Digitalization of SMEs: an ecosystem-based perspective

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Digitalization of SMEs: an ecosystem-based perspective

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Abstract: Over the last decade, digital technologies have been able to strike disruptive changes in the contemporary business landscape and so affecting small and medium enterprises (SMEs). SMEs have limited R&D, financial and human resources to invest in their digitalization process. In this research, we contextualize that SMEs can enhance their digitalization by collaborating with different actors of the ecosystem i.e., competing SMEs, higher education institutions (HEIs), co-creating with customers and utilizing support and facilitation activities provided by intermediary organizations. Therefore, our main research question is "How do SMEs enhance their digitalization through engaging with ecosystem-based dynamic collaborations?" To answer the research question, we conducted qualitative multiple case study research based on semi-structured interviews with the Northern Finland innovation ecosystem actors. The results confirm that ecosystem-based interactions enhance SMEs' digital competencies, and digital orientation and help them in emerging technology adoption which eventually leads them to maintain competitive advantage and achieve business model innovation.

Keywords: Innovation ecosystem; coopetition; co-creation; digitalization; SMEs; digital technologies; multiple case study; SME-HEI collaboration

1. Introduction

Over the last decade, digital technologies have been able to strike disruptive changes in the contemporary business landscape and so affecting small and medium enterprises (SMEs). SMEs have limited R&D resources as well as lack financial and human resources to invest in their digitalization process. In this context, SMEs can enhance their digitalization by collaborating with various networks including competing and non-competing actors in the ecosystem. Recent research (e.g., Olsen et al. (2020) shows that competition is the main barrier to co-creation for digitalization and so we propose SMEs can avoid pitfalls of competition through coopetition, which will minimize their silos in digitalization. Also, we empirically analyse intermediaries' facilitating role in activating and enhancing ecosystem-based coopetition and collaborations for SMEs' digitalization.

The existing research on inter-organizational collaborations highlights that SMEs engaged in collaborative and coopetitive interactions with external networks has a positive influence on their different type of innovations such as internal innovative capabilities (Apa et al., 2021; Mendoza-Silva, 2020), open innovation (Rosa et al., 2020) and radical innovation (Bouncken and Kraus, 2013; Saunila, 2020). Moreover, the digitalization aspect of SMEs has been explored from different perspectives such as technological views, firms' information technology capabilities, and contextual factors such as collaborations with external actors (Meier, 2021). Despite that the studies on SMEs' digitalization present a technological perspective (Dressler and Paunovic, 2021), internal capabilities view (Ahmed et al., 2022) and system dynamic view (Viswanathan and Telukdarie, 2021), existing research is missing in providing a holistic view of SMEs and their digitalization. Particularly, the prior research is scarce that empirically analyses the synergetic effect of dynamic ecosystem-based interactions on SMEs' digitalization. Furthermore, literature on SMEs' digitalization has overlooked intermediary organizations' role in facilitating SMEs' digitalization. Therefore, the objective of this paper is to explore different ecosystem-based interactions and their roles in enabling the digitalization of SMEs. We ask the following research question: "*How do SMEs enhance their digitalization through engaging with ecosystem-based dynamic collaborations?*"

This research contributes to the existing literature on innovation ecosystem and SMEs' digitalization by empirically analysing the previously overlooked dynamic ecosystem-based interactions. Furthermore, our research empirically explores the missing link of intermediary organizations' role in enabling the digitalization of SMEs. Our research assists previously less active SMEs to come out of their bubble and form collaborations with different actors in the ecosystem.

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2. Theoretical background

2.1 Innovation ecosystem

Ecosystems should be assumed as co-evolving mechanisms, in which dependencies among the actors play a significant role in success, outputs and mobilization in an ecosystem (Adner and Kapoor, 2010). The growing interest in the concept also spurred different types of ecosystems such as business, innovation, and knowledge ecosystems. Although these ecosystems share a majority of the features and often overlap in terms of multiple interactions among the different actors, it is inevitable to distinguish between the innovation ecosystem (IE), business ecosystem (BE) and knowledge ecosystem (KE). The recent research by (Valkokari, 2015) explains that BE is closer to business networks which primarily collaborate to create customer value. However, the major difference between business networks and BE is that later have different layers of collaborations and interactions in which a variety of actors come along around companies to create business value. KE main focus is the creation of knowledge facilitated by research institutes, innovative entrepreneurs and technology providers. Whereas, IE integrate the concept of knowledge exploration and exploitation, combining the essence of KE and BE (Valkokari, 2015; Oh et al., 2016). The IE also involved a wide range of actors such as policy-makers, innovation intermediaries, technology and knowledge brokers, and public organizations that provide a different kind of support.

