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How Knowledge Services Clustered Firms Leverage Different Channels of Local Knowledge Spillovers for Service Innovation

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ABSTRACT Built upon configuration theory, this study performs a Qualitative Comparative Analysis (QCA) to delineate alternative and sufficient configurations of local knowledge spillover (LKS) channels, that is, how informal interactions and spinoff, and absorptive capacity are combined to facilitate service innovation. Primary data was collected from the largest software outsourcing cluster in Vietnam in 2018, which provides a sample size of 42 firms. The findings imply that multiple configurations of different channels of LKS in conjunction with absorptive capacity can lead to service innovation. This study makes three important contributions. First, it contributes to the debate over the critical role of LKS and absorptive capacity in innovation by offering a more holistic, yet nuanced understanding of the causal mechanisms underlying service innovation. Second, this study sheds light on viable and equifinal pathways for enhancing innovation capabilities, therefore contributing to the literature on cluster upgrading and global service sourcing. Third, it provides some managerial implications for indigenous spinoff firms in developing countries seeking to innovate through the strategic use of LKS.

KEYWORDS innovation, knowledge service cluster, knowledge spillovers, qualitative comparative analysis

INTRODUCTION

The importance of knowledge spillovers to the knowledge accumulation, learning process, and innovation of geographically proximate firms has been well documented in the literature (Breschi & Lissoni, 2001; Mathias, McCann, & Whitman, 2020; Rawley & Seamans, 2020; Speldekamp, Knoben, & Saka-Helmhout, 2020). Local knowledge spillovers (LKS) via informal interactions and the establishment of new ventures, known as spinoffs from established organizations, have been demonstrated to increase cluster competitiveness and innovativeness

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(Hervas-Oliver, Lleo, & Cervello, 2017; Pyke, Becattini, & Sengenberger, 1990; Saxenian, 1996; Speldekamp, Knoben, & Saka-Helmhout, 2020). At the firm level, social interactions, governed by trust and reciprocity, allow co-located firms to gain access to fine-grained knowledge and needed resources for their innovation process (Danquah & Sen, 2021; Gulati, 1999; Uzzi, 1996). Spinoff represents another effective channel of LKS. A spinoff firm founder could utilize past work experience at a co-located parent organization to effectively realize and exploit commercial values of ideas and expertise (e.g., through the creation of a new product/service) (Acs, Audretsch, & Lehmann, 2013; Boschma, 2015; Hervas-Oliver et al., 2017; Klepper, 2011; Lorenzen, 2019).

Despite the critical role that LKS plays in the innovativeness and competitiveness of a cluster, several important issues remain unexplored. Past studies have focused exclusively on the net effect of a single LKS channel or on the relative relevance of informal interactions versus spinoff channel for innovation (Helmers, 2019; Kesidou, Caniëls, & Romijn, 2009; Schmidt, 2015). There are mixed results on the impact of LKS since it does not always benefit proximate firms, but rather requires a certain level of absorptive capacity to successfully integrate and harness this form of external knowledge for innovation (Cohen & Levinthal, 1990; Qian & Jung, 2017). Given that a complex phenomenon such as innovation is attributed to the interplay between multiple factors, rather than to isolated components (Fainshmidt, Witt, Aguilera, & Verbeke, 2020), a more nuanced understanding of the configuration of absorptive capacity and different channels of LKS is needed. This necessitates an investigation to explore the underlying mechanisms and unpack the complex causalities that lead to the innovation of co-located firms.

The purpose of this study is to examine how emerging service providers in the knowledge services cluster (KSC) innovate using LKS channels. It focuses on service innovation, defined as the introduction of new or substantially improved service to the market (OECD, 2005; Schumpeter, 1934, 1942). The degree of novelty could be either incremental or radical, and innovation needs to be new to the introducing firms, albeit not necessarily new to the industry. KSC is a term that refers to an emergent type of cluster in developing countries characterized by their cost-competitive technical and analytical skills, which are needed to compete in global markets for knowledge services (Manning, Ricart, Rosatti Rique, & Lewin, 2010). The context of KSC gives rise to further investigation due to its inherently distinct characteristics compared to high-tech clusters in developed countries and to low-cost manufacturing clusters in developing ones (Manning et al., 2010). In comparison to firms in the manufacturing sector, those operating in the knowledge-intensive sector rely more on tacit knowledge such as LKS for innovation (Brunow, Hammer, & McCann, 2020; Giuliani, Pietrobelli, & Rabellotti, 2005; Pavitt, 1984).

In addition, KSC provides an intriguing setting for this study owing to their important positions in global sourcing and locational choice strategies of transnational firms (Rodgers, Khan, Tarba, Nurgabdeshov, & Ahammad, 2019). However, international business literature regards service provider firms as

subordinate only (Brandl, Jensen, & Lind, 2018; Lorenzen, 2019) and stresses the importance of global sources of knowledge over local sources of knowledge, such as LKS, in the innovation process of knowledge service providers in developing countries (Turkina & Van Assche, 2019). This premise introduces a hitherto unexplored phenomenon into the role of LKS in such innovation processes.

