cross over." Findings from Articles II and III indicate that customers are pursuing various types of values within digital services, suggesting that value is multidimensional and subjectively determined by actors. Specifically, the interview data in Article II suggest that patients care about mental and social wellbeing in addition to physical wellbeing. By mapping the main pathways leading to VCC and VCD in Article II, we respond to Gummesson and Mele's (2010) call to simultaneously study social interaction and resource integration in a larger and complex network, describing the multidimensionality of VCC and VCD in terms of process and outcomes. Besides, findings from Article III suggest that while geocachers pursue hedonic value while seeking and hiding caches, other values are also essential to create a sustainable ecosystem for the game, such as protecting the quality of a place and respecting others' privacy. Thus, our study sheds light on the understanding of value formation by investigating its multidimensionality (Ostrom et al., 2015) through an examination of VCC and VCD in different digital services.

This dissertation contributes to the body of knowledge by explicating the inherent connections between contradictions and VCC and VCD and by examining pertinent concepts in a specific service context. Although the contradictions of perceived value have been acknowledged in the past, it remains unclear how these contradictions relate to VCC and VCD. Examining contradictions from the perspectives of VCC and VCD in a service context is crucial, as it reveals how value is dynamically co-created or co-destructed via structural tensions. In addition, our research contributes to the literature by offering an example of how to identify contradictions in services through manifestations from the perspectives of VCC and VCD in geocaching. As contradictions are abstract and cannot be observed, examining actors' expressions or discussions related to clashes, problems, and ruptures is an appropriate method for uncovering the concealed tensions embedded in the service experience and provides a perceptive vantage point from which to comprehend users' behaviors. Consequently, we see that the integration of contradiction theory and the concepts of VCC and VCD can benefit research investigating services and collaborative interactions.

5.3 Contributions to practice

Our findings also have several implications for practice. First, they suggest that value creation activities facilitated by IT should be meticulously planned to ensure positive outcomes, as IT may also impede value formation. The literature has previously suggested that IT enables enhanced opportunities for interaction

and collaboration among various actors (Blasco-Arcas et al., 2014; Paredes et al., 2014). In order to provide a broader and more systematic understanding of the involved actors and activities, we argue that it is crucial to study both VCC and VCD when examining collaboration processes. This can provide a comprehensive view of how to balance or influence a process to achieve the desired results. For instance, firms often use online communities to increase their access to a large number of prospective customers. To make customers feel valued and unique, however, a certain level of exclusivity must be maintained among community members. In addition, system designers should think about technology complexity, ensuring that the system is user-friendly and does not require an excessive amount of knowledge and number of skills to operate. If expertise is necessary, the company should offer instructions clearly or provide training in multiple languages across institutions. When there is a large amount of information available, it is crucial to provide sorting and searching functions. For instance, big data and cognitive technology can be employed to analyze massive amounts of data and respond in real time to customers' needs. Combining customer expectations, organizations must assess the quality of IT and make a trade-off between benefits and limitations, transferring potential VCD practices into VCC.

Through the identification of contradictions in digital services from the viewpoints of VCC and VCD, this dissertation identifies potential methods of facilitating better service management and avoiding undesirable outcomes. The identification of contradiction manifestations allows managers to comprehend customer behaviors that may result in the deterioration or destruction of the activity, through which managers can better balance the process by manipulating related conflicts to prevent VCD. Knowing the embedded contradictory poles behind the tensions/conflicts can be useful for understanding customers' needs and expectations from the interactions. In the case of geocaching, for instance, it is essential to maintain secrecy due to the nature of the activity, while, at the same time, introducing geocaching to non-participants could have positive welfare implications in a broader sense as it is a healthy form of exercise. However, widespread geocaching publicity would diminish the thrill of seeking caches, resulting in VCD. Therefore, to balance the collaborative process, practitioners and service managers should not only plan or design VCC activities that enable, for instance, the exclusivity of a hobby, but also mitigate VCD practices by, for instance, facilitating participation. The concept of contradiction represents the unity of meaningful opposites, and through differentiation and integration, the opposing poles reinforce each other. Consequently, we argue that understanding the contradictory poles of VCC and VCD in digital services enables better service management.

In addition, this dissertation showcases the main pathways leading to VCC and VCD, providing clues for service managers regarding the creation of a better service experience for customers and indicating potential ideas for system development. The pathways toward VCC and VCD regarding different values through social interaction and resource integration reflect the inherent strengths

and weaknesses of digital services, implying potential solutions for service improvement and enhanced wellbeing. In the case of digital health services, for instance, our findings suggest that social interaction primarily affects patients' mental health, such as confidence and trust. Consequently, it is vital to facilitate effective communication and dialogue for human interactions. For instance, developers can create an online community or discussion forum for those specific populations, so that they can seek guidance or feedback from other users, share their experiences with peers, or even schedule an appointment with professionals directly. In addition, features that allow sending a "thumbs up" to encourage others or recognize the accomplishments of peers in relevant activities can facilitate a deeper level of co-creation. Such features can significantly boost customers' confidence through social interactions and motivate them to collaborate more, thereby enhancing their mental health. Therefore, we argue that understanding the main pathways leading to VCC and VCD in digital services enables practitioners to better manipulate the service process to achieve the desired outcome and provides potential solutions for system development.

Moreover, our findings indicate that organizations should plan their strategies concerning social interaction with care in order to minimize unwelcome responses. This dissertation argues, on the one hand, that IT can facilitate the creation of interactive dialogue and trustworthy settings for the establishment of sustainable relationships with customers and other stakeholders. On the other hand, our findings suggest that organizations should establish governance rules for social interactions to prevent unwarranted negative word of mouth and cyberbullying, as well as rules ensuring customer data are used appropriately to avoid issues related to privacy and security. In addition, our findings regarding VCD occurrence in digital services indicate that service providers should be prepared for potential IT failures and difficulties and plan response mechanisms to reduce customer dissatisfaction if such issues arise. Providing accessible dialogue and communicating with customers in timely fashion, immediately after an IT failure, is also essential in restoring customers' faith in the company. Lastly, our findings regarding the IT-supported VCC and VCD framework, main pathways leading to VCC and VCD, and contradictions from the VCC and VCD perspective will enable practitioners to quickly identify a negative situation and adjust their strategies to achieve the desired results. To effectively manage such negative situations, organizations can, for instance, provide relevant training to enhance employees' abilities to rapidly analyze social contexts and improve the communication skills of frontline employees. In this way, skilled employees are able to quickly and accurately recognize situations during social interactions, thereby performing proactive tasks to avoid VCD occurrence, reducing organizational costs, and boosting productivity.

Lastly, our findings suggest that companies should pay more attention to the resources that involved actors can contribute, investigate opportunities that can involve various stakeholders with congruent expectations, and design service systems facilitating broader VCC through resource integration. In the case of digital health services, for instance, our findings suggest that access to

relevant resources is crucial, and there are several ways that the involved actors can contribute to co-create value more effectively. For example, hospital staff can contribute by ensuring that patients have access to resources such as adequate pain medication and guidance, information about joints, and surgery. Service providers can facilitate VCC by providing access to pertinent information by developing websites or applications with clear and comprehensible instructions or advice from professionals or by arranging seminars where professionals can share their knowledge and answer patients' questions. Despite the fact that the COVID-19 pandemic has restricted patients' access to equipment for indoor exercise, they can proactively explore access to other activities, such as walking in the forest or practicing home yoga, to enhance their physical and mental health. In addition, if actors are to successfully integrate resources, they must have the capability and motivation to do so. It would be advantageous if service providers could provide sufficient training resources for user skills or develop systems with gamified features to encourage deeper engagement by competition, reward, or recognition. Therefore, practitioners can use the findings of this dissertation as a starting point to quickly identify practices related to resource integration to check if they have provided access to needed resources, or if resources have been matched or utilized appropriately, when planning collaborative events. Besides, our methods of data collection, namely interviewing customers and analyzing online posts, offer good examples of getting to know customers better.

5.4 Limitations and future research topics

There are some limitations and implications for future research in this dissertation. The limitations caused by each individual article included in this dissertation are first discussed, with some recommendations for future research made. Then, some limitations of this dissertation as a whole are presented, followed by some avenues for future research based on various themes.

Article I's breadth as a literature review is constrained by elements of the research design, such as the defined keywords employed to retrieve the data. Other terms that did not appear in our keyword searches may also indicate VCC and VCD, such as co-production, customer engagement, and service failure. It is thus recommended that future research investigate more relevant literature using a variety of keywords for searching, while carefully assessing the relevance of the phenomena studied. In addition, while limiting the included articles to journals shown on the ABDC list and AJG ensures an overall high quality, it may result in the exclusion of some very good or influential articles, such as conference papers or book chapters. Therefore, when choosing literature for their studies, researchers should view this as a trade-off.

For Article II, the study focuses on VCC and VCD in the exergame for TKR rehabilitation as an exemplar of digital health service. There was evidence of generalizability, attributable to its utilization of theory lens (S-D logic) and the research method (laddering interviews) to other complex service contexts. Future

research can investigate how VCC and VCD manifest in different contexts and examine whether Article II's findings regarding the main pathways of VCC and VCD will overlap with findings from other contexts. Second, although Article II collected both quantitative and qualitative data, the sample size of the quantitative data appears to be too small to offer rich and significant insights. We thus encourage future research to collect larger sample sizes and enrich the findings via diverse quantitative analyses, such as examining how different games significantly affect actors' health improvement. It would also offer additional insights if future research can study the different effects of digital health service based on ages, genders, and cultural diversity.

In Article III, through the interpretive content analysis of online post data, this study analyzed how forum participants experience VCC and VCD in geocaching activities. We acknowledge that the generalizability of this study is limited by its focus on a single digital service, geocaching. At this time, the findings from Article III are contextual, despite the fact that interesting connections are emerging between the recognized contradictions and VCC and VCD activities. Further research should be conducted on theorizing and conceptualizing VCC and VCD from the perspective of contradiction to better comprehend this phenomenon and how it contributes to the existing S-D logic literature. To complement our findings by enabling wider generalizability, future research involving larger datasets and a variety of contexts will be required.

As this dissertation focuses on VCC and VCD, practices that contribute to value non-creation were not analyzed, although some scholars have emphasized their importance (e.g., Makkonen & Olkkonen, 2017). Future research can expand on our findings by investigating potential patterns between VCC and VCD, encompassing the entire spectrum of dynamic value formation. In addition, while the empirical studies of this dissertation center on the perspective of certain actors, such as patients and geocachers, it would be interesting to examine a relevant phenomenon from a wider variety of perspectives involving more actors. Furthermore, even though this dissertation has demonstrated the multidimensionality of the processes and outcomes of value formation, it is still a preliminary effort, given the complexity of various service contexts and the little-known transformation mechanisms between VCC and VCD. Future research that longitudinally investigates value formation can contribute to our understanding of how value dynamically forms and transforms from VCC to VCD, and vice versa.

Table 13 outlines some promising avenues for future study of VCC and VCD based on different themes. Explanations of how the proposed themes relate to our findings and why it is essential to address them are given, and potential research questions and promising research methods to address them are suggested.

TABLE 13 Avenues for future study

Themes	Explanation	Possible research questions and approaches
Theme 1: Actors in VCC and VCD	This dissertation acknowledges that different actors have different roles and expectations when involved in the collaboration process. Individual-level research is essential to comprehend value-formation processes because it provides insights into different categories of people and facilitates group-based strategies. Future research should investigate, for instance, actors' characteristics in a particular setting, the relationships and tensions in the processes of VCC and VCD, etc.	• Do the personal characteristics of actors influence the process and outcome of VCC and VCD? (Gender, education, nationality, etc.) • How do the various roles of the actors influence their evaluation of the processes and outcomes of VCC and VCD? • How can relationships and tensions between various actors impact the VCC and VCD processes? • Does the number of service system actors influence resource integration and social interaction? Does an increase in the number of actors entail an increase in resources but also in interaction difficulties? Depending on the research questions, both conceptual and empirical research can provide new insights.
Theme 2: IT types and IT quality related to VCC & VCD	This dissertation indicates that VCC and VCD may be influenced by different types and quality levels of IT, indicating that research in the future should investigate these in greater depth and identify the underlying mechanisms. Such research can aid practitioners in better integrating resources based on distinct requirements, as different types of technologies represent diverse architectures of choice. Therefore, we contend that categorizing IT based on the perspective of value is a crucial step in comprehending VCC and VCD. Moreover, it is essential to comprehend how VCC and VCD can be affected by IT quality, transferring investments into benefits. With this objective achieved, managers are able to make optimal decisions to ensure IT quality meets customers' fundamental requirements, but at a relatively low cost.	• How do VCC and VCD occur with different types of IT (e.g., IT with different function/features)? • How can the IT quality be defined and measured from a value perspective? • Does the IT quality level act as a mediator between IT and VCC and VCD? The findings may be enriched by a mixed-methods approach combining qualitative and quantitative perspectives.