2.2 Digitalization and innovation ecosystem-based collaborations

The manifold interest of researchers in the concept of digitalization has also emerged other similar concepts such as digitization, digitalization and digital transformation (Imran et al., 2021). Often these concepts have been utilized interchangeably, however, few researchers have defined them in different contexts. For example, digitization is transforming analogue information into digital format, whereas, digitalization is more linked with creating and capturing business value using digital channels (technologies) (Parida et al., 2019). However, digital transformation is associated with bringing changes at different levels of organizations, such as configuring internal resources, organizational cultural shifts, and strategic and business model changes (Imran, et a., 2021). In this research, we focused on digitalization as we study how SMEs can create value and capture business opportunities by utilizing digital technologies. The previous research confirms external support (Ghobakhloo and Iranmanesh, 2021) and firm external collaborations (Agostini and Nosella, 2019) have a positive link with their digitalization. The external collaborations are not confined only to traditional value chain actors, but also to other IE actors such as research institutes, innovation intermediaries, public sector organizations, govt legislators, knowledge brokers and competitors.

Among the research institutes, higher education institutions (HEIs) (including both universities and universities of applied sciences) are prominent entities that have an integral role in the creation, diffusion and preservation of knowledge (Birtchnell et al., 2017). The modern view of HEIs explains that they are not limited to traditional academic activities and basic research, but they strive to increase collaborations with other actors, conduct applied research, provide practical solutions and capitalize on the knowledge they created (Birtchnell et al., 2017). Research shows business organizations, e.g. SMEs having collaborations with HEI can build innovative capabilities (Shahzad, 2021), access to technological knowledge and build technological innovations (Petruzzelli and Murgia, 2021). SMEs through HEIs' collaborations can access knowledge on cutting edge technological innovations and build digital orientation (Petruzzelli and Murgia, 2021). Furthermore, recent research by Birtchnell et al. (2017) shows HEIs also act as testbeds for emerging technologies i.e. 3D printing. Therefore, collaborating with HEIs can help SMEs to get access to research facilities (living labs and testbeds) and familiarize themselves with emerging technologies.

Similarly, the role of coopetition in providing innovative solutions is well established in the existing research. However, few researchers have evaluated the coopetition from the technological and digitalization perspective. Ritala and Sainio (2014) study confirm that the firms tend to engage in technological coopetition and achieve their business model radicalness. Research carried out by Ellingsen and Aasland (2019) suggests that coopetition has a major role in the digitalization of different processes of large industrial organizations in the maritime industry. Moreover, the intermediary organizations play an important role in supporting different actors of the IE in knowledge development and diffusion through various initiatives (Howells, 2006; Kanda et al., 2019). Public and private intermediaries provide support at the firm and systems-level (Kivimaa et al., 2019), thus helping individual firms in their innovations and linking their knowledge networks to wider IE. In the context of SMEs, previous research suggests external support and initiatives prove to be the point of departure in SMEs' voyage towards digitalization (Ghobakhloo and Iranmanesh, 2021). For SMEs, their journey toward digitalization remains full of challenges as they lack the necessary financial and human

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resources required to implement digital technologies. Therefore, intermediary organizations can support SMEs in acquiring knowledge about emerging digital technologies and help them in building digital orientation.

Based on the discussion, we conceptualize that SMEs can enable digitalization by opening up themselves to ecosystem-based interactions, particularly by collaborating with HEIs, coopetition with peer SMEs and reaching out to regional intermediary organizations to get support for their digitalization process.

3. Research Design

The research adopted a qualitative research approach to perform an in-depth analysis of SMEs' digitalization. To attain the maximum variations, a purposive sampling technique was adopted (Guest et al., 2006) and key informants helped researchers to identify and select the respondents of the study (Yin, 2009). The research is based on a multiple case study design, including respondents from SMEs, HEIs and intermediary organizations operating in the regional innovation ecosystem in Northern Finland. We interviewed 17 senior-level managers involved directly in strategic level decision making on their collaborations, 6 intermediary organizations and 7 representatives from 3 HEIs. The sample includes the service sector (~60%) and manufacturing (~40%). The data was collected through in-depth semi-structured interviews and participants were invited through sending personalised emails containing a brief introduction of the research. Three separate sets of interviews questionnaires were designed for interviews, and interviews were conducted online using Zoom and Microsoft Teams. We continued interviewing the participants until we reached the saturation point, that is no additional insights can be gained through more interviews (Guest et al., 2006).

