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**A Bibliometric Review of Service Ecosystems Research: Current Status and Future
Directions**

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Abstract

Purpose- Service ecosystems are becoming an important domain of joint value creation and resource integration, and the literature in the field is burgeoning. The recent growth in the literature warrants consolidating the findings of the existing literature, summarizing the recent development, and identifying avenues for more impactful future research on the topic. Our primary objective is to map the service ecosystems research domain and synthesize insights by integrating qualitative content analysis with quantitative data analysis.

Design/methodology/approach- This paper employs algorithmic bibliometric review (quantitative) with VOSviewer and R-package and content analysis (qualitative) on 119 service ecosystems articles published between 2003 and 2020.

Findings- The bibliometric analysis uncovers the critical research domains, knowledge trajectories, influential authors and journals, and author networks in the field. The content analysis identifies the four most important research themes (value creation, change triggers, strategic and entrepreneurial action, and institutional embeddedness and agency) and provides an integrative view of the dynamics among these themes. We also find the need for more empirical and theory grounded research around these four themes. Furthermore, based on the review, we discuss the disciplinary identity of the service ecosystems field and suggest interesting future research opportunities, along with ideas for useful empirical approaches and theoretical extensions.

Originality/value- Our comprehensive analysis offers an overview of the evolution and identity of the service ecosystems research and identifies several promising opportunities for future research on service ecosystems.

Keywords Service ecosystems; Bibliometric review; Systematic literature review; Service-dominant logic

1. Introduction

Services and service-dominant logic have taken a central place in marketing strategy and economic production (Rabetino *et al.*, 2017; Vargo & Lusch, 2008, 2017). *Service ecosystems* have been facilitating this development as service providers increasingly rely on ecosystems due to the increasing complexity of contemporary service provision, and researchers relatedly recognize the systemic nature of value creation (Akaka *et al.*, 2013; Frow *et al.*, 2014; Koskela-Huotari *et al.*, 2016). Ecosystems enable allocating and coordinating complementary tasks among partners, as well as collective organizational learning and pooling of resources (Shipilov & Gawer, 2020). Ecosystem approach has also been found especially useful in highlighting the interdependence between different actors in co-production and co-creation of value (e.g., Battistella *et al.*, 2013; Beirão *et al.*, 2017; Aarikka-Stenroos & Ritala, 2017). As a result, research on service ecosystems has witnessed unprecedented growth in the last couple of decades.

Although early references to service ecosystems date back to 2003, the concept gained visible attention from 2010 onwards. A seminal study is by Vargo and Akaka (2012), where they define service ecosystems as “relatively self-contained, self-adjusting systems of resource-integrating actors connected by shared institutional logics and mutual value creation through service exchange.” Service ecosystems differ markedly from other ecosystem conceptualizations. While mainstream ecosystem scholars at large focus on the complementary production side of value (Shipilov & Gawer, 2020), service ecosystems highlight the role of users as crucial actors embedded in the institutional context of value co-creation processes (Vargo *et al.*, 2015). As such, service ecosystems as a construct involve a unique focus on customer value creation and the co-evolving system of interdependent actors and their actions, making such value creation possible. Furthermore, service ecosystems can create value for all the actors by appropriate resource integration, where a balance needs to be achieved in view of competing objectives and priorities (Vargo & Lusch, 2017). Value creation in service ecosystems emanates from the value potential intrinsic in actors’ own resources, which can

be realized in interactive exchange among ecosystem actors (e.g., Akaka *et al.*, 2019; Lusch *et al.*, 2016). Accordingly, service ecosystems are becoming an important construct for B2B marketing and management literature (Vargo *et al.*, 2017; Aarikka-Stenroos & Ritala, 2017), and a better understanding of service ecosystems can enhance researchers' and practitioners' understanding of these complex value creation contexts.

However, despite the advances in the literature, service ecosystems research is still in its early stages, and we are missing an understanding of how the research field is constructed. The rapidly growing interest in the topic and the substantial theoretical and methodological diversity in this research domain make it difficult to track its evolution. Research findings on service ecosystems remain fragmented, and the interplay between major research streams on service ecosystems is not clearly explained. Thus, we suggest that the research domain would significantly benefit from a bibliometric review to further understand the structure of the domain, as well as different dynamics within it. Unlike the descriptive literature reviews that often lack analytical rigor, the bibliometric method offers a mathematical and structural review with quantitative accuracy, mitigating subjective bias (Ali & Gölgeci, 2019). The existing void can hamper the advancement of service ecosystems research, if scholars do not have sufficient knowledge of the network of informal communication links that usually occurs amongst the most prominent researchers in this line of research (cf. Vogel & Güttel, 2013). Furthermore, the lack of an integrative view of the dynamics between major themes comprising service ecosystems research can inhibit a logistic understanding of the phenomenon.

Our primary objective is to map the service ecosystems research domain and synthesize insights of service ecosystems as a ground for future research. Driven by the core objective and the ability to utilize both quantitative and qualitative approaches, we pose the following research questions (RQs):

1. *What is the interplay between major research themes in service ecosystems research?*

2. *How has research on service ecosystems evolved over the past twenty years?*
3. *What are the methodological developments in exploring service ecosystems?*
4. *Which are the predominant underpinning theories on service ecosystems research?*
5. *What are the opportunities for more impactful research in the field?*

Based on a bibliometric review of 119 articles published between 2003 and 2019, our paper is one of the first to specifically undertake such an analysis in the area of service ecosystems. We provide systematic and quantitative data on research activity in this domain, reveal prominent authors, articles, countries, and journals. Furthermore, utilizing a qualitative content analysis method, we develop an integrative framework of key research themes and dynamics in service ecosystem literature accompanied by discussion on field-specific and cross-disciplinary implications and future research opportunities, as well as practical implications.

2. Service ecosystems: A brief overview

Service ecosystems research has grown out of a larger body of research on the concept of “ecosystems” that was originated in biology and was borrowed to management and innovation research (Ganco *et al.*, 2020; Järvi *et al.*, 2018; Phillips & Ritala, 2019; Shipilov & Gawer, 2020). The key premise of ecosystems research is that socioeconomic entities (i.e., individuals, groups, and firms) are interdependent constituents of a larger system, and they interact with each other within such a system with spatial and temporal boundaries. As the “systems” component of the ecosystems concept indicates, these sets of interacting and interdependent constituents self-organize to form an integrated whole for a specific purpose (Shipilov & Gawer, 2020), such as service creation and delivery (Beirão *et al.*, 2017). As such, the ecosystems concept has helped raise awareness and sparked attention to new ways of value creation and capture beyond conventional theories that emphasize resources of discrete organizations and clear industrial boundaries (Adner, 2017).

Ecosystems are also characterized by coevolution (Zhang & Wang, 2018; Aarikka-Stenroos & Ritala, 2017), the interplay between macro-level phenomena and micro-level actors (Audretsch *et al.*, 2019), and the dynamic pendulum of collaboration and competition (Adner *et al.*, 2013). Therefore, there are certain similarities between ecosystems and network concepts, which have been analyzed significantly in management studies (Alvedalen & Boschma, 2017). Nonetheless, despite some potential overlaps, ecosystems and networks denote different concepts: networks involve clear (often contractual) structural relationships, while ecosystems involve a system of interdependencies and complementarities in a broader system of actors (Shipilov & Gawer, 2020). Furthermore, Wieland *et al.* (2012) offer a good argument in this concern by saying that “a system view differs from a network view in that each instance of resource integration, service provision, and value creation, changes the nature of the system to some degree and thus the context for the next iteration and determination of value creation.” This constant change increases the complexity associated with ecosystems, and relatedly, benefits from systems lenses to understand such complexity (see also Phillips & Ritala, 2019).

Service ecosystems are a type of ecosystem that underlines the systemic and institutional characteristics of value (co-)creation, emphasizing service exchange and resources (Koskela-Huotari *et al.*, 2016; Vargo & Lusch, 2017; Vargo *et al.*, 2015). Research on service ecosystems is inextricably intertwined with affiliated product-service networks (Blair *et al.*, 2019; Gebauer *et al.*, 2013; Rabetino *et al.*, 2017) and service-dominant logic research streams (Hsu *et al.*, 2019; Lusch & Vargo, 2014; Vargo & Lusch, 2008, 2017). Therefore, service ecosystems are seen as an integral element of the servitization journey and effective service provision within contemporary socioeconomic and technological conditions (Palo *et al.*, 2019; Rabetino *et al.*, 2017).

Service ecosystems are multi-layered structures active at macro, meso, and micro levels (e.g., Akaka *et al.*, 2013; Vargo & Lusch, 2018). The macro-level of service ecosystems mostly comprises the generic socioeconomic and physical setting in which firms operate. System-level value creation

is done mostly through institutionalized rules (e.g., Chandler *et al.*, 2019). At the meso level, each relevant stakeholder identifies actors from the macro environment with whom interaction is expected to result in the exchange of unique knowledge and the development of relatively strong relationships (Beirão *et al.*, 2017). The meso stage is crucial in the service ecosystems perspective because it connects the macro-level with the micro-level representing individuals and individual capabilities, attitudes, and behaviors in service ecosystems. As a result, the actors with relevant resources can share them using direct service-for-service exchanges (Lusch *et al.*, 2016).

Shared institutional logics are another key feature of service ecosystems. Lusch and Vargo (2014) stressed that, in service ecosystems, “resource-integrating actors connected by shared institutional logics” influence value creation by those actors. Hence, the importance of institutions is paramount in service ecosystems because they offer the guidelines that frame interactions among actors for value creation (e.g., Akaka *et al.*, 2019; Akaka *et al.*, 2013). It has further been argued that institutions are essential as they set the rules for co-production of service offerings and actors to engage in mutual service provision (e.g., Akaka *et al.*, 2019; Lusch *et al.*, 2016).

