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Laurea University of Applied Sciences
Ratatie 22, 01300 Vantaa, Finland
Phone +358 (0)9 8868 7150
Fax +358 (0)9 8868 7200
firstname.surname@laurea.fi
www.laurea.fi
Business ID 1046216-1
Domicile Vantaa

Digital open innovation and co-creation in service organisations: Enablers and barriers

Krista Keränen (krista.keranen@laurea.fi)
Laurea University of Applied Sciences, Finland

Ruusa Ligthart
Laurea University of Applied Sciences, Finland

Abstract

The role of digitalisation in open innovation activities is increasingly attracting organisations. Digital platforms seem to enable multiple partners to co-create better services and customer outcomes, i.e., service innovations. However, it seems that organisations are facing challenges in adopting digital open innovation activities. This research aims to better understand the use of digital open innovation and co-creation activities. In this research, altogether 47 semi-structured interviews were accomplished in 8 service organisations. Early results of this research indicate that the organisations are aiming to increase digital open innovation and co-creation activities, and there seems to be certain enablers such as the need to effectively develop new services and barriers such as inadequate operating models. The final objective of this research project is to build a gamified roadmap that would support organisations in transforming their innovation models toward digital open innovation platforms enabling co-creation.

Keywords: Digital platforms, Digitalisation, Open Innovation, Co-creation, Service Innovation

1 Introduction

Digitalisation can be compared to an industrial revolution when looking at changes in organisations' and people's daily lives (Kenney et al., 2015). Digital technologies are expected to introduce disruptions in even the most traditional analogue markets (Soule et al., 2014). Moreover, digital technologies seem to have already changed organizations' innovation policy, and the role of digitalisation in open innovation activities is increasingly attracting organisations. Nevertheless, digitalisation seems to be quite unclear for organisations, and major players still find it difficult to draw up their digitalisation strategies (Rodrigues et al., 2011). Moreover, it seems that there is very little literature on digital open innovation among more traditional fields of business.

New disruptive technologies are changing the manner in which knowledge is managed within organisations, calling for a new and inventive knowledge management system and an open approach to foster knowledge flows (Santoro et al., 2017). Connecting technology with a user-centric perspective of open innovation allows unique opportunities for co-creation (Kohler et al., 2009). The interaction in digital environments has created a gigantic stream of behavioural data that provide novel research opportunities to move beyond traditional innovation activities (Brunswicker et al., 2015). Parmentier and Mangematin (2014) state that digital industries exemplify innovation processes where users bring new ideas and innovate directly with organisations. Individuals can use open, voluntary technology-enabled collectives to share data and knowledge and to co-create novel solutions for organisations (Brunswicker et al., 2015). There is a general feeling that

communication and collaboration using technology can boost the innovation process with positive impacts on business indicators.

Digitalisation seems to enable open innovation platforms to co-create service innovations. Stakeholders are empowered with technology to co-create anytime and anywhere. Digitalisation opens possibilities for stakeholders to accomplish their aims together where individuals or organisations could not do it alone (Preece and Shneiderman, 2009). The advances in digital technologies are considered to form a megatrend with global impacts through international interconnectivity and the capability for real-time information sharing (Lee et al., 2012). For instance, social media enables constant hearing of users' voices instead of traditional customer satisfaction surveys and focus groups activities (Westerman et al., 2014; Buhalis and Law, 2008).

Furthermore, user participation with several stakeholders in the global context might be a challenge, but digital open innovation platforms can offer promising solutions (Friedrich, 2013). According to Mahr and Lievens (2012), virtual communities tend to propose solution-focused contributions, which provide greater value for organisations than more problem-focused traditional innovation activities. Moreover, digital platforms differ in terms of user purpose, but they have some common characteristics: for example, mass participation that allows greater intellectual capabilities and more ideas (Mačiulienė and Skaržauskienė, 2016), especially among external stakeholders (Hienerth, 2011). This allows organisations to advance new opportunities by harnessing users' innovation capabilities by integrating them into a service innovation process (Hienerth, 2011). However, digital open innovation and co-creation activities are not often used because when digital technology services are offered by external companies, organisations might not find them reliable enough (Mačiulienė and Skaržauskienė, 2016). Moreover, organisations face the challenge that there is often not enough time to evaluate the reliability of a technology (Chesbrough, 2006). Apart from this knowledge, there seems to be very little information on other barriers related to digital open innovation and co-creation.