Themes	Explanation	Possible research questions and approaches
Theme 3: VCC and VCD process in different stages	The dynamic nature of the IT-supported VCC and VCD processes suggests that future research with a longitudinal view could yield insightful findings. It is essential for managers to comprehend these processes throughout the different phases of a digital service's lifecycle in order to strategically allocate their resources and concentrate on interactions to maximize benefits at specific stages. Beyond illustrating the value formation routes in IT-supported platforms and services, empirical studies would inform implications for system design in relevant IT-supported instances.	• Do the resource integration activities, specifically access, matching, and resourcing, have varying effects on value outcomes at various stages? • Does social interaction have a different emphasis in VCC across different phases? • Does IT have different roles throughout the project's different phases? To investigate these issues, a longitudinal study is encouraged, and studies with empirical data on VCC and VCD may provide enriched insights.
Theme 4: Measurements of relevant constructs	This dissertation identified how VCC and VCD occur in digital services but lacks a focus on assessing and measuring relevant concepts. To better manage and evaluate the service process and performance, further research can contribute to current knowledge by investigating the measurement and evaluation of the constructs of VCC and VCD process and outcome.	• How can VCC and VCD be measured from a process and outcome standpoint? • How can the effects of IT on VCC and VCD be measured? For instance, does IT usage frequency impact VCC and VCD? • How can the effects of social interaction on VCC and VCD in digital services be evaluated or measured? Does the frequency of interactions affect VCC and VCD, for instance? • How can the effects of resource integration on VCC and VCD in digital services be evaluated or measured? The application of qualitative or quantitative research can enrich the findings via an empirical method.
Theme 5: VCC & VCD pathways/routes in different service contexts	This dissertation only examines the main pathways leading to VCC and VCD in the context of a selected digital health service, indicating that further research can enrich our understanding by investigating the pathways or routes of value formation in different service contexts, such as education and tourism. Doing so can establish a foundation for theorizing the pathways/routes of VCC and VCD, which can provide a lens for understanding actors' behavior and facilitate better service management.	• What are the VCC and VCD pathways/routes in education/tourism/financial services/consulting? • Do the VCC and VCD routes/pathways differ for IT-supported and non-IT-supported services? The application of multiple case studies may provide useful insights for formulating the VCC and VCD pathways/routes.

Themes	Explanation	Possible research questions and approaches
Theme 6: VCC & VCD related to system design and service governance	The negative effects of IT on value formation suggest promising research directions for system design and service governance from the perspective of VCC and VCD. Specifically, our findings suggest that actors experience VCD due to system complexity, privacy violations, poor IT quality, etc. Thus, it is essential to consider these factors when designing a digital service in order to reduce the likelihood of undesirable results. However, evidence-based design knowledge regarding VCC and VCD in digital services is lacking. Design science research may provide a suitable framework for analyzing the innovation procedure (Nambisan, 2015; Peffers et al., 2007), facilitating the plan and implementation of system design, and providing valuable insights for service governance.	• What implications does VCC and VCD occurrence have for the design of a digital service or system development? • What does VCC and VCD occurrence imply for the governance of a digital service? • How can a digital service be designed from the perspective of VCC and VCD to reduce the negative impacts of IT? Design science research may be a useful approach, as research on VCC and VCD in digital services is not only concerned with comprehending actors' behavior, but also relates to designing, developing, and managing systems.

YHTEENVETO (SUMMARY IN FINNISH)

Palvelusektori, joka kattaa globaalisti 65,7% valtioiden bruttokansantuotteesta (BKT), on mullistanut maailmantalouden ja vaikuttanut markkinoihin ja työvoimaan, jotka ovat tiiviisti sidoksissa organisaatioihin ja yksilöihin. Sen vuoksi on oleellista tutkia palveluita sekä niihin liittyviä ilmiöitä. Arvo ja arvon luominen ovat palveluiden ytimessä, ja ne ovat kriittisiä palvelujärjestelmien dynamiikan ymmärtämisessä sekä palvelutieteen edistämisessä. Näin ollen se, kuinka arvoa luodaan asiakkaille, palvelun tarjoajille sekä muille palveluprosessiin osallistuville toimijoille, on keskeinen kysymys palvelututkijoille ja ammatinharjoittajille. Arvon yhteisluominen on saavuttanut viime vuosina lisääntyvää huomiota keskeisenä strategiana kilpailuetua etsivien yritysten parissa, ja palvelukeskeinen logiikka on tarjonnut keinon ymmärtää arvon yhteisluontia palveluiden yhteydessä. Koska yhteistoiminta voi tuottaa niin positiivisia kuin negatiivisiakin seurauksia, on tärkeää tutkia myös vastaavaa negatiivistä ilmiötä, nimittäin arvon yhteistuhoamista. Suurin osa olemassa olevasta kirjallisuudesta on kuitenkin keskittynyt arvon yhteisluontiin. Arvon yhteisluonnin ja -tuhoamisen tutkimus samanaikaisesti sekä se, kuinka arvon yhteisluonti ja -tuhoaminen kytkeytyvät toisiinsa, on suurelta osin tutkimatta. Lisäksi informaatioteknologian (IT) vaikutus arvon yhteisluontiin ja -tuhoamiseen on jätetty huomioimatta, ja se, miten arvo ilmenee digitaalisissa palveluissa, on epäselvää.

Tämän väitöskirjan tavoitteena on vastata seuraavaan tutkimuskysymykseen:

RQ Miten arvon muodostuminen näkyy digitaalisissa palveluissa arvon yhteisluonnin ja yhteistuhoamisen näkökulmista?

Tarkemmin sanottuna väitöskirja koostuu kolmesta artikkelista, jotka tarjoavat vastauksia kolmeen osatutkimuskysymykseen. Ne puolestaan auttavat osaltaan vastaamaan edellä mainittuun yleiseen tutkimuskysymykseen.

Ensimmäiseksi, 103 artikkelista koostuvan systemaattisen kirjallisuuskatsauksen perusteella, Artikkelissa I kehitettiin käsitteellinen viitekehys, joka havainnollistaa IT-tuetun arvon yhteisluonnin ja -tuhoamisen rakenteita palvelujärjestelmissä. Artikkeli ehdottaa, että sosiaalinen vuorovaikutus ja resurssien integrointi ovat kaksi toisistaan riippuvaista IT-tuetun arvon yhteisluonnin ja -tuhoamisen prosessia, joihin IT vaikuttaa ja jotka sisältyvät vuorovaikutteisiin arvonmuodostamiskäytäntöihin, johtaen arvon yhteisluonnin ja -tuhoamisen lopputulemiin. Viestintä, vuoropuhelu ja luottamus ovat sosiaalisen vuorovaikutuksen elementtejä, ja resurssien integrointiin kuuluu havaintojemme mukaan pääsy (engl. access), yhteensovittaminen (engl. matching) sekä resursointi (engl. resourcing). On todettu, että IT:llä on huomattava vaikutus sosiaaliseen vuorovaikutukseen ja resurssien integrointiin arvon yhteisluonnin ja -tuhoamisen prosesseissa. Informaatioteknologia helpottaa erityisesti sosiaalista vuorovaikutusta tarjoamalla alustoja vuoropuhelulle ja viestinnälle, muuttaen vuoropuhelun piirteitä lisäämällä mediarikkautta ja autonomiaa, tekemällä viestinnästä kustannustehokkaampaa ja räätälöidympää reaaliaikaisten tarpeiden mukaan sekä lisää-

mällä luottamusta nopean tiedonvaihdon ja lisääntyneen avoimuuden avulla. Lisäksi IT edistää resurssien integrointia tarjoamalla alustoja, joilla voidaan käyttää ja sovittaa yhteen erilaisia resursseja, sekä analysoimalla ja hyödyntämällä asiakastietoja. Yritysten tulisi kuitenkin ottaa huomioon IT:n negatiiviset vaikutukset, kuten negatiivisten kommenttien levittämisen helppous, turvallisuuteen ja yksityisyydensuojaan liittyvät huolenaiheet, tekniset viat, IT:n heikkolaatuisuus ja järjestelmien monimutkaisuus. Näin ollen Artikkeli I vastasi seuraavaan osatutkimuskysymykseen:

RQ1 Miten IT-tuettu arvon yhteisluonti ja yhteistuhoaminen ilmenevät palvelujärjestelmässä sosiaalisen vuorovaikutuksen ja resurssien integroinnin kautta?

Toiseksi Artikkelissa II tutkittiin arvon yhteisluontia ja -tuhoamista digitaalisessa terveyspalvelussa, jossa potilaat käyttivät liikuntapeliä kotikuntoutukseen polven tekonivelleikkauksen jälkeen. Potilaiden haastattelujen ja hierarkkisen klusterianalyysin perusteella muodostettiin seitsemän klusteria havainnollistamaan tärkeimpiä polkuja, jotka johtavat arvon yhteisluontiin ja -tuhoamiseen resurssien integroinnin ja sosiaalisen vuorovaikutuksen kautta liikuntapelien kanssa. Kunkin klusterin keskeistä teemaa voi edustaa potilaiden kokema pääarvo, mikä havainnollistaa, miten erilaiset toiminnot tai kokemukset voivat johtaa kunkin arvon yhteiseen luomiseen tai tuhoamiseen. Tuloksemme osoittavat, että sosiaalinen vuorovaikutus vaikuttaa ensisijaisesti arvon yhteisluontiin ja -tuhoamiseen suhteessa potilaiden mielenterveyteen, sisältäen selviytymisen (engl. coping) ja mielenterveyden, itseluottamuksen sekä luottamuksen. Resursseihin pääsy ja niiden yhteensovittaminen vaikuttavat arvon yhteisluontiin ja -tuhoamiseen lähes jokaisen tunnistetun arvon kohdalla. Liikuntapelit vaikuttavat ensisijaisesti arvon yhteisluontiin ja -tuhoamiseen suhteessa potilaiden käsitykseen tehokkaasta ja monipuolisesta liikuntaharjoittelusta, liikunnan kiinnostavuudesta, motivaatiosta sekä itsetyytyväisyydestä. Aiempien tutkimusten mukaisesti Artikkeli II osoitti, että arvo on moniulotteista ja että toimija (engl. actor) määrittelee sen subjektiivisesti palveluun liittyvien odotustensa ja kokemustensa perusteella. Näin ollen Artikkeli II vastasi seuraavaan osatutkimuskysymykseen:

RQ2 Miten arvon yhteisluonti ja yhteistuhoaminen ilmenevät digitaalisen terveyspalvelun yhteydessä potilaiden näkökulmasta?

Artikkelissa III osoitettiin, että ristiriidan konseptia voidaan käyttää paljastamaan arvon yhteisluonnin ja -tuhoamisen välinen yhteys ja päinvastoin. Geokätköilyn osalta tuloksemme osoittavat, että geokätköilijät saavuttivat erilaista arvoa, kuten hedonista arvoa, etsiessään ja piilottaessaan kätköjä pelin aikana. Samanaikaisesti, prosessissa on myös mahdollista tuhota arvoa yhdessä. Verkkojulkaisuista, jotka mahdollisesti viittaavat ristiriitoihin kansainvälisissä ja suomalaisissa geokätköilyn verkkoyhteisöissä, tunnistettiin tulkitsevan sisällönanalyysin pohjalta kuusi eri ristiriidan ilmenemismuotoa liittyen arvon yhteisluonti- ja tuhoamistoimintaan geokätköilyssä. Nämä ristiriidan ilmenemismuodot sisältävät: 1) geokätköily haitallisin seurauksin, 2) geokätköilyn ominaispiirteitä turvaavien sääntöjen rikkominen, 3) kätköily väärällä tavalla (yksilöillä eri-

laiset odotukset), 4) konfliktit ulkopuolisten kanssa, 5) konfliktit hallinnon kanssa ja 6) kätköjen heikko laatu. Ehdotamme näiden kuuden ristiriidan ilmenemismuodon pohjalta kolmea arvon yhteisluonti- ja tuhoamiskäyttäytymiseen liittyvää ristiriitaista ääripäätä: 1) hedoninen käyttäytyminen vastaan sosiaaliset normit, 2) suljettu järjestelmä vastaan avoin järjestelmä ja 3) autonomia vastaan keskinäinen riippuvuus. Näin ollen Artikkeli III vastasi seuraavaan osatutkimuskysymykseen:

RQ 3 Miten arvon yhteisluonnin ja yhteistuhoamisen ristiriidat ilmenevät geokätköilyssä?

Tämä väitöskirja edistää palvelu- ja tietojärjestelmätieteen kirjallisuutta tutkimalla arvon yhteisluontia ja -tuhoamista samanaikaisesti IT-tuetuissa palveluissa. Tutkimuksemme täydentää uusia tutkimuksia, joiden mukaan arvon yhteisluonti ja -tuhoaminen voivat esiintyä yhdessä. Tarjoamme kuitenkin laajemman näkökulman käsitteellistämällä digitaalisiin palveluihin liittyviä lopputulemavaihtelua aiheuttavia sisäistettyjä rakenteita ja käytäntöjä. Tässä väitöskirjassa tarkastellaan myös käsitteellisesti ja empiirisesti IT:n roolia vuorovaikutteisessa arvonmuodostusprosessissa. Tutkimalla IT:n roolia arvon yhteisluonnissa ja -tuhoamisessa on mahdollista ymmärtää, kuinka digitaaliset työkalut voivat synnyttää innovaatioita ja asettaa haasteita. Tämä on erityisen hyödyllistä tietojärjestelmäilmiöiden kuten IT-innovaatioiden ja järjestelmäanalyysin- ja suunnittelun ymmärtämisessä, sillä IT:n soveltaminen ei aina takaa hyötyjä. Lisäksi tämä väitöskirja täydentää tietämystä selittämällä ristiriitojen sekä arvon yhteisluonnin ja -tuhoamisen välisiä luontaisia yhteyksiä ja tarkastelemalla keskeisiä käsitteitä tietyssä palvelukontekstissa.