Along with institutions, which are also referred to by the scholars as social features of service ecosystems (e.g., Akaka *et al.*, 2019), symbolic, technological, human, and interactive dimensions of service ecosystems are also critical (e.g., Akaka *et al.*, 2019; Vargo *et al.*, 2015).

The symbolic dimension of service ecosystems deals with shared means of communication (signs, values) among actors and stakeholders (Akaka *et al.*, 2013; Kurtmollaiev *et al.*, 2018). Such shared means of communication clarify the expectations of different actors regarding value co-creation and interaction and have been found to play an indispensable role in the success of service ecosystems (Tuominen *et al.*, 2020).

Furthermore, the technological dimension (such as digital interfaces, platforms, and communities) is vital for service ecosystems (Koskela-Huotari *et al.*, 2016). Due to the increased visibility and importance of technology in all spheres of services, some scholars have referred that

the technological dimension can even influence institutions and associated rules (Chandler *et al.*, 2019; Koskela-Huotari *et al.*, 2016). It is important to mention that technology has often been highlighted as an operand resource for value creation in service ecosystems due to its potential to shape organizational routines (Lusch & Nambisan, 2015; Sklyar *et al.*, 2019). This perception of technology in service ecosystems context has significant implications, especially for resource integration dynamics as well as knowledge sharing aspects (e.g., Sklyar *et al.*, 2019; Cassia *et al.*, 2020).

The human dimension is also crucial for service ecosystems (e.g., Barile *et al.*, 2017; Vargo & Lusch, 2018) because it brings in skills that lead to the development of resources (services) which actors can exchange to create value. Scholars have further stressed that the human dimension creates shared value in service ecosystems and that humans have the capability and means to alter institutional norms that define the rules of the game (e.g., Vargo & Lusch, 2018). Skills, experiences, and knowledge, which are closely linked to the human dimension, depict operand resources closely linked to competitive advantage in service ecosystems context (e.g., Polese *et al.*, 2019).

Finally, the interactive dimension deals with the context of service exchange for value co-creation (e.g., Vargo & Lusch, 2008; Vargo & Lusch, 2018). The interactive dimension of service ecosystems is essential for resource integration within a single service ecosystem and multiple service ecosystems (Akaka & Vargo, 2015). It has been argued that in service ecosystems, value is created based on the social settings (Vargo & Lusch, 2008) where the interaction takes place between operand and operant resources (e.g., Polese *et al.*, 2019). Hence, both kinds of resources are important for operation and value co-creation in service ecosystems generally and at individual dimensions level.

Beyond various dimensions of service ecosystems, it is also worth noting the connection between service ecosystems and B2B marketing and policy. Within the B2B marketing domain, service ecosystems have typically been examined in relation to value (co-)creation, value proposition,

and institutional theory (Meynhardt *et al.*, 2016; Vargo *et al.*, 2015). That said, innovation and technology have also been examined in connection with service ecosystems and B2B marketing (Leminen *et al.*, 2018). On the marketing policy front, Trischler and Charles (2019) applied service ecosystems lens to public policy analysis and design, conceptualized public policy as a means to enable service by coordinating multiple actors' value co-creation activities to address public problems, and explained how service ecosystems could be a basis for relevant stakeholders' engagement in change initiatives.

Furthermore, within the marketing domain, service ecosystems have also been increasingly examined in relation to digitalization and digital ecosystems (e.g., Kopalle *et al.*, 2020; Sklyar *et al.*, 2019). For example, Sklyar *et al.* (2019) examined digital servitization through service ecosystems perspective and found that within-firm centralization and integration in service ecosystems play an instrumental role in the capacity to organize for digital servitization. Likewise, Kopalle *et al.* (2020) noted that legacy firms could develop capabilities for digital customer orientation by distilling key insights on digital natives and harnessing their digital ecosystems based on the dynamic portfolio of goods and services. Their findings reveal a close interdependence between service ecosystems and digital ecosystems and offer initial insights on as to how the two types of ecosystems interact. In fact, the brief review of service ecosystems, their dimensions, and their connection to B2B marketing and policy presented thus far builds a good base for us to go further in-depth on this concept by performing a bibliometric review, which is presented in the next section.

3. Research methodology

In line with the research objective, we follow both bibliometric review and qualitative content analysis for this systematic literature review. For bibliometric analysis, we jointly used two freely available software, including (1) VOSviewer Software (van Eck & Waltman, 2009) and (2) word cloud with popular R-Package (Hornik & Grün, 2011). VOSviewer allows automatic and algorithmic

analysis of articles, exploring keywords' clusters, co-authorship, and most productive authors in the field (van Eck & Waltman, 2009). On the other hand, R-package helps generate word clouds more rigorously and observe knowledge shift or flow in a field over time (Hornik & Grün, 2011). Such an automatic and quantitative analysis greatly enhances the analytical rigor and reliability of findings compared to the traditional method of literature review, which is often based on a pre-coding schema or narrative analysis and increases the risk of researcher bias. In addition, the content analysis was performed by screening the articles to observe the evolution of research, methodological development, and underpinning theories in service ecosystems.

This study's data were retrieved from Scopus, which is most widely accepted and contains thousands of scholarly publications (Ali & Gölgeci, 2019). The publications were collected on 10 November 2020. Initially, a range of terms with various combinations was tried, for example, 'service ecosystem' AND 'service-dominant logic' AND 'service platforms,' 'service innovation.' However, the combination of 'service*' AND 'ecosystem' terms resulted in the maximum number of articles related to service ecosystems research. The terms were identified in the title, abstract, keywords of the publications. The initial search produced 231 articles from the Business, Management, and Accounting field published in the English language only. Peer-reviewed scholarly journal publications possess a greater quality and reliability of findings than not peer-reviewed publications or practitioner-oriented outlets (Tang & Musa, 2011). Therefore, we excluded conference papers, book series, trade publications, reports, books, and undefined publications, leaving a sample of 206 articles.

To further ensure the inclusiveness of the articles, we read the title and abstract of each paper. In so doing, we crosschecked each other's evaluation results to enhance the objectivity of the selection process and ensure interrater reliability. In this process, we removed 28 papers related to ecology and biology disciplines. Furthermore, we jointly removed 59 papers that use ecosystem

terminology tangentially and papers that do not primarily examine service ecosystems, arriving at a refined set of 119 most related articles for final analysis.

The publications in Scopus cover large information, such as publication year, title, keywords, authors, source title, DOI, subject area, and references, among others. The data of 119 publications from Scopus were transferred to the CSV file to be used for quantitative analysis with VOSviewer and R-package.

4. Findings

This section presents both bibliometric analysis (VOSviewer coupled with R-package) and content analysis.

4.1 Bibliometric analysis

4.1.1 Keywords co-occurrence analysis. Addressing RQ1, this section explores the most prominent topics, also called clusters of interrelated items, in which current research on service ecosystems exists. To identify various clusters/topics from a large dataset, VOSviewer offers three techniques: 1) co-citation–clusters contain pairs of articles which are frequently co-cited other articles; 2) bibliographically coupling – clusters constitute pairs of articles that reference a third common article in their bibliographies; 2) co-occurrence – clusters of frequently co-occurring keywords (van Eck & Waltman, 2009).

The cluster from the first two techniques contains the authors' initials and presents a relatively complex mechanism to identify the topics. By contrast, the clusters from co-occurrence analysis frequently contain co-occurring keywords, allowing them to identify key topics more vividly (Ali & Gölgeci, 2019; van Eck & Waltman, 2009). Therefore, in this study, co-occurrence analysis has been used as a preferred tool. The co-occurrence analysis generates clusters of keywords based on their association strength, which is calculated using a natural language processing algorithm as follows:

$$AS_{ij} = \frac{c_{ij}}{w_i w_j}, \quad (1)$$

In the above equation, " c_{ij} denotes the number of co-occurrences of items i and j and where w_i and w_j denote either the total number of occurrences of items i and j or the total number of co-occurrences of these items. It can be shown that the similarity between items i and j calculated using (1) is proportional to the ratio between on the one hand the observed number of co-occurrences of i and j and on the other hand the expected number of co-occurrences of i and j under the assumption that co-occurrences of i and j are statistically independent" (van Eck & Waltman, 2009, p. 531). Using the above index, the software identifies the links between similar keywords and group them into clusters with different colors). The articles within a cluster of similar keywords focus on a similar or closely related issue/theme (Ali & Gölgeci, 2019; van Eck & Waltman, 2009). After necessary formatting (van Eck & Waltman, 2009), we uploaded a dataset of 119 articles to the software and selected the 'co-occurrence' function, generating four distinct research clusters (see Figure 1). These clusters are grouped as follows. **The red color cluster** represents actors engaged in and means for *value creation* in service ecosystems. It mainly includes such keywords as engagement platforms, value proposition, value co-creation, actor engagement, and customer engagement. **The yellow color cluster** represents *change triggers* in service ecosystems. It includes such keywords as digitalization, digitization, internet of things, servitization, diffusion, and business model innovation. **The green color cluster** represents *strategic and entrepreneurial action* in service ecosystems. It encompasses such keywords as strategy, system thinking, value in-context, entrepreneurship, and radical innovation. **The blue color cluster** represents *institutional embeddedness and agency* in service ecosystems. It covers such keywords as institutional work, co-production, agency, innovation ecosystem, business ecosystem, actor-to-actor engagement, and service experience. These research clusters and their implications for service ecosystems have been profoundly discussed in section 5.1.

Researchers often find it challenging to remain current with the fast-evolving research in their research area. Nonetheless, some early career scholars are specifically overwhelmed by the number of studies they need to read to identify research gaps and select an appropriate research topic. The

information from the bibliographic coupling can help provide insight on similarities in authors' areas of work and particular topics of interest in service ecosystems research. Such analysis can inform about prospective research avenues and support researchers in gauging the potential for collaboration with leading authors in the area.