Based on the literature, it seems that an increasing body of literature exists around digitalisation, open innovation and co-creation. However, there seems to be a very little empirical research on digital open innovation and co-creation. Thus, this research aims to better understand the use of digital open innovation and co-creation activities. Furthermore, it aims to better understand enablers and barriers of digital open innovation and co-creation. As this research is exploratory, using an abductive approach, this paper first only briefly discusses digitalisation, open innovation and co-creation to demonstrate the definitions of these phenomena, i.e., to demonstrate how digitalisation, open innovation and co-creation are understood in this research. Secondly, the abductive approach and methods used in this research are introduced. Thirdly, the findings of this research are introduced. Finally, conclusions, limitations, and future research are presented.

2 Digitalisation

As noted in the introduction, digital technologies seem to create new possibilities for open innovation and co-creation activities. Moreover, digitalisation has some distinct characteristics that have fundamental implications for open innovation (Nylen, 2015).

There seems to be no uniform definition for the concept of digitalisation, and in research articles digitalisation is often bound to a certain field of business or to an individual process (Ligthart et al., 2016). Definitions range from digitalisation as a global megatrend (Lee et al., 2012, 818-819) to the much narrower "digital representation of signals, information, and objects in binary code" (Stein, 2015, 2). Ilmarinen and Koskela (2012) note that instead of defining the concept of digitalisation itself, it is often described through examples.

The research literature also use the terms "digitalisation" and "digitisation" interchangeably and give both a number of definitions. Lipiäinen (2014, 20) defines the term "digitisation" as a social phenomenon in which everyday communication channels are pivoting from traditional forms towards their digital counterparts. While Lipiäinen (2014) refers to digitisation in the context of communications, the focus of the definition is on the social phenomena, not on the technical process of transforming information to a binary form. Tilson et al. (2010, 749) take a contradicting

stance in stating that digitisation refers to a technical process, whereas digitalisation would be the proper term to use when the context is more of a social nature.

Definitions of both digitisation and digitalisation feature the same key component of transition from analogue to digital. Digitisation, defined as the conversion from analogue to digital, is identified as a key driver for enhancing digitalisation (Ilmarinen and Koskela, 2015, 21). Aside from a transformation from analogue to digital, the definition of the term appears to be highly contextual. Gartner's IT glossary (2016) defines digitalisation on a broad level and adopts a business transformation viewpoint: "Digitalisation is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business". While research in digitalisation is available in vast quantities, the numerous ways digitalisation is defined and interchanged with the term digitisation sets requirements to understand in which context the term is presented in research articles.

To conclude, this paper looks at digitalisation from an open innovation and co-creation point of view, seeing it as a transformation from analogue (i.e. face-to-face communication) to digital communication through digital platforms and a social phenomenon that can involve a large number of stakeholders

3 Open Innovation and co-creation

It seems that open innovation and co-creation have some overlapping characteristics. According to Chesbrough (2003), open innovation can be defined as the intentional use of inputs and outputs of knowledge to accelerate internal innovation and expand market possibilities for the use of these innovations. Open innovation is based on utilizing both external and internal ideas and open channels for accessing and employing knowledge and solutions. Marilungo et al. (2016) states that open innovation refers to a process in which external partners are involved in the development process. This means that an organisation's external stakeholders are well-recognised as a valuable source for innovation (Von Hippel, 2001). It should be noted that there are many intelligent people outside the organisation (Aas and Pedersen, 2016). Therefore, open innovation can generate substantial benefits for organisations, such as the introduction of an external perspective (Gassmann et al., 2010).

On the other hand, co-creation is understood as a powerful approach to foster innovations (e.g. Ramaswamy and Gouillart, 2010). The power of co-creation in innovation is its capability to combine the knowledge of stakeholders from different perspectives (Keränen, 2015). Grönroos and Voima (2013, 141) see that interactions "form a platform for co-creation of value", meaning that there needs to be a certain kind of interaction to co-create value. Keränen (2015, 218) introduces a co-creation framework that focuses on face-to-face and B2B co-creation in service companies, and she goes on to state that there are certain kinds of characteristics in co-creation which she calls pre-conditions and co-design manners. Moreover, Keränen (2015) indicates that co-creation creates a certain potentiality for strategic thinking and that triggers are needed to enhance co-creation activities. Co-creation can be seen as a learning process of creating new knowledge/solutions for the stakeholders involved (Keränen, 2015).