This research is built upon configuration theory (Ketchen et al., 1997; Meyer, Tsui, & Hinings, 1993) and insights from relevant studies on the relationship between LKS channels and innovation. It is informed by social network theory and entrepreneurship theory of knowledge spillovers, particularly the advantages and limitations of individual LKS channels on innovation. Accordingly, absorptive capacity acts as the knowledge filter for firms, allowing them to absorb and integrate external knowledge efficiently and effectively for innovation (Acs et al., 2013). Configuration theory, on the other hand, knits these insights together, which enables a holistic understanding of an organizational phenomenon by encompassing multiple organizational attributes that have synergistic rather than additive effects on the organizational outcome (Doty & Glick, 1994). Its reductionist principle, which sorts different cases into homogenous sets, provides a scientific approach to exploring various causal mechanisms or patterns that lead to the same outcome via set relations (Fiss, 2011; Meyer et al., 1993). Therefore, configuration theory offers insights that are closely aligned with complex realities by providing a theoretical lens through which to assess the alternative pathways from many antecedents to service innovation (Schneider & Wagemann, 2012).

This research fills two voids in the literature. First, while the literature suggests that absorptive capacity influences the extent to which innovation benefits from LKS, there is a dearth of research examining the complex interplay between different LKS channels and absorptive capacity. Second, it remains unclear how geographically proximate firms deploy different channels of LKS in conjunction with their absorptive capacity to successfully launch new products or services to the market. Particularly, in the case of export-driven services clusters, like KSCs, excessive reliance of clustered firms on global linkages for technical and market knowledge presents an interesting inquiry into the importance of local sources of knowledge to innovation (Lorenzen & Mudambi, 2013; Täube, Karna, & Sonderegger, 2019). Therefore, the research question is *how do geographically proximate firms configure different LKS channels with absorptive capacity for service innovation?* We conduct a Qualitative Comparative Analysis (QCA) on data collected from the largest software outsourcing cluster in Vietnam to investigate the combinational effects of LKS channels and absorptive capacity, which serve as equifinal paths to the creation and introduction of new service innovation. QCA is well suited given the small sample size, and its underlying Boolean algorithm allows other researchers to test and replicate the findings (Fainshmidt et al., 2020; Ragin, 2008; Rihoux & Lobe, 2009; Schneider & Wagemann, 2012).

The contribution of this study is fourfold. First, this study offers a more holistic understanding of the combined effects of different channels of LKS and absorptive

capacity on service innovation. Our findings demonstrate that innovative firms excel at mobilizing multiple channels of LKS. It was discovered that absorptive capacity is not a necessary condition to make innovation happen and only plays a marginal role. In these instances, spinoff firms successfully innovate by leveraging the knowledge and network resources obtained via informal interactions. Second, this study contributes to the body of knowledge about the innovativeness of firms within a cluster based on LKS by focusing on service provider firms in KSCs in developing countries. This research elucidates the underlying causal mechanisms by which service provider firms in developing countries can offer new or more advanced services. Third, in doing so, it contributes to the cluster upgrading and global services sourcing literature (Gebreeyesus & Mohnen, 2013; Kimura, 2011; Manning, 2013; Manning et al., 2010; Ramirez, Clarke, & Klerkx, 2018; Turkina & Van Assche, 2019). Spinoff is proven to be an effective mechanism of LKS when firms possess a highly educated workforce, that is, high degree of absorptive capacity, and capitalize on informal interactions with other co-located organizations. As such, these spinoff firms innovate by effectively integrating and utilizing expertise gained through outsourcing. Fourth, the present study provides some important managerial implications for service provider firms, especially indigenous spinoffs from incumbent outsourcing companies in developing countries. While there is no doubt on the significance of global sources of knowledge for firms' technological advancement and innovativeness in developing countries (Lorenzen & Mudambi, 2013; Täube et al., 2019), firms that rely on local sources of knowledge, such as LKS, can also become innovative if they strategically configure their absorptive city level and different channels of LKS.

THEORETICAL BACKGROUND

Informal Interactions Channels of LKS and Service Innovation

LKS is inextricably linked to 'the socialized processes of local knowledge creation' (Capello & Faggian, 2005: 75). In such processes, geographical proximity initially initiates face-to-face meetings and conversations, which are followed by an intensification of informal interactions based on trust and reciprocity (Boschma, 2005; Juhász & Lengyel, 2018). This, in turn, fosters social proximity among co-located firms and further facilitates the transfer and diffusion of knowledge to firms in the vicinity (Mattes, 2012). In addition, timely access to knowledge about innovative projects being undertaken by other organizations enables co-located firms to innovate more effectively (Shearmur & Doloreux, 2016). This is particularly crucial for high-tech firms as technological externalities can only be circulated and exploited within a small number of actors through personal contact in close spatial proximity (Cohendet, Grandadam, Simon, & Capdevila, 2014). Furthermore, LKS through informal interactions provides co-located firms with useful knowledge about organizational practices and routines that

strengthen their organizational effectiveness and competitiveness, thereby improving their technological innovation capabilities (Camisón & Villar-López, 2014; Nelson & Winter, 1982; Nemlioglu & Mallick, 2021).

