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# Service Innovation Research in the Context of Business Ecosystems-A multidisciplinary Mapping Study

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# **SERVICE INNOVATION RESEARCH IN THE CONTEXT OF BUSINESS ECOSYSTEMS – A MULTIDISCIPLINARY MAPPING STUDY**

*Completed Research*

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## **Abstract**

*Advances in technology and digitalisation have changed the ways services are created and offered to users. Successful new innovative services and service value co-creation are done in collaboration with organisations and actors in contexts such as business ecosystems. The research relating to service design and open innovation in business ecosystems is cross-disciplinary, and relevant knowledge is scattered throughout different fields. In this research, we are focusing on the research that exists in the areas of service design and open innovation in the business ecosystems context. We aim to collect, analyse and synthesise this existing knowledge in order to increase the understanding of the companies' service design and open innovation activities in business ecosystems. A mapping study method is utilised to identify the existing related research in the area and to create an overview. The final analysis included 38 papers. Our analysis revealed that the relevant research is focused mainly on two research areas: business research and information technology-related research. Most of the papers combine the open innovation and business ecosystem aspects, but service design is mostly present as a general view on services as means for value creation. We identified antecedents for service value co-creation, such as practices for ecosystem actor involvement. We also identified challenges, such as managing the business ecosystem in terms of finding the right actors. The results indicate that more focused research on the practical understanding of service design and open innovation practices, methods and tools as well as sound theory development are still needed as the research field matures. The results help inform future research in this cross-disciplinary phenomenon.*

*Keywords: Business ecosystems, service innovation, service design, open innovation, mapping study.*

## 1 Introduction

The present day information and communication technology (ICT) industry is increasingly reliant on collaboration with other companies to keep up with the competitive global business environment. ICT companies are adopting new, more open ways for developing innovative services or integrating their technologies to support service provision. This creates a demand for processes, methods and guidelines for managing the development and design of innovative service solutions (Chesbrough, 2012). In the changing business environment, companies are seeking leverage from different types of collaboration networks, such as regional clusters, supply-chain networks or business ecosystems, to complement their own products or services. The advantage of forming collaboration networks is the access they provide to resources that the organisations do not individually own (Batt and Purchase, 2003).

Research on services and innovation in the context of a diverse set of actors and the technology-based value co-creation process is cross-disciplinary. Business networks, service design and ICT technology-based innovations are studied in several different disciplines, from information systems to business studies. Collaborative value creation through services and innovation is the focus of three different research fields: business ecosystems, open innovation and service design research. These research fields have different conceptualisations and viewpoints on collaborative services and innovation, but they are essentially studying the same phenomenon, providing the topic for our research. Theoretical and practical knowledge from each of the different research fields have the potential to cross-fertilise each other and lead to the sharing of their practices and verified solutions, advancing the research and producing better practical results.

*Business ecosystems* as a concept was introduced by Moore in 1993 (Moore, 1993), but it has only recently attracted more interest and been adopted more widely in practise. The business ecosystem transcends industries and emphasises the interaction of a variety of actors, organisations and individuals that are important for the success of the ecosystem (Moore, 1996; Heikkilä and Kuivaniemi, 2012). Iansiti and Levien (2004) focused on the roles the actors take in the ecosystem, particularly on the need for a strong leader, a keystone. The business ecosystem analogy helps in recognising the types of organisations or actors involved. Recent literature has emphasised the roles of the members in the ecosystem and their potential for influencing the innovative services or products that the ecosystem offers (Peltoniemi, 2006). In addition, increasing the understanding of ecosystem in terms of organisational cooperation and convergence helps deal with change and capture value (Basole et al., 2014). Vargo and Luch (2012) add that we need to increase our understanding of the concrete creation of service value, as the services are also central in every business ecosystem.

*Open innovation* research emphasises that innovative capacity can exist outside the boundaries of one company, and therefore companies should open their processes and interact with suitable partners or individuals to accelerate the innovation process (Chesbrough, 2012). This approach endorses the formation of networked organisations to gain the advantage of increased value, which has been applied to both product and service innovation. Mustak (2013) studied service innovations in business networks, focusing on the innovation perspective, and identified determinants that lead to companies' involvement in networks. Participation in innovation networks is determined by aspects of social and cognitive closeness, but also by the perceived advantage (complementarities) over the negative effects (lack of cohesion or leadership). These are also network management issues.