The number and type of different partners with which an organisation collaborates with can demonstrate the organisation's openness to innovation. The larger the number of partners, the more open the innovation process seems to be (Lazzarotti and Manzini, 2013). Sivard et al. (2014) mention that most innovations occur through a learning process where various actors, individuals as well as organisations, take part. Thus, organisations would not have to rely entirely on their internal research, but should open the innovation process to all employees, suppliers and customers i.e. the main stakeholders of the organisation. Open innovation is based on co-creative activities where stakeholders jointly create value to develop better or new service innovations (Carbone et al., 2012). It has received substantial business attention as a means of providing organisations with the ability to co-create new products and services in hyper-competitive environments (Almirall et al., 2014).

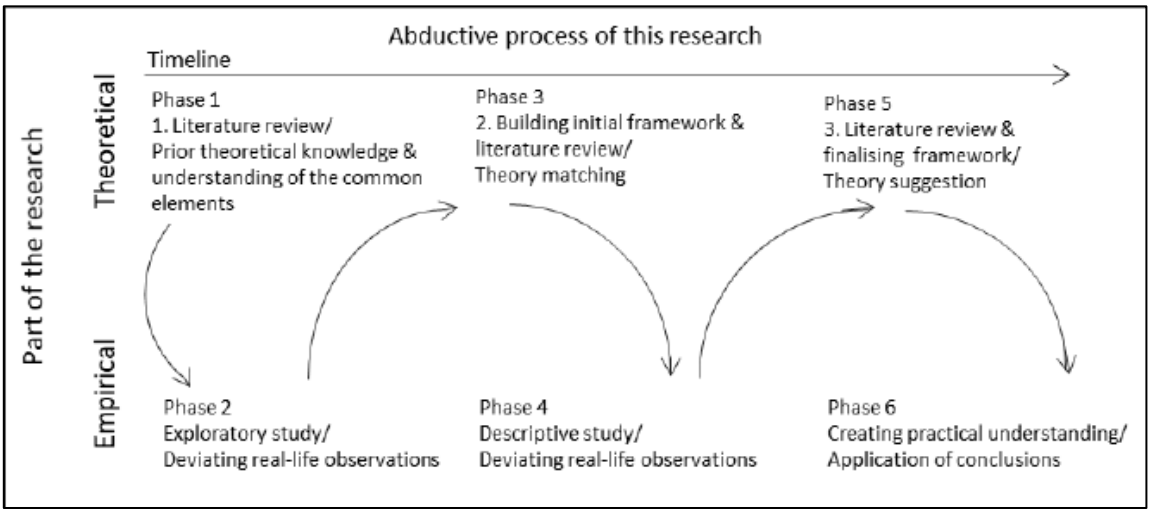

Figure 1 – The abductive process of this rese

One of the key elements in innovation is the use of technology (Saguy, 2011). Fostering new opportunities using technology is vital for organisations in today's global market (Rabelo & Bernus, 2015). However, most competitive organisations are no longer proud to say that their technology was "developed in-house", because the results of this open environment tend to be better (Burcharth et al., 2014). No organization or institution has reached a leading position in the development of technology by accumulating all their knowledge in isolation, but they have achieved this through co-creation activities in a collaborative environment and the rapid spread and transmission of knowledge (Van Vrande et al., 2009).

To conclude, open innovation in this research is understood as the intentional use of both external and internal inputs and outputs of knowledge to accelerate internal innovation and expend market possibilities (Chesbrough, 2003). On the other hand, co-creation can be defined in the following way: co-creation is a joint value creation process (Grönroos & Voima, 2013) of developing solutions (e.g. Aarikka-Stenroos & Jaakkola, 2012; Hakanen & Jaakkola, 2012), facilitating innovations (e.g. Kristensson et al., 2008), and creating strategic potentiality through co-design manners for the stakeholders involved (Keränen 2015, 222). Hence, this research sees open innovation as a platform of sharing knowledge where an organisation's external and internal stakeholders co-create solutions that facilitate innovations for the stakeholders involved. The platform itself can contain both digitally enabled co-creation activities and/or face-to-face activities.