However, informal interactions (as opposed to formal interactions through market transactions) via personal networks and firms' membership in the local business association do not necessarily foster innovation. Personal networks, especially those of managers and key technological specialists, enable clustered firms to acquire unique and complementary knowledge about technological dynamics, market intelligence, and organizational practices in order to develop new services (Gulati, 1999; Herbane, 2019; Uzzi, 1996). The extent to which a firm is embedded in a network, known as network embeddedness, shapes the volume of knowledge and other resources that can be exchanged between co-located firms. A firm can, therefore, leverage such embedded context to identify and capitalize on resources through networking with a variety of counterparts for different purposes, such as seizing business opportunities related to their innovation (Thornton, Henneberg, & Naudé, 2014). Network embeddedness can be measured by the network degree centrality of a firm, which accounts for the number of direct connections a firm has (Borgatti, Everett, Johnson, & Everett, 2018). A higher level of network embeddedness brings about an abundance of holistic and tacit knowledge (Freeman, 1978/79; Uzzi, 1997), which facilitates the innovation outcome (Borgatti et al., 2018; Uzzi & Gillespie, 2002). However, over-embeddedness may have a detrimental influence on service innovation as the highly central firm would receive little new and non-redundant information required for innovation (Andersen, 2013; Burt, 1992; Uzzi, 1997).

Similarly, LKS derived from local business associations has both positive and negative implications for the innovation of participant firms (Kahle, Marcon, Ghezzi, & Frank, 2020; Wang & Tan, 2019). On the one hand, local business associations emerge as a collective effort of geographically proximate firms to address common problems, such as export market access, and to act as a lobbying group to raise political and strategic demands to the government (Humphrey & Schmitz, 1996; Saxenian, 1989; Thornton, Henneberg, & Naudé, 2013; Uzzi, 1996). Given that organizational learning is a collective and interactive process, local business associations create a platform for inter-firm knowledge sharing and transfer by facilitating trust and personal interaction among its members (Capello, 1999; Morgan, 1997; Wang & Tan, 2019). In addition, firms can exploit the pooled resources and synergies by networking through business associations to have access to a wealth of diversified resources for their innovation efforts (Zhang & Guo, 2019). On the other hand, joining a business association does not prevent firms from encountering issues such as free-riding on the sharing of tacit knowledge (Zhang & Guo, 2019), which can be detrimental to their innovation process (Jansen, 2010; Levine & Prietula, 2014). The unrestricted flow and sharing of LKS as a type of public good dampen firms' propensity and willingness to create knowledge and invest in their innovation capabilities (Arrow, 1962).

Furthermore, business associations may offer minimal benefits to their members' innovation processes when accessible knowledge pertains to political and legal issues rather than to technological knowledge and know-how, which are critical for innovation success (Kahle et al., 2020).

LKS Through Spinoff and Service Innovation

When the labor mobility of highly skilled employees results in the formation of new enterprises, known as spinoffs, it facilitates the spread of LKS (Audretsch & Keilbach, 2008; Capello, 1999; Juhász, 2021). Spinoffs tend to co-locate with their parent organizations inside a dense concentration of related firms to learn from the incumbent and to take advantage of agglomeration economies (Audretsch & Keilbach, 2008). Following this, innovative spinoffs serve as an efficient conduit of LKS through established organizations or research institutes for several reasons (Acs, Braunerhjelm, Audretsch, & Carlsson, 2009; Audretsch, Belitski, & Caiazza, 2021). Due to the contextual nature of tacit knowledge and its embeddedness within a network of professionals, it can only be efficiently acquired through direct experience (Howells, 2002; Nonaka, 1994; Polanyi, 1958). The temporal dimension of a spinoff firm, such as the founder's employment history with an incumbent organization, enables the firm to obtain not only technical knowledge and skills but also knowledge about organizational routines, practices, and procedures in a related industry (Boschma, 2015; Klepper, 2011). By utilizing such accumulated knowledge, entrepreneurial spinoffs, which are risk-taking and responsive to market opportunities, can successfully translate LKS from their parent organizations into new service innovation (Hervas-Oliver et al., 2017; Shane & Venkataraman, 2000). However, a spinoff does not necessarily lead to the creation of new knowledge embodied in service innovation, especially when it only represents a mere shift of knowledge from one place to the other (Breschi, Malerba, & Montobbio, 2007). Under this circumstance, spinoff firms only conduct replicative work as of the parent organizations (Camuffo & Grandinetti, 2011).