Tuloksillamme on myös useita käytännön vaikutuksia. Havaintomme viittaavat siihen, että IT:n mahdollistamat yhteisluontitoimet tulisi suunnitella huolellisesti myönteisten tulosten varmistamiseksi, sillä IT voi myös haitata arvonmuodostusta. Tunnistamalla digitaalisten palveluiden ristiriitoja arvon yhteisluonnin ja -tuhoamisen näkökulmista tämä väitöskirja tarjoaa johtohenkilöille näkemyksiä, joiden avulla he voivat ymmärtää asiakaskäyttäytymistä, joka voi johtaa toiminnan heikkenemiseen tai tuhoutumiseen, ja paremmin tasapainottaa prosessia vaikuttamalla siihen liittyviin ristiriitoihin arvon yhteistuhoamisen estämiseksi. Lisäksi tässä väitöskirjassa esitellyt arvon yhteisluontiin ja -tuhoamiseen johtavat pääpolut tarjoavat palvelujohtajille ehdotuksia paremman palvelukokemuksen luomiseksi asiakkaille sekä tuottavat mahdollisia ideoita järjestelmien kehittämiseksi.

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ORIGINAL PAPERS

I

INFORMATION TECHNOLOGY–SUPPORTED VALUE CO-CREATION AND CO-DESTRUCTION VIA SOCIAL INTERACTION AND RESOURCE INTEGRATION IN SERVICE SYSTEMS

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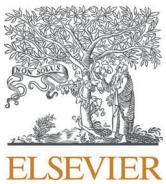

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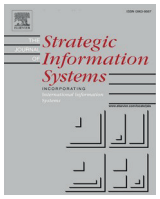

Information Technology–Supported value Co-Creation and Co-Destruction via social interaction and resource integration in service systems

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ABSTRACT

The paper develops a conceptual framework to study the constructs of information technology (IT)-supported value co-creation and co-destruction through shared processes of social interaction and resource integration as mediated by IT and embedded in interactive value formation practices. In particular, the elements of social interaction and resource integration are identified, and the role of IT is discussed. We conduct a systematic literature review and analyze the data using the service system perspective. Our research contributes by identifying the constructs of value-creating phenomena enabled by IT from the service system perspective and presenting a research agenda for further studies.

Introduction

Value co-creation (VCC) is getting increasing attention for organizations seeking competitive advantages. By successfully managing the VCC, organizations can improve their market performance, strengthen their relationships with stakeholders, improve productivity and efficiency, reduce costs and risk failure (Payne et al., 2008; Roser et al., 2013). To better benefit from VCC, it is essential to understand how the co-creation takes place and affects various engagers. The service systems perspective offers a great foundation for analysis as it centers on the participants, processes, resources that interact to co-create value (Vargo et al., 2008).

Service systems are "value co-creation configurations of people, technology, value propositions connecting internal and external service systems, and shared information" (Akaka & Vargo, 2014, p. 368). Furthermore, the literature adopts the term actor to describe those involved in service systems, engage in the collaboration process, and contribute to creating value for themselves and others (Vargo et al., 2008). Compared with a singular entity–level perspective that focuses on actors like service providers or customers only, the service system perspective tends to have more explanatory power (Breidbach & Maglio, 2016) as it offers an overview of the networks and the connections among different service systems. Any singular entity-level perspective can be integrated into service systems through value propositions if connected with other service systems. Therefore, service systems are an ideal unit of analysis and provide systemic perspectives for studying VCC (Breidbach & Maglio, 2016).

LEGO company's way of involving their customers is an example of VCC in a service system. LEGO provides a community where customers, as the service system actors, can contribute ideas for the brand's new model, vote and comment on others' ideas (Fagerstrøm et al., 2020). LEGO is an actor in this service system, and they provide the technology and shared information to enable

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VCC. After the ideation, voting, and commenting, the resulting customer ideas with high levels of supporters will be launched by LEGO (Fagerstrøm et al., 2020). This saves time and money in market research for the company but also strengthens their customer loyalty. The customers, in turn, are more empowered to influence the company's product development choices through VCC.

However, despite a large amount of research on VCC, there are apparent research gaps: (1) no research studies VCC and its destructive side (value co-destruction, VCD) simultaneously in service systems; (2) the role of IT in VCC and VCD within service systems remains largely unexplored although its importance has been acknowledged; (3) The definitions of VCC and VCD appears to be incongruent as generated from different perspectives and contexts; (4) resource integration and social interaction, being acknowledged as the main processes leading to VCC and VCD, has not been studied together in IT-supported environment.

As value is "perceived and determined by the customer on the basis of value-in-use" (Vargo & Lusch, 2004, p. 7), the destructive side of value-in-use should not be underestimated (Cabiddu et al., 2019). VCC and VCD are integral parts of interactions and key dimensions of interactive value formation (Echeverri & Skålén, 2011). Likewise, some authors (Chowdhury et al., 2016; Vartiainen & Tuunanen, 2014) argue that VCC and VCD are linked and cannot exist independently in the context of creating value. However, most previous studies have focused on VCC, and research examining VCD is scarce (Chowdhury et al., 2016), let alone that studying both. Unboxing VCC, VCD, and their interconnection might facilitate in discovering what and how relevant factors create or destroy value and provide valuable insights to organizations for making strategic decisions about involving actors in co-creation activities. Considering the possibility of VCD offers a critical understanding of value formation as collaboration does not always result in VCC. Besides, studying VCC and VCD together in a service system can facilitate the understanding of coordinated interactions and relationships, revealing the transition mechanisms between VCC and VCD and the governance mechanisms within the service system.

As an essential element of service systems, information technology (IT) and its role in service value contribute to the continuous integration of resources to create new forms of innovation for value creation (Hsiao et al., 2019). Recent research indicates that advancements in IT not only expand collaboration opportunities to co-create value (Böhmann et al., 2014) but may also result in value co-destruction (VCD). For instance, the use of like functions of crowdsourcing communities can intrinsically motivate contestants. Nonetheless, their excessive use among befriended contestants can potentially threaten platform providers' business models, resulting in VCD (Faullant & Dolfus, 2017). Thus, IT-supported collaboration can yield beneficial and unfavorable outcomes for the actors involved in a service system (Faullant & Dolfus, 2017; Plé & Cáceres, 2010). However, although the importance of IT has been recognized, IT-enabled VCC and VCD remain neglected in the literature (Breidbach & Maglio, 2016; Sarker et al., 2012). In particular, it is unclear which activities and processes are relevant for the emergence of value (Akaka & Chandler, 2011), and the impact of IT on VCC and VCD remains a key challenge for current research (Breidbach & Maglio, 2016). Multiple studies have called for more in-depth research on IT-supported VCC and VCD (Böhmann et al., 2014; Breidbach & Maglio, 2016; Lusch & Nambisan, 2015). Therefore, a joint analysis of IT-supported VCC and VCD is needed, which is scarce in the literature.

VCC and VCD have various definitions from different perspectives. McColl-Kennedy et al. (2012) defined VCC as "benefit realized from integration of resources through activities and interactions with collaborators in the customer's service network" (p. 375). Russo-Spena (2012) proposed that VCC is "a process in which social and technological resources are integrated" (p. 546). Similarly, VCD is defined as the collaborative destruction or diminishment of value by providers and customers during interaction (Echeverri & Skålén, 2011) that can happen due to failed resource integration (Järvi et al., 2018). Plé and Cáceres (2010) conceptualized VCD as "an interactional process between service systems that results in a decline in at least one of the systems' well-being" (p. 431). These definitions are incongruent as provided in different contexts: VCC and VCD are sometimes referred to as outcomes and sometimes processes. This might cause confusion owing to different constructs and a lack of clear agreement on the definitions. Construct clarity is needed when studying VCC and VCD together within the same service system to provide the research community with a common language (Suddaby, 2010). Therefore, VCC and VCD should be redefined with clear constructs indicating the embedded building blocks and their connections when studied simultaneously in a service system.

Despite the different perspectives of conceptualization, these definitions recognize resource integration and social interaction as the key processes leading to both VCC and VCD. Resource integration offers a unique view on product/service use by shifting the focus from utilizing one firm's single offering to how such offerings can be applied by combing various other resources (Vargo & Lusch, 2004). Resource integration allows intended, unintended, or negative value to emerge, depending on the alignment or misalignment of practices within the network (Caridà et al., 2018). Therefore, successful resource integration contributes to VCC, whereas VCD is triggered by failed resource integration (Smith, 2013). Moreover, multiple actors always co-created value, implying that value is interactional (Vargo & Lusch, 2016). VCC is inherently a social process requiring social interaction—although VCD notably also occurs during social interaction when incongruent elements of practice and unexpected behaviors occur (Quach & Thaichon, 2017). Resource integration and social interaction are also arguably interdependent and dynamic in value formation within a service system (Akaka et al., 2012). To study the value formation process, such perspectives necessitate discussing social interaction and resource integration simultaneously in a broader context of networks and relationships (Gummesson & Mele, 2010). However, little light has been shed on how actors engage in resource integration and social interaction in traditional contexts, let alone IT-supported ones. More specifically, social interaction and resource integration elements that affect interactions and how IT integrates resources (Cabiddu et al., 2019) are still unclear. Addressing this research gap is important, as the underlying elements of social interaction and resource integration can provide practical and actionable insights for managers when planning and developing IT tools and platforms for collaboration. VCC and VCD do not happen by chance and could be foreseeable as consequences of actors' ways of interacting and their decisions related to resource integration (Cabiddu et al., 2019). Thus, studying the constructs of IT-supported VCC and VCD via social interaction and resource integration is vital, as they can offer profound insights into the involved actors, activities, and interconnected relationships.

Consequently, our research question is: *How do IT-supported VCC and VCD occur in a service system via social interaction and resource integration?* Our objective is to exam VCC and VCD together in a service system from the perspective of social interaction and resource

Table 1
Defining stage in the literature review process.

Defining stage	Criteria	Reasons & explanations of choices
Fields of research	In the field of marketing, management, and information systems (IS)	VCC and VCD were widely and mainly discussed in those three fields and have led the discussion on this topic.
Publication Year of research	Since 2010	The time limit was set because the concept of VCD was formally introduced in 2010 by Plé and Cáceres (2010), and we aim to study VCC and VCD simultaneously.
Database for searching	ProQuest, Science Direct, and Web of Science	Those databases were considered appropriate sources since they cover a wide range of literature and are frequently used by scholars (e.g., Bakkalbasi et al., 2006; McKeown, 2010).
Quality of research	Listed in the Australian Business Deans' Council (ABDC) list or the Academic Journal Guide (AJG), rank >=2	ABDC and AJG are widely accepted in academia as measures of scholarly journal quality (Krueger & Shorter, 2019). Consequently, articles not on either the ABDC list or the AJG (rank >=2) would be excluded, which means that some papers would be missed at the cost of selecting good-quality literature for analysis.
Keywords for searching	Value co-creation OR value co-creation OR value co-destruction OR value co-destruction) AND (resource integration OR integrate resource OR resource combination OR combine resource OR rebundle resource OR social interaction OR social connection	Researchers use different synonyms for VCC, VCD, resource integration, and social interaction. For instance, some may use the term *value co-creation* instead of *value co-creation* and replace *resource integration* with *resource combination*. *Social connections* can also be used to indicate *social interactions*.
Criteria for inclusion and/or exclusion	1) The research must focus on studying VCC and/or VCD, meaning that the main idea should be related to VCC/VCD. 2) Satisfying 1), the research must discuss resource integration and/or social interaction.3) Satisfying 1) and 2), articles should be included if they discuss IT-related issues, such as (but not limited to) IS/IT artifacts, online platforms/communities, artificial intelligence (AI) , etc. 4) Satisfying 1) and 2) articles that are not IT-related but contribute to our understanding of the relationships between VCC and VCD, i.e., articles simultaneously discussing VCC and VCD should be included.	The inclusion criteria are defined based on our defined research questions and the aims of the paper.

integration, explore the role of IT and the elements of social interaction and resource integration, and redefine VCC and VCD in service systems with clear and congruent constructs. Our study will approach the research question by synthesizing and analyzing relevant previous research, and it is based on the service systems perspective.

Methodology

This study adopts Wolfswinkel et al.'s (2013) five-stage grounded theory method for reviewing the literature systematically and rigorously: defining (the criteria for inclusion or exclusion), searching (actual navigating the databases), selecting (filtering sample of studies to be reviewed), analyzing (extract genuine value from the chosen articles), and presenting (writing a coherent overview paper). A literature review is an effective methodology to answer our research question since it enables summarizing and analyzing studies on the same topic and provides insights into extending the work (Webster & Watson, 2002). This research does not intend to cover the entirety of the field. Still, it aims to provide a focused and informative evaluation of carefully selected research about IT-supported VCC and VCD from the perspective of resource integration and social interaction.

Table 1 summarizes the criteria and explanations for the *defining stage* in the literature review process.

Fig. 1 presents the *searching and selecting stages*. From three databases, 584 papers were retrieved using the defined keywords, and 112 papers that were not in the field of management, marketing, or IS and not on the ABDC list or AJG mentioned above were excluded. Subsequently, 88 articles were excluded owing to duplication, leaving 384 papers for further checking.