4 Research Method

This qualitative research was carried out using the abductive research approach. And the nature of this phase was explorative, as we wanted to better understand digital open innovation, which seems to be an unexplored phenomenon. The core idea of the abductive approach (see Figure 1) is that the researcher moves between the theoretical and empirical worlds and accepts the incompleteness of thoughts, taking non-linear approaches throughout the research to deepen both theoretical and empirical understanding (Dubois & Gadde, 2002). This can also be called "systematic creativity" (Kovács & Spens, 2005). The abductive approach is to an extent inductive in attempting to theorise the knowledge gained through empirical enquiry rather than deductively testing the theory. However, the abductive approach attempts to understand the theory related to the topic to gain pre-understanding and to generate an understanding of the common elements of the research which can lead to an understanding of the phenomenon in a new way (Kovács & Spens, 2005). This research moves up to Phase 3 as it attempts to build an initial model based on the empirical findings of the exploratory study.

Table 1 – Cases and the service sectors of this research

Organisation	Service sector
O1	Retail
O2	HR services
O3	Taxation
O4	Insurance
O5	Consultation
O6	Finance and banking
O7	Insurance
O8	Property management

Table 2 – The levels of adaptation of open innovation and co-creation activities

Level of adaptation	Description
High	Open innovation/co-creation activities are regularly used in the organisation's operations and they are embedded in the organisation's main processes
Moderate	Open innovation/co-creation activities are used in the organisation's operations but they are not embedded in the organisation's main processes
Low	Open innovation/ co-creation activities have been used couple of times in the organisation's operations
None	Open innovation/ co-creation activities have not been used in the organisation's operations

To gain a better understanding, not just from one organisation but from multiple organisations, this research was carried out as a multiple-case study design where the units of analysis were eight service organisations located in Finland (Yin, 2009).

The cases were chosen to have a wide collection of different kinds of organisations. Organisations also varied in size; three organisations were small- or medium-sized organisations, and five were large organisations. The organisations operated in the following service sectors: finance and banking, taxation, insurance, retail, property management, consultation and HR services (Table 1).

The data was collected from 47 semi-structured interviews among eight organisations between April and August 2016. Interviewees were managers and specialists. Each interview was 45 to 90 minutes long. After conducting the interviews, the data was transcribed and analysed.

In this phase, data was analysed first based on the level of adaptation of open innovation and co-creation practices (see Table 2). Next to be analysed were the enablers and barriers related to adopting digital open innovation and co-creation activities. Finally, the results were presented to the organisations which, after an initial model, moved towards open innovation and co-creation activities.

5 Findings

In this paragraph, we demonstrate the data and findings of this research. First, we mapped the level of adaptation of open innovation and co-creation. Secondly, we looked at enablers and barriers in open innovation and co-creation.

The evidence from the analysed data pointed out that none of the organisations were adopting co-creation activities or open innovation activities on a high level. At this point, the data also revealed that neither digital nor face-to-face open innovation and co-creation activities were extensively adopted in these organisations.

Table 3 – Level of open innovation and co-creation adaptation among organisations

Level of adaptation / Organisation	Open innovation High	Co-creation High	Open innovation Moderate	Co-creation Moderate	Open innovation Low	Co-creation Low	Open innovation None	Co-creation None
O1					x	x		
O2					x	x		
O3			x	x				
O4					x	x		
O5			x	x				
O6			x	x				
O7							x	x
O8					x	x		

Table 4 – Open innovation and co-creation enablers

Enablers	Enablers to open innovation	Enablers to co-creation
E1. A need to effectively develop new services	O1 O2 O3 O4 O5 O6 O7 O8	O1 O2 O3 O4 O5 O6 O7 O8
E2. Systematic process	O1 O2 O3 O4 O5 O6 O7 O8	O1 O2 O4 O5 O7 O8
E3. Regular activity with customer	O3 O5	O2 O3 O5 O6 O8
E4. Regular collaboration among personnel		O2 O3 O6 O7
E5. Person responsible for the process	O7 O8	O8
E6. Piloting	O1 O8	O3
E7. Encouraging organisation culture	O3 O4	O2
E8. Process transparency	O6 O8	
E9. Rewarding those involved in process	O2 O7	
E10. Digitalisation		O1
E11. Workshops		O1
E12. Tools		O8
E13. Consultants and other external support	O6	

