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The role of peripheral vendors in enhancing the absorptive capacity of offshore software development teams in challenging institutional environments

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ABSTRACT

This study aims to elucidate how vendors located at the periphery facilitate the advancement of offshore software development (OSD) teams' absorptive capacity (AC) despite the unfavourable skill environment prevalent in their home country. Current research does not explain whether and how vendor teams located at the periphery respond to adverse skill environments and contribute towards OSD teams' AC in spatially distant linkages with international clients at the core. Using an inductive approach, this study developed a conceptual framework that outlines how vendor teams at the periphery acquire the "need knowledge" embedded in the context of clientele teams and subsequently transfer "solution knowledge" to international clients. Our findings highlight the importance of recursive interaction between the periphery vendor team, client teams, external agents, global experts, consultants, and incubators that facilitate this process. All these actors co-drive the AC process whereby periphery vendor teams are not just recipients of knowledge but also contributors of knowledge towards international clients in core regions.

1. Introduction

The interconnectedness between advanced countries (referred to as "the core") and developing/emerging countries (referred to as "the periphery") has allowed suppliers from peripheral regions to participate in global value chains (GVCs) (Cuervo-Cazurra & Pananond, 2023; Mudambi et al., 2017). Engagement in GVCs offers opportunities for rapid learning, expanded market access, and skill development (Zhu et al., 2017). In the context of service GVCs, while lead firms in core regions possess the necessary expertise and knowledge about service users, suppliers in peripheral regions are engaged in understanding client requirements and developing solutions (Cattani et al., 2017; Safadi et al., 2021; von Hippel, 2017). In contrast to products, services are rendered through an interactive process that takes place in the context of a unique and complex set of relationships among different actors endowed with different resources (Vargo et al., 2008). However, suppliers in peripheral regions, including Pakistan, face challenges when participating in GVCs due to institutional voids[1] (Doh et al., 2017; Manning & Richter, 2023; Sinkovics et al., 2019). These challenges are related to the adverse skill environment (Manning & Richter, 2023).

Studies highlight the challenges faced in the core-periphery dynamic of GVCs, including failures associated with this relationship (Horner, 2014). Suppliers in peripheral regions with institutional voids encounter two primary skill-related challenges in service GVCs. These challenges are related to substandard training and development institutions that fail to deliver skilled labour matching global standards and operate within precarious contractual environments that hinder the maintenance of a skilled workforce (Cuervo-Cazurra & Genc, 2008; Soliman et al., 2023). These deficits hinder the advancement of peripheral regions towards global competencies, especially for developing economies

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[1] Institutional voids are conditions within a country's institutional environment that hinder the ease of interaction between buyers and sellers, resulting in increased costs for accessing resources, including the skills needed to develop capabilities and meet international buyers' demands (Doh et al., 2017).

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distant from innovation hubs and major urban or industrial centres (Manning & Richter, 2023; Prashantham & Bhattacharyya, 2020).

However, little is known about the strategies suppliers in peripheral regions can adopt to enhance knowledge generation and integration (Gereffi, 2019; Manning & Richter, 2023). Absorptive capacity (AC) plays a vital role in addressing these challenges, as it enables firms to recognize and effectively utilize the knowledge of international customers for commercial purposes (Cohen & Levinthal, 1990; Prashantham & Bhattacharyya, 2020). In software development GVCs, the absorptive capacity (AC) of offshore software development (OSD) teams, comprising vendor teams in peripheral regions and clientele teams in the core, is critical for project success. The multidimensionality of an OSD team's AC includes "need knowledge" and "solution knowledge". Need knowledge refers to a firm's ability to identify, assimilate, and exploit knowledge about customer needs within their environmental context. Vendor teams rely heavily on their core clientele counterparts to build need knowledge, while the core clientele teams depend on vendor teams to acquire solution knowledge. The interplay and mutual learning between core and peripheral teams are crucial for the comprehensive development of AC, which is a determinant of project success.

To address this research gap, this study aims to answer the following research question: *How do vendor teams in periphery regions, operating in adverse skill environments, acquire need knowledge from core clients and contribute to their solution knowledge to enhance OSD teams' AC?* The study uses a qualitative inductive approach to explore the AC development of 17 Pakistani SSPs.

Despite the skill-related challenges, the software industry in Pakistan has shown resilience and growth (Sinkovics et al., 2019). While there is a gap in the literature regarding the strategies adopted by Pakistani software service providers (SSPs) to enhance absorptive capacity, understanding their dynamics is a significant factor in comprehending their success (SBP, 2021a). While existing literature focuses on how developing country firms build AC for technical knowledge, there is a gap in understanding how vendor teams in peripheral environments overcome skill-related challenges and contribute to AC development in OSD projects (Choksy et al., 2018; Darwish et al., 2020).