Value creation through *service design* research has been considered a need for networked interaction with customers and other stakeholders for the creation of improved services (Edvardsson and Olsson, 1996; Edman, 2011; Ramaswamy, 2009). A service design focus emphasises the value creation process and the importance of customer interaction (Ramaswamy, 2009). Managing the process for service creation at an ecosystem level has been identified as a challenge in earlier research. Adner and

Kapoor (2010) summarised some of the challenges of ecosystem value creation concretely related to business models, the value chain, actor positioning and coordination choices as well as the participation incentives.

Concrete actions to capture and create value in the ecosystem could be brought over to business ecosystem research following practices from open innovation research and service design research. Moreover, the business ecosystem perspective could provide new directions for research on the design of technology-based services through understanding the dynamics of actors and their roles during collaboration. The need for a diverse set of actors and innovation process thinking to enhance value creation can be adopted from the open innovation perspective. Service design contributes to the understanding of the service value co-creation perspective in business ecosystems. The knowledge produced by researchers in these seemingly disparate research areas could be combined to create a larger picture of how companies could form their ecosystems and create better services together.

For a clearer view of the existing research on open innovation and service design in business ecosystems, we employed a mapping study approach to investigate a cross-section of the existing literature. This approach was used to gain an overview of the topic: existing research trends and possible research gaps and future focus areas. Through identifying and analysing the relevant literature, we have identified trends of current research in the field. The connections found between these research fields are used to come to conclusions regarding the challenges of organising service design and innovation activities and strategic decisions in business ecosystems.

The remainder of the paper is organised as follows. First, the applied mapping study method and the process are presented. Next, the results based on the identified primary studies are described, including trends in research and focused content analysis. Finally, the findings are discussed and conclusions presented.

## **2 Methodology**

A systematic literature review has become an increasingly used research method for cutting-edge research areas in order to aggregate the existing knowledge. The systematic literature review tradition that originated in the medical sciences has gained popularity in information systems (IS) and software engineering (SE) research, following strict guidelines and search strategies adapted by Kitchenham et al. (2011). As a form of a systematic literature review, a systematic mapping study allows the researcher to map a broader subject domain, and it may be used to study new emerging research areas where relevant, high-quality primary studies are scarce, or to provide a more general overview of the subject (Kitchenham et al., 2011; Petersen et al., 2008). In this study, we have chosen to follow the tradition of SE research in conducting a systematic mapping study. This tradition provides a rigorous protocol for the execution of the study as well as guidelines for analysis and reporting.

### **2.1 Research questions and protocol**

The following research questions were set to obtain an overview of the existing research on business ecosystems and the existing connections to service design and open innovation research:

- What are the research trends of the research topic?
- How has the topic been studied in different disciplines?
- What elements of service design and open innovation research is being brought to business ecosystem research?

The starting point for conducting the mapping study was the understanding that service design and open innovation research happens in the context of ecosystems. Therefore, we looked for research that combines elements of the different research domains: business ecosystems, service design and open innovation. At first, pilot searches in the databases were performed to determine the set of keywords that would most effectively return the papers representing the focus of this research. Based on these trial searches, we decided that another term needed to be added to describe the ecosystem research field. To extend the search, a term similar to business ecosystem, “business network,” was included. The final search string was: ((“service design” AND “business ecosystem”) OR (“service design” AND “open innovation”) OR (“open innovation” AND “business ecosystem”) OR (“service design” AND “business network\*”) OR (“open innovation” AND “business network\*”). The search string was adjusted to fit the syntax of each database and to search in the titles, abstracts and keywords.