The qualitative data was analysed through thematic analysis and NVIVO software was used to code and derive the themes based on the data. To ensure reliability and validity of the results, researchers used the triangulation technique which is to review primary data carefully and verify the information with existing secondary data (Carter et al., 2014) obtained through other sources i.e. news, blogs, websites and published documents of the interviewed organizations.

4. Preliminary findings

The preliminary findings of the study support the research proposition that SMEs' IE based interactions enhance their digitalization in terms of increasing their digital orientation, competencies, new technologies implementation and enhancing their knowledge about emerging technologies. However, as can be seen from figure 1, compared to coopetition and HEI's collaborations, co-creation with customers and suppliers has been found the most successful form of collaboration for digitalization. Engaging with customers and suppliers in the co-creation process help SMEs utilize their knowledge in the implementation of new technologies such as VR, AI and IoT. In co-creation, customers shared their experience with SMEs on digital technologies which helped them to build capabilities to collect, transmit, store, and analyse the real time data using IoT and adopt a data-driven business model. Similarly, participants also explained that taking customers on board helped their organization to augment VR technology, which was otherwise near to impossible. Regarding coopetition, results indicate that coopetition on digital technologies is in a stage of their infancy and SMEs' and share very basic information. Based on the data, it can be induced that coopetition has been able to create digital awareness among SMEs, however, its role in digital capabilities and implementation of technologies was not found. We found a limited role of HEIs in SMEs' digitalization that is a few SMEs utilize HEIs' research facilities for additive manufacturing and product development. The majority of the SMEs perceive HEIs as knowledge hubs and talent pools, and they collaborate to hire thesis workers and interns.

The empirical evidence shows that SMEs face resource shortages and challenges in finding a suitable business partner, especially for digitalization. We found that regional intermediary organizations – both the public and private, facilitate SMEs in their digitalization through several initiatives i.e. resource mobilization, providing financial support, expert guidance and knowledge diffusion. They mobilize resources for SMEs' digitalization by conducting different events such as seminars, workshops, and webinars to gather different actors, digitalization experts and companies to create awareness of digital technologies. They also facilitate SMEs in getting financial support either by providing in-house funding or helping them in applying for funding from external resources. Another important aspect is that intermediaries provide consultation and expertise to SMEs on the utilization of digital technologies, devising a digital marketing strategy and digital presence and communication. Furthermore, we found that intermediaries promote the digitalization of SMEs through knowledge development and diffusion. They facilitate collaborations by bringing together highly digitalized and low digitalized SMEs, and present real cases and prototyping for digital technologies in their different processes.