----- **Insert Figure 1 here** -----

Further, to view a broad picture of the research trajectories/shift or the knowledge flow over the past 17-years, we utilized the word cloud, a popular R-package function. Word cloud with R-package finds the most frequently used keywords in the sampled articles. Two word clouds were generated to allow a visual interpretation of main keywords and their shift between the two main periods, covering 2003–2014 and 2015-2020. We tried different tools but found that R-package is the most reliable tool to generate word clouds more rigorously and observe the shift in research over time. As such, the Data file for each period was imported to a popular R-package supported with default Dirichlet hyperparameters (Hornik & Grün, 2011). Next, the following R-package functions were applied to create word clouds: tm for text mining; snowballC for text stemming; Wordcloud2 for generating word cloud images; RColorBrewer for color palettes.

Note that the uneven distribution of years between the two periods is attributed to the uneven evolution of research in the field. That is, service ecosystems is a nascent research area, and, hence, most articles emerged in the past 5-year. As such, we tried to compare the recent (2015-2020) and previous (2003–2014) literature.

As shown in Figure 2, the word clouds show a noticeable shift between the first (2003-2014) and second periods (2015-2020). In the first period (2003–2014), the popular keywords include service, ecosystem, service, dominant, logic, value, chain, collaboration, network, platform, conceptual, qualitative, relationship management, co-creation, engagement, internet, technology, value, proposition, quality.

----- **Insert Figure 2 here** -----

Although most keywords of the first and second period are similar, the new keywords that appeared in this period (2015-2020), include servitization, transformation, internet of things, Industry 4.0, empirical, survey, multi-methods, modeling, circular, economy, artificial intelligence, digitalization, service, innovation. Indeed, these new keywords show the current research on service ecosystems.

We believe that keywords represent fundamental concepts or topics of research and, hence a shift in keywords shows a significant move in research between two decades. The visualization of word clouds provides a broad picture of the research dynamics that can be a useful tool for prospective researchers, particularly early-career searchers or Ph.D. students, who are keenly interested in research on service ecosystems but still confused on how to kick start.

4.1.2 Authors and their cooperation. Co-authorship analysis is an effective method to uncover key researchers and their cooperative networks in the field. The co-authorship pattern of 262 authors was analyzed with VOSviewer. The analysis of the co-authorship network is shown in Figure 3. The size of the circles shows the number of documents by an author, and the distance between two authors shows the level of collaboration amid them – less distance, more collaboration. The colors denote the collaborative clusters.

In the co-authorship network, eight major clusters among principal authors are evident: green, grey, aqua, yellow, orange, purple, red, and blue. The most notable collaboration in each cluster is as follows: Green cluster exists between Vargo, Akaka, and Lusch; brown cluster involves Quero and Venture; aqua cluster mainly embraces Parida and Visnjic; yellow cluster includes McColl-Kennedy and Frow; orange cluster exists between Maglio, Nenonen, and Breidback; purple cluster covers Mele and Pels; red cluster embraces Edvardsson and Reynoso; blue cluster between Tronvoll and Kowalkowski. It seems that other researchers are connected to and expand upon these leading scholars in service ecosystems.

----- **Insert Figure 3 here** -----

Next, we identified the most productive authors by ranking them based on the total number of publications on service ecosystems (see Table 1). The analysis demonstrated that Stephen L. Vargo is identified as the most productive author with 12 publications on service ecosystems. The next more prolific author is Bo Edvardsson, with seven publications. With six publications, Melissa A. Akaka was ranked the third most productive author in the field, was found the fourth most prolific author. Identifying the fourth-ranking author was also challenging as we had three authors, Rober F. Lusch, Janet R. McColl-and David Sörhammar, with each producing five publications. Thus, we used the total number of citations, where Rober F. Lusch was selected with the highest citation score among the five authors. The same issue was identified for the fifth ranking, where each of the six authors had four papers. However, Pennie Frow received the highest citation and hence stood fourth most prolific author. While citations were used for ranking purposes, we duly acknowledge all these authors' valuable contributions in developing the research on service ecosystems.

----- **Insert Table 1 here** -----

Further, the analysis of authors' collaboration revealed that around 88 % (105/119) publications had two or more authors, while only 128 % (14/119) had a single author. This indicates that there is a collaborative research culture in the service ecosystems domain, as multi-authored articles constitute a significant portion of the sample. A high number of multi-authored articles indicate a greater opportunity for future collaboration and a high likelihood of further literature growth on the topic. It has also been noted that most of the multi-authored publications received more citations than single-authored ones, encouraging more research collaboration.

4.1.3 Countries' collaboration. The analysis of countries' collaboration revealed that researchers in 35 countries published 119 articles. The countries with no collaboration were automatically removed from the network. The analysis produced three major clusters of countries collaborating in service ecosystems research (see Figure 4). The primary cluster (red) of cooperation exists between the UK and Europe. The next prominent cluster (green) cluster, albeit it looks like an isolated island, includes

the USA. Finally, a smaller cluster (blue) shows the collaboration between Canada, Mexico, and Norway.

----- **Insert Figure 4 here** -----

The analysis shows that service ecosystems research is mainly governed by the UK, Europe, and the USA. Astonishingly, the USA alone published 31 articles (See Figure 5) without collaboration with any other region or country.

----- **Insert Figure 5 here** -----

These findings show geographical silos or colonial patterns of current research work on service ecosystems. Nonetheless, many global companies, such as Apple, Walmart, Zara, and Amazon, outsource materials and human resources globally. This trend of globalization needs cross-region/continent research collaboration and knowledge exchange to comprehend the dynamic challenges of international markets and develop more holistic and reliable solutions. In particular, Asia hosts favorite places for outsourcing, including Southern Asia, such as India, Bangladesh, Nepal; north-east Asia, such as Japan, South Korea, as well as the regions of Hong Kong, Taiwan; and south-east Asia, such as Singapore, Malaysia, Indonesia, Philippines, and Vietnam. Thus, we highlight the need for more research collaboration between Western and Asian researchers.

4.1.4 Journals' citation analysis. Journal citation analysis is a common method for evaluating the most influential journals in the area. Citation analysis allowed us to determine the popularity of a journal by counting the frequency by which other works on service ecosystems cite it. Citation analysis of 41 journals helped identify the top 10 most influential journals (see Table 2). These journals make up about 79% (94) of all service ecosystems articles, including *Journal of Business Research*; *Journal of Service Management*; *Journal of Product Innovation Management*; *Industrial Marketing Management*; *European Management Journal*; *International Journal of Research in Marketing*; *Journal of Business & Industrial Marketing*; *Marketing Theory*; *Journal of Service Marketing*; *Journal of International Marketing*.

----- **Insert Table 2 here** -----

The results show that marketing management journals currently dominate the service ecosystems research field. However, publication channels could be expanded, including supply chain management (SCM), operations, general management, and accounting journals. In particular, despite a strong connection of service ecosystems research with both marketing and SCM, it is astonishing that there is still a scarcity of research at the intersection of marketing and SCM. Likewise, our findings reveal that research on service ecosystems lacks within the fields of international business, information systems, and strategy. However, these fields can offer new angles to service ecosystems and examine the concept via a new approach that would advance the knowledge on the issue. For example, while information systems and strategy can explicate digital platforms' role in service ecosystems, international business research can reveal interesting insights into national innovation systems' role in service ecosystems. This knowledge can be useful for potential researchers interested in publishing articles on service ecosystems and are looking for valuable outlets for knowledge building and publication of their research.

4.2 Content analysis

The content analysis of this study builds upon descriptive statistics to depict the evolution of extant research, methodological approach, and underpinning theories used in service ecosystems research from 2003 to 2020.

4.2.1 Evolution of service ecosystems research. This section outlines the developments in the extant literature regarding the publications' distribution over time, aiming to observe the evolution of research interest. As evident in Figure 6, the topic of service ecosystems is relatively new, where the first academic publication appeared in 2003. Surprisingly, no article was found in 2004 and 2005. In 2006, one academic article was published, while 2007 and 2008 have not seen a publication. Two articles appeared in 2009, while no published research was reported in 2010-2011. Thus, from 2003 to 2011, there was an uneven growth in literature on the topic. Steady growth in literature can be seen

after 2011. Particularly, from 2015 to 2020, there has been a dramatic evolution in literature with an almost seven-folds (107 articles) increase in the number of publications compared to 2003-2014 (12 articles). This sharp increase in recent times is a sign of very high acknowledgment and popularity of service ecosystems research among the academic community.

----- **Insert Figure 6 here** -----

4.2.2 Methodological approaches. The review of existing research methods could improve researchers' understanding of current research methods applied and opportunities for further research, contributing to the methodological development of research on service ecosystems.

The content analysis of articles revealed that a range of methods was applied to service ecosystems research. The contribution of different research methods includes *Qualitative case study* (59 articles, for example, Blasco-Arcas *et al.*, 2020; Parida *et al.*, 2019); *Conceptual* (38 articles, for example, Edvardsson *et al.*, 2018; Tuominen *et al.*, 2020); *systematic literature reviews (SLRs)* (5 articles, for example, Kohtamaki *et al.*, 2019; Meynhardt *et al.*, 2016); *modeling* (8 articles, for example, Cahyandito & Ramadhan, 2015; Choi, 2018; Gonçalves *et al.*, 2019); *survey research* (6 articles, for example, Barac *et al.*, 2017; Kleinaltenkamp *et al.*, 2018); *mixed-methods research* (Sarmiento & Simões, 2019); *longitudinal study* (Liu *et al.*, 2020). In short, the service ecosystems research lacks methodological pluralism and joint application of multiple methods, with qualitative case study research and conceptual research dominating the field.