We then checked the titles and abstracts of these papers with the pre-defined criteria for inclusion and exclusion, and 92 articles were included. Next, we assessed the full texts against the same pre-defined criteria for inclusion and exclusion, leaving 81 papers. Then, we went backward by reviewing the citations of the identified articles and went forwarded by using Google Scholar to identify articles citing the identified articles to find additional relevant articles with the same inclusion criteria. The final analysis included 103 articles (see the online Appendix A for a complete list of the included articles).

In the *analysis stage*, we made descriptive notes about each article in Excel to obtain an overview of all included articles. We used the qualitative data analysis software ATLAS.ti for open, axial, and selective coding (Wolfswinkel et al., 2013). We conceptualized and articulated potentially useful excerpts that may have helped answer our research questions with 958 open codes through open coding. Next, we conducted axial coding by grouping the codes and creating subcategories to find interrelations between them. Last, we conducted selective coding using the "network" function in ATLAS.ti, which facilitates comparing, relating, and linking identified categories. Fig. 2 illustrates the final aggregation of key codes regarding social interaction, resource integration, and IT, showing an example of how relevant concepts were developed. Appendix B shows an overview of the included articles.

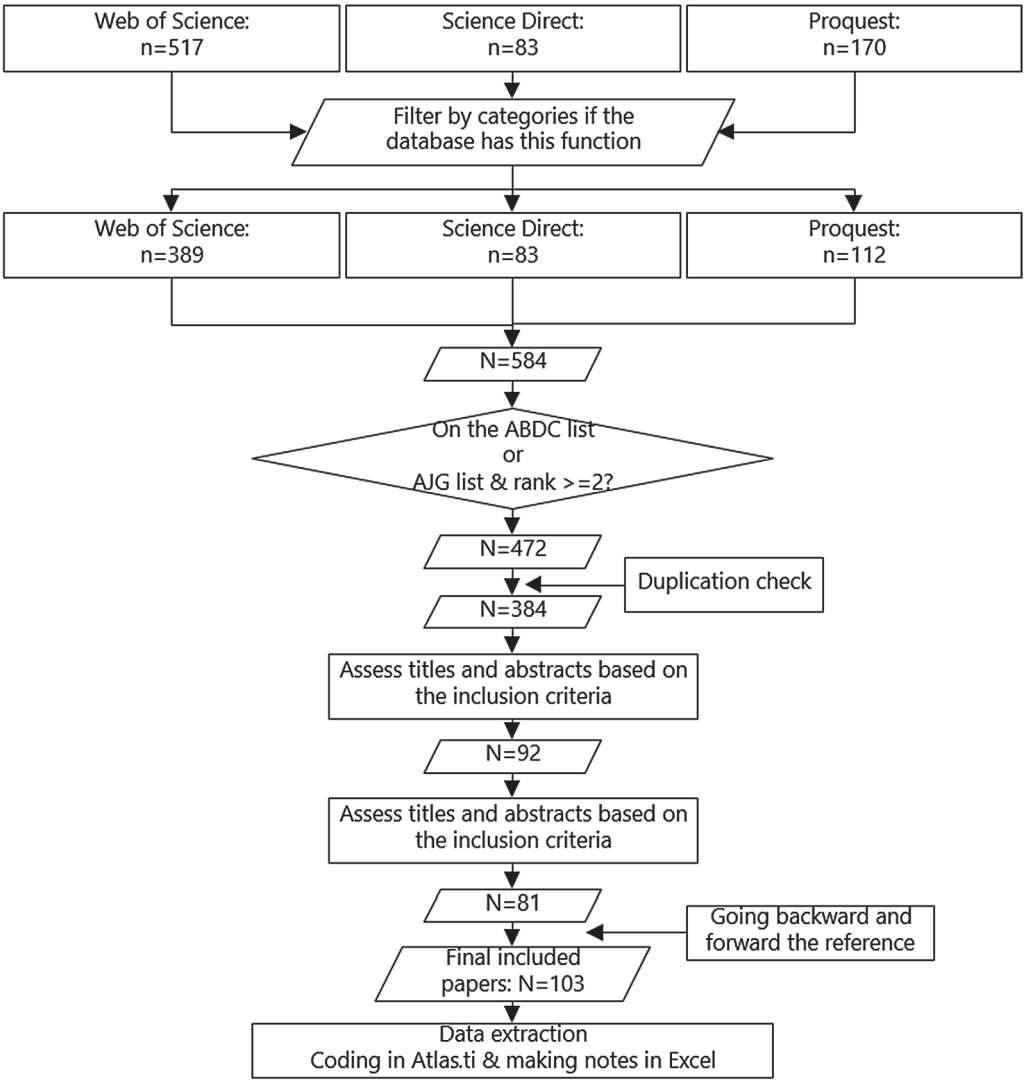

Fig. 1. *Searching* and *selecting stages* in the literature review process.

Findings: A framework of IT-supported VCC and VCD in a service system

A framework emerged through our literature review (Fig. 3). It depicts that IT-supported VCC and VCD entail both process and outcome. The process includes social interaction and resource integration, which is affected by IT and embedded in VCC and VCD practices. In contrast, the outcome is an increase or decline in at least one of the systems' well-being, determined by actors in specific contexts. As an antecedent of resource integration, social interaction comprises communication (expectations, shared language/institutions, and communication styles), dialogue, and trust. Access, matching, and resourcing are important elements of resource integration. IT can enable or prevent social interaction and resource integration in various ways, summarized in Fig. 3 and explained in detail in sections 3.2 and 3.4. These processes result in VCC and VCD outcomes that are multidimensional, subjective, and dynamically determined by actors. Table 2 summarizes the definitions and clarifications of the key constructs used in the framework.

The literature illuminates the dual roles of IT as both *operand and operant resources* in VCC processes (Lusch & Nambisan, 2015). Technology can be considered an operand resource that requires some action performed on it to have value and an operant resource that can act on other resources (Vargo & Akaka, 2012). IT as an operand resource represents an outcome of human action facilitating the underlying VCC process, with a passive role in enabling resource mixing and matching (Lusch & Nambisan, 2015). For instance, IT is used to build and manage a service ecosystem and search for appropriate resources (Mandrella et al., 2020). Simultaneously, research conceptualizes IT as an operant resource because it "seek[s] out and pursue[s] unique resource integration opportunities on its own, and in the process, engage[s] with (or act[s] upon) other actors" (Lusch & Nambisan, 2015, p. 167). In that sense, IT is proactive in initiating the VCC process and influencing other actors and their behaviors (Mandrella et al., 2020).

The literature defines technology as "a combination of practices, processes, and symbols that fulfill a human purpose" (Akaka and

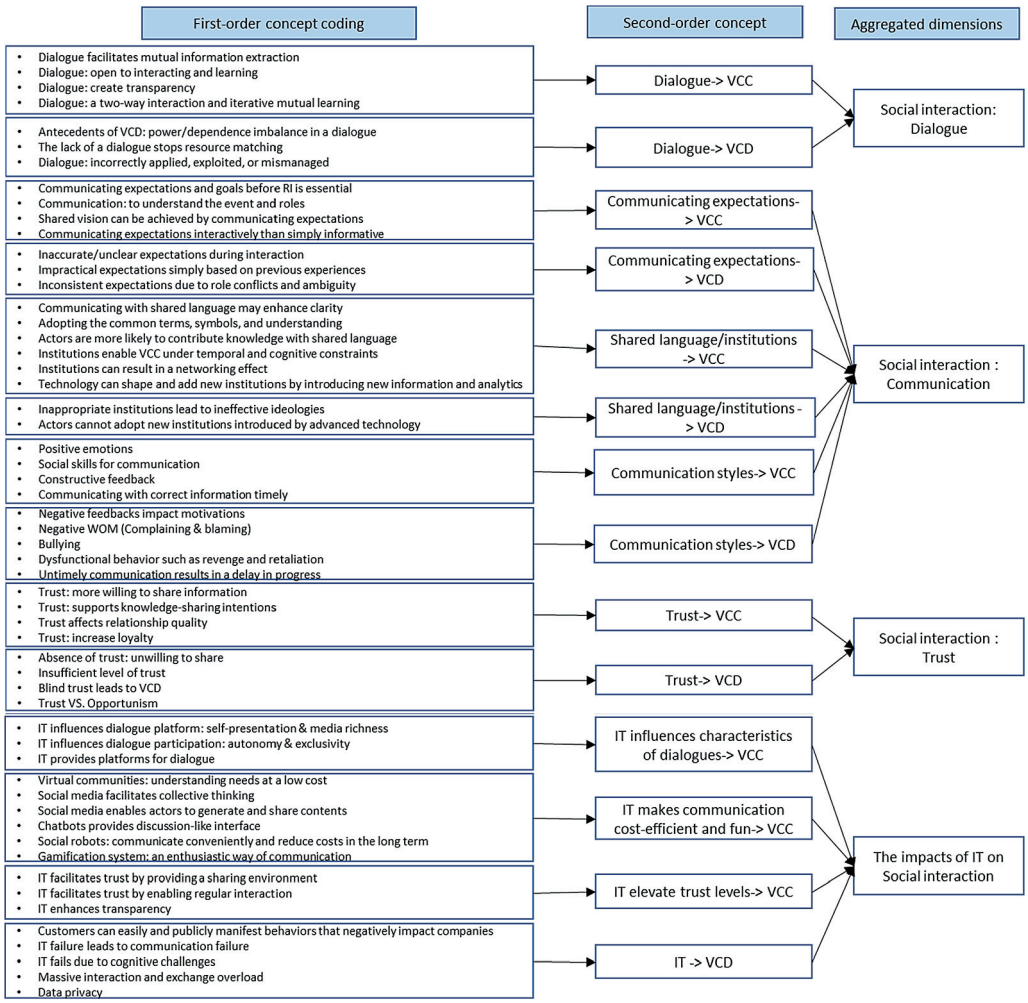

Fig. 2. Final aggregation of the key codes regarding social interaction, resource integration, and IT.

Vargo, 2014, p. 377). Technology can connect operant and operand resources where actors create new technology with their knowledge and skills and then use the new technology to create products or services (Hsiao et al., 2019). Technology, as a process, consequently, does not ensure VCC, implying VCD may also occur. Considering IT as an outcome of human action (resources) and as a process (Vargo & Akaka, 2012) can help better understand VCC and VCD within service systems (Akaka & Vargo, 2014), indicating the functions of IT and how IT impacts the co-creation process.

Social interaction

Social interaction is a "mutual or reciprocal action where two or more parties have an effect upon one another," during which "the customers' and the firms' value-creation processes are simultaneously occurring" (Grönroos, 2009, p. 14). In other words, social interaction represents two-way or multidirectional communication between actors (Tajvidi et al., 2017).

Based on the synthesis and analysis of literature, three social interaction dimensions were identified that could simultaneously lead to VCC and VCD: communication, dialogue, and trust. Next, how social interaction relates to resource integration and IT's role in social interaction is discussed.

Communication

Communication is conceptualized as "an act of transmitting or broadcasting content by an organization that is meant to inform an audience" (Abeza et al., 2020, p. 473). As the core of social interaction, communication is vital for transferring information between actors, allowing understanding others' thoughts and feelings to maintain relationships (Diffley & McCole, 2015). Communication also reduces the risk of exclusion by offering opportunities for actors to understand products and services, exchange information, and engage in co-creation (Canhoto et al., 2016; Säwe & Thelander, 2015). Actors may misunderstand and misbehave based on false

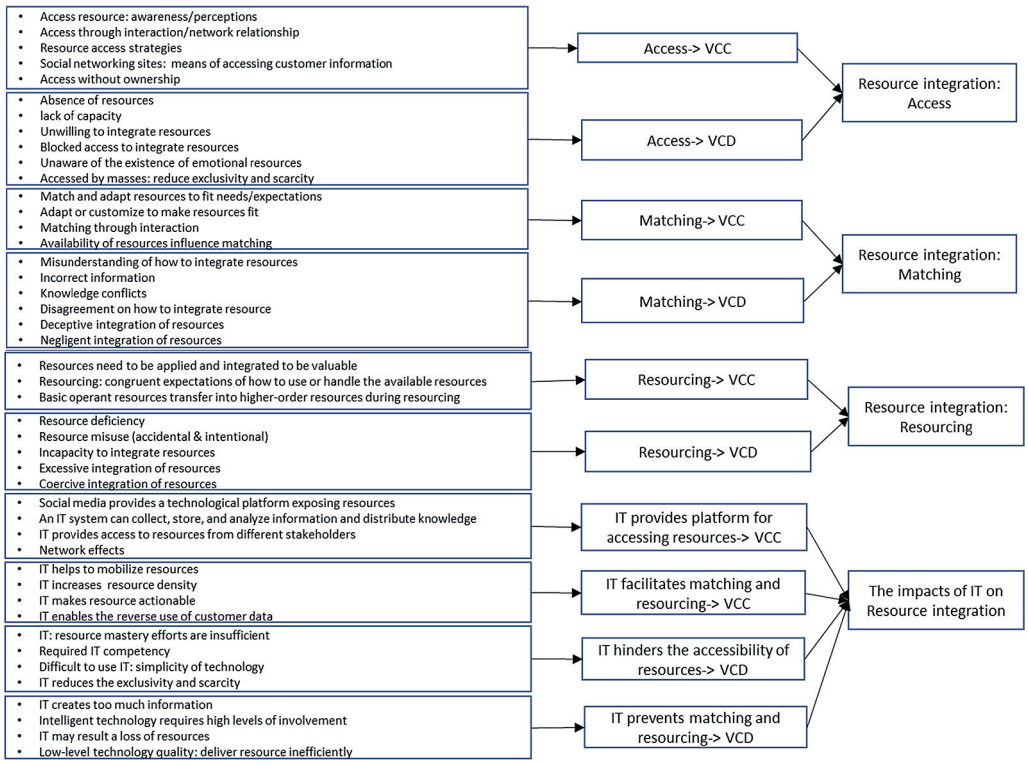

Fig. 2. (*continued*).