The bibliographic databases were chosen to include those that contained relevant IS and SE research as well as cover management, marketing and other economics disciplines. The selected databases were Scopus, Academic Search Premier (EBSCO), ACM Digital Library, IEEE Xplore, Springer Lecture Notes in Computer Science, Science Direct, Web of Science and Wiley Online Library. Time restrictions for the searches were defined so that papers published any time prior to the end of 2015 were included.

## 2.2 Study selection and data extraction

After the database search, the results were uploaded to a citation management tool, which was used to remove duplicate papers. After removing duplicates, the number of papers was 737. The study selection process is presented in Table 1.

Step	Inclusion: The article is	Exclusion: The article is	Total #
1.	Metadata: a conference paper OR a journal paper OR a book chapter	a duplicate OR extended abstract OR an editorial OR review OR is non-English	737
2.	Title and keywords: Setting is business networks AND service design AND/OR Open innovation	Outside the scope of business studies or information systems/software engineering	339
3.	Abstract: Setting is business networks AND organisational OR collaboration, OR innovation OR service design	Not business network, OR only customer point of view	58
4.	Light reading: criteria from Round 3 exists in the paper	Criteria not met OR is a short paper (< 5 pages)	38

Table 1. Criteria for primary study selection.

For screening and assessing the articles, two researchers conducted separate analyses for the exclusion or inclusion of the papers. The papers in these rounds were categorised as accept, reject or cannot decide. Selection conflicts were determined for papers that received conflicting ratings, and these conflicts were resolved through consensus discussion. Papers accepted through the screening round were those that included business ecosystems, networks in combination with service design or open innovation. This was deducted based on abstracts and keywords. A final selection round, “light reading,” was included because some of the abstracts were considered somewhat inconclusive as to the study’s content. This reduced the final set of primary studies to 38 (see Appendix A).

The data extraction from the primary studies was done using a data extraction template, to extract needed metadata, classification data and descriptive data. The extracted data were the year and type of publication and the citation count. The identified research area (business ecosystem, other business networks, service design and open innovation) was based on the description found in the paper. Similarly, we extracted the terminology the authors used for the type of network they had studied, along with the text explaining the relationship of the study to services or innovation and the other frameworks or theories that were named and used in the study. This content from the papers was inserted into large tables, allowing us to see the relevant data and use it to compose the results.

### 3 Results

In the analysis of the results, we identified publication trends and research directions. The primary studies were classified to show the focus of existing in service design and open innovation in relation to business ecosystems. In addition, emerging themes from the contents of the primary studies relating to our research topic were analysed to highlight the focus of the found research.

#### 3.1 Identified trends

The primary studies were classified according to the publication type: 26 were journal papers and 12 were conference papers, as shown in Figure 2. The first identified publication was from 2004.

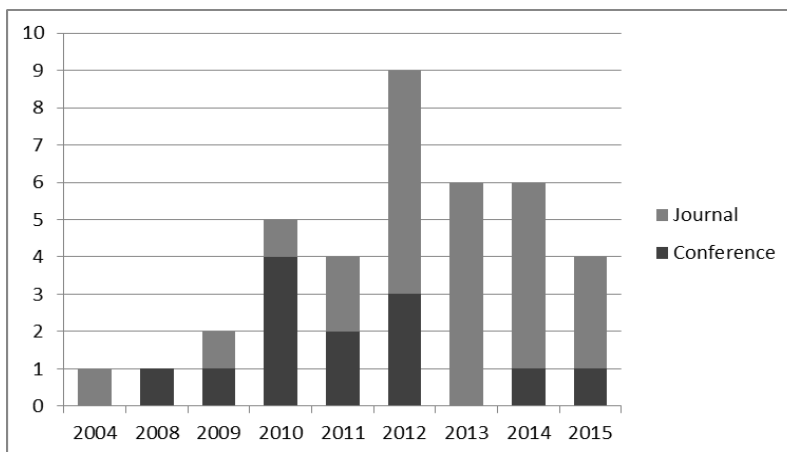


Figure 2. Trend of research by publication type.