Thus, the analysis reveals that 50 % of articles on service ecosystems build upon qualitative research. As such, it can be derived that research on service ecosystems is still in its embryonic stage and relies on insights gained directly from the field. Although qualitative research adds new knowledge and enables analytical or conceptual generalization (Creswell, 2013), it has limitations in terms of statistical generalization due to the limited sample sizes. Thus, there is a need for complementary quantitative research and application mixed-methods to achieve greater methodological pluralism and enhance the possibility of generalization and to further advance

knowledge in the field. Indeed, while survey research is an effective method allowing researchers to collect data from a larger population, the share of survey-based quantitative research in our sample was only 6 %. Moreover, around 7 % of publications use mathematical modeling, drawing upon assumptions and projections of a future scenario. Furthermore, only one study (0.84%) adopted either mixed-methods or a longitudinal research design. Finally, about 32 % of articles are based on conceptual studies and SLRs, which help to develop and integrate the field, but call for empirical validation and inquiry. These methodological approaches suggest that the field is still in an early stage, involving a strong emphasis on conceptual development and (mostly) qualitative inquiry over the key features of the phenomenon.

4.2.3 Theoretical underpinnings. A theoretically underpinned research could validate and expand an existing theory or even develop a new theory (Ali & Gölgeci, 2019; Dubey *et al.*, 2015), thereby adding novel knowledge to the extant literature. Theory provides a strong premise for a systematic understanding of a phenomenon and allows us to be more consistent with existing facts than common sense. Referring to “system of constructs...in which constructs are related to each other by propositions” (Bacharach, 1989), theory is considered a *sine-qua-non* for developing all research domains, including service ecosystems research.

Despite numerous benefits of theoretical grounding, only 13 (11%) papers explicitly used a particular theory as a basis for examining service ecosystems. For instance, utilizing neo-institutional theory, Gonçalves *et al.* (2019) devise an empirical framework explicating how individuals believe in the institutional logic of a network in interactions with suppliers and how the business interactions are shaped through the individual behaviors. Drawing upon institutional theory, Hartmann *et al.* (2018) re-define selling from the perspectives of the interaction between actors aimed to create and maintain the places at which service could be effectively bartered for service with a current orientation of institutional procedures and appropriate relations. Koskela-Huotari *et al.* (2016) find innovation as a practice that occurs with modifications in the institutional settings involving resource

reconfiguration in service ecosystems. Koskela-Huotari and Vargo (2016) examine that several partly contradictory institutional measures jointly exist in service ecosystems, thereby offering business partners with sense-making settings of resourcefulness. These examples highlight the prominent role of institutional theory in service ecosystems research.

Nonetheless, the use of other theories also provides valuable insights into service ecosystems. For example, adopting the theory of the firm, Kohtamaki *et al.* (2019) explore that digitalization shapes firm boundary decisions, which not only requires an alignment of a firm's business goals with other firms within an ecosystem. Employing the theory of public service ecosystems, Petrescu (2019) tests the service ecosystems view on the public service logic exploring the benefits and barriers in managing public services. Adopting practice theory, Palo *et al.* (2019) expound the servitization method as a contestation of a firm's existing and dominant emerging business models. Utilizing structuration theory, Alexander *et al.* (2018) examine multiple views of actors' engagement that expands understanding of diverse engagement contexts and implies that harmonizing numerous roles may disengage actors. Integrating activity theory and engagement theory, Hepi *et al.* (2017) report the enablers and barriers in engagement between social service providers and their clients in an indigenous setting. Following ecosystem theory, Chen *et al.* (2014) analyze how systems thinking and fundamental quality management principles are advanced. Quero *et al.* (2017) develop a plan for value co-creation through a value propositions perspective with various actors within service ecosystems. Adopting sociological theory, Simmonds and Gazley (2018) examine the change and stability experienced by the realization of multi-level causal power systems.

Notwithstanding the examples provided above, the reality is that most of the extant studies (106) on service ecosystems are without explicit theoretical grounding. To further reinforce the advances in service ecosystems research, it is essential to move beyond producing exploratory, non-theoretical and descriptive research, engage in further theory testing and merging efforts, and apply frameworks in practice. Additionally, the majority of the papers underpin a single theory. However,

integrating more than one theory and exploring their complementary characteristics (the missing traits) can help expand the knowledge by investigating multi-dimensional concerns of service ecosystems.

5. Overview of the field, discussion, and future research opportunities

The rise of research on service ecosystems not only demonstrates the new models of value creation and capture within service industries and the increasing interdependencies between and engagement of multiple actors to provide relevant value. It also highlights the challenge of capturing the overview of this diverse research domain, its knowledge trajectories, temporal and spatial dimensions, and evolution. As such, this review helps to achieve a state-of-the-art view of service ecosystems research. In doing so, it provides an opportunity to consolidate our understanding and grounds for future research.

In this research, we map the knowledge trajectories in service ecosystems literature, analyze the nature and span of the networks among researchers examining service ecosystems, and address the empirical context of the research domain. We conducted a bibliometric review of relevant articles on service ecosystems published between 2003 and 2020 and lay out the interplay between critical articles, citations, authors, journals, and research settings. We also examine the evolution of service ecosystems research in B2B marketing with particular attention to theoretical underpinnings and methodological approaches.

5.1 Key themes in the literature

This section discusses the key themes in the literature (as identified earlier; see Figure 1) and builds an integrative framework highlighting the most important discussions within these themes (Figure 7).

----- **Insert Figure 7 here** -----

The first major research theme illustrated with red color in Figure 1 represents actors engaged in and means for *value creation* in service ecosystems. It includes keywords, such as value proposition,

value co-creation, actor engagement, engagement platforms, and customer engagement. We see this as the “hard core” of service ecosystem research, where the center of attention takes place among two dynamics: how different actors, including service providers and customers, build, realize and consume value propositions (Frow *et al.*, 2014), and how they engage in value co-creation activities in service ecosystems (Vargo & Akaka, 2012). The literature around this theme has examined different aspects, structures, and means for value creation by service ecosystem actors. For example, Sarmiento and Simões (2019) examine trade fairs as engagement platforms and delve into the interplay between physical and virtual touchpoints in enabling value creation in such platforms. Likewise, value propositions are highlighted within this cluster (e.g., Frow *et al.*, 2014) and examined as a dimension of different actors’ interactive value creation activities across multiple levels in service ecosystems. Furthermore, the engagement between actors, including customers, embedded in service, is an integral element of value creation in service ecosystems, as highlighted by Blasco-Arcas *et al.* (2020). Consequently, value creation has attracted substantial research interest in the service ecosystems research domain and is examined holistically by accounting for the path-dependent and multifaceted nature of value creation as it emerges from the interactions between various actors across multiple levels of analysis.

The second major research theme illustrated with the yellow color cluster represents *change triggers* in service ecosystems. It includes such keywords as digitalization, digitization, internet of things, servitization, diffusion, and business model innovation. Here, digitalization and related processes can be portrayed as enabling technologies that provide affordances (Autio *et al.*, 2018; Yoo *et al.*, 2010) that drive service ecosystem change at the intersection of production and service creation. Likewise, innovation, including business model innovation and the diffusion of innovation within service ecosystems, are part of this research theme. For example, on the digitalization and new technologies front, Sklyar *et al.* (2019) investigate the transition toward digital servitization in service ecosystems and present the organizational change processes, highlighting the key role of

organizational integration, centralization, and service-centricity in implementing digital servitization. Likewise, Leminen *et al.* (2018) explore the interplay between the internet of things and heterarchical service ecosystems and discuss three evolutionary paths of new business model emergence: opening up the ecosystem for industry collaboration, replicating the solution in multiple services, and return to a closed ecosystem as the technology matures. Furthermore, Watkins *et al.* (2015) explain how interactions between a set of distinct, nationally bounded institutions support and facilitate technological change and the emergence and diffusion of innovations, while Kohtamaki *et al.* (2019) explicate digital servitization business models of firms in the context of ecosystems and shed light on how digitalization transforms the business models of solution providers. This research theme constitutes a notable cluster in service ecosystems research. It provides valuable insights into the intertwinement between digitalization, the internet of things, and business model innovation as change processes and tools in service ecosystems.

The third major research theme illustrated with the green color cluster represents *strategic and entrepreneurial action* in service ecosystems. One might assume that strategy and entrepreneurship are downplayed in service ecosystems due to their complex nature and the focus on customer value creation (Vargo & Lusch, 2017; Vargo *et al.*, 2015). Nonetheless, this research theme highlights that scholars should not overlook strategy and entrepreneurship phenomena in service ecosystems. Indeed, service ecosystems' key characteristics of coevolution (Zhang & Wang, 2018; Aarikka-Stenroos & Ritala, 2017) and the interplay between macro-level phenomena and micro-level actors (Audretsch *et al.*, 2019) can be captured by a perspective where the system and its constituents are entwined in quest of strategic and entrepreneurial value creation. This research theme encompasses such keywords as strategy, system thinking, value in-context, entrepreneurship, and radical innovation. It illustrates the multidisciplinary nature of service ecosystems research and connects different insights into the interplay between strategy, entrepreneurship, and service ecosystems. Two important dynamics within the research theme arise: entrepreneurial action is

needed to identify entrepreneurial opportunities (Baron, 2006) and scale up the ecosystem to capitalize on those opportunities, while strategic action is needed to identify the competitiveness of the ecosystem in its environment (i.e. “strategic fit”, Zajac *et al.*, 2000). Similarly, as Roundy *et al.* (2018) highlight the role of entrepreneurship in ecosystems, Di Pietro *et al.* (2018) show how entrepreneurs design and manage a scalable service ecosystem to realize value propositions and highlight entrepreneurs as the driving force behind business-driven service innovations in service ecosystems. In terms of strategic action, Rabetino *et al.* (2017) extend research on the service-based business models and provide a framework for benchmarking, developing, and implementing a strategy in service ecosystems while mitigating the tensions between long-term value creation and appropriation. System thinking and a holistic perspective to service ecosystems emphasizing how configurations of people, technology, or information bring about value co-creation are also highlighted in this research theme (e.g., Chandler *et al.*, 2019).