Absorptive Capacity and Service Innovation

Being merely exposed to different channels of LKS by virtue of geographical closeness is insufficient to facilitate the innovation process. Rather, it requires a certain level of absorptive capacity to successfully integrate and exploit LKS for their innovation (Cohen & Levinthal, 1990; Li, Zhang, & Lyles, 2013; Torre, 2008). Absorptive capacity refers to the 'ability to recognize the value of new information, assimilate it, and apply it to commercial ends' (Cohen & Levinthal, 1990: 128). Firms rely on their absorptive capacity to acquire and exploit not just technological and scientific knowledge but also market and organizational knowledge, all of which are indispensable for service innovation (Acs et al., 2013). Greater capacity helps to attenuate and buffers the impact of uncertainty associated with the acquisition of complex knowledge

(Camuffo & Grandinetti, 2011). It facilitates the internal learning process in which external knowledge is integrated with the firm's existing knowledge base to create new knowledge (Boschma & Weterings, 2005; Thornton, Henneberg, & Naudé, 2015). Therefore, firms with a higher level of absorptive capacity are more likely to harness new knowledge and seize entrepreneurial opportunities to improve their innovation capabilities and performance (Qian & Acs, 2013; Tsai, 2001).

As knowledge is possessed by human beings, educational attainment is a key determinant of and proxy for absorptive capacity (Brandl et al., 2018; Qian & Acs, 2013). It reflects not only organizational knowledge stock but also its ability to utilize external knowledge efficiently and effectively for innovation (Kesidou & Romijn, 2008; Zahra & George, 2002). Moreover, absorptive capacity, as captured by the quality of human resources, represents a firm's internal resources, which are critical to competitiveness and innovation performance (Barney, 1991). In particular, for firms in developing countries, a highly educated workforce strengthens organizational and technological capabilities that are essential for creating more advanced products and services (Gereffi & Fernandez-Stark, 2010).

According to configuration theory (Ketchen et al., 1997; Meyer et al., 1993), the effect of a single LKS channel on the outcome of service innovation is contingent on its combination with other LKS channels and absorptive capacity. Simultaneously, equifinal paths to service innovation would be constructed from different antecedents, which can be varied both in kind and degree (Fainshmidt et al., 2020; Schneider & Wagemann, 2012). These insights prompted us to investigate and interrogate how firms leverage their absorptive capacity to capitalize on the gains from single or multiple channels of LKS. In addition, as firms utilize LKS channels differently, we empirically explore which causal patterns of LKS channels lead to service innovation. Addressing these two guiding questions provides a nuanced and holistic picture of the phenomenon under study. First, in light of the contradictory findings of the effect of multiple channels of LKS on innovation outcome, this study will articulate holistically how spinoff firms create service innovation by orchestrating their absorptive capacity with other channels of LKS. Second, this study will examine the circumstances under which being a member of a local business association or being deeply embedded in the local network might either facilitate or hamper the innovativeness of service provider firms.

METHODS

Fieldwork Site

The fieldwork study is conducted at the Quang Trung Software City (QTSC) cluster located in District 12, Ho Chi Minh City, Vietnam in 2018. This is the largest software outsourcing cluster in the country. Following the economic development strategy of the local government, QTSC cluster was founded in March 2001, and currently houses more than 20,000 employees and students according to the official

website of the QTSC Development Company.[1] Most of the clustered firms inside the cluster are specialized in software offshore outsourcing for Japanese, American, and European markets. According to a survey by KPMG Vietnam, service exports generated about 60% of the cluster's total revenue in 2015.[2]

In comparison to India, Vietnam entered the global offshoring services value chain much later, in the early 2000s (VNCI, 2003). However, the country has rapidly developed into a global outsourcing hotspot. According to the Business Process Outsourcing (BPO) and Shared Service Location Index (Cushman & Wakefield, 2016), Vietnam was recognized as the most attractive place among pioneering countries for service outsourcing. The country was ranked fifth in the Global Services Location Index (GSLI) by A.T. Kearney (2020), with a comparable level of financial attractiveness to India.

Data Collection

A structured survey was devised to include questions about firm characteristics and networking behavior based on the theoretical background of this research. The questionnaire was distributed to QTSC cluster members via on-site visits and phone calls between July and September 2018 in accordance with the Oslo Manual's guidelines for collecting innovation data (OECD, 2005). Forty-two useable surveys were returned from 97 firms co-located in the cluster, giving in a response rate of 43.3%.

Table 1 shows that the majority of firms (85.7%) are small and medium enterprises (having less than 100 employees). The networking behavior of firm representatives, including CEO or firm founder and head of the subsidiary in the case of foreign-invested firms, was recorded. Those participants were purposely targeted given their strategic vision and authority to initiate innovation efforts in their organizations (Damanpour, 1991). The sample includes 27 CEO/firm founders and 15 heads of subsidiaries. In the previous three years, 18 out of 42 firms (42.8%) in the sample had introduced service innovation. The sample comprises 12 spinoffs (28.6%) and 23 firms with a membership in the local business association, VNITO (54.7%).

The publicly available secondary data on innovation activities of service provider firms in the QTSC cluster is scarce. According to a press release from the cluster's business incubator, until the end of 2017, the incubator has supported 62 business proposals, with 15 spinoff enterprises now operating in QTSC (QTSC Incubator, 2017). Our sample adequately covered 12 spinoffs among those. The dataset for this study has been made publicly available and can be accessed from the Open Science Framework (Ngo, 2022).