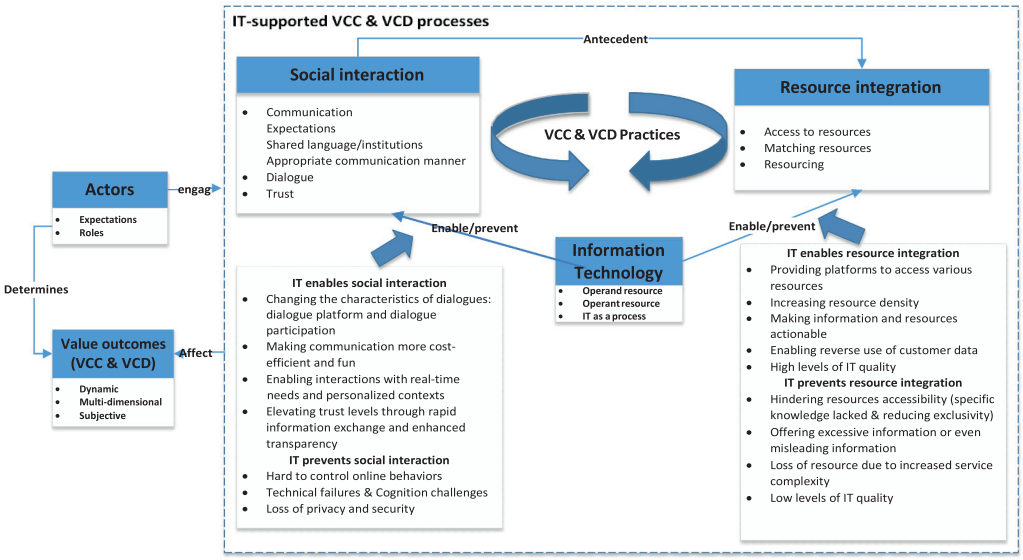

Fig. 3. IT-supported VCC and VCD in a service system.

assumptions owing to a lack of established systematic communication (Makkonen & Olkkonen, 2017) or inadequate communication (Vafeas et al., 2016); therefore, strategic communication among actors is essential for enabling VCC and preventing VCD. Based on the literature, three dimensions of communication are identified: communicating expectations, shared language/institutions, and communication styles.

(1) Communicating expectations

Table 2
Definitions and clarifications of the key constructs.

Concepts	Definition/clarification	Sources
IT-supported value co-creation (VCC) and value co-destruction (VCD)	IT-supported VCC and VCD entail both process (include SI and RI, which is affected by IT and embedded in VCC and VCD practices) and outcome (an increase or decline in at least one of the systems' well-being, determined by actors in specific contexts).	This paper
Service system	'Value-co-creation configurations of people, technology, value propositions connecting internal and external service systems, and shared information (e.g., language, laws, measures, and methods)'	Maglio & Spohrer (2008, p. 18)
Social interaction	'Mutual or reciprocal action where two or more parties have an effect upon one another.'	Grönroos (2009, p. 14)
Communication	"An act of transmitting or broadcasting content by an organization that is meant to inform an audience".	Abeza et al. (2020, p. 473).
Communicating expectations	Informing and calibrating the expectations and goals with other actors accurately and interactively.	This paper
Shared language/institutions	Shared language: Adopting common terms, symbols, and understanding during communications. Institutions: characterized by shared rules and social norms.	Vargo & Akaka (2012) Akaka & Vargo (2014)
Communication styles	Communication styles include exchanging information in a timely and accurate manner and communicating with positive emotions and communicative skills.	Diffley & McCole (2015) Vafeas et al. (2016)
Dialogue	'Interactions, deep engagement and the willingness to act on both sides'	Prahalad & Ramaswamy (2004, p.9)
Trust	Trust is equivalent to "confidence in an exchange partner's reliability and integrity."	Morgan & Hunt (1994, p. 23)
Resource integration	"The incorporation of an actor's resources into the processes of other actors'."	Gummesson & Mele (2010, p. 192)
Access	Access relates to the existence of potential resources and is accessible for actors.	Caridà et al. (2018)
Matching	The fitness of available resources to create higher resource density and strategic interactions.	Gummesson & Mele (2010)
Resourcing	The operation of available resources to transform and reinforce them for mutual benefit based on shared meanings and purposes.	Caridà et al. (2018)
Operand resource	An operand resource requires some action performed on it to have value.	Vargo & Akaka (2012)
Operant resource	An operant resource can act on other resources.	Vargo & Akaka (2012)
Practice	Practices can be understood as "doings and sayings" that actors routinely perform in a given social context.	Echeverri & Skålén (2011)
Value outcomes	Value outcomes refer to an increase or decline in at least one of the systems' well-being resulting from the IT-supported VCC and VCD process. They are multidimensional, subjective, and dynamically determined by actors in specific contexts.	This paper

Throughout value creation, communicating actors' collaboration-related expectations is essential during social interaction. Säwe and Thelander (2015) suggested that informing and calibrating interaction expectations is crucial to know the roles and events in collaboration. This can facilitate VCC by ensuring that the two service systems have congruent expectations about resource use during the interaction (Plé & Cáceres, 2010). Järvi et al. (2018) agreed that providing accurate expectations with correct information lays the foundation for VCC between actors and is important for informing all actors about the project stage and what is expected from them. Accordingly, a shared vision and mutual understanding can be achieved during the interaction (Zhao et al., 2015).

In contrast, VCD occurs without clear expectations or with inconsistent ones. It is impossible for companies to offer satisfying products or services if their customers cannot clearly express their expectations or needs (Järvi et al., 2018). Correspondingly, both organizations and customers may fail to match their understanding and expectations during the interaction (Quach & Thaichon, 2017). Actors may also have inaccurate expectations with inadequate communication simply based on previous experiences (Järvi et al., 2018). For example, when customers meet a new provider, they may expect the same experience with a previous provider. VCD may occur if these expectations are unmet. Moreover, actors may face inconsistency in expectations among different actors owing to role conflicts and ambiguity. For instance, employees may experience role conflicts and ambiguity concerning their task objectives and the client's expectations (Chowdhury et al., 2016). Inconsistent expectations might lead to job stress for employees and negative impacts on the provider–customer relationships and future interactions, leading to VCD (Chowdhury et al., 2016).

(2) Shared language/institutions

Communicating with other actors in a shared language may enhance the clarity and possibility of VCC. By adopting common terms, symbols, and understanding during communications, actors use a shared language to facilitate effective communication and shared understanding with well-established codes of conduct (Zhao et al., 2015). Zhao et al. (2015) found that actors are more likely to contribute knowledge and have greater intentions to continue their memberships when shared language is used in online health communities. Contrarily, incorrect assumptions might occur when actors use different terms and assume that other actors can understand (Järvi et al., 2018). This may result from knowledge asymmetry due to specializations and/or skills (Wang et al., 2019). Hence, actors may have divergent or unclear understandings about the collaboration, leading to failed interactions and decreased well-

being (Canhoto et al., 2016).

Institutions, characterized by shared rules and social norms, are essential in influencing VCC interaction (Jefferies et al., 2019). They enable actors to exchange services and co-create value under temporal and cognitive constraints (Vargo & Lusch, 2016), thus enabling and restraining the actors' actions and interactions and affecting the value derived from those interactions (Akaka & Vargo, 2014). When shared by actors, institutions can cause a networking effect by facilitating a shared environment for various actors in the service system (Beirão et al., 2017). Notably, technology can shape and add new institutions by dynamically introducing new information and analytics, affecting actors' performances and decision-making (Jefferies et al., 2019). Barile et al. (2017) noted that technology such as artificial intelligence could continuously introduce new institutions that can increase coordination by extracting new information and analyzing data. However, VCD may occur when actors cannot adopt new institutions or when the institutions are inappropriate—for instance, actors may act without thinking about or re-evaluating the appropriateness of institutions in the current context (Vargo & Lusch, 2016). Actors may also fail to understand advanced technology's new institutions that require specific knowledge (Vargo & Lusch, 2016).

(3) Communication styles

Literature suggests that communication styles concern whether the communication is timely and accurate, with positive emotions and communicative skills. Exchanging timely and correct information is essential for VCC and promotes coordination between actors (Vafeas et al., 2016). Communicating with up-to-date information is vital to offset any change in understanding the value of other actors in the value network (Diffley & McCole, 2015). Communication with positive feedback, such as likes and positive comments, motivates actors to stay active within social interactions. Even if feedback is not exclusively positive but is constructive for further improvement, it can elicit positive emotions such as a sense of accomplishment and competence (Faullant & Dolfus, 2017). Communicative skills of "listening, explaining, non-assertive response and a demonstration of understanding" contribute to VCC during interactions (Osei-Frimpong et al., 2015, p. 450). For example, by applying these two-way communicative skills instead of only questioning and answering in electronic healthcare settings, both doctors and patients can share detailed information, seek clarification, and eventually enhance opportunities for accurate diagnosis and VCC (Osei-Frimpong et al., 2018).

In contrast, VCD emerges with negative communication styles, such as communicating untimely, spreading negative emotions and word of mouth (complaining or blaming), and power exertion. Untimely communication results in delayed progress, additional costs, and diminishing value realization (Vafeas et al., 2016). Within coordination, untimely communication can involve poorly timed feedback and a lack of synchronized actions (Vafeas et al., 2016). Complaining involves communicating something negative about a product or service, and blaming is a kind of harmful complaining (Järvi et al., 2018). Blaming is especially detrimental when customers blame an organization for no reason or blame others for their own mistakes (Järvi et al., 2018). Organizations may consequently lose reputation and trust, thus losing customers and competitive advantage (Castillo et al., 2020). In addition, communication styles accompanying negative power exertion, where one actor is too dictatorial or domineering during social interaction, may negatively impact VCC (Chowdhury et al., 2016). For example, the agency may be unwilling to engage in VCC when one client exerts power by trying to boss the agency around (Chowdhury et al., 2016).

Dialogue

As an integral part of an interaction, dialogue is defined as "interactions, deep engagement and the willingness to act on both sides" (Prahalad & Ramaswamy, 2004, p. 9). Dialogue facilitates strategically engaging actors in the "joint" creation of value without either party controlling the interaction (Alimamy et al., 2018). Engaging actors in dialogue is a two-way interaction and an iterative, mutual learning process, compared with just listening, allowing, and encouraging (Keeling et al., 2020; Okazaki et al., 2020). Therefore, dialogue is a critical element of VCC, facilitating mutual information extraction (Diffley & McCole, 2015) and being open to learning and interacting together (Truong et al., 2012). In this paper, *dialogue* is used distinctly from *communication*. The former stresses two-way interactions, whereas the latter focuses on communicated content and communication styles during interactions.

VCD, however, may occur when platforms for dialogue are unavailable or used inappropriately (Keeling et al., 2020). Without dialogue, actors cannot interact bidirectionally, leading to asymmetrical information and a greater power imbalance (Vafeas et al., 2016). In such scenarios, all actors do not have the same access and transparency to information and other resources (Prahalad & Ramaswamy, 2004) and are likely to experience misunderstandings. Moreover, a lack of dialogue may disable resource integration in the initial phase of resource matching and lead to VCD (Caridà et al., 2018).

Trust

Trust, "confidence in an exchange partner's reliability and integrity" (Morgan & Hunt, 1994, p. 23), is a fundamental driver of collaborative value formation (Åkesson et al., 2014; Alalwan et al., 2019). For example, patients feel freer and are more willing to share information with doctors when they trust them, resulting from previous experience (Osei-Frimpong et al., 2015; Zhao et al., 2015). Relationship quality and loyalty increase when trust exists between actors (Hajli et al., 2017). Hadaya and Cassivi (2012) found that joint collaborative planning anchored in control and trust can strengthen the relationships between actors in supply chain collaborative systems; this well-structured interaction can be seen as a vital governance mechanism for enhancing the chain of IT VCC. Alimamy et al. (2018) suggested that the opposite of risk is trust. Thus, companies can reduce the risk of purchases by increasing trust during interactions.

VCD occurs when actors interact without trust or when trust is "blind" and with opportunistic behaviors. Without trust, actors will not open up to each other and will be unwilling to share relevant resources (Åkesson et al., 2014). However, when trust is excessive or

"blind," the potential for VCC is limited—for example, actors may commit to resources beyond their needs and experience ineffective resource integration (Wang et al., 2019). An excessive trust may also make one actor too dependent on another. VCD may occur when one actor fails to provide another with promised resources, as the actor affected by this failure may not have formed an alternative plan for achieving the desired outcome (Wang et al., 2019). *Opportunism* describes situations in which people seek their interests in conflict with the principle of VCC and violate their mutual trust with other actors during interactions—for example, clients may act opportunistically by persuading agencies to agree to perform additional tasks without payment (Chowdhury et al., 2016). Although behaving opportunistically at the beginning of a relationship is risky, weak-form opportunism is tolerated in long-term interactions. It is sometimes used as a managerial tactic to maintain long-standing relationships with customers (Wang et al., 2019).

