



The catalyst roles of clusters in the relationship between open innovation and Digitalisation:
A systematic review and research agenda within SME context

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Abstract

The practice of cluster has been widely applied for small and medium enterprises (SMEs) innovation during the last two decades. However, its application is complicated due to the challenges and issues in low and middle-income countries. All SMEs are expected to benefit from the unique learning and innovative opportunities in a cluster. A systematic review and research agenda on how open innovation in a cluster could stimulate digitalisation in SMEs has not been addressed. Hence, this study seeks to conduct a review of existing literature on the role of clusters in fostering SMEs' digitalisation through the practices of open innovation. The research-specific objectives are to examine SMEs' open innovation practice, analyse the benefits and assess a cluster's intermediate role in digitalisation within the context of SMEs. The paper aims to provide a framework for future research by presenting propositions based on published peer-reviewed articles between January 2016 and December 2021. The study will inspire policymakers to formulate policies that directly or indirectly support clusters' development and promote SMEs' digitalisation through OI.

Introduction

Digital innovation is the use of digital technology and applications to improve existing firm processes, develop business models that will enhance employee effectiveness, boost customer experience, and provide new commodities to the public (Warner and Wäger 2019). Digital technologies could be utilised to aid small and medium enterprises (SMEs) digitisation by adjusting to modern business reality (Ricci, Battaglia, and Neirotti 2021). The integrated deployment of these diverse technologies in the activities of a firm's value chain may aid in data gathering, transmission, analysis, and deployment of crucial information to every stage of the value chain operations (Autio et al. 2018).

Clusters promote innovation and growth in SMEs (Mudambi et al. 2017). Extant literature is replete with the relationship between SMEs innovation and clusters (Gomezelj 2016; Hunt and Kiefer 2017; Kim and Shim 2018; Turkina and van Assche 2018; Chen, Zhang, and Fu 2019). However, most of these studies focused on how businesses within clusters encourage innovation among themselves. For instance, Kim and Shim (2018) assert that knowledge sharing is classified among businesses within clusters. Clustered businesses are more imaginative than geographically scattered ones (Belso-Martínez, Mas-Tur, and Roig-Tierno 2016).

Adopting open innovation (OI) in clusters would stimulate digital innovation in SMEs (Leckel, Veilleux, and Dana 2020). OI can unlock concealed potential for value creation in SMEs and reduce costs through knowledge sharing and collaboration (Del Vecchio et al. 2018). It will broaden SMEs' digital innovation space through partnerships with other organisations (Huber, Wainwright, and Rentocchini 2020).

Therefore our contribution to existing studies on the role of a cluster in SMEs' digitalisation is to uncover the external influence using OI. Likewise, we will contribute to the body of knowledge by revealing the intermediate role of clusters in SMEs' digitalisation through the adoption of OI. Useful guidance for future research in this promising and unique field will be provided to interested scholars. According to Sahut, Iandoli, and Teulon (2021), SME digitalisation is enhanced by collaboration with a diverse range of technology partners located at greater distances from the businesses. In contrast, Ben Arfi and Hikkerova (2021) reveal that open innovation activities such as cooperation and information sharing with partners substantially influence SMEs' ability to innovate and grow. Thus, digital innovation technologies would significantly benefit SMEs (Di Vaio et al. 2021).

Consequently, our paper aims to answer the following research questions: what are SME OI practices? And what is the input of clusters to SMEs' digitalisation through the adoption of OI?

Theoretical Framework

This study will be built on social capital theory. Pillai et al. (2017) reveal that social capital is necessary for the quest for supplementary knowledge. The social networks underpin learning processes in which organisations seek and employ new information. Many studies have also shown that firms are embedding inside their network of interactions aid in the development of the business learning potential (Baker, Grinstein, and Harmancioglu 2016; Kazadi, Lievens, and Mahr 2016; Evans et al. 2017; Najafi-Tavani et al. 2018; Wang, Chen, and Fang 2018). Through resource sharing, collaboration, and adaptability, an inherent logic of exchange enhances a firm's economic and innovative success. As a result, the firm's success is greatly influenced by the networks of ties it maintains outside of the business (Leenders and Dolfsma 2016). The social capital theory promotes the formation of clusters that assist businesses in connecting with