Measurements

Service innovation is quantified using a dummy variable, with a value of 1 indicating that they had introduced new or significantly improved services to their clients

Table 1. Sample composition

	n	%		n	%
Service innovation			*Respondent profile in networking question*		
Innovator firms	18	42.8	CEO/Founder	27	64.3
Non-innovator firms	24	57.2	Head of subsidiary	15	35.7
Historical profile			*Local business association membership*		
Spinoff	12	28.6	VNITO-membership	23	54.7
Non-spinoff	30	71.4	Non-VNITO-membership	19	45.3
Firm size by the number of employees			*Firm age*		
≤9	1	2.4	0–5	20	47.6
10–49	30	71.4	6–10	11	26.2
50–99	5	11.9	>10	11	26.2
≥100	6	14.3			
			Legal ownership		
			Foreign-invested firm	22	52.4
			Domestic firm	20	47.6

in the recent three years, and 0 if otherwise. To avoid any confusion and misunderstanding, all participants were briefed on the concept of service innovation before to completing the surveys.

Network embeddedness is captured via the network degree centrality. We asked participants to provide the names of other firms in the same cluster where their friends work, and with whom the participants have sought advice and/or shared information. The network degree centrality was then computed by adding up all of a firm's direct connections in this personal network.

The spinoff channel of LKS is captured by a dummy variable, which takes the value of 1 if a firm is a spinoff from an organization in the same cluster and 0 if otherwise. Through secondary data, this study gathered and documented firms' memberships in a local business association, the VNITO Alliance (Vietnam Information Technology Outsourcing Alliance).[3] This variable is set to 1 if a firm is a member, and to 0 if otherwise.

Absorptive capacity is measured using the educational attainment of a firm's employees following Kesidou and Romijn (2008). Firms were asked to disclose the number of their employees at different levels of educational qualifications, including (1) college and vocational degree; (2) undergraduate degree; (3) master's degree; and (4) doctoral degree. Then, a weighted average of these four items is derived to represent educational attainment:

$$\text{Educational Attainment} = \frac{\text{Doctoral Degree}*4 + \text{Master Degree}*3 + \text{Undergraduate Degree}*2 + \text{College and Vocational Degree}}{(\text{Total number of employees}*10)}$$

Qualitative Comparative Analysis

We employ a QCA, a set-theoretic approach, to investigate the sufficiency of combinations of LKS channels and absorptive capacity for the presence of service innovation (Ragin, 2008; Schneider & Wagemann, 2012). A set is a group of cases that share an empirical property (Schneider & Wagemann, 2012). QCA examines the causal significance via relations between the sets of cases that share a particular antecedent or combination of antecedents and the sets of cases with the outcome (Ragin, 2008). QCA is well suited to deciphering complex causalities in a small sample (Greckhamer, Misangyi, Elms, & Lacey, 2008). It avoids the omitted variable bias problem associated with other correlational, variable-based approaches such as regression analysis, as QCA is case-based, using Boolean Algebra, rather than variable-based, using correlations (Fainshmidt et al., 2020).

Building on configuration theory, QCA allows an exploration of the combinational effects among various causal conditions on the outcome of new service innovation (Ragin, 2008; Schneider & Wagemann, 2012). QCA serves as an analytical approach and a research method that incorporates the primary advantages of qualitative and quantitative analysis (Fainshmidt et al., 2020; Ragin, 2008; Rutten, 2019). As a case-based research method, it allows a multidimensional and contextual understanding of a phenomenon, while its minimization logic enables replication and therefore generalization (Rihoux & Lobe, 2009). Statistical analysis, such as regression analysis, is concerned with the net effects of independent variables, which can only be varied either in degree or in kind. Therefore, it is unable to ascertain multiple paths leading to the desired outcome (Fainshmidt et al., 2020). In addition, the statistical interaction effects as modeled in regression analysis fall short of dealing with the increasing level of complexity among independent variables, such as higher-order interaction (Ragin, 2008).

QCA is a stepwise approach, starting with calibration, which transforms all raw data to set membership scores of defined, theoretically driven conditions. Table 2 summarizes the outcome and antecedent conditions in this study. Due to their categorical nature, three variables, namely service innovation, spinoff, and local business association membership, are calibrated into crisp sets. Crisp set calibration determines whether or not a case is a member of a set, hence the set value of each case is either 0 or 1. We used a direct calibration method to convert two remaining antecedents, namely educational attainment and degree centrality, into fuzzy sets (Ragin, 2008; Schneider & Wagemann, 2012). Calibrated scores of fuzzy sets are assigned values between 0 and 1 based upon three qualitative anchors for non-membership, cross-over and full membership. This research uses the 10th, 50th, and 90th percentile of each variable for these three anchors, respectively (see Table 3). To avoid dropping any cases with the score equal to the cross-over point, that is, 0.5, a constant of 0.001 is added to all scores below the full membership score of 1 (Fiss, 2011). Following calibration,