Our study makes important theoretical contributions. While much of the extant literature emphasizes the concept of absorptive capacity, it mainly focuses on knowledge creation and transfer within the core region. There is scant research on the contextualized understanding of absorptive capacity (Boschma, 2022) explaining the periphery-core relations that improve the connectivity of the periphery with the core through knowledge co-creation and transfer. We identified the unique challenges arising from such knowledge transfer and realization and illustrated the process of how vendor teams located in a peripheral region grasp and build need knowledge. We thus advance scholarly knowledge of the existing GVC work on value chain suppliers, providing an understanding of the barriers that limit periphery vendors in contributing towards absorptive capacity and their internal and external practices in addressing those barriers. We responded to the call for a more contextualized understanding of absorptive capacity by unpacking a) the interconnection between industry-related features of software services provision and the adverse skill environment for periphery vendors and b) how this interconnection shapes periphery vendors' internal and external practices towards AC development and contribution back to the client in the core region (Boschma, 2022; Meyer, 2015; Tsui, 2006; Whetten, 2009).

2. Theoretical background

Cohen and Levinthal (1990) introduced the term "absorptive capacity" (AC) in their seminal paper, arguing that firms' ability to benefit from external knowledge flows necessitates more than mere exposure. They must possess the capacity to not only recognize and assimilate but also effectively transform new external knowledge for commercial purposes (Cohen & Levinthal, 1990, p. 128). AC and learning are often described as co-evolving and mutually reinforcing, which enables firms to innovate and strengthen existing knowledge based on acquiring new knowledge (Manuela et al., 2021; Van den Bosch et al., 1999). While existing literature on absorptive capacity varies, there is a common understanding that it is a unilateral and firm-led process grounded in idiosyncratic path-dependent experiences and knowledge (Cohen & Levinthal, 1990), routines (Lewin et al., 2020), and processes (Lane et al., 2006; Zahra & George, 2002) that are instrumental in creating value.

In the context of the periphery-core relationships, majority of literature points out that periphery firms develop their absorptive capacities to internalize knowledge originated in the core environment (Stallkamp et al., 2018; Manning & Richter, 2023). Firms in the periphery regions, through their collaboration with the firms in the core regions, gain access to different resources and capabilities (Ahuja, 2000) and capitalize on the latest technologies, which in the first instance imported to the periphery region, transformed into new knowledge, and exported to the core region (Li et al., 2018). Firms in core regions enjoy their competitive advantage by holding back their unique stock of knowledge and avoiding their cooperation in the key R&D activities while utilizing the common stock of knowledge (Prahalad & Hamel, 1990), which serves as instrumental in the development of new knowledge in the periphery regions.

Drawing upon Schweisfurth and Raasch (2018), we argue that there are two types of knowledge that are critical for periphery suppliers in contributing towards OSD's AC development in GVCs – need knowledge and solution knowledge. Need knowledge refers to the knowledge of customers' needs and expectations and requires firms to span the organizational boundary either by taking users' perspectives (Homburg et al., 2009), interacting with users (von Hippel, 1994), or by employing individuals who already have knowledge of customers (Schweisfurth & Raasch, 2018). According to Teece (2018), strong relationships with international clients allow vendors to obtain insights into the culture, customs, and business practices of the target market. This information can help vendors tailor their products and services to better meet the needs of the local market, leading to a greater chance of success.

In a software application development GVC context, need knowledge refers to knowledge about international clients' business requirements or business problems, including software application users' needs and user experience, international clients' business domain knowledge, and the industry domain. In the software services sector, technical knowledge of software development is often intertwined with domain knowledge of international clients and the needs, experiences, and cultural backgrounds of the end users (Tuli et al., 2007). Xu and Yao (2013) explain that in OSD teams, international clients are dependent upon vendor teams for project knowledge (knowledge related to the management of the project) and technical knowledge (software programming, coding, quality assurance). We refer to both project knowledge and technical knowledge as *solution knowledge*. On the other hand, vendor teams rely heavily on their international clientele counterparts to build need knowledge. The interplay and mutual learning between client-vendor teams are crucial for the comprehensive development of AC, which is a determinant of project success. Following this understanding of OSD relations (client-vendor), we define the OSD team's AC as the ability of vendor-client teams to acquire, assimilate, and transform both need knowledge and solution knowledge to deliver clients' requirements.