Social interaction toward resource integration

Social interaction between actors is the antecedent of resource integration (Bruce et al., 2019). Through interaction, actors in a network can access specific kinds and quantities of resources (Plé, 2016). For instance, Plé (2016) identified 12 potential resources in a study of service employees' interactions with customers, implying that interactions between actors are a means to gaining access to resources and a platform for integrating them, aiming for VCC (Singaraju et al., 2016). Interactions can also produce varying resources for value formation. For example, transactional big-data resources derive from transactional interactions between customers and companies (Xie et al., 2016) and can thus be analyzed to guide operations and improve companies' future performance. Communication interactions among actors generate data resources for analysis to identify better customer needs and expectations (Diffley & McCole, 2015). Therefore, actors can own physical or digital resources but, without interactions, cannot leverage resources or transfer those resources into cooperative assets because interactions create a foundation for exchanging resources (Truong et al., 2012).

Role of IT in social interaction

Inspired by Jurietti et al. (2017), we summarize that IT changes the characteristics of dialogues from two perspectives: dialogue platform and dialogue participation. A *dialogue platform* is a set of various communication instruments through media richness and self-presentation (Jurietti et al., 2017). This means that IT changes actors' dialogue experiences by enhancing media richness through engaging participants in effective communications and facilitating opportunities for actors to disclose opinions, beliefs, or information on virtual platforms. Alimamy et al. (2018) used the example of augmented reality to show that IT provides dialogues between customers and organizations by incorporating digital elements into the physical world. Such technology makes customers feel informed and connected by offering providers new ways to engage them and providing customers platforms to gain knowledge and information (Alimamy et al., 2018). The development of live communication tools in an online environment also enables the building of dialogues directly between companies and customers (Zhang et al., 2018). For example, Okazaki et al. (2020) illustrated that social media platforms provide dialogues for customers to generate ideas, receive feedback, etc., thus shifting the consumer's role from a receiver to a co-creator. Online engagement platforms provide touchpoints for interactions between actors (Hollebeek et al., 2017; Luo et al., 2019), for example, by providing online forums to discuss various topics and exchange ideas. Therefore, IT empowers actors to be more involved in decision-making with the provided platforms (Osei-Frimpong et al., 2018).

Dialogue participation has two essential aspects: autonomy and exclusivity (Jurietti et al., 2017). IT enables actors to freely engage in interactions and express themselves with a high level of autonomy (Zwass, 2010). Virtual communities, enabled by social media, are usually used as a new means of engaging customers on platforms where they can feel free to enter, leave, and exchange information and communicate about specific products or brands without time and space limitations (Cheung et al., 2020a, 2020b). Complementarily, virtual dialogues are exclusive due to restrictions on the number of participants, which reveals a community's distinctiveness and can lead to increased social identification, an important resource for VCC (Zhao et al., 2015). Storbacka et al. (2016) recognized IT's potential in affecting dialogues through its ability to change the number and variety of actors available for engagement and the volume of interaction joints among actors, enhancing the possibility of VCC. IT impacts on autonomy, and the exclusivity of dialogue participation represents a two-way influence during the interaction process.

Literature indicates that *IT might make communication more cost-efficient and fun.* Virtual communities can support companies in better understanding consumers' needs and expectations in new product development at a low cost and can facilitate collective thinking (Bugshan, 2015). Thus, social media provides both social and informational support for actors involved in online communities and is considered cost-efficient for open innovation when companies need support from external sources (Bugshan, 2015). Chatbots are a new type of interaction through which companies co-create value for customers by making information and data conveniently accessible based on a discussion-like interface (Riikkinen et al., 2018). Specifically, chatbots are supported by an intelligent system that responds to customers with suggested answers in text format automatically and immediately (Riikkinen et al., 2018). Social robots represent another IT-enabled service for convenient communication and can reduce long-term costs for organizations. For example, a nursing home can benefit from using social robots to save money. The robots will not quit working because of sickness or boredom, and they can easily be programmed to adapt to changes in their working environment (Laud et al., 2019). Nobre and Ferreira (2017) argued that IT enables the VCC experience to be more pleasant through gamification systems. An IT-based gamified approach provides an enthusiastic way of communication to stimulate customer motivation to engage and connect with a brand. The richness and pleasantness of the environment increase customer willingness to share their experiences with others, improving communication.

IT can help elevate trust among actors during social interactions through rapid information exchange and enhanced transparency. To build trust, actors need time to know each other and develop relationships through regular meetings. Advances in IT facilitate such interactions by making rapid information exchange possible in digital environments (Alimamy et al., 2018). IT increases customers' trust in brands by providing sharing environments wherein they can see the experiences and knowledge shared by other customers about the

brand (Tajvidi et al., 2017). Textual information shared through online discussions among customers can reduce the perceived risk of using a new brand when they see both its pros and cons (Tajvidi et al., 2017). IT also facilitates trust by enhancing transparency in VCC (Lusch & Nambisan, 2015). For example, an online platform can make a work process transparent by offering customers documentation and how-to guides that are easily accessible on the platform (Hein et al., 2019).

IT enables SI based on real-time needs and offers a personalized context. The development of cognitive technology and big data technology enhances actors' ability to react based on real-time needs by providing dynamic content that involves the actors' ongoing behavior. Instead of pre-defining problem analysis and solution formulations, cognitive technology can provide decision support through the continuous elaboration and analysis of real-time data (Mele et al., 2020). For instance, social robots are used in aged care to improve patient well-being (Laud et al., 2019). Robots continuously document and reconstruct daily data and prepare for future reactions (Mele et al., 2020). Mingione et al. (2020) provided examples of using sentiment analysis to analyze interactions in online brand communities. By identifying pain points and analyzing consumer sentiments at each step of the shopping experience, a company can develop targeted, customer-centered strategies for brand communication (Mingione et al., 2020). These technologies affect actors' behavior in both predetermined and dynamic ways based on the intertwining of different data and information (Mele et al., 2020) and shape the interactions between actors to be more contextual and customized (Storbacka et al., 2016).

However, *IT can lead to negative interactions owing to the ease of spreading negative comments, technical failure, and cognition challenges*. The volume of customer complaints has increased because of the public nature of the Internet, as social media makes communicating opinions with others easier (Castillo et al., 2020; Rosenthal & Brito, 2017). For example, customers can easily and publicly manifest behaviors that harm companies (e.g., by posting negative reviews), and companies can have little control over them (Järvi et al., 2018). Some participants on a crowdsourcing platform mentioned that they suffered from negative feedback and even bullying from others during SIs, resulting in withdrawal and negative emotions (Zhang et al., 2018). Moreover, IT can sometimes facilitate failed communication and lead to VCD. For example, technological failures may occur during a service process and disable the interactions between a customer and an organization. Because customers expect companies to solve system-related issues and maintain robust technology environments, this communication failure can lead to VCD (Zhang et al., 2018). Another example of communicating with artificially intelligent chatbots where IT can fail to interact effectively due to cognition challenges. A common issue is that chatbots cannot understand communication when customers give excessive descriptions and questions or when the exact answer is provided to different questions (Castillo et al., 2020).

IT can also lead to a loss of privacy and security during social interactions. Jayashankar et al. (2019) clarified that farmers were worried about data ownership and privacy when using digital agriculture, which caused relational tensions, thus affecting trust and VCC. Specifically, the yield data were stored in the cloud so the service provider could use the data to undermine farmers' benefits, such as selling information to others. The farmers might then receive massively annoying advertisements. Čaić et al. (2019) asserted that social robots might lead to destructive consequences, such as a loss of privacy, personal data leaks, or monitoring concerns. Hsiao et al. (2019) also mentioned that although mobile payment has a noticeable advantage that enables transactions to happen anytime from anywhere, security issues are involved owing to the vulnerable characteristics of mobile networks (Hsiao et al., 2019). Therefore, IT-related privacy and security issues need to be addressed to avoid failed interactions.

Resource integration

Gummesson and Mele (2010, p. 192) defined resource integration as "the incorporation of an actor's resources into the processes of other actors." Resource integration is a central mechanism in the interactive value-formation process (Caridà et al., 2018). Based on the literature review, three dimensions of resource integration are found in both VCC and VCD processes: access, matching, and resourcing.

Access

To co-create value, actors must first be aware of and have access to potential resources (Caridà et al., 2018; Rusanen et al., 2014). Technological development increases the ease of access to external resources and provides opportunities for further collaboration (Zwass, 2010). For instance, Diffley and McCole (2015) mentioned that social networking sites are an increasingly important means of accessing customer information in the hotel industry. Du and Chou (2020) proposed that actor-to-actor interactions mediated by digital platforms provide access to resources without paying for ownership, which gives customers more options without limitations (Alimamy et al., 2018). For example, actors can access songs and movies through iTunes and Netflix, respectively, without describing full albums or channels through an online collaborative subscription service (Alimamy et al., 2018).

In contrast, VCD might emerge if actors cannot access resources, hindered by an objective absence of resources or a lack of awareness. For example, the absence of information occurs when both parties cannot provide or process information (Robertson et al., 2014; Smith, 2013). This can happen because others are unwilling to provide reciprocal resources or do not have the required skills (operant resource) to be effective resource integrators (Farquhar & Robson, 2017). Laud et al. (2019) claimed that due to biases, stereotyping, prejudices, etc., deliberate restriction or prevention would also block access to resources. Grönroos (2012) added that resource accessibility involves not only physical but also mental and emotional accessibility. Sometimes, actors are unaware of the existence of emotional resources within certain contexts. For example, a waiter might notice a customer's physical disability and wheelchair (a physical resource) but might be unaware of the customer's current mood (an emotional resource; Plé, 2016). In this situation, VCD can occur if one actor cannot access another's emotional resources and unintentionally behaves in an offensive or unexpected way.

Matching

As the guiding principle of resource integration, *matching* is defined as the fitness of available resources to create higher resource density and strategic interactions (Gummesson & Mele, 2010). Resources can be complementary when they diverge in quantity and quality or redundant when they are similar and increase joint volume (Gummesson & Mele, 2010). To improve the well-being of service systems, actors should be able to match and adapt resources to fit their needs (Plé, 2016; Laud et al., 2019). Bruce et al. (2019) proposed that "integrable quality," "the extent to which resources possess the characteristics necessary to support resource integration activities" (p. 182), has affects whether VCC or VCD occurs. Through interaction, employees must assess the customers' available resources against their own and match the two to provide products or services that meet customer expectations (Plé, 2016).

However, VCD occurs when resource matching fails. Actors can fail to match resources owing to knowledge asymmetry. Customers may misunderstand and/or misevaluate a value proposition because an organization fails to communicate clearly (Wang et al., 2019) or cannot provide correct information (Järvi et al., 2018; Laud et al., 2019), leading to failure of resource matching. Actors might disagree based on their own needs when they experience conflicts over integrating their goals, resources, and practices (Osei-Frimpong et al., 2015). Laud et al. (2019) identified two other manifestations of deliberate misintegration during the adapting stage: deceptive and negligent integration of resources. Actors might fail to match or adapt resources given purposeful concealment, misrepresentation, inattention, or carelessness by at least one actor in the resource integration process (Laud et al., 2019).

Resourcing

Resources in isolation do not have value unless they are integrated or applied through interactions (Robertson et al., 2014). Resourcing involves the operation of available resources to transform and reinforce them for mutual benefit based on shared meanings and purposes (Caridà et al., 2018). During resourcing, basic operant resources transfer into higher-order resources, improving the sustainability of an organization's competitive advantages and leading to VCC (Paredes et al., 2014). The organization can benefit from a synergic effect in which the integrated resources become more valuable and less easy to imitate than distinctive resources before integration (Hadaya & Cassivi, 2012).

However, VCD might emerge when resources are deficient or misused intentionally or accidentally (Farquhar & Robson, 2017). Plé and Cáceres (2010) defined the term *misuse of resources* as integrating and/or applying resources in an unexpected and/or inappropriate manner. For example, customers may deliberately break a product and blame a provider, even if the provider offers support and information about how to correctly use the product (Järvi et al., 2018). Plé and Cáceres (2010) identified four cases of intentionally misusing resources: role conflict, employee misbehavior, distribution-channel management, and customer misbehavior for their benefit while co-destroying a company's value. In contrast, customers may misuse or be unable to use an organization's resources owing to resource deficiency, such as when they lack adequate knowledge, skills, or time to operate the resources during the interaction, leading to VCD (Castillo et al., 2020; Farquhar & Robson, 2017).

The role of IT in resource integration

IT can enable resource integration by offering a platform to access various resources. For example, Chang et al. (2017) described an electronic medical record–exchange system as a platform that combines multiple resources in medical settings, thus providing actors with more opportunities for VCC by increasing their ability to identify and exploit information from other actors. For example, e-health services can address the unaffordability and inaccessibility of health care and improve medical treatment and diagnosis but also patients' involvement in the service (Robertson et al., 2014). In another vein, technologies such as self-service (Du & Chou, 2020) and social media platforms offer actors accessibility to resources from other interacting actors. They also facilitate the integration of those resources' economic, technical, and social features into the creation of new resources (Abbate et al., 2019; Singaraju et al., 2016; Zadeh et al., 2019). The network effect is more apparent when more adopters use a platform, thus providing more valuable resources for VCC (Yu et al., 2019).