For the moderate-level organisations, O3, O5, and O6 were mapped to have moderate open innovation and co-creation activities. Four organisations have been testing open innovation or co-creation activities (using them a couple of times): O1, O2, O4, and O8. Organisation O7 had not been using any open innovation and co-creation activities so far. Here it should be noted that all organisations have digital services for their customers, but open innovation and co-creation seem to be new activities for them (Table 3).

Next we looked at open innovation and co-creation enablers within these organisations. We were able to map altogether 13 enablers (see Table 4). The most common enabler among all organisations was a need to effectively develop new services (E1). This enabler would occur as an

Table 5 – Open innovation and co-creation barriers

Barriers	Barriers to open innovation	Barriers to co-creation
B1. Traditional operating model/ closed organisation culture	O1 O2 O3 O4 O5 O6 O7 O8	O1 O2 O3 O4 O5 O6 O7 O8
B2. Not enough resources, not enough time	O5 O8	O3 O8
B3. Short projects not ongoing activity	O6	O6 O8
B4. Organisation's capability to react fast enough to changes	O1 O2 O7	O2
B5. No knowledge how to interact deeply with customer		O1 O2 O4 O5
B6. No knowledge on how to interact deeply with personnel	O2	O2
B7. Too many ideas – choosing the most innovative is challenging	O3 O5	
B8. Management is passive		O3

enabler for both open innovation and co-creation. The organisations generally brought up the need for a systematic process (E2), meaning that there is a need for a systematic process to be open innovative and co-creative. For co-creation, it seems that there is a need for regular activity with customers (E3) and regular collaboration among personnel (E4). This would mean, for example, regular steering group meetings with customers, regular workshops or other regular activities. Moreover, organisation O3 and O5 brought up that regular activities with customers (E2) would also enable open-innovation activities. It also seems that for a few organisations, it is important to have a person who would be responsible (E5) for co-creation (O8) and open innovation activities (O7, O8). Case O3 proposed that piloting (E6) would enable co-creation activities, and cases O1 and O8 made proposals from the open-innovation point of view. Here piloting would mean short pilot projects that would enable organisations to test new approaches like open innovation and co-creation. Cases O3 and O4 from open innovation point of view and O2 from co-creation point of view brought up that encouraging organisation culture is an important enabler. More over process transparency (E8), rewarding those involved in the process (E9) and consultants and other external support (E12) could enable open innovation activities. On the other hand, case O1 indicated that digitalisation (E10) and workshops (E11) and case O8 indicated that tools enable co-creation activities.

After mapping the enablers, we looked at open innovation and co-creation barriers within these organisations. We were able to map altogether 8 barriers enablers (see Table 5). The most common barrier, both for open innovation and co-creation among all organisations, was the traditional operating-model/closed-organisation culture (B1). With a traditional operating-model/ closed-organisation culture, we mean a model in which the organisation is hierarchical, focusing on its own competences, resources, processes, and technologies, and an outsider's access to the organisation's information is very limited. Next, we found that in some organisations (O5, O3, O8), it seems that there is not enough resources and time (B2) to accomplish open innovation and co-creation activities. Moreover, it seems that some organisations stated that open innovation and co-creation activities are carried out within short projects, but they are not embedded in the organisation's ongoing activity (B3). This means that open innovation (O6) and co-creation (O6, O8) are seen as an extra activity. Barrier B4 (an organisation's capability to react fast enough to changes) was related to open innovation in three organisations (O1, O2, O7) and to co-creation in only one organisation (O2). Barrier B5 (no knowledge on how to interact deeply with the customer) divided organisations, as no one saw this as a barrier to open innovation while four organisations (O1, O2, O4, O5) saw this as a barrier to co-creation. Barrier B6 (no knowledge on how to interact deeply with personnel) was seen

Figure 2 – An initial model of moving toward open innovation and co-creation activities

as a barrier in organisation O2. Organisations O3 and O5 brought up that open innovation activities might cause too many ideas and it might be difficult to choose the most innovative ones (B7). Organisation O3 saw passive management as a barrier to co-creation activities.