Most of the papers were recent, having been published within the past few years. The highest number of papers was published in 2012, after which the number of papers appears to be decreasing slightly. There seems to be a transition from conference papers to journal articles over time. This could be considered a sign of maturing of the research area and indicate stabilisation of the research related to business ecosystems from 2012 onwards. It should be noted, however, that because we were focusing on such a specific set of papers, the small number of final primary studies does not provide very strong evidence for making wider generalisations about business ecosystem research trends in general. The reported research methods in the primary studies varied: 30 of the studies included empirical data, of which 22 were reported as case studies, and most were described as qualitative. In addition, eight studies were purely theoretical.

Within the primary study set, the Bosh study [P004] from 2009 and Snow et al. [P034] from 2011 study were referred to the most. To further evaluate the impact and quality of these papers, we looked

at the citations they had received using Google Scholar (June 2016). The four most referenced papers were Bosh [P004], a software ecosystem study from; Snow et al. [P034], about the collaborative community of firms and innovation in development; Agarwal et al. [P001], on dynamic capability building in networks; and Rampesad et al. [P029], on innovation network management.

Table 2 shows the identified research disciplines by the publication venue focus area of the primary studies. As can be observed, about half of the papers were published in various ICT-related conferences or journals. From the various disciplines falling under Economics and Management Sciences, we wanted to differentiate Innovation Management and Marketing and Technology Management since they were the fields we were expecting to get papers from.

Research Forum Focus	n	Study
Economic Sciences (business and management studies incl. Service Science)	9	P001, P006, P007, P008, P010, P017, P016, P019, P021
Innovation Management	4	P011, P018, P026, P034
Marketing	3	P005, P028, P029
Production Management	2	P009, P031
ICT	20	P002, P003, P004, P008, P012, P013, P014, P015, P020, P023, P024, P025, P027, P030, P032, P033, P035, P036, P037, P038

Table 2. Identified research disciplines

The theories used in the analysis of business ecosystems and networks were mostly related to network aspects. Actors in the ecosystems were studied using both activity theory [P020, P021] and the actor–resource–activity model [P025]. Social aspects of the ecosystems were studied using social exchange theory [P025] and the social systems approach of studying multiple network characteristics in relation to innovation performance [P026]. In addition, the Schumpeterian theory of evolutionary economics was used in [P022] to study the formation and exploitation of innovative opportunities.

The research areas identified in the primary studies were classified so that all the papers were addressing a business network, whether it was named a business ecosystem or not. Again, the review was intended to find the union of the research areas, as described in the methods section. Table 3 depicts the classification of the papers.

Identified research area	n	Study
Ecosystem or Network	5	P003, P004, P025, P033, P036
Ecosystem or Network AND Services	5	P012, P019, P024, P027, P038
Ecosystem or Network AND Innovation	17	P002, P005, P007, P011, P013, P016, P017, P018, P022, P023, P026, P029, P030, P032, P034, P035, P037
Ecosystem or Network AND Services AND Innovation	11	P001, P006, P008, P009, P010, P014, P015, P020, P021, P028, P031

Table 3. Identified research areas

Most of the papers were classified as belonging to the areas of innovation and ecosystems. In addition, the primary studies were either network-focused papers (meaning a network management perspective, where the services and innovation aspects were background suppositions, not actually the focal point), a combination of ecosystem and open innovation, ecosystem and service design or all three areas, at least to some degree. A more detailed analysis of the connection between the research areas is discussed in the following section.

### **3.2 Service design and open innovation-related content**

Since we aim to find out what can be learned from the open innovation and service design approaches to value-creation in business ecosystem-type networks, we look at how these aspects are addressed in the primary studies. Overall, the main research themes that emerge from the studies regarding service design and open innovation are the understanding of how to strategically organise and make decisions regarding the co-creation of value and the actual activities, that is, the involvement of relevant actors in the value co-creation within the business ecosystems.