IT can also contribute to VCC by enabling resource matching and resourcing through increased resource density and reverse use of data. Beirão et al. (2017) suggested that IT-enabled platforms increase resource density (the mobilization of a combination of contextually relevant resources for a situation; Blaschke et al., 2019) and foster resource integration through efficient and effective service exchanges. IT as an operand resource helps with seeking and bundling appropriate resources and facilitating resource matching within and across service platforms (Paschen et al., 2020). For instance, digital tools empowered by cognitive technologies affect actors' resource integration processes by making information and resources actionable through the active design of choice content (Mele et al., 2020). For example, smart wearables provide multiple pre-determined choices (resources) based on the real-time data in wearable devices to meet consumers' needs (Mele et al., 2020). This opportunity is based on a design that enables the tangible component to acquire and set information, whereas the intangible component analyzes the data and creates new resources (Mele et al., 2020). The efficiency and effectiveness of VCC are enhanced by these technologies, with increasing resource density and easy access to appropriate resource bundles (Xie et al., 2016). Big data technologies are usually combined to enable extra information based on the analysis of massive data and multiple interactions, which increases the richness of resources and assists actors in making better decisions by providing updated resources. Similarly, Sorensen et al. (2017) argued that social media posts could be used as resources to plan and adapt social media strategies to enhance customer engagement. The reverse use of customer data represents a new way of exploring the potential of customer data and facilitating customers' VCC processes (Riikkinen et al., 2018).

However, VCD occurs when *IT hinders the accessibility of resources owing to a lack of specific knowledge, or eases resource access to masses, reducing exclusivity*. IT causes VCD when actors' resource mastery efforts are insufficient (Breidbach & Maglio, 2016). Diffley and McCole (2015) claimed that appropriate IT infrastructure and employees' IT competencies, such as skills and knowledge, are

required to use IT resources effectively. For instance, knowledge and intellectual resources are particularly needed in the early stages of the high-tech market to avoid VCD (Park & Lee, 2015, 2018). The simplicity of the technology, which is the degree of difficulty when using and adapting technology, is considered an important aspect of the company's technology-related collective strength (Sarker et al., 2012). Therefore, companies planning to apply IT-related systems for VCC with customers should also consider the ease of use of the technology and the knowledge required by the targeted customers. Moreover, VCD might occur as the development of technology eases resource access to the masses, which reduces the exclusivity and scarcity of certain communities. For example, some customers do not want to associate with different social classes. Still, they cannot avoid this when joining brand communities or when brands are tagged on social media (Quach & Thaichon, 2017).

IT may also lead to VCD in matching and resourcing. IT can create an environment with excessive or even misleading information. Consequently, actors might spend more time obtaining the correct information or match resources with the wrong information in unexpected ways (Bruce et al., 2019). Thus, an organization must facilitate resource matching by providing technology that sorts, relates, and considers actors' expectations of its resources. Some authors have argued that using IT may also waste resources. For example, service complexity increases when artificial intelligence technology is applied because it always requires customer participation (Castillo et al., 2020). As customers spend time and effort with higher levels of involvement, unmet expectations may cause frustration and anger, resulting in a loss of resources, such as patience and time (Castillo et al., 2020). VCD might also occur when the technology quality cannot meet customers' needs. For instance, the simplest form of chatbot only provides low levels of support for customers, usually supplying the same type and amount of information because low-level technology quality can only adopt AI and reverse the use of customer data in a limited manner (Riikkinen et al., 2018). In this respect, these chatbots fail to offer additional resources and to deliver resources efficiently. Advanced chatbots with effective data analysis or predictive support add value by saving customers' time and helping them access new resources to integrate into their VCC processes (Riikkinen et al., 2018). Therefore, knowing the functionality, reliability, and other characteristics of the technology itself is essential (Barrutia et al., 2016; Sarker et al., 2012). For example, Hu et al. (2019) suggested four dimensions to check technology quality for social commerce: attractiveness, reliability, accessibility, and customer flexibility.

VCC and VCD practices

The synthesis and analysis of the literature reveal that practice is essential for VCC and VCD (Ardley et al., 2020; Du & Chou, 2020; Korkman et al., 2010; Russo-Spena & Mele, 2012). Practices can be understood as "doings and sayings" that actors routinely perform in a given social context (Echeverri & Skålén, 2011). Through interactions, practices lead to experiences that have both positive and negative value formations. Practices in service systems are dynamic and can consequently enable transitions between VCC and VCD by mapping different routes for interactions (Von Becker et al., 2015). Therefore, practices are vehicles for realizing value (Frow et al., 2016) and can provide a critical lens and processual insights for understanding VCC and VCD in various social contexts (Korkman et al., 2010).

Resource integration and social interaction studies allow researchers to connect practices and value formation more explicitly. Vargo and Akaka (2012) suggested that value is co-created by enacting practices. Resource integration is the central feature of practices because when actors integrate resources by enacting practices, they interact with other actors and contribute to VCC processes. Some authors proposed that value does not preexist; instead, it comes from distinct social practices where resources are integrated (Skålén et al., 2015; Vargo et al., 2015). VCC practices shape service ecosystems by influencing resource integration through enabling access to new pools of resources and offer opportunities for additional resource integration (Frow et al., 2016; Korkman et al., 2010). Suseno et al. (2018) found that practices related to value creation arise from actors' interactions within a digital innovation ecosystem. In studying interactions among actors, the point of departure is the observability of the interactional practice (Echeverri & Skålén, 2011). Luo et al. (2015) indicated that VCC practices strengthen interactions among community members, bringing members closer and increasing their loyalty to a brand. Practices also implicitly coordinate interactions in value formation by assigning meanings to signs and signifiers (Akaka & Vargo, 2014). For example, by involving a brand community in value-creating practices, community members can better understand the brand's offerings and share brand experiences (Sanz-Blas et al., 2019). Therefore, understanding practices enables analyzing the social connections among actors and their situated contexts (Russo-Spena & Mele, 2012). Companies can plan their practices to enhance customers' brand community experiences and facilitate value (Sorensen & Drennan, 2017).

Cabiddu et al. (2019) identified two types of VCD practices based on cross-case analysis: practices related to resource integration and social interaction. The former demonstrates what actors do when managing the integration of cultural and economic capital, such as improperly using knowledge or economic resources. In contrast, the latter depicts how actors act to decrease social and symbolic capital, such as not interacting under social rules or damaging actors' legitimacy. By identifying these VCD practices, managers can quickly respond and make decisions accordingly to avoid risks and potentially destructive collaborations (Frow et al., 2016).

Value outcomes

Value outcomes refer to an increase or decline in at least one of the systems' well-being resulting from IT-supported VCC and VCD processes. However, a misalignment practice does not always lead to permanent VCD because coping mechanisms such as a realignment strategy can potentially turn VCD into VCC, framing dynamic value outcomes (Laud et al., 2019). Furthermore, Pinho et al. (2014) noted that value is dynamic owing to three kinds of interdependencies: dynamic role interdependency (the actor's role may change over time), temporal interdependency (SI occurs sequentially), and self-interdependency (VCC depends on the

individual's perceptions and actions). Thus, VCC outcomes are interdependent and dynamically influence actors within the service system (Beirão et al., 2017; Laamanen & Skålén, 2015).

Value outcomes are also multidimensional and subjectively determined by individual actors. Several scholars have discussed values based on distinct categories. For example, Kim et al. (2020) examined how other customers' VCC and VCD behaviors can influence focal customers' perceived value, including economic, emotional, epistemic, and social value. Keeling et al. (2020) described how longitudinal VCC and VCD occur based on the value of efficiency, excellence, and esteem in health service interactions. An actor's perception determines the value outcome. The same practice may lead to VCC for one actor and VCD for another, depending on the actor's expectations and perceptions of the context (Kim et al., 2020). Therefore, value is a function of actors' articulated sets of preferences (Echeverri & Skålén, 2011); it is collectively created but subjectively assessed (Säwe & Thelander, 2015).

Discussion and implications for research and practice

Our study contributes to the literature by improving the understanding of VCC and VCD from various new perspectives and addressing the identified research gaps. Thus far, previous literature reviews have mainly focused on VCC and summarized the themes and theories that have gradually developed and the definitions, drivers, and consequences of VCC (Galvagno & Dalli, 2014; Leclercq et al., 2016). However, little is known about VCD, let alone the relationship between VCC and VCD. Our study fills this research gap, as considering the possibility of VCD is essential for providing a critical understanding of value formation and thus avoiding "co-creation myopia." Notably, this is the first study on IT-supported VCC and VCD constructs in a service system with congruent definitions, addressing the incongruence of constructs from previous literature and providing a shared language for understanding relevant phenomena. Our findings indicate that VCC and VCD should entail both process and outcome perspectives. The same social interaction and resource integration process may result in different outcomes for different actors involved. One actor may experience the dynamic transition of VCC and VCD throughout the collaboration. Diverse consequences would be ignored if we only focus on the process perspective. In contrast, the outcome-oriented perspective might ignore the dynamic changes of actors' experiences and perceptions during the process.

The constructs articulate the key elements underpinning IT-supported VCC and VCD via social interaction and resource integration and their interconnections. This is important because "the whole is best understood from a systemic perspective and should be viewed as a constellation of interconnected elements" (Fiss et al., 2013, p. 2). Therefore, the arrangement of the elements or attributes, rather than the nature of social interaction and resource integration, leads to VCC and/or VCD. The identified constructs can assist in the empirical analysis because well-defined constructs are easier to operationalize and test (Suddaby, 2010). As VCC and VCD are abstract concepts, the findings enable us better to understand VCC and VCD with actionable and observable elements. Furthermore, this study broadens the existing knowledge on value formation by adopting the service system perspective, responding to the call of Smith (2013) for a network/system approach to understanding VCC and VCD and Farquhar and Robson's (2017) call to examine how VCC and VCD operate within a service system. Our findings explain how actors, processes, IT, and value outcomes are connected at the system level, suggesting a strategic analysis of VCC and VCD in service systems.

Our paper also contributes to the existing literature by examining the role of IT in the interactive value-formation process, an under-researched topic, as most previous studies have focused on either a business or management perspective. This study thus responds to the call for more IT-related research regarding the value formation process (Blasco-Arcas et al., 2014) because technological advancements have profoundly changed the nature and process of value formation (Akaka & Vargo, 2014). In particular, how IT affects the underlying elements of social interaction and resource integration is identified and explained, suggesting that IT can both enable and prevent the value formation process in various ways. Investigating the role of IT as an outcome and a process and the mechanism of how IT contributes to VCC and VCD facilitates an understanding of how digital tools can initiate innovation and bring challenges. This is particularly useful for understanding IS phenomena such as IT innovation and IS analysis and design, as IT does not always ensure benefits. This perspective complements current literature by considering the negative role of IT instead of only the positive one.

Moreover, our research has implications for research by indicating many exciting avenues for future study. We explain how these themes relate to our findings and why addressing them is important based on five different themes. Possible research questions and research approaches are also suggested:

Theme 1: Actors in VCC and VCD. The service system perspective limits the understanding of VCC and VCD from an individual-level perspective, which is essential as they offer insights into distinct groups of people and facilitate strategizing based on target groups. Therefore, future research can examine, for example, the characteristics of individual actors in a specific context and the relationships and tensions in the VCC and VCD process. More detailed research questions of interest can be: •Do the actors' attributes (e.g., gender, education, nationality, etc.) influence the VCC and VCD process? •How do actors' roles affect their perceptions of VCC and VCD processes and outcomes? •How can the relationships and tensions among actors affect the VCC and VCD process? •Do tensions always lead to VCD? •Do more actors mean more resources but more difficulties in interaction? Either conceptual or empirical research may enrich the results based on different research questions. Besides, the complexity of value formation also indicates that different value outcomes may arise in different contexts, suggesting studies on different cultures, countries, and industries.

Theme 2: IT types and IT quality related to VCC and VCD. Our findings indicate that diverse technologies and IT quality levels affect VCC and VCD in various ways, suggesting that future research should further study the phenomenon and understand the embedded mechanisms. This can be useful for managers to integrate better resources based on distinct needs since different technologies represent different choice architectures. Without a value-based classification of IT, it is difficult to link a specific type of IT to a particular value in the VCC process. Therefore, we argue that classifying IT from a value perspective is critical in understanding IT-supported VCC and VCD. In addition, it is vital to understand the mechanism of how the IT quality level affects VCC and VCD,

trading investments for benefits. To this end, managers can make the best choice by deciding what levels of IT quality should be provided to customers at the lowest cost while meeting customers' basic expectations. Potential research questions can be: • How do different types of IT contribute to VCC & VCD? E.g., IT-based on its function/features, the applied contexts, the outcomes pursued, etc., and how they affect diverse forms of value. • How to define IT quality level and how to measure it? •Does the IT quality level mediates the effect of IT on VCC and VCD? A mixed-methods approach of qualitative and quantitative research may enrich the results.