suppliers and other partners. It obtains complementary and interdependent resources to those held internally, enhances their learning capabilities, and later uses such information to generate innovation (Turkina and Van Assche 2018). Firms form clusters and alliances not just to get access to new resources but also to learn how to maximise the value of their existing resources (Delgado, Porter, and Stern 2014). A learning network fosters open innovation by encouraging the generation of new ideas, creativity, and efficacy in developing unique processes, products, and patents (Lauritzen and Karafyllia 2019). Learning through social capital could promote innovation rather than a single firm working alone (Martínez-Pérez, García-Villaverde, and Elche 2016).

The social capital process is particularly critical for clustered firms (Ritala and Stefan 2021). Clusters are the structural component of social capital that facilitate face-to-face interactions and promote information transfer, tacit knowledge and creativity (García-Villaverde, Parra-Requena, and Molina-Morales 2018). SMEs in clusters benefit from the social capital network and have a high innovation potential (Kim and Shim 2018).

Methodology

The study approach and procedures are thoroughly detailed in this section. It starts with discussing the study's research topic and concludes with data extraction and synthesis for its goal. This paper intends to integrate existing data by performing a systematic literature approach and proffers a theoretical framework for understanding SMEs' digitalisation in a cluster through OI. The comprehensive literature review will critically examine selected literature research results and summarise articles using systematic techniques (Snyder 2019). A systematic literature review research aims to offer a wide-range review of all accessible literature on a specific scientific topic (Torraco 2016). As a result, the researcher is free to search any relevant databases and gather and synthesise all relevant data. Snyder (2019) asserts that the primary goal of a systematic literature review is to demonstrate the link between the current issue, past research, and relevant ideas to explain the subject matter clearly.

Search strategy: Scopus and web of science will be consulted as the search database for this study. For the study, keywords will be identified based on the authors' prior experience, an initial literature assessment, and brainstorming sessions. Specified keywords include "SMEs," "small businesses cluster," "open innovation," "business cluster," "cluster", "open innovation", etc. These keywords will then be organised into search strings: [*open innovation* AND *small and medium-sized enterprises* OR *SMEs* OR *small businesses* *open innovation*].

Inclusion and Exclusion Criteria

| Inclusion Criteria | Exclusion Criteria |
|---|---|
| 1. Studies that look at OI and clusters as a tool or source of SMEs innovation | 1. Sources of evidence that do not match the study objective. |
| 2. Studies focusing on OI that consider SMEs as their point of analysis or vice versa | 2. Sources of evidence not written in English. |
| 3. Journal articles and books will be taken into account | 3. The source of evidence that requires payment for access |

Study selection process: The sources of evidence will be limited to recent origin (January 2016 to December 2021) because the articles reflect the newest knowledge on the roles of Cluster for SMEs Digital Innovation through Open Innovation in Nigeria. The initial database search will be done by customising the date range and removing irrelevant materials. The titles and abstracts will then be screened for the first selection of eligible articles. The full-text screening will be done for the second selection of relevant articles based on inclusion and exclusion criteria.

The proposed methodology would be used to validate the following propositions:

Proposition 1: OI is significantly beneficial to SMEs

Proposition 2: Cluster as a catalyst for SMEs digitalisation through OI

Proposition 3: The intermediate role of clusters in SME digitalisation

Theoretical Implications

The link between OI and digitalisation is currently understudied, even though both may be significantly influenced by environmental factors (Kurnia et al. 2015). Scholars like Dunne et al. (2016); Prajogo (2016); Prasad and Junni (2016); Barasa et al. (2017); Wang et al. (2020) have studied how innovation is greatly influenced by the environment in which the business operates. Though some specific variables, such as the amount of research and development, the type of goods, and technical expertise, have influenced SMEs' decisions to adopt digitalisation (Cassetta et al. 2019; Fossen and Sorgner 2021; Pappas et al. 2021). SMEs in low-tech sectors, in particular, must adapt their business models more dramatically than SMEs in high-tech industries to incorporate digital innovation technology (George, Merrill, and Schillebeeckx 2021). Because their workers' technical skills are limited, low-tech SMEs face more implementation challenges. Similarly, since they usually operate in a less dynamic setting, their managers are more resistant to change (Eller et al. 2020). As a result, collaboration with other organisations may be crucial for SMEs in low-tech sectors. Still, its impact on adopting digital innovation technologies is less clear, as their poor absorptive capacity may restrict their ability to grip new information (Presutti et al. 2019; Thomä and Volker Zimmermann 2020; Won and Park 2020). The diagram below depicts how clusters could stimulate digitalisation in SMEs through OI.