Finally, the fourth major research theme illustrated with the blue color cluster represents *institutional embeddedness and agency* in service ecosystems. It covers such keywords as institutional work, co-production, agency, innovation ecosystem, business ecosystem, actor-to-actor engagement, and service experience. Broadly, this theme explains the interplay of institutional work (Lawrence *et al.*, 2009) and institutional embeddedness (Gonçalves *et al.*, 2019), where actors in the service ecosystems both experience the institutional constraints and barriers and also engage in agency to change and uphold the shared institutional logic (Vargo *et al.*, 2012). As highlighted by the influence of research networks grounded on Vargo and Lusch’s work, institutions and institutional theory to service ecosystems are important research domains within service ecosystems research (Akaka *et al.*, 2019; Vargo *et al.*, 2015). Drawing on these foundations, Sajtos *et al.* (2018) introduce the concept of boundary objects as a means of facilitating institutional work across service ecosystems. They find that boundary objects (such as a particular type of solution over which different actors can join their views) disrupt boundaries between actors’ ecosystems. They change

the type and extent of interaction between actors in service ecosystems to allow these actors to re-define their place in new institutional arrangements. Furthermore, this research theme examines innovation as a process that unfolds through changes in the institutional arrangements that govern resource integration practices in service ecosystems (Koskela-Huotari *et al.*, 2016; Lusch *et al.*, 2016) and business ecosystems for analyzing, modeling, and foresighting interactions within network structures (Battistella *et al.*, 2013). The above discussions resonate with the long-held debate on structure and agency in institutional theory (Heugens & Lander, 2009). Hence, this theme scrutinizes the subtle and sophisticated interplay between agency, institutional environment, institutionalization, and institutional change in service ecosystems (Johannisson *et al.*, 2002; Koskela-Huotari *et al.*, 2016; Tuominen *et al.*, 2020; Vargo *et al.*, 2015). Consequently, the role of institutional theory provides a strong foundation for service ecosystems literature and places these systems at the interface of agency and institutional structures.

5.2 Disciplinary identity of service ecosystems research

Our findings point to several important conclusions concerning the disciplinary identity of service ecosystems research. Our findings reveal that Vargo and Lusch and their affiliates constitute the most productive and influential research group in service ecosystems research, followed by Edvardsson and colleagues. The dominance of the Vargo and Lusch network within service ecosystems research explains the widespread adoption of these authors' definitions of service ecosystems and the relatively heavy reliance on *service-dominant logic*. In fact, service ecosystems research can be seen as a natural evolutionary trajectory of service-dominant logic, which emphasizes service attributes over product attributes and relational interactions among ecosystem partners over arms-length transactions (Akaka *et al.*, 2019; Lusch & Nambisan, 2015; Vargo & Lusch, 2008). Service-dominant logic highlights the focus on users, customers, and value co-creation (both value-in-use and co-production perspectives), and thus helps to contextualize the resource integration in ecosystems around these phenomena (for discussion, see e.g., Lusch *et al.*, 2016).

Within service-dominant logic the *institutional theory* plays a key role in helping to distinguish service ecosystems research from broader service systems research (Hartmann *et al.*, 2018; Koskela-Huotari *et al.*, 2016; Koskela-Huotari & Vargo, 2016). In this regard, the service ecosystems view of institutional embeddedness of resource integration and value co-creation provides a richer and more dynamic conceptualization of service context than previous marketing research (Akaka & Vargo, 2015). Furthermore, the institutional theory allows for understanding how loosely coupled ecosystem actors can organize around “shared institutional logics” (Lusch & Vargo, 2014) and engage in institutional work that allows re-defining actor roles and resources in service ecosystems (Koskela-Huotari *et al.*, 2016). It is not a surprise that institutional theorizing has played a role in developing the service ecosystems concept. In essence, the promise of ecosystems has always been about a better understanding of the dynamic interaction between actors and their environment, starting from Moore (1993) seminal contribution. Thus, by building on institutional theory, coupled with service-dominant logic and other discourses in service and marketing theory, service ecosystems scholarship shows promise in explaining how value is co(-created) and captured among diverse actors participating in service exchange in a relevant institutional context.

Furthermore, the review results underscore the emerging disciplinary identity of service ecosystems as a field within the broader ecosystem discussion. Recently, different authors have pursued demonstrating the distinctiveness of different ecosystem conceptualizations. In their systematic review of B2B literature, Aarikka-Stenroos and Ritala (2017) highlight the distinctive aspects of seven different ecosystem conceptualizations, including business, innovation, entrepreneurial, platform, and service ecosystems. They point out that service ecosystems are distinctive due to their emphasis on the systemic and institutional nature of value co-creation, while other ecosystem streams are more focused on networks of business actors or ecosystems comprised of key actors or technologies (such as digital platforms). More recently, Thomas and Autio (2020) distinguish service ecosystems as a “consumption system” where the ecosystem exists to integrate

resources and actors around consumptions of value by users (i.e., value-in-use). This is a clear difference from the “production system” approach in strategy and innovation literature, where ecosystems are often viewed as upstream structures that enable complementary providers to interact in realizing a value proposition (Adner, 2017; Shipilov & Gawer, 2020). This also differs from the information systems perspective (and platform ecosystems view in strategy), which focuses on the affordances provided by digital platforms to ecosystem actors (Thomas & Autio, 2020), and particularly the generative properties of ecosystems (Cennamo & Santaló, 2019). Therefore, service ecosystems seem to build on partially different theoretical assumptions and phenomenological foci than other fields of ecosystem scholarship in social sciences. Establishing such a disciplinary identity is certainly helpful in building momentum for a research program around service ecosystems. At the same time, it might also unnecessarily restrict cross-disciplinary learning and development – a challenge that we address in the next section.

5.3 Looking forward: methodological and inter-disciplinary research opportunities

Extant research argues that service ecosystems are an overarching concept with different intellectual roots. However, our findings distinctly indicate that current research on service ecosystems has mostly been drawn from within the marketing and service management literature, focusing on particular service ecosystems-related topics. While service-dominant logic could continue offering useful insights into service ecosystems, we suggest that incorporating new theories and perspectives – and going deeper into the institutional dimension – could bring useful insights into the development, evolution, and consequences of service ecosystems. To move research forward in this regard, we present potential methodological and inter-disciplinary research avenues and possible corresponding research questions (Table 3).

----- **Insert Table 3 here** -----

First, the analysis of methodological approaches in service ecosystems research uncovered that qualitative and conceptual approaches are the most frequently adopted approaches. In contrast,

surveys, mixed-methods, mathematical modeling, and longitudinal research are less represented. Using more diverse research methods would help to achieve a more nuanced and robust understanding of the service ecosystem's research practice and performance to ensure the field's methodological development. For instance, combining qualitative and quantitative methods with diverse data sources, mixed-methods studies allow rigorous investigation of different aspects of service ecosystems (Creswell, 2013). For example, an interesting research design could collect survey data of customer assessments of different aspects of the customer value (proposition) of the service ecosystem, while interview data could complement this by revealing how such value is being co-created. Likewise, longitudinal research can enable scholars to capture service ecosystems' evolution and behavioral dynamics more accurately (Evers *et al.*, 2017). For instance, it would be interesting to study how the shared institutional logics begin developing among service ecosystem members over time and what processes are involved. Only a longitudinal research design can respond to these types of questions.

Second, it would be useful to examine what makes service ecosystems distinct and what service ecosystems scholars can draw from other disciplines, and vice versa. As Autio and Thomas (2019) recognize, service ecosystems research could be usefully cross-pollinated with strategy and information systems scholars' approaches and theories. Indeed, the growth in research examining the role of digital technologies in service ecosystems is evident in the green cluster (see Figure 1). However, despite substantial contributions, there is still a considerable gap for more empirical research and theoretical integration among service ecosystems and information systems literature. For example, while the internet of things and Industry 4.0 may have instrumental influences on how service ecosystems are designed and coordinated (Leminen *et al.*, 2018; Xu *et al.*, 2018), little is known about how these technologies would impact service ecosystems in the long run. Likewise, the role of digital servitization in service ecosystems entails further exploration, including topics such as platform-based business models and infrastructures that enable value co-creation among customers

and service providers. In addition, little integration is seen between service and strategy literature streams regarding ecosystems, which seem to be going in different directions. The former focuses more on the systems context of value-in-use, while the other focuses more on strategizing the upstream structure of complementarities (see e.g. Adner, 2017; Jacobides et al., 2018). Some recent research has, however, started such integration, where users' activities – along with those of ecosystem orchestrator and complementors – are seen to contribute to the ecosystem and its evolution (see e.g. Thomas & Ritala, 2021).

Furthermore, service ecosystems research can benefit from greater infusion from *international business* literature. As our findings reveal, extant research on service ecosystems has, thus far, somewhat overlooked international aspects of service ecosystems, such as those that could reveal the interplay between service ecosystems and national culture (Hofstede, 1980; Hofstede *et al.*, 2010) and national innovation systems (Watkins *et al.*, 2015). Culture plays an instrumental role in individuals' norms, values, and cognitive processes. As such, individuals' cultural backgrounds in service ecosystems can have inevitable influences on the dynamics and functioning of service systems. Likewise, as national innovation systems play a critical role in building institutional capacities for innovation (Watkins *et al.*, 2015), they may have an interesting interplay with service ecosystems in relation to service innovation at the firm and system level. Furthermore, while the role of networks in firms' internationalization has been examined extensively (Sharma & Blomstermo, 2003), less attention has been paid to the role of ecosystems, especially in the context of services. Therefore, relevant research on international business can offer unique insights into further understanding of service ecosystems.