2.1. Absorptive capacity under institutional voids

Management scholars have long acknowledged that AC is closely related to innovation performance Bilgili et al., 2016; Cuervo-Cazurra and Huaichuan, 2017; Sultana & Turkina, 2020; Yao et al., 2022). However, AC development can be challenging for supplier firms operating in peripheral regions (McAdam et al., 2004) facing institutional voids. Institutional voids, a feature of developing countries (Khanna &

Palepu, 2000, 2010), are created when key institutions are either missing or underperforming (Doh et al., 2017; Mair & Marti, 2009). Firms operating under institutional voids have limited formal institutional arrangements that provide them with access to a skilled workforce and high-quality training and knowledge and face difficulties in attracting and retaining skilled talents (Cuervo-Cazurra & Genc, 2008), which makes it more challenging for them to obtain, decode, and apply incoming external knowledge (Nair et al., 2016; Temouri et al., 2020). Therefore, suppliers in periphery regions, due to institutional voids, will face the liability of foreignness in acquiring need knowledge as the knowledge of international clients' domains, users' needs, and experiences primarily originates from core regions with very distinct institutional environments (Epede & Wang, 2022).

Studies have shown that institutional voids influence firms' ability to exploit and explore market opportunities (Acquaah, 2007; Khanna & Palepu, 2000, 2010). When formal institutions are weak, firms tend to utilize alternative channels for support (Ge et al., 2019). Essentially, institutional voids trigger strategic calls by firms to enhance their learning effort (Adomako et al., 2019).

Taking insights from institutional voids and absorptive capacity literature, we argue that successful suppliers in periphery regions will develop alternative strategies to address the adverse skill environment and contribute towards OSD teams' AC development. From a GVC perspective, the governance structures and power dynamics inherent in GVCs critically shape periphery vendors' inter-firm linakges with lead firms in the core regions. According to Gereffi et al. (2005), codification of knowledge, complexity of transferring knowledge and capabilities of suppliers to learn and internalize the knowledge shapes the extent of explicit coordination and power asymmetries in the inter-firm linkages between periphery-core firms. Given that these periphery vendors often have restricted backing from local institutions, understanding the inter-firm linkagescan enhance understanding of periphery vendors' contribution towards OSD team's AC and in turn how periphery vendors' may benefit core firms (Khan, Lew, & Marinova, 2018).

3. Empirical context and research methods

The study context is unique, given that the Pakistani software development industry has established key business connections with end customers from developed economies. We chose this context for two reasons: firstly, the relevance of Pakistan's weak education and skill context to our research topic, and secondly, the consistent growth of the Pakistani software industry despite weak institutions, as many suppliers from Pakistan are part of global software GVCs. The labour market in Pakistan generally falls short of meeting global industry demands across all sectors. Labour productivity in Pakistan is rated the lowest among its neighbouring countries, including India, China, Bangladesh, and Sri Lanka (Lopez-Calix & Touqeer, 2013). While neighbouring countries like China and India are gradually moving towards high value-added sectors, the majority of labour in Pakistan falls into low value-added sectors. Furthermore, Pakistani universities have faced internal and external challenges that have hindered their progress despite their efforts to facilitate education. With 163 universities in total, comprising 91 public and 72 private institutions, the slow progress has been attributed to factors such as a lack of innovation in teaching approaches, and a focus on theoretical subjects rather than practical learning. Furthermore, there is a reluctance to form networks with businesses and share perspectives with other universities, and a lack of proficiency among teachers and administrators. These challenges have resulted in a gap between industry demands and university education.

Despite these conditions, the Pakistani software industry has experienced significant growth over the last decade (Choksy, 2015; PSEB, 2011; Sinkovics et al., 2019). Pakistani SSPs are now working in multiple technological domains, including web applications, Java enterprise applications, mobile app development, cloud-based solutions, business intelligence, and big data analysis, among others (PSEB, 2011). Between 2010 ($124 mn) and 2020 ($348 mn), Pakistani software service exports experienced a growth rate of 180%, with an annual growth rate of 20%, making it one of the best-performing sectors despite the slowdown in the overall economy (SBP, 2021a,b). Therefore, the case of Pakistani software vendors is interesting as it helps us understand how these vendors not only acquired need knowledge but also contributed solution knowledge to clients towards OSD teams' AC.

3.1. Research methods and data

Given the relatively unexplored nature of absorptive capacity development in an adverse skill context, we conducted a qualitative inductive study. We followed the method described by Gioia et al. (2013) to collect and analyse our data, focusing on the contextual interrelationships regarding absorptive capacity to address existing theory.

We adopted a purposive sampling approach to select the firms from the database of the Pakistan Software Housing Association (PASHA). We selected firms that have grown since their inception and shown industry recognition and achievement, as identified from their website media and press coverage. Furthermore, we selected small and medium enterprises (i.e. those employing 10–300 employees). Table 1 provides a description of the sampled firms' case data and their client's region. We followed a semi-structured in-depth interview protocol. The lead researcher conducted 34 interviews with personnel from 17 software service providers (SSPs) or vendors – two interviews from each SSP, including one member of the top management team and one project manager. The interviews were conducted face to face. Taking the perspective of the top management member and project manager provided us with generic-level challenges and strategies while investigating the same for specific vendor teams working on client projects primarily in US, UK and Europe.