Table 2. Description of outcome and antecedents

Type	Condition	Measurement	Crisp/Fuzzy set
Outcome	Service innovation	Whether a firm has introduced any new or significantly improved services in the last three years	Crisp
LKS channels	Degree centrality	The degree centrality measure in the local social network	Fuzzy
	Local business association membership	Whether a firm is a member of the VNITO Alliance (Vietnam Information Technology Outsourcing Alliance) or not Yes =1, No = 0	Crisp
	Spinoff organization	Whether a firm is a spinoff from co-located organization or not Yes = 1; No = 0.	Crisp
Absorptive capacity	Educational attainment	The average educational attainment weighted by the total number of employees	Fuzzy

Table 3. Three qualitative anchors for fuzzy sets

Condition	Non-membership	Cross-over	Full membership
Educational attainment	0.118	0.1825	0.217
Degree centrality	0	1	5

necessity and sufficiency analyses are performed, using the QCAPro package in the R environment (Thiem, 2018). QCAPro applies a more advanced Quine-McCluskey algorithm in comparison to fs/QCA software (Ragin, 2018). It helps to alleviate the problem of model ambiguity, which refers to the scenario in which multiple models fit the data (Baumgartner & Thiem, 2017; Thiem, 2014).

ANALYSIS AND RESULTS

Necessity Analysis

Necessity analysis identifies any conditions that are always present with the outcome. We perform the necessity analysis for both presence and absence of service innovation, following QCA literature (Schneider & Wagemann, 2012). To identify any necessary condition, a consistency score, indicating the extent to which a condition is the superset of the outcome, equal or greater than 0.9 must be observed (Schneider & Wagemann, 2012). Table 4 summarizes the result of the necessity analysis, which shows that none of the prerequisites are essential for service innovation.

Sufficiency Analysis

Sufficiency analysis employs the logical minimization principle based on truth tables. Two truth tables are created for the presence and absence of service innovation, each table has 2^4 (16) rows including all possible combinations of four antecedents. Rows without any empirical cases with a membership score larger than 0.5 are treated as logical remainders, that is, there are two logical remainders for each truth table. The outcome for each row is given a value of 1 if its raw consistency score and PRI consistency score are both equal to 1 – this is significantly greater than the standard of good practice for QCA research (Greckhamer, Furnari, Fiss, & Aguilera, 2018; Schneider & Wagemann, 2010; YoungKi, Fiss, & El Sawy, 2020). Rows with consistency scores less than 1 are assigned with an outcome of 0. In the next step, rows with the outcome value of 1 are included in the logical minimization using Boolean algebraic theorems. This reduction process aims to identify parsimonious causal regularities known as sufficient configurations of antecedents for the outcome (Rihoux & Lobe, 2009).

The logical minimization process produces three types of solutions of varying complexity depending on how logical remainders are used. If all logical remainders

Table 4. Necessity analysis for the presence and absence of service innovation

| | Presence of service innovation | | Absence of service innovation | |
	Consistency	Coverage	Consistency	Coverage
Spinoff	0.47	0.67	0.16	0.33
~Spinoff	0.53	0.3	0.84	0.7
Local business association	0.65	0.48	0.48	0.52
~Local business association	0.35	0.32	0.52	0.68
Educational attainment	0.67	0.50	0.45	0.5
~Educational attainment	0.33	0.29	0.55	0.7
Degree centrality	0.48	0.43	0.42	0.56
~Degree centrality	0.52	0.38	0.57	0.62

Notes: ~ means absence of antecedent; necessity consistency threshold = 0.9.

are ignored, the minimization returns the (most) complex solution, while the (most) parsimonious solution can be achieved if logical remainders that increase parsimony are used. The intermediate solution, an in-between solution that balances parsimony and complexity, is commonly used as it avoids making any untenable assumptions about the relationship between individual antecedents and outcome (Ragin, 2008; Schneider & Wagemann, 2012).

Consistency and coverage are two important parameters of solution fit. Consistency assesses the degree to which cases attributed to a particular configuration are also present in the outcome of interest, while coverage assesses the degree to which a configuration explains the outcome (Ragin, 2006). Table 5 illustrates the intermediate solutions for the presence and absence of service innovation. All configurations have consistency scores between 0.962 and 1, which satisfies the recommendation from the literature (Schneider & Wagemann, 2010). Configurations 1a and 1b as a solution account for 22.1% of service innovative firms. Configurations 2a and 2b explain 26.5% of non-innovators in the sample.

For the presence of outcome, that is, achieving service innovation, a high level of absorptive capacity is combined with LKS via spinoff and informal interactions through a local business association (Configuration 1a). This configuration has a raw coverage of 0.137, indicating its non-trivial empirical relevance (Douglas, Shepherd, & Prentice, 2020). With a raw coverage of 0.175, Configuration 1b exhibits a distinct pattern of combination, namely regardless of the absorptive capacity as captured by the educational attainment of employees, certain spinoff firms can still be innovative. These firms are led by highly competent founders who have previously worked in co-located incumbent organizations. Instead of relying on their internal absorptive capacities like those spinoffs in Configuration 1a do, their service innovation benefited from their informal interactions, particularly personal contacts in the embedded social network.