Another possible way forward is to draw even further from *institutionalization* – the maintenance, disruption, and change of institutions – is one of the critical features of service ecosystems thinking (Koskela-Huotari *et al.*, 2016; Vargo *et al.*, 2015). Looking at institutional embeddedness of how value is being co-created and how value propositions are delivered – in

interaction by downstream and upstream actors, might provide a way forward. In this regard, some authors have suggested viewing ecosystems as co-evolving systems of actors, technologies, and institutions (Aarikka-Stenroos & Ritala, 2017), which provides lenses that might be useful for both service and strategy scholars. Indeed, B2B literature has traditionally involved an evolutionary perspective to actors and networks (Wilkinson, 2006). Service ecosystems can provide further insights into coevolution between value-creating actors and their institutional environment. Relatedly, scholars have recently advocated adopting legitimacy lenses to ecosystems, which could help to show how and why ecosystems and their actors become legitimate or illegitimate in their institutional environments (Thomas & Ritala, 2021).

Finally, an additional potential avenue for future research is to draw more intensively from the *systems* part of the ecosystems analogy. Some scholars have recently explicitly called upon research that would examine ecosystems as *complex adaptive systems* (Phillips & Ritala, 2019; Roundy *et al.*, 2018). We see features of service ecosystems literature in adopting some of the systems theoretic principles, such as self-organization (Meynhardt *et al.*, 2016). Going forward, service ecosystems research could draw even more heavily from complex adaptive systems lenses. For instance, the conceptual, structural, and temporal dimensions suggested by Phillips and Ritala (2019) might help contextualize value co-creation and resource integration in service ecosystems more systematically. For example, service ecosystems scholars could focus more explicitly on ecosystem emergence (i.e. where, how, and why does ecosystem come about), coevolution of value co-creation in service ecosystems (i.e. how different actors contributions and interactions on value creation vary over time), and the interactive role between ecosystem actors and their institutional environment.

5.4 Managerial and policy implications

Our study has revealed several managerial and policy implications. For instance, the discussion of literature in section 5.1 informs managers about the significance of digital servitization to transform conventional systems into more innovative service ecosystems. Our study also highlights the focal

role of value co-creation and the role of different actors, including service providers, customers, and other business partners (see e.g., Barac *et al.*, 2017), for value creation in service ecosystems. Despite the variety of ecosystem actors, managers and experts building or managing a service ecosystem should focus first and foremost on customer value, given its prominent role (e.g., Leminen *et al.*, 2018; Rustholkarhu *et al.*, 2021). Based on the analysis of customer value, the focus should then be on a thoughtful design of a service ecosystem and necessary technological architectures, such as platforms, other interfaces such as internet-of-things technologies (see Leminen *et al.*, 2018; Soltani, 2021) to support the co-creation of value. Also, for B2B firms' managers, a better understanding of the role of these technologies concerning the engagement with the whole service ecosystem is very important (e.g., Rustholkarhu *et al.*, 2021; Soltani, 2021).

Our analysis also emphasized ecosystem rules and norms so that uncertainty is minimized for actors operating at different levels and associated with different dimensions of the service ecosystem. Hence, policymakers need to develop rules and policy frameworks that help to incorporate the dynamism of service ecosystems and continuous value co-creation. The importance of B2B marketing in the global service economy is increasing and is expected to become even more dominant in the future. Hence, policy makers need to specifically look at mechanisms, including incentives that can strengthen the development of evolutionary rules, as well as shared norms, are expected to foster resource integration and value co-creation (e.g., Husmann *et al.*, 2020; Soltani, 2021) at micro, meso and macro levels of service ecosystems. This would help in the development and the growth of service ecosystems offering value to relevant stakeholders within B2B marketing context, and hopefully to the larger society.

5.5 Research limitations

As with many other studies, there are some limitations to our study. While all possible measures were taken to ensure that all relevant articles on service ecosystems are included, a few articles might have

been ignored. However, the dataset comprises 119 related articles, which is a good sample size for such a new research domain. Therefore, we believe that the potential absence of a few articles will not impact the paper's overall findings. Given the objectives of this research, we used only one function of R-package (word cloud); however, future research can further explore the possibilities of using the software when vast literature on service ecosystems becomes available. For example, 'latent topic modeling' is a useful, though complex, R-package function used to analyze an extensive dataset. This study employs only keyword co-occurrence analysis as a preferred tool. Future research may also attempt with the alternate analysis tool, such as co-citation, to generate clusters.

From a conceptual and theoretical perspective, we are aware that "service ecosystems" is a fluid concept. This may limit the accuracy of our findings. With the increasing popularity of ecosystems, there is an increased possibility that networks and ecosystems concepts are used interchangeably (Shipilov & Gawer, 2020). This means we may not capture the fuller picture of service ecosystems if researchers used network-based terminology and do not explicitly focus on the concept of "service ecosystems". Likewise, while the institutional theory is often used to examine service ecosystems, the lack of unifying theory behind the concept hinders our ability to draw an extensive set of theoretical implications.

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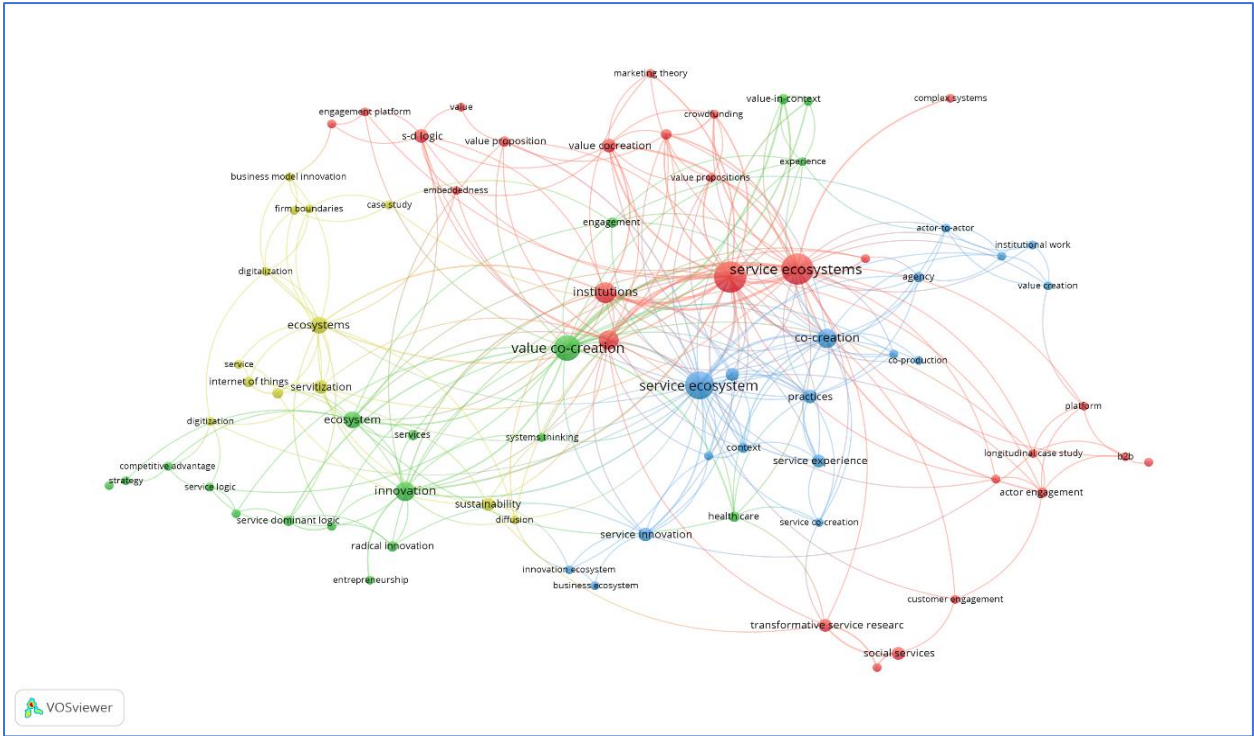


Figure 1. Keywords co-occurrence analysis

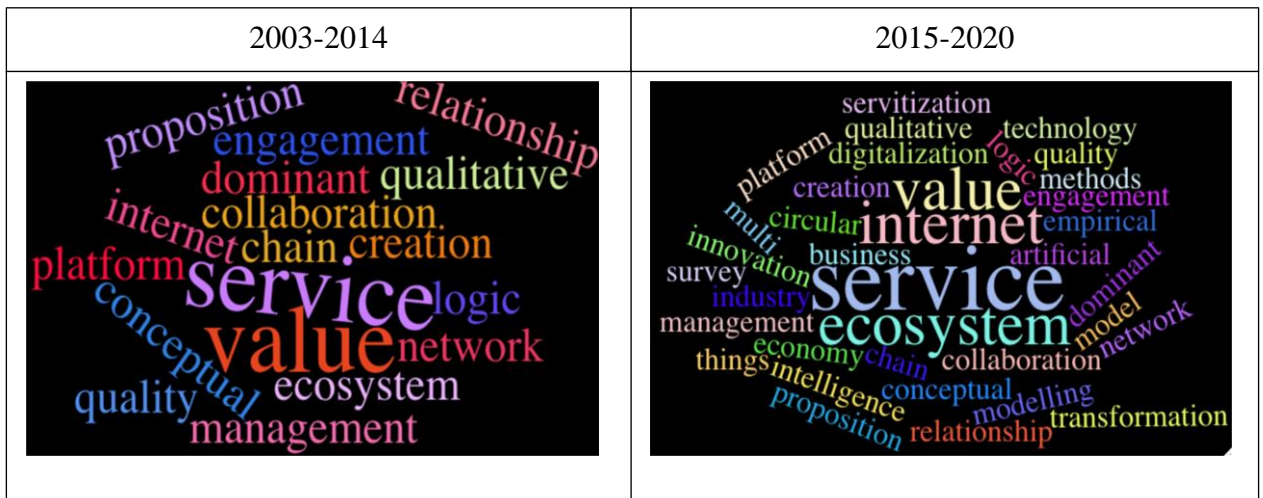


Figure 2. Word cloud showing knowledge flow in service ecosystems research.