Open innovation as a theoretical approach has some common ground with business ecosystems and other network theories. Many of the studies combined these views (see Table 3), such as the construction of an open innovation model based on business ecosystems in Xiaoren et al. [P037]. However, Rong et al. [P032] claim that open innovation research is focused entirely on the research and development (R&D) or market aspects of open innovation and not as much on network coordination, persuading partners or building a roadmap, the elements that can be added to the research by including a business ecosystem approach. We can, however, look at the antecedents of open innovation management in the business ecosystem settings that can be found in our primary study set. From the strategic organising and management perspective, some aspects were related to open innovation. Management of the formation phase of the ecosystems was discussed in many of the papers. The main principles of formation were related to the management of actor relationships [P001], recognising their capabilities [P022], creating the vision of the joined activities [P018] and allowing mutual trust to develop in the ecosystem [P025; P029; P034; P026].

The actors' roles and influence on service innovations are discussed in [P027; P003; P023]. Qu et al. [P027] argue that ecosystems may offer unlimited possibilities for their members to combine services, as the actors augment the ecosystems. Ecosystem structures are evolving to the point where new actors enter to create service offerings via complementarity with the traditional or initial value chain in the ecosystem. Roles in the ecosystem can determine participation and success in open innovation. Mäkinen et al. [P023] observe that ecosystems' "niche players" have a large role in generating innovation and creating value – the leading firms are dependent on them. Leaders are responsible for the ecosystems' adaptability and the integration of technological innovations [P027]. While awareness of organizational roles and consequent dynamics of actors help companies to connect, it also helps leaders to manage. Through evaluation of the company itself and its position and role in the network, the company will decide whether to stay in the network.

Coordination of the ecosystem should not be too rigid; it seems to affect open innovation possibilities in business ecosystems. Rampesad et al. [P029] emphasise the understanding and harnessing of the input of all collaborations within the ecosystem, where organisations are actively involved in mutual give-and-take practices. Interestingly, [P014] and [P017] observe that the organisations that together the service or product are not necessarily the same set of organisations that commercialise the service or product. The challenges in commercialisation are to find the novel and innovative combination of actors [P014] and to understand the business model [P017]. In [P002], these challenges are met with the utilisation of the business model canvas method. Through the application of the canvas tool, [P002] found that a thriving ecosystem needs stimulus from the key actors, managing openness, inter-



faces, rules and regulations and their effect on the ecosystem, but these can be challenging nonetheless.

Value creation is essentially the service innovation outcome, and the process is an integral part of business ecosystems, as discussed in five papers [P011; P002; P012; P031; P019]. Moreover, there is no value unless there is a customer [P012; P031]. The inclusion of a customer extends the business ecosystem actors' view. Interaction with the customer in order to share knowledge and to learn about customer point of view is important to all the ecosystem actors involved in the service design process, and the technological platform for the interaction is presented in [P031]. Yamakami [P038] presents a model of the service stages is a technology-based service that can help in identifying the need for openness in a business ecosystem in terms of improving the service.

Business ecosystem can leverage customer insights in the value creation process by including them through interaction. The aim is to learn, conduct transactions and share knowledge with all the ecosystem members involved in the development and use of services, and virtual, electronic tools are utilised for this process. For the successful management of service value co-creation, [P019] develop a framework to help service providers understand the resource types and constraints in the network. Frow et al. [P010] combine the innovation aspects with practical design thinking in their analysis framework aimed at facilitating managerial strategic decision-making in recognising innovation opportunities. The identified challenges of service innovation in business ecosystems or networks are discussed in few papers, and they are clearly similar to overall collaboration management issues. As de Reuven and Bouwman [P008] put it, companies may lack insight into how service innovation processes affect management in ecosystems. Challenges in innovation in business ecosystems can arise from the lack of guidance for organisations involved in the innovation and the lack of involvement of different stakeholders for the creation of value [P021]. Barriers in the application of open innovation include organisational and cultural issues when starting collaborations and the risk of losing core competencies or key technologies through know-how leakages [P026].

## **4 Discussion and conclusion**

In this study, we identified 38 primary studies describing service design or open innovation used in a business ecosystem context. To ensure a sufficiently wide perspective on the research, some adjacent concepts, such as the business network, were included. All the studies were quite recent, which indicates that the research area is still rather young and immature, thus offering possibilities for new research opportunities. The identified studies were almost equally either from the management and business sciences or the ICT field. IS researchers, as part of applied socio-technical sciences, can integrate this existing knowledge into their research and then complement the knowledge base in turn by deepening the IT specific aspects, such as the digitalisation of services and managing technology or software platforms. The need for cross-disciplinary research is evident in this particular topic. Interestingly, we can see that overlapping of open innovation and business ecosystems already exists in the research, as these concepts have similarities in the way they understand the need for a wide set of actors in the service value co-creation process.