For the absence of service innovation, Configuration 2a with a raw coverage of 0.234 is perfectly symmetrical with Configuration 1a. It shows that a poor

Table 5. Intermediate solutions for the presence and absence of service innovation

Antecedents	Presence of service innovation		Absence of service innovation	
	1a	1b	2a	2b
Degree centrality		●		●
Local business association membership	●	●	⊗	⊗
Spinoff organization	●	●	⊗	⊗
Educational attainment	●		⊗	
Raw coverage	0.137	0.175	0.234	0.097
Unique coverage	0.045	0.084	0.167	0.031
Consistency	1	1	0.965	0.962
Number of cases with greater than 0.5 membership	2	3	6	3
Solution coverage	0.221		0.265	
Solution consistency	1		0.967	

Notes: We use the following symbols according to Fiss (2011): ● = present; ⊗ = absent; blank space = either present or absent (don't care).
Larger symbols are core and smaller symbols are peripheral.

absorptive capacity in combination, combined with a lack of resources through LKS channels, whether through spinoff or networking in the local business association, does not support the creation of new service innovations. Similarly, Configuration 2b is symmetrical with Configuration 1b, and it has a raw coverage of 0.097. Despite obtaining a prominent position in the local social network (high network embeddedness), firms will be unable to innovate successfully if they lack additional knowledge from the spinoff channel and networking in the local business association. These firms may be over-embedded in the local social network, resulting in a scarcity of non-redundant (novel) information and knowledge for service innovation (Burt, 1992; Uzzi, 1997).

DISCUSSION

This study adopts a distinct research approach that enables the dissection of complex causalities, providing insights not previously available from relevant studies that simply examined the net impact of a single LKS channel on innovation (Helmers, 2019; Kesidou et al., 2009; Schmidt, 2015). Instead of examining the relative independence of variables, QCA identifies alternative combinations of multiple antecedents that are sufficient for achieving service innovation (Ragin, 2008; Schneider & Wagemann, 2012). This identification of causal configurations yields a more detailed, nuanced picture and enables greater insights into the combinational effects of different LKS channels and absorptive capacity at the firm level. Our research contributes to the literature in four ways that enrich and add to the existing knowledge on how firms can leverage internal and external resources through their absorptive capacity and multiple channels of LKS.

First, this research provides a more holistic understanding of the complex interaction effects of different channels of LKS and absorptive capacity on new service innovation. On the one hand, it corroborates and elucidates that geographically proximate firms are not automatically entitled to the benefits from LKS for their innovation (Cohen & Levinthal, 1990; Qian & Jung, 2017). On the other hand, this study ascertains the equifinality and conjunctural causality of complex reality in which there are alternative sufficient combinations of antecedents for service innovation to occur (Schneider & Wagemann, 2012). Innovative firms excel at utilizing their social ties through the local business association while also leveraging their accumulated knowledge and skills from incumbent firms (Configuration 1a) (Crescenzi & Gagliardi, 2018). Configuration 1b indicates that regardless of absorptive capacity, firms exposed to multiple channels of LKS via spinoff and informal interactions within the local business association, combined with a high degree of centrality, that is, being well embedded in the network, are more likely to introduce new service innovation. Configurations 1a and 1b demonstrate how absorptive capacity and network embeddedness may be substituted. While absorptive capacity represents the internal capabilities for integrating external knowledge, network embeddedness determines the flow of external knowledge and the availability of external resources that a firm can tap into (Borgatti et al., 2018; Boschma & Weterings, 2005; Gilsing, Nooteboom, Vanhaverbeke, Duysters, & van den Oord, 2008; Lyu, He, Zhu, & Li, 2019; Uzzi & Gillespie, 2002). This suggests that when the personal network and accumulated knowledge of spinoff firms' founders from parent firms are combined with the pooled resources of local business association membership, the average educational attainment of employees is negligible (Ganter & Hecker, 2014). In addition, absorptive capacity as captured by educational attainment is not a prerequisite for service innovation as it must be paired with other factors.

Second, the findings of this study leverage and extend our current understanding of how service provider firms located within KSCs in developing countries innovate using local sources of knowledge such as LKS to offer more advanced and new services to their clients (Turkina & Van Assche, 2019; Wu & Wei, 2013). This research also aligns with previous findings in the context of high-tech clusters (Saxenian, 1996; Speldekamp, Knoben, et al., 2020) and demonstrates the critical nature of networking via multiple channels for innovation in spinoff firms (Buenstorf & Costa, 2018; Hervas-Oliver et al., 2017; Juhász, 2021). Two paths exist for spinoff firms to attain innovation success. One strategy is to leverage resources through a local business association in conjunction with a strong level of absorptive capacity from a highly qualified workforce. The other is via mobilizing external resources from the local business association and personal contacts associated with a high degree of network embeddedness (Thornton et al., 2013).