In conclusion, the evidence from the analysed data pointed out that none of the organisations were adopting neither co-creation activities nor open innovation activities on a high level. Thus, it can be said that none of the organisations have extensive experience in open innovation or in co-creation. Seven out of eight organisations have been open innovating and co-creating at least a couple of times. However, it seems that these organisations are highly interested in learning how to adopt open innovation and co-creation activities, but they brought up that they need a road map on how to shift toward open innovation and co-creation activities. It should be noted here that although we were initially looking at digital open innovation and co-creation activities, we did not find any. And these organisations did not seem to view digitalisation as an enabler as only one organisation brought it up (O1). As said earlier, these organisations are offering digital services for their customers, but they seem not to have any digital activities related to open innovation or co-creation.

Hence, based on this empirical evidence, our attempt is to build a first draft to best describe the journey from a non-open innovative and non-co-creative organisation to an organisation where open innovation/co-creation activities are regularly used in the organisation's operations and they are embedded in the organisation's main processes (see Figure 2).

During the interviews, we noticed that many of the interviewees spoke about a cultural change and an iterative process where the stakeholders of the process would have a chance to learn while moving toward more active open innovation and co-creation activities. Thus, the initial draft of the model demonstrates the journey as an iterative process where enablers are currently arranged to the best to our knowledge and where barriers are turned into enablers. To give an example, barrier B8 (management is passive) is demonstrated as an active management in the model, and B2 (not enough resources, not enough time) is demonstrated as adding resources.

Moreover, the data indicated that there has to be some kind of trigger or a need for organisations to show an interest in open innovation and co-creation. In this case, the trigger seems to be a need to effectively develop new services.

To conclude, the data demonstrated that organisations have a little experience in open innovating and co-creating with their stakeholders. However, they seem to be highly interested in learning how to open innovate and co-create, but there needs to be trigger/need which will activate organisation to pilot open innovation and co-creation activities. Nevertheless, they seem to lack knowledge on how to open innovate and co-create. Thus, we created an initial model that serve as a road map for organisations for their journey from a non-open innovative and non-co-creative organisation to a highly open innovative and co-creative organisation. As this result is based on

empirical data, the next step needs to deepen the current theoretical aspects of open innovation and co-creation in order to build an initial framework to better understand the phenomena.

6 Conclusion

In this research, altogether 47 semi-structured interviews were taken in eight service organisations. This research initially aimed to better understand the use of digital open innovation and co-creation activities. Furthermore, it aimed to better understand enablers and barriers to digital open innovation and co-creation. As this research is exploratory, using an abductive approach, this paper first only briefly discussed digitalisation, open innovation and co-creation to demonstrate the definitions of these phenomena. Secondly, the abductive approach and methods used in this research were introduced. Thirdly, the findings of this research were introduced. Next we discuss the conclusions, limitations, and future research.

As we stated earlier, our starting point for this research was to better understand digital open innovation and co-creation activities. However, we quickly understood that organisations did not seem to have much experience in both open innovation and co-creation activities, either on the digital level or face-to-face. Nonetheless, the results of this research make us better understand that there are some enablers and some barriers related to open innovation and co-creation activities. Moreover, early results of this research indicated that the organisations are aiming to increase digital open innovation and co-creation activities but there needs to be certain triggers or a need to effectively adopt open innovation and co-creation activities, and organisations need a road map on how to approach open innovation and co-creation activities.

We presented an initial model (see Figure 2) that introduces an iterative journey moving toward a systematic process of open innovating and co-creating among an organisation's stakeholders. This model might support theorising on open innovation and co-creation phenomena, as in the next phase the results of this study are compared with existing knowledge. Moreover, this model might support organisations in their journey toward a highly open innovative and co-creative organisation, which according to current literature, would bring new aspects into their innovation process and competitive advantage.