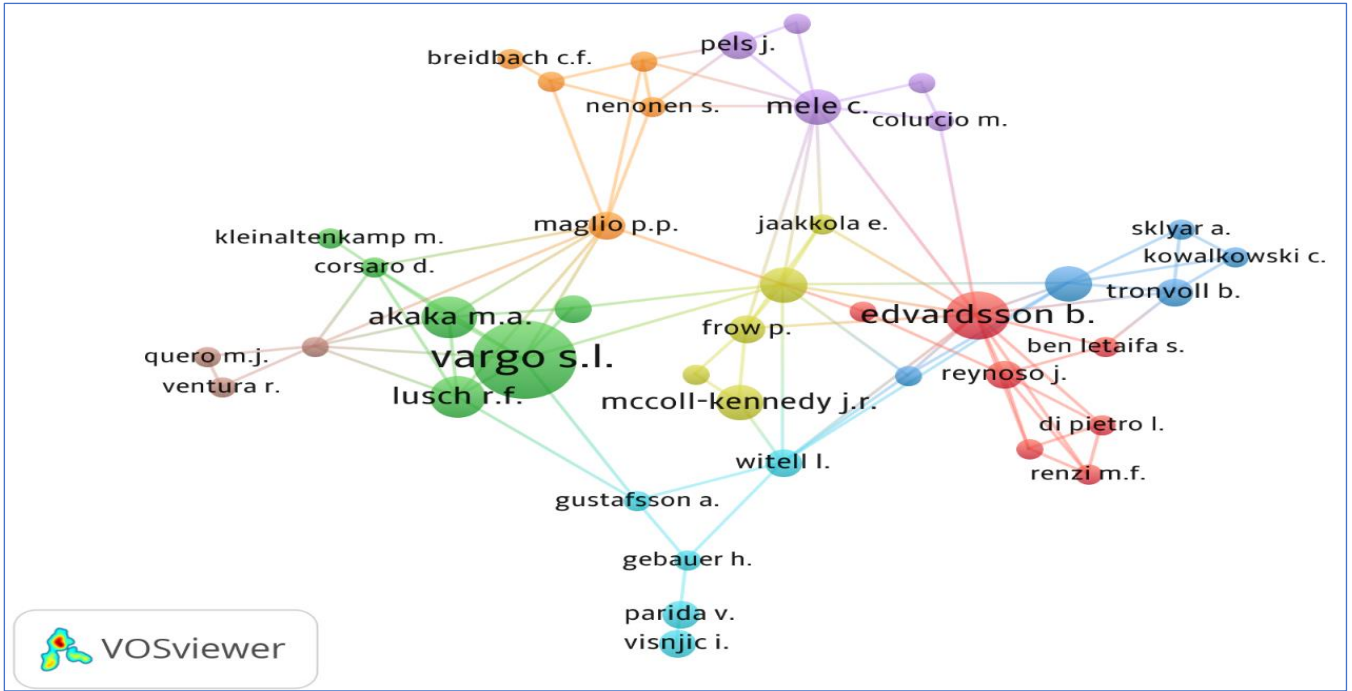


Figure 3. Cooperative network among the principal authors

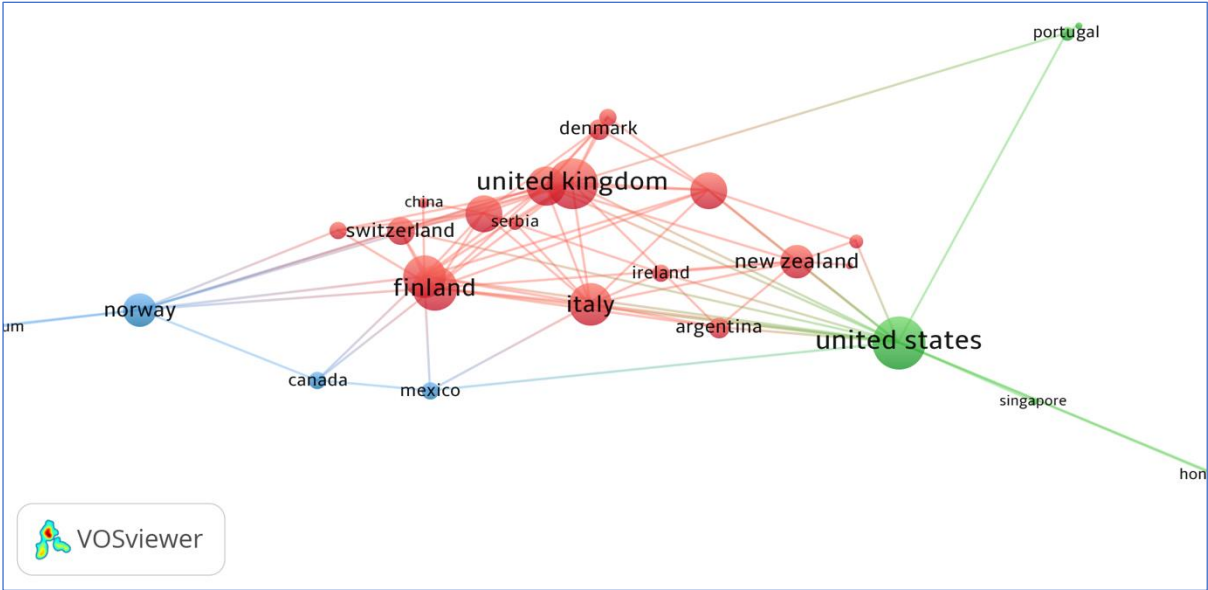


Figure 4. Research collaboration between various countries of the world

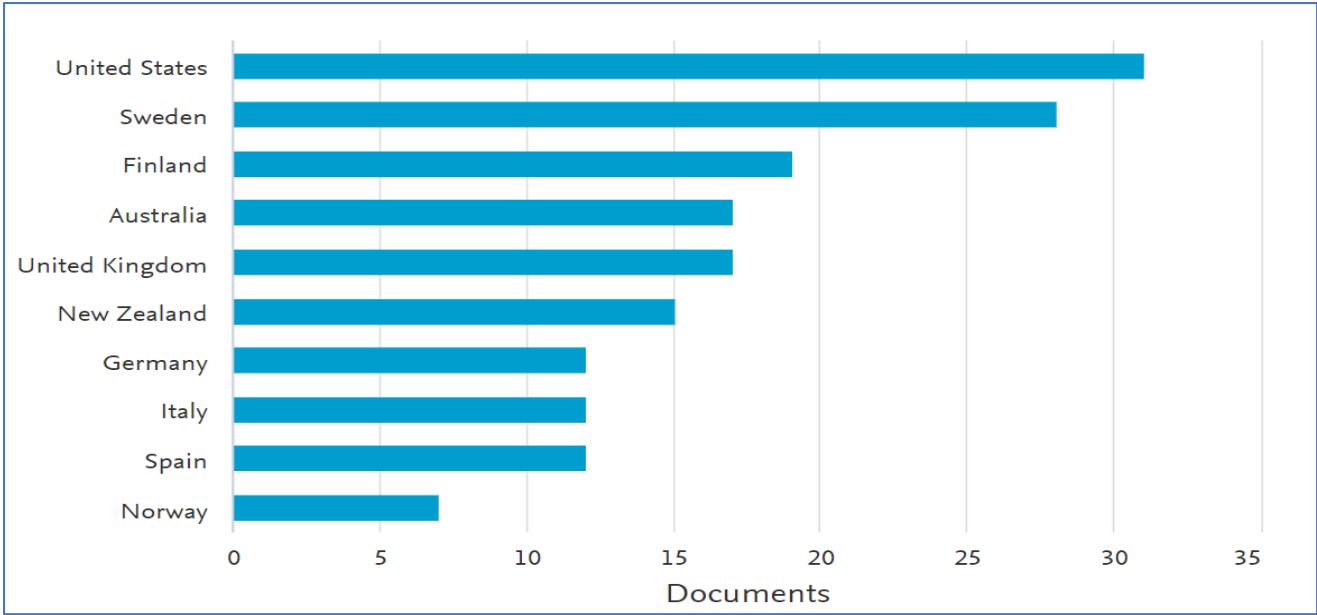


Figure 5. Documents by country/territory

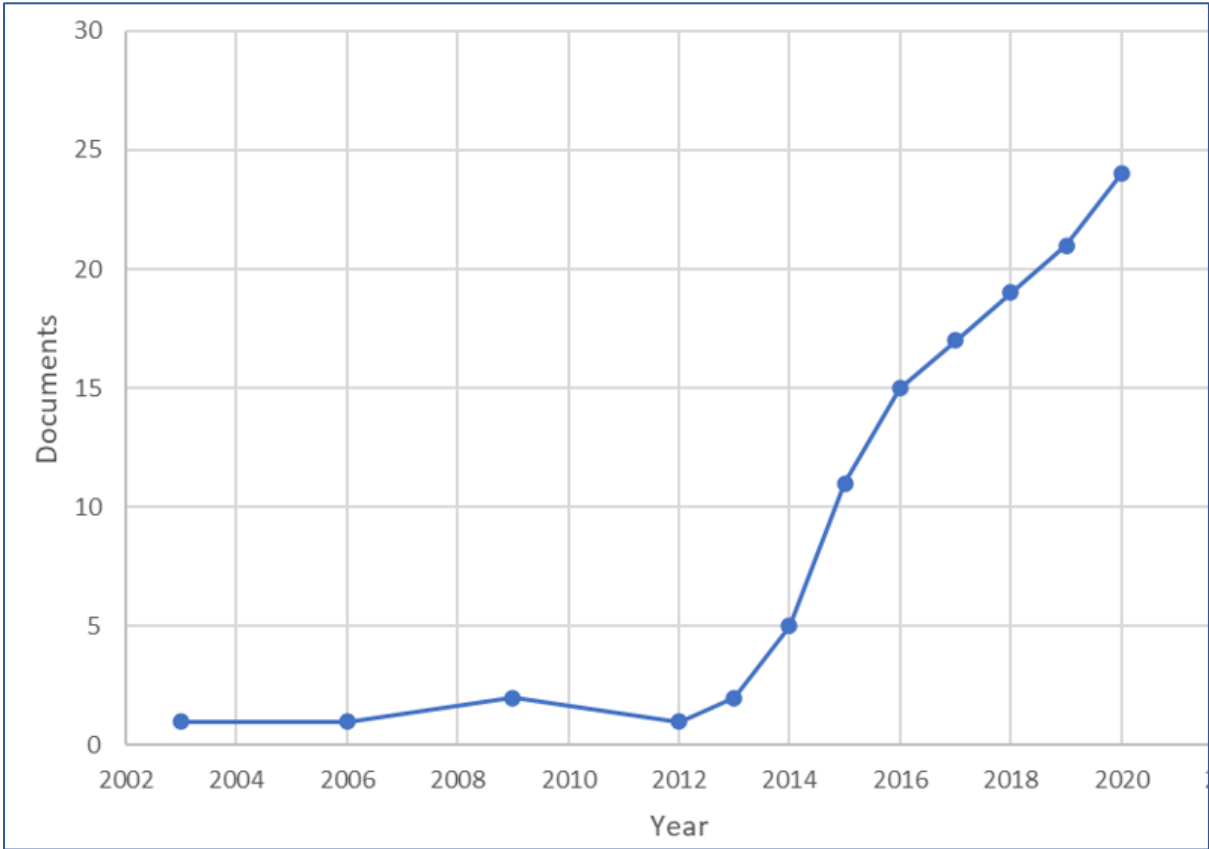


Figure 6. Evolution of research on service ecosystems from 2003 to 2020

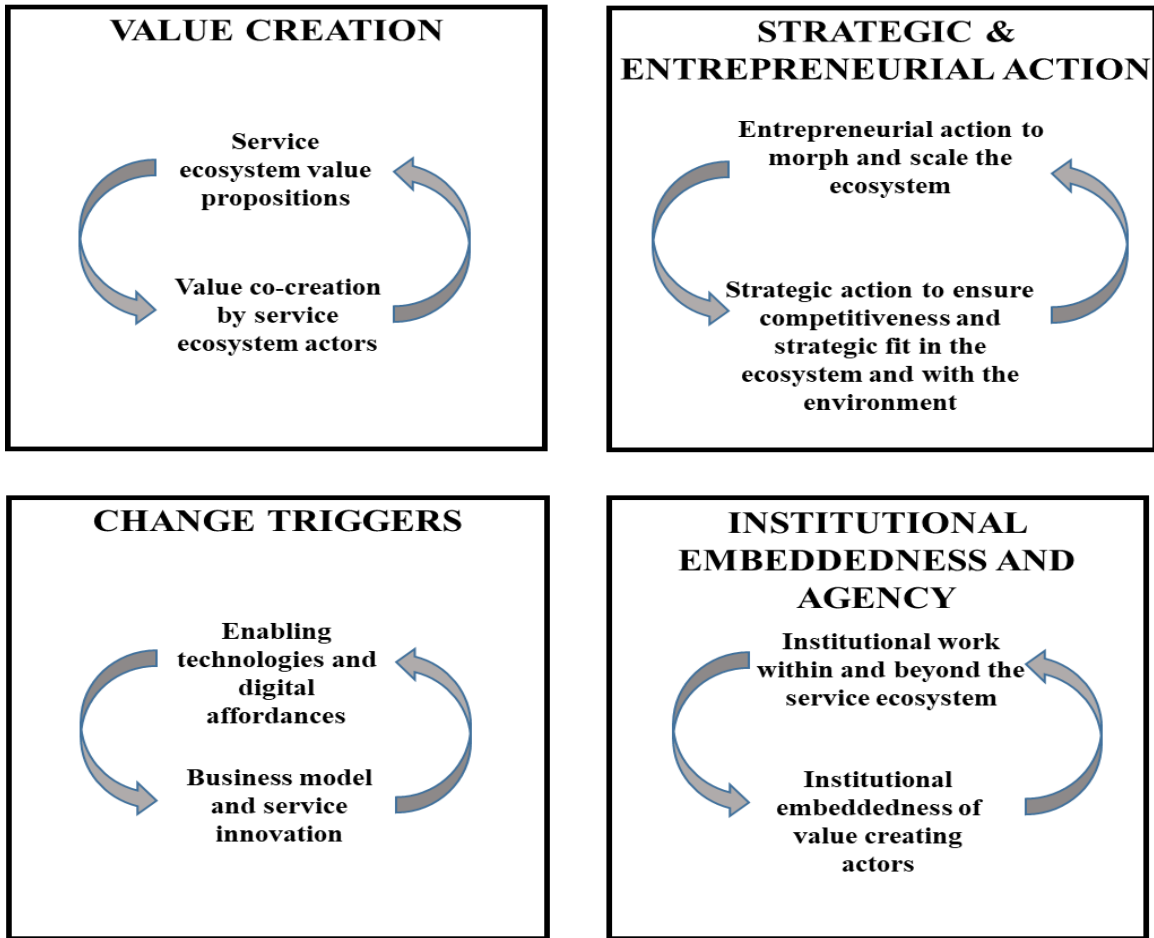


Figure 7. Integrative framework of key research themes and dynamics in service ecosystem

literature

Table 1. Most productive authors in service ecosystems domain

No	Author	Publications	Citation
1	Vargo Stephen Louis	12	1428
2	Edvardsson Bo	7	174
3	Akaka Melissa Archpru	5	664
4	Lusch Robert Frank	5	591
5	Pennie Frow	4	247

Table 2. Top-10 journals publishing articles on service ecosystem

No	Source	Citations
1.	<i>Journal of Business Research</i>	728
2.	<i>Journal of Service Management</i>	632
3.	<i>Journal of Product Innovation Management</i>	593
4.	<i>Industrial Marketing Management</i>	515
5.	<i>European Management Journal</i>	342
6.	<i>Internal Journal of Research in Marketing</i>	285
7.	<i>Journal of Business & Industrial Marketing</i>	279
8.	<i>Marketing Theory</i>	237
9.	<i>Journal of Service Marketing</i>	226
10.	<i>Journal of International Marketing</i>	170

Table 3. Research gaps and future research avenues

Research gap	Potential research questions	Theories/concepts that can be applied
<i>Methodological pluralism</i>	What methods can capture the complexities and behavioral dynamics of service ecosystems over time? How can perceptual and objective aspects of service ecosystems be examined simultaneously?	Mixed-methods (Creswell, 2013) Longitudinal research (Evers <i>et al.</i> , 2017)
<i>Service ecosystems, information systems, and strategy</i>	How is information searched and shared within and across service ecosystems? What is the role of emerging digital technologies in socio-technical elements of service ecosystems? How do the governance and coordination decisions in service ecosystems influence digital servitization and deservitization processes of ecosystem members? What is the role of digital servitization in the development and success of service ecosystems? How do service ecosystems contribute to the competitive advantage of firms and ecosystems as a whole? What are the resource allocation strategies applicable in service ecosystems?	