Theme 3: VCC and VCD process in different stages. Our research provides a theoretical foundation for understanding the IT-supported VCC and VCD, but the lack of empirical support suggests new possibilities for studying the relevant phenomenon. As one case, the dynamic IT-supported VCC and VCD processes indicate that a longitudinal study may provide valuable insights. Understanding these processes across the lifecycle phases of a digital service is essential so managers can distribute their resources strategically and focus on interactions that maximize benefits in certain stages. Example research questions can be: •Do the elements of resource integration have diverging impacts on value outcomes in varying life-cycle stages? •Does social interaction differ in different stages? •Does IT play different roles in different phases of a project? A longitudinal study is encouraged to investigate these issues. Furthermore, conducting case surveys to collect empirical data on VCC and VCD would considerably contribute to the respective research communities. These empirical studies would provide a foundation for illustrating the actual realization of VCC through IT-supported platforms and services and informing design considerations in such IT-supported instances.

Theme 4: Measurements of relevant constructs. Our study only identified "what" and "how" elements of social interaction and resource integration can contribute to IT-supported VCC and VCD, indicating that more research is needed to focus on the assessment and measurement of relevant concepts. Research on these issues can offer insights for designing the service to ensure resources and high-quality interactions. Thus, prospective research is motivated to measure the constructs of IT-supported VCC and VCD to realize appropriate modular architectures and IT applications. An example of research questions can be: •How to measure VCC and VCD from the perspective of process and outcome? •How to measure the effects of IT on VCC and VCD? E.g., does the frequency of IT use affect VCC and VCD? •How to measure the effects of social interactions on IT-supported VCC and VCD? E.g., is the frequency of interactions as important as their quality? •How to measure the effects of resource integration on IT-supported VCC and VCD? •Do the "levels of access" of resources have varying effects on the value formation process, and how to measure them? An empirical approach may enrich the results by applying either qualitative or quantitative research.

Theme 5: VCC and VCD related to IS design and governance. Our findings have identified many IT-related perspectives that can lead to VCC and VCD, which are essential to consider when designing an IT-based platform for interaction to minimize potential negative outcomes. However, there is a lack of evidence-based design knowledge on service systems to enhance VCC (Böhmann et al., 2014). Research for planning and executing strategic design and development can focus on questions such as •How to design a platform with less system complexity but maintain its functions for VCC? •How can community governance and customer freedoms of behavior be balanced within the online community from the perspective of VCC and VCD? •How can an interface be designed to efficiently collect and analyze customer data while considering privacy and security? Researchers and managers can target these questions to comprehend and facilitate VCC factors. This can provide valuable insights for IS design and governance. Finally, we encourage future researchers to extend further or revise our framework to study IT-supported VCC and VCD. Design science research may be an attractive approach, as IT-supported VCC and VCD not only involve understanding a service system's actors' behavior but are also related to the design, development, and management of an IT platform or artifact. Design science research may thus offer a suitable analytical framework for understanding factors regarding the process of innovation (Nambisan, 2013; Peffers et al., 2007), where our framework of IT-supported VCC and VCD in service systems could offer a unique perspective.

Our findings have several implications for practice. First, IT offers organizations various options to co-create value with customers and can be considered a strategic, complementary asset that enables organizations to integrate resources from external actors. However, our findings suggest that co-creation activities through IT should be carefully planned, designed, and evaluated to facilitate positive results because IT might also hinder value formation. For example, companies can create an online community to increase access to many potential customers. However, they need to maintain a certain degree of exclusivity among community members to feel valued and unique. Moreover, designers and developers should consider system complexity, ensuring that it is easy to use and does not require inordinate knowledge and skills to work. If knowledge is required, the platform should provide clear instructions using shared languages and institutions. Sorting and searching functions should be provided when the amount of available information is large. For instance, big data and cognitive technology can provide analytical results from massive data and respond to customers' real-time needs. Organizations need to evaluate IT quality and make a trade-off between the benefits and limitations, combining customers' expectations. In doing so, potential VCD practices can be identified and transited into VCC before developing and introducing products into service contexts (Čaić et al., 2019).

Besides, our findings suggest that organizations should carefully construct their social interaction strategies to minimize unwanted responses. Despite the significant role of IT in facilitating interactions and resource integration, many aspects still require human effort. For example, organizations can arrange relevant training to increase service employees' skills in rapidly analyzing social contexts and frontline employees' communicative skills. When these preemptive tasks are undertaken, skilled employees can quickly and accurately identify resources during interactions, reduce organizational costs, and increase productivity. In many cases, IT can facilitate interactive dialogue and create trustworthy environments to build long-term relationships with customers and other stakeholders. Online brand communities can be used to communicate with customers and collect customer feedback and innovative ideas. Big data technologies can collect and analyze customer data to better understand customers' needs and market changes. However, our findings indicate that organizations should set up governance rules to avoid groundless, negative word of mouth, cyberbullying, and rules for the appropriate use of customer data to ensure security and privacy. Organizations should also be prepared for IT failures and challenges and plan reaction mechanisms to reduce customer complaints when such problems occur.

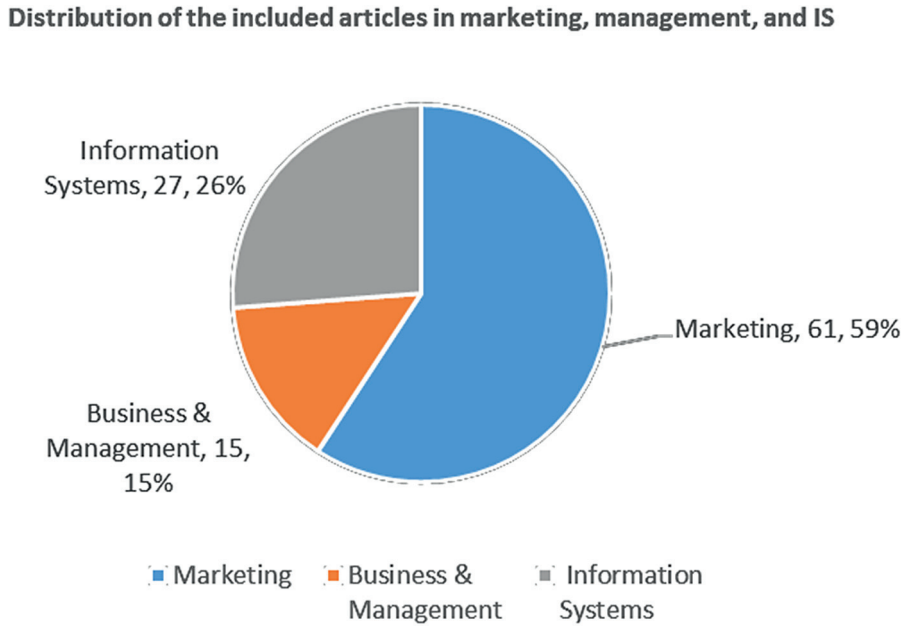

Fig. B1. Distribution based on fields.

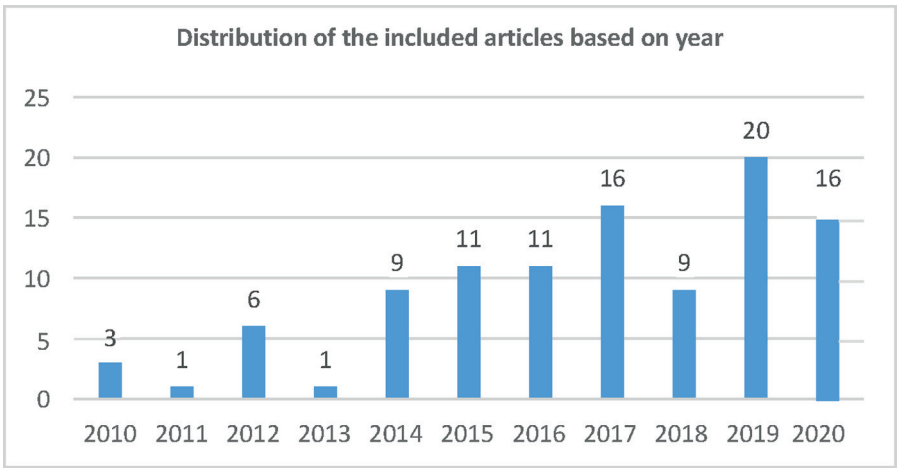

Fig. B2. Distribution based on year.

Communication with customers after an IT failure is also important for rebuilding customers' confidence in the organization and planning actionable VCC practices. Finally, our findings will allow organizations to recognize a negative situation quickly, adjust their strategies toward desired outcomes, and inspire system and service development.

Concluding remarks and limitations

Our study proposes a conceptual framework depicting the constructs of IT-supported VCC and VCD in a service system. This study is the first to suggest that IT-supported VCC and VCD are triggered by two interdependent processes—social interaction and resource integration—affected by IT and embedded in interactive value-formation practices, leading to VCC and VCD outcomes. Literature review reveals that communication, dialogue, and trust are the elements of social interaction, and resource integration involves access, matching, and resourcing. This conceptual framework also asserts that IT significantly affects social interaction and resource integration in the VCC and VCD processes. IT enables social interaction by providing platforms for dialogue and communication, changing the dialogue characteristics with enhanced media richness and autonomy, making communication more cost-efficient and personalized based on real-time needs, and elevating trust with rapid information exchange and enhanced transparency. Meanwhile, IT enables resource integration by providing platforms for accessing and matching updated and enriched resources and facilitating the analysis

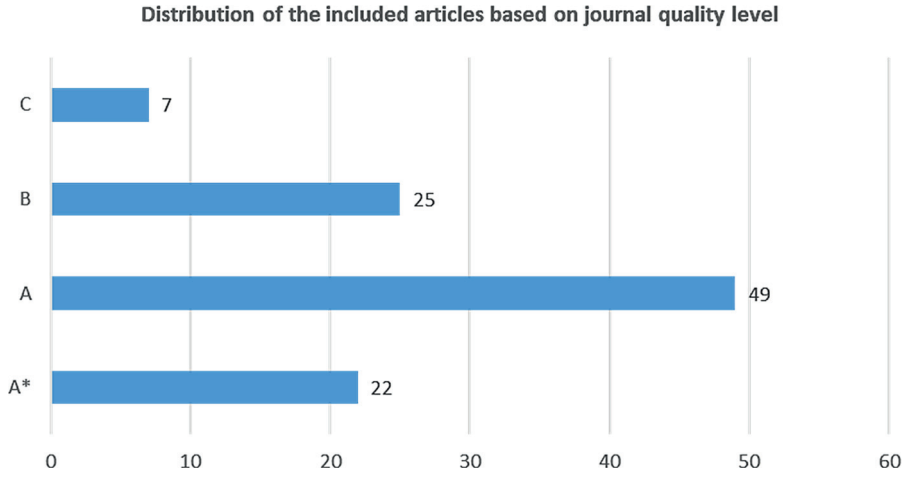

Fig. B3. Distribution based on journal quality levels.

Table B4
Distribution of related topics in the included article.

Topics discussed	Number of articles
VCC	103
VCD	31
VCC&VCD	31
SI	71
RI	54
SI&RI	22
VCC&VCD&SI&RI	8

and reverse use of customer data. However, firms should also consider the negative effects of IT, such as easier spreading of negative comments, security and privacy issues, technical failures, low IT quality, and system complexity.

Our research has some limitations. Like all literature reviews, the breadth of this study is limited by the research design, such as the keywords used for retrieving data. For example, VCC and VCD might also be represented by terms not included in our keyword searches, such as *customer engagement*, *co-production*, and *service failure*. We encourage other researchers to cover more potentially relevant literature using different search terms while carefully checking the relevancy based on the definition of the studied phenomenon. Moreover, although limiting the sample within the ABDC list and AJG ensures the overall quality of the included articles, it may also lead to some articles being excluded, such as conference papers and book chapters. Researchers should, therefore, consider this a trade-off when selecting literature for their studies.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix B:. Overview of the sources selected

Of the 103 papers included in this study, 61 are related to marketing, 27 are related to IS, and 15 to business and management (see Fig. B.1). This distribution is roughly equivalent to the proportion of publications on VCC and VCD in these fields. Most of the included articles were published in 2019. Only few were published in 2010–2013 (see Fig. B.2). This year-based distribution of the included articles indicates the increasing attention in recent year.

The ABDC (2019) journal quality list describes four quality categories based on explicit and rigorous review processes: A* (highest quality) and A, B, and C (lowest quality). Of the 103 papers included, 22 were published in A* journals and 49 in A journals (cf. Fig. B.3). Including majority of high-quality articles from leading representative publications enhanced the reliability and generalizability of our findings.

Table B.4 shows the distribution of the relevant topics (VCC, VCD, RI, and SI) mentioned in the included papers. VCC was discussed in all articles, and 31 discussed both VCC and VCD. SI-related papers (71) were more than RI-related papers (54), with 22 papers discussing both. Only 8 of the 103 papers covered all four topics. Notably, though VCC, VCD, RI, and SI are evidently interrelated, minimal research has been conducted to understand their connections, which lends significance to this work.

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II

INVESTIGATING DIGITAL HEALTH SERVICES FROM VALUE CO-CREATION AND CO-DESTRUCTION PERSPECTIVE: MULTI-DIMENSIONAL VALUE FORMATION PROCESSES AND OUTCOMES

by

Li, M., Aartolahti, E., Janhunen, M., Tuunanen, T., Heinonen, A., Jämsä, T., and Luimula, M.

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III

MANIFESTATION OF STRUCTURAL TENSIONS IN USING THE GEOCACHING ARTIFACT: CONTRADICTORY POLES OF VALUE CO-CREATION AND VALUE CO-DESTRUCTION

by

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