Third, these findings further the literature on cluster upgrading and global services sourcing (Turkina & Van Assche, 2018). Particularly, extant studies

emphasize the relevance of local inter-firm linkages and joint action for cluster upgrading, although they focus only on the spillover effects of kinship and family ties in industrial clusters specialized in manufacturing and traditional crafts (Gebreeyesus & Mohnen, 2013; Kimura, 2011; Ramirez et al., 2018). With a particular emphasis on knowledge-intensive clusters, such as KSCs, this study demonstrates viable, alternative upgrading opportunities in the form of service innovation for indigenous firms spun off from incumbent organizations through their human capital endowment and exposure to other channels of LKS. In addition, social networks within industrial clusters and KSCs are intrinsically distinct. The former is ingrained within formal supplier–customer transactions (Antonelli, 2006) and kinship (Gebreeyesus & Mohnen, 2013; Kimura, 2011). Meanwhile, from its inception, the latter targets the global market given the marginal demand for knowledge services such as software and IT services in domestic markets (Manning, 2013). Starting with few inter-firm linkage (Caniëls & Romijn, 2003; Täube et al., 2019), social network within KSCs is more likely to take shape through serendipitous meetings and shared working experience owing to geographical proximity. In the absence of trust based upon kinship or contractual transaction, local business associations in developing countries, such as VNITO in the QTSC cluster, play an important role in fostering inter-firm trust (Kahle et al., 2020; Wang & Tan, 2019), thereby promoting the dissemination of LKS for innovation (Configuration 1b). Not only does it assist indigenous firms in gaining access to export markets by offering market and business knowledge, but also facilitates social interactions among co-located firms through organization of social networking events (Chaminade & Vang, 2008; Täube et al., 2019).

Moreover, this study elucidates the causal mechanisms underlying the successful creation of service innovation, thereby enhancing our understanding of the innovation capabilities of service provider firms (Brandl et al., 2018; Chaminade & Vang, 2008). Service innovation capabilities of provider firms in developing countries are a key determinant in the global services sourcing strategy of multinational corporations (MNCs) (Manning, Massini, Peeters, & Lewin, 2018). As a result of their heightened knowledge base, certain services outsourcing hubs have become more appealing to MNCs from developed countries (Chaminade & Vang, 2008). Our research observes a shift away from capabilities to fulfill repetitive outsourcing tasks toward capabilities to generate service innovation. Despite the initially limited technological foundation, innovative spinoffs develop their own software services by leveraging inherited knowledge from parent organizations and their own human capital to absorb multiple channels of LKS efficiently (Configuration 1a).

Fourth, the research findings provide some practical implications for spinoff firms, particularly those located in KSCs in developing countries. These service provider firms can utilize their own human resources to efficiently and effectively exploit informal interactions channels of LKS for their innovation. In addition, our findings suggest that those firms that participate in the local business association

prove to be more innovative than non-participants (Configuration 1a and 1b). Given the collective and interactive nature of learning for successful innovation (Capello, 1999; Morgan, 1997), service provider firms are encouraged to join a local business association in order to gain timely knowledge relevant to their business, such as information about exporting markets, and to leverage the synergies via networking for innovation (Thornton, Henneberg, Leischnig, & Naudé, 2019). Policymakers tasked with the responsibility of establishing and upgrading KSCs in developing countries should also promote the advantages of membership in local business associations (Wang & Tan, 2019).

Limitations and Future Research Implications

We identify three limitations in this study that might pave the way for future research. First, this study measures absorptive capacity using the average educational attainment level, as it shapes the extent to which a firm can acquire, assimilate, transform, and exploit external knowledge to capture commercial values like new service innovation (Zahra & George, 2002). Considering the multidimensional nature of absorptive capacity (Jiménez-Barrionuevo, García-Morales, & Molina, 2011), it would be fruitful for future studies to ascertain whether other proxies for absorptive capacity would provide further insight into the effects of LKS channels on service innovation. Second, while this study employed QCA to identify pathways that differentiate innovators from non-innovators, it did not capture the breadth and depth of innovation, such as the extent and volume of service innovation. Future research should be conducted to examine which configurations of LKS and absorptive capacity contribute to a high level of innovation performance. Finally, findings from our study are drawn upon primary data collected from a KSC at a specific point in time. Given the insights into the changing role of LKS channels overtime during the cluster development evolution (Täube et al., 2019), there is ample scope for additional research to investigate whether the constellation of spinoff and informal interactions channels sufficient for innovation varies across cluster development stages (Speldekamp, Saka-Helmhout, & Knoben, 2020).

NOTES

[1] At https://www.qtsc.com.vn/en/why-qtsc
[2] This report was sent to the corresponding researcher by email from the QTSC Development Company.
[3] At http://vietnamitodirectory.com/directory/

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in the Open Science Framework at https://doi.org/10.17605/OSF.IO/D457M

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