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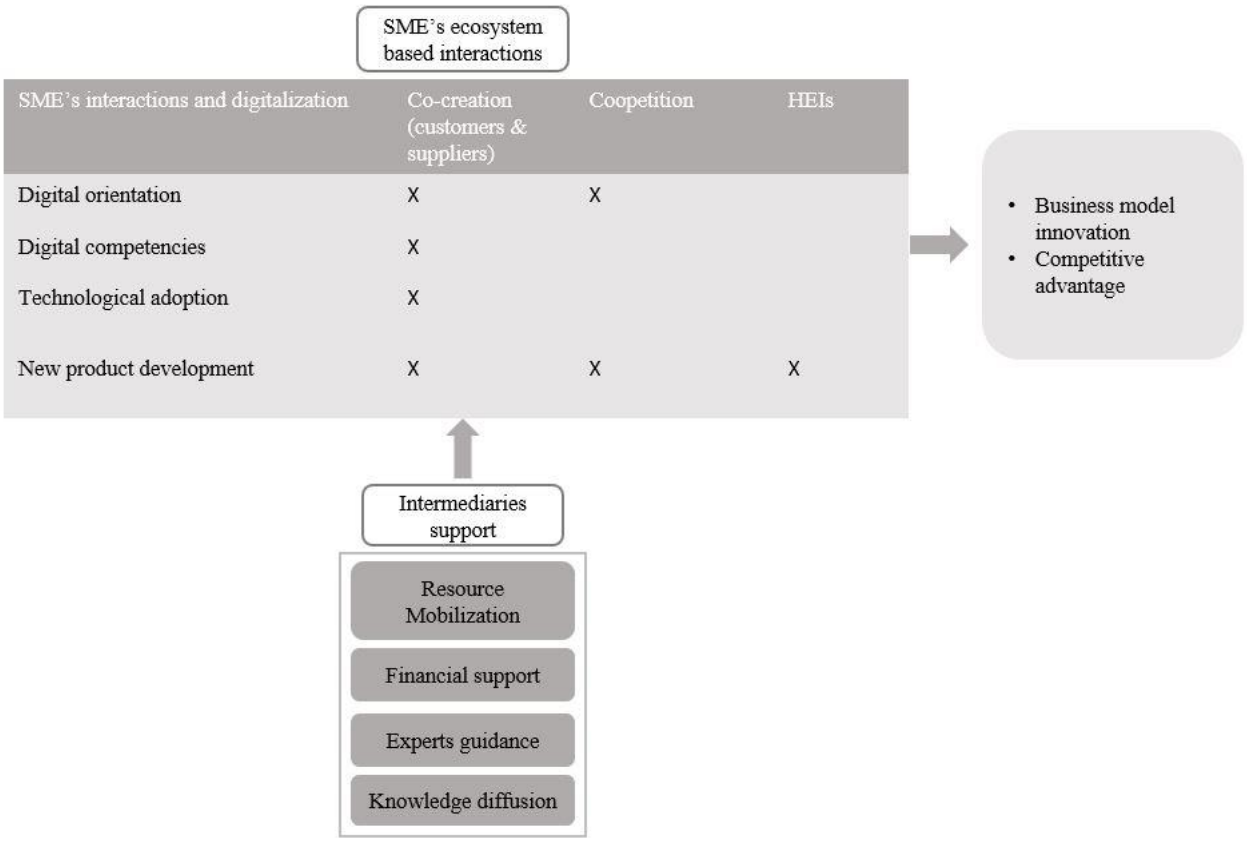

Figure 1. SMEs' ecosystem-based interactions and digitalization

5. Conclusions

This research found interesting insights and adds to the literature on the innovation ecosystem by providing empirical evidence on IE interactions (coopetition, SME-HEI, and co-creation), intermediary organization, and their role in SMEs' digitalization. By applying the IE lens, we analyse the dynamic interactions and their role in SMEs' digitalization. We provided empirical evidence that SMEs' co-creation activities with their customers and suppliers have a greater role in their digitalization, particularly in creating digital orientation, adopting new technologies and building their digital competencies, compared to coopetition and HEI's collaboration activities. The notion behind this phenomenon of low level of collaboration in coopetition can be explained by analysing the underlying risks in coopetition such as opportunism, and fear of intellectual property rights (IPR) leakages that can harm their competitive advantage. Another interlinked issue is that the knowledge of implementation of emerging technologies is still a relatively new concept to several SMEs and they perceive digital knowledge and competencies as a cornerstone to maintain their competitive advantage. Therefore, they remain reluctant to reveal information to competitors on emerging technologies. However, for product development and attaining competitive advantage, SMEs need to adopt IE based approach, supported by intermediary organizations. Also, the intermediary organizations, as results suggest, can play a significant role in building trust among the competitors to share the technological knowledge and form technology-based coopetition.

6. Practical implications

We have several practical suggestions for the management of SMEs in terms of enhancing their digitalization through ecosystem-based collaboration with different actors. Co-creation with customers and suppliers plays an important role, thus, we suggest that SME managers must extend their traditional supply chain relationships into joint projects that support them in creating digital orientation, adopting new technologies and building their digital competencies. Intermediary organizations as facilitators in an ecosystem can manipulate several interactions in favour of SMEs. Therefore, we suggest that SMEs should actively engage with intermediary organizations as they offer expert guidance on technological implementation, financial and non-financial support, hands-on workshops and seminars on

digitalization, and real case demonstration. SMEs can benefit from such offerings and enhance their digital awareness, and knowledge of digital technologies, which can function as a triggering factor for their digitalization.

7. Feedback

Since this is a working paper, we would like to get some feedback on linking intermediary organizations with the digitalization of SMEs in an innovation ecosystem. Moreover, we would also like to welcome suggestions on different types of co-creation activities and the way they contribute to enabling digital competencies.

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