The use of social and economic theoretical models and frameworks to analyse ecosystems is an indication that research on business ecosystems is maturing and the understanding of the dynamics and changes in actors' roles in service value co-creation is relevant. The use of activity theories and an actor–resource–activity model to analyse the actors, resources and structure of the networks in ecosystems aims to analyse the relationships within the ecosystem. The frameworks that are used add to the understanding of ecosystems at the network level. Business ecosystems research emphasises the role of a strong leader and the need for a diverse set of actors with loose but dynamic connections, which are also seen as antecedents to service innovations. However, various types of ecosystems are inten-

tionally formed and facilitated in Europe through strategic funding, with the purpose to support the European economy (cf. Digital Business Ecosystem: Nachira et al., 2007). The concept of ecosystems is therefore expanding, as the emphasis is placed on the collaboration between smaller companies instead of their formation around one strong leader. This does not remove the need for facilitating collaboration and an organisation that ultimately takes leadership. It does introduce new challenges that can be overcome by understanding the possible pitfalls that collaboration in such types of ecosystems may face.

Value co-creation, collaboration, knowledge-sharing, and ecosystem-wide knowledge generation are seen as both antecedents for success and major challenges in business ecosystems. Moreover, customer insight needs to be made visible to the ecosystem. Interestingly, it seems that communication and collaboration are management issues both internally, within the core ecosystems, and towards the expanded ecosystem. Solutions for making the knowledge and expertise visible within the ecosystem must be developed. Increasing visibility through communication and applicable tools (perhaps adapted from social media) can also decrease the reported issues in trust-building, interaction and fairness in strategy development, thus enhancing the overall value co-creation experience and outcome of the service innovation. Managing service innovation creation in the ecosystem requires an understanding of the interactions of different actors and customers as well as understanding and management of the necessary knowledge and resources to make decisions that benefit the actors and the ecosystem. Managing the service innovation ecosystem is a challenge, but increasing visibility by learning from others, building trust and understanding the dynamic nature of ecosystems is important.

Overall, the key findings that require practical solutions are related to structured decision-making, which should be based on understanding the core capabilities and service value co-creation potential within an ecosystem, with an emphasis on the formation phase of the ecosystem. It directs the management and joint service innovation, but poses a challenge to ecosystems that encompass various organisations with different cultures, roles, interests and resources. In the stages of service innovation within an ecosystem, different resources and know-how are needed. These need to be recognised and managed through communication and knowledge-sharing. The actors in the ecosystem understand their respective roles, for example, customer insight, technology knowledge and market knowledge, to innovate and create services in knowledge-intensive fields.

To conclude, we were looking for existing research that already spans service design or open innovation research and business ecosystems research. Although not all the studies referred to networks as business ecosystems, similar terminology and features were used in most of them. The keywords were selected to find papers that would give directions to future research, but we acknowledge that the focus was quite specific. The primary studies were selected using criteria that should reveal a specific cross-section of existing research. Surprisingly, the innovation-focused research venues were in the minority in our primary study set. It may be that the chosen databases had an effect on these results, although many of them were multidisciplinary.

Our study provides a basis for synthesising existing knowledge from different research fields for service design and open innovation research in the business ecosystem context. For future research directions, service ecosystems and innovation ecosystems could be better conceptualised through detailed, systematic analysis and a comprehensive synthesis of different types of value co-creation aspects identified in this research. There is evidently a need for longitudinal, evidence-based research in the formation of business ecosystems and service value co-creation in the field. The research could be extended to analyse the tools and methods used for practical aspects of managing the business ecosystem and for the co-creation of value. Closely related research or studies published outside of our search area could contribute to understanding the different aspects of service innovations in ecosystems.

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