Service-dominant logic (Lusch & Vargo, 2014; Vargo & Lusch, 2017) Internet of things and Industry 4.0 (Xu <i>et al.</i> , 2018) Digital servitization (Kohtamaki <i>et al.</i> , 2019) Resource allocation (Klingebiel & Rammer, 2014)
<i>The international dimension of service ecosystems</i>	What role does the national culture of constituent actors play in the dynamics and inner workings of services ecosystems? How do service ecosystems and national innovation systems interact in a given country in the pursuit of service innovation? What is the role of service ecosystems in the internationalization processes of their smaller constituents?	National culture (Hofstede, 1980; Hofstede <i>et al.</i> , 2010) National innovation systems (Watkins <i>et al.</i> , 2015)
<i>Institutional underpinnings of service ecosystem theory</i>	What is the interplay between institutionalization and deinstitutionalization in service ecosystems? How and why do the members of service ecosystems embed themselves into the institutions within which they operate? What is the role of service ecosystems in service actors' sense-making and internalization of their institutional context? How are service ecosystems legitimized and delegitimized?	Institutionalization (Koskela-Huotari <i>et al.</i> , 2016; Vargo <i>et al.</i> , 2015) Institutional embeddedness (Johannisson <i>et al.</i> , 2002) Ecosystem legitimacy and identity (Thomas & Ritala, 2021)
<i>(Complex adaptive) systems approach to service ecosystems</i>	Can complex adaptive system lenses explain the emergence of service ecosystems? How does value co-creation co-evolve among actors and their environment over time in service ecosystems? What are the underpinning dynamics of the environment, services ecosystems, and their constituents?	Complex adaptive systems (Phillips & Ritala, 2019; Roundy <i>et al.</i> , 2018)