This paper suffers from some limitations that need to be addressed in future research. First, the data was collected without an extensive literature review. Thus, it might be that the literature already demonstrates similar results. However, digitalisation seems to be a new research topic, and when combined with open innovation and co-creation, the initial literature research did not reveal any studies. Secondly, the initial model has not been tested yet in practice in any organisations; thus, we do not know how generalisable our findings are. Furthermore, the model needs to be designed in a more coherent way.

To conclude, as this research is part of a larger research project where the final objective is to build a gamified roadmap. The purpose of the roadmap would be to support organisations in transforming their innovation models toward digital open innovation and co-creation platforms. Hence, we will continue this research in strengthening the theory and testing the model and letting the theory and testing take us to the next research steps.

References

Aarikka-Stenroos, L. and Jaakkola, E. (2012). Value co-creation in knowledge intensive business services: A dyadic perspective on the joint problem solving process. *Industrial Marketing Management*, 41(1),15–26.

Aas, T. and Pedersen, P. (2016). The Feasibility of Open Service Innovation. In A–L. Mention and M. Torkkeli (eds.), *Open Innovation a Multifaceted Perspective*, Stallion Press, 287–314.

Almirall, E., Lee, M. and Majchrzak, A. (2014). Open innovation requires integrated competition-community ecosystems: Lessons learned from civic open innovation. *Business Horizons*, 57(3), 391–400.

Brunswicker, S., Bertino, E. and Matei, S. (2015). Big Data for Open Digital Innovation - A Research Roadmap. *Big Data Research*, 2(2), 53–58.

Buhalis, D. and Law, R. (2008). Progress In information technology and tourism management. 20 years on and 10 years after the internet. The state of etourism research. *Tourism Management*, 29(4), 609–623.

Burcharth, A. L. de A., Knudsen, M. P. and Sondergaard, H. A. (2014). Neither invented nor shared here: the impact and management of attitudes for the adoption of open innovation practices. *Technovation*, 34, 49-161.

Carbone, F. et al. (2012). Open Innovation in an Enterprise 3.0 framework: Three case studies. *Expert Systems with Applications*, 39(10), 8929–8939.

Chesbrough, H. W. (2003). The era of open innovation. *MIT Sloan Management Review*.

Chesbrough, H. W. (2006). New Puzzles and Findings. In H. W. Chesbrough, W. Vanhaverbeke, and J. West (eds). *Open innovation: Researching a new paradigm*. Oxford: Oxford University Press, 15–34.

Dubois, A. and Gadde, L.E. (2002). Systematic combining: an abductive approach to case
research. *Journal of Business Research*, 55(7), 553–560.

Friedrich, P. (2013). Web-based co-design. Social media tools to enhance user-centered design and innovation processes. VTT Science 34. Doctoral dissertation. Espoo VTT: Aalto University School of Science.

Gassmann, O., Enkel, E. and Chesbrough, H. (2010). The future of open innovation. *R&D Management*, 40 (3), 213–221.

Gartner. (2016). IT Glossary, Digitalization. http://www.gartner.com/it glossary/digitalization. [4 August 2016].

Grönroos, C. and Voima, P. (2013). Critical service logic: making sense of value creation and co-creation. *Journal of the Academy of Marketing Science*, 41, 133–150.

Hakanen, T. and Jaakkola, E. (2012). Co-creating customer-focused solutions within business networks: a service perspective. *Journal of Service Management*, 23(4), 593–611.

Hienerth, C., Keinz,P. and Lettl, C. (2011). Exploring the nature and implementation process of user-centric business models, *Long Range Planning*, 44(5-6), 344–374.

Ilmarinen, V.; Koskela, K. (2015): Digitalisaatio. Yritysjohdon käsikirja. Helsinki: Talentum.

Kenney, M., Rouvinen, P. and Zysman, J. (2015). The Digital Disruption and its Societal Impacts. *Journal of Industry, Competition and Trade*, 15, 1-4.

Keränen, K. (2015). Exploring the characteristics of co-creation in the B2B service business. PhD disseration in Engineering. Cambridge: University of Cambridge.

Kohler, T., Matzler, K. and Fuller, J. (2009). Avatar-based innovation: Using virtual worlds for real-world innovation. *Technovation*, 29 (6-7), 395–407.