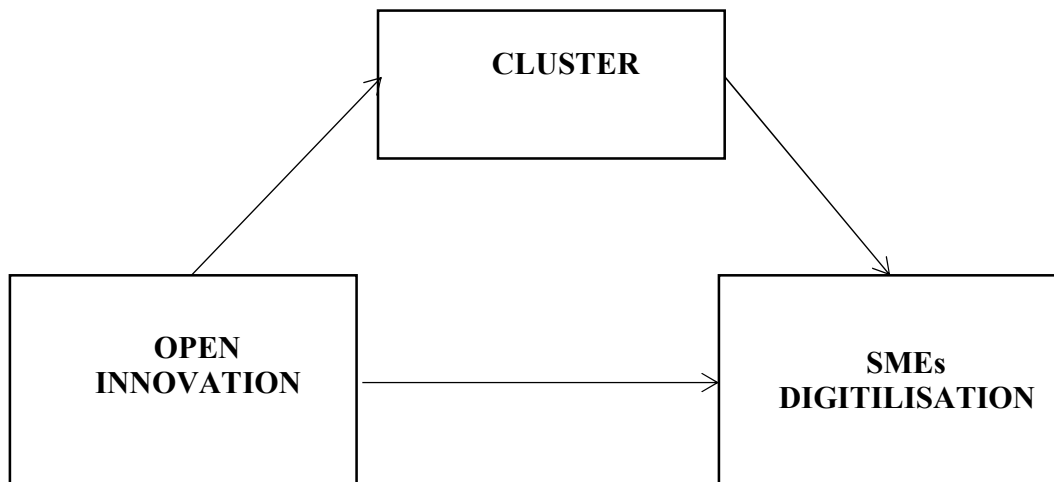


Figure 1: Conceptual framework.

Clusters have an impact on the successful application of OI for SME digitalisation. According to Denicolai, Ramirez, and Tidd (2014), high-tech and low-tech businesses provide various settings for knowledge generation and exchange, resulting in differing degrees of OI. The degree of complexity in industrial knowledge bases influences the link between OI and firm success. The knowledge-sharing process and creation can be influenced not only by the level of R&D but also by the sources of healthy competition and the risks of failure (Woods, Galbraith, and Hewitt-Dundas 2022). These elements could impact SMEs' willingness and ability to embrace external partners through OI based on extensive or intensive connections (Aliasghar, Sadeghi, and Rose 2020). We intend to fill a vacuum in the literature by studying the moderating role of clusters on SMEs' digital innovation by adopting OI. In the illustration in figure 1 above, we propose that cluster benefits SMEs' adoption of digital innovation through OI.

Practical Relevance of the Study

Our findings would be relevant to members of business boards of directors, chief executive officers (CEOs) and captains of industries. It may inspire the various tiers of government to formulate policies that will directly or indirectly support clusters development and promote SMEs' digitalisation through OI, as shown by our findings. Furthermore, cluster administrators should focus more on collaborative activities, which are critical to the advancement of digitalisation. They may also utilise their office to persuade those in leadership authority to allocate more funds to OI initiatives in budgetary allocations. Also, additional resources should be encouraged to boost OI in clusters by leveraging collaboration with universities and research institutions. Stakeholders and intending entrepreneurs interested in gaining a better grasp of how cluster governance could support OI may treasure our findings. Similarly, our results would help entrepreneurs be more aware of the advantages of involving themselves in OI and the need to increase their creative skills.

Current stage

Currently, the researchers are reviewing related materials based on the proposed inclusion and exclusion criteria.

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