Kovács, G. and Spens, K.M., (2005). Abductive reasoning in logistics research. *International Journal of Physical Distribution & Logistics Management*, 35(2), 132–144.

Kristensson, P., Matthing, J. and Johansson, N. (2008). Key strategies for the successful involvement of customers in the co-creation of new technology-based services. *International Journal of Service Industry Management*, 19(4), 474–491.

Lazzarotti, V. and Manzini, R. (2013). Different Models of Open Innovation: A Theoretical Framework and an Empirical Study. In J. Tidd (eds.) *Open Innovation Research, Management and Practice***,** Series on Technology Management: Volume 23, Imperial College Press, London, 15**–**37.

Lee, S., Olson.,L. and Trimi, S. (2012). Co-innovation: convergenomics, collaboration, and co-creation for organizational values. *Management Decision*, 50(5), 817-831.

Lipiäinen, H. (2014): Digitization of the Communication and its Implications for Marketing. Doctoral dissertation. Jyväskylä: University of Jyväskylä.

Ligthart, R., Porokuokka, J. and Keränen, K. 2016. Using Digital Co-Creation for Innovation Development. XXVI International RESER Conference. Nables.

Mačiulienė, M. and Skaržauskienė, A. (2016): Evaluation of co-creation perspective in Networked collaboration platforms. *Journal of Business research*. Forthcoming.

Mahr, D. and Lievens, A. (2012). Virtual lead user communities: drivers of knowledge creation for innovation. Research Policy, 41 (1), 167–177.

Marilungo, E., Coscia, E., Quaglia, A., Peruzzini., M. and Germani, M. (2016). Open Innovation for ideating and designing new Product Service Systems. *Procedia CIRP*, 47, 305–310.

Nylen, D. (2015). Digital Innovation and Changing Identities Investigating Organizational Implications of Digitalization. Department of Informatic. Doctoral Dissertation. Umeå University.

Parmentier, G. and Mangematin V. (2014). Orchestrating innovation with user communities in the creative industries. *Technological Forecasting & Social Change*, 83, 40–53.

Preece, J. and Shneiderman, B. (2009). The reader-to-leader framework: motivating technology-mediated social participation. *AIS Transactions on Human-Computer Interaction*, 1(1), 13–32.

Ramaswamy, V. and Gouillart, F. (2010). The Power of Co-creation: Build It With Them to Boost Growth, Productivity, and Profits. 1st ed., New York: Free Press.

Rodrigues, M.A. de S., Chimenti, P.C.P. de S. and Nogueira, R.A.R. (2011). The convergence challenge: an analysis of the ecosystem of open-signal TV in Brazil. *R. Adm.*, 46(1), 1–24.

Saguy, S.I. (2011). Academia-industry Innovation Interaction: Paradigm Shifts and Avenues for the Future. *Procedia Food Science*, 1, 1875–1882.
Santoro, G., Vrontis, D., Thrassou, A., Dezi, L. (2017). The Internet of Things: Building a knowledge management system for open innovation and knowledge management capacity. Technological Forecasting and Social Change. Forthcoming.
Soule, D., Carrier, N., Bonnet, D. and Westerman, G. (2014). Organizing for a Digital Future: Opportunities and Challenges. MIT Center for Digital Business and Capgemini Consulting. Working Paper.
Stein, V. (2015): Human Resources Development in Times of Digitalization: A Dynamization Agenda. Arbeitspapier Nr. 006–2015. Universität Siegen.
Tilson D.; Lyytinen K.; and Sørensen C. (2010): Digital infrastructures: The missing IS research agenda. Information Systems Research 2, pp. 748-759.
Van de Vrande, V., de Jong, J. P. J., Vanhaverbeke, W. and de Rochemont, M. (2009). Open innovation in SMEs: trends, motives and management challenges. *Technovation*, 29, 423–437.
Von Hippel, E. (2001). Perspective: user toolkits for innovation. *The Journal of Product Innovation Management*, 18(4), 247–257.
Westerman, G., Bonnet, D. and McAfee, A. (2014). Leading digital: Turning technology into business transformation. Harvard Business Press.
Yin, R.K. (2009). *Case Study Research: Design and Methods* 4th ed., California: Thousand Oaks.