We started by asking general questions about the respondents and their companies. We then asked questions focusing on the process, i.e. how firms identify, transform, and exploit external knowledge to produce new products. Subsequently, we asked what factors hinder absorptive capacity development and how suppliers address those barriers. During the interviews, to increase the trustworthiness of the data, we used the "*court room*" style of interviewing, focusing on specific events and examples. Lead researcher who is fluent in both Urdu and English languages undertook interviews in both languages. To ensure the validity and dependability of the data, the lead researcher then transcribed all the interviews into English including the translation of Urdu parts into English. The transcribed documents were sent to the participants (who were well versed in English) to ensure that the transcription matched their responses. All the documents were stored in NVivo, a computer-assisted data analysis software (CASDAQ).

We used the template analysis technique (King, 2012) to analyse the data after entering all the collected information into NVivo (Sinkovics & Alfoldi, 2012). A *chain of evidence* was established for each participating organization. We began our analysis using an open coding approach by analytically and systematically breaking down the data sentence by sentence to document and evaluate the degree and breadth of support for themes across respondents. We then grouped them into first-order categories. This process continued until we achieved theoretical saturation. We used NVivo software to associate segments of text in each interview and other data sources to have an initial categorical system to reflect our respondents' perspectives. We identified relationships among these first-order categories and clustered and aggregated them into second-order segregated themes to compare within and across interviews. This process was continued until we identified any new categories. We then started looking for dimensions underlying these categories to develop a grounded framework that linked the various categories emerging from the data. We analysed and discussed how these themes are related to one another and established a conceptual framework that captured these links. Table 2 shows the data structure,

Table 1
Description of the companies (sample).

SSP	Head office	Overseas office	Clients' Region	Designation	Business formation	No. of employees
SSP#A	Karachi	US	US	Head of Services	2005	200+
SSP#B	Lahore	Saudi Arabia	US and Saudi Arabia	CEO	2011	30
SSP#C	Islamabad	UK	UK and Europe	CEO	2007	30
SSP#D	Karachi	UK	UK and Europe	CEO	2009	30–50
SSP#E	Lahore	None	Europe	CEO	2007	300+
SSP#F	Lahore	US	US and Europe	Head of Services	2005	200+
SSP#G	Lahore	US	US and Europe	Head of Services	2006	150+
SSP#H	Lahore	US	US	CEO	2009	100+
SSP#I	Karachi	None	Europe	Head of Products and Services	2011	10–20
SSP#J	Lahore	None	Europe	Head of Services	2009	20–30
SSP#K	Lahore	Singapore	Singapore and US	CEO	2010	30–50
SSP#L	Lahore	US	US	CEO	2009	200+
SSP#M	Lahore	US	US	CEO	2007	30–50
SSP#N	Karachi	Malaysia	Europe and Malaysia	Head of Services	2007	50+
SSP#O	Karachi	Netherlands	Europe	Head of Services	2011	20+
SSP#P	Karachi	None	Europe	CEO	2009	20+
SSP#Q	Lahore	US	US and Europe	CEO	2007	50

including first-order concepts (those meaningful to the respondents) and second-order themes (induced by the researchers), that led to the generation of the aggregate dimensions.

4. Findings

To understand the process through which vendor teams from adverse institutional settings contribute towards OSD absorptive capacity, we identified key aggregate dimensions, second-order constructs, and first-order categories. Participants highlighted the strategic interdependency between vendors' internal processes and customer engagement in bypassing the institutional barriers and AC development. OSD teams' absorptive capacity was categorized into three aggregate dimensions, namely *knowledge acquisition*, *knowledge assimilation*, and *knowledge transformation*. Finally, inter-firm collaborative processes were also categorized into two aggregate dimensions: *agile engagement* and *client involvement*.

4.1. Institutional barriers

Drawing upon institutional void literature, institutional barriers here refer to barriers that constrain vendors from contributing towards OSD teams' absorptive capacity because of a weak formal institutional environment, particularly labour market institutions. Our data analysis showed institutional barriers that constrain SSPs' absorptive capacity development and how they cope with them. We identified the two major aggregate dimensions relevant to institutional barriers: *skill shortage* – difficulty in accessing skilled labour in the home institutional environment; and *skilled labour turnover* – difficulty in retaining skilled labour and a high turnover of skilled labour in organizations due to weak contractual systems in the labour market.

4.1.1. Skill shortage

Responses indicated two themes to explain the nature of skill shortage in the home institutional environment that prevents vendor teams from contributing to OSD teams' AC: *skill shortage in solution knowledge* and *skill shortage in need knowledge*. *Skill shortage in solution knowledge* relates to the fact that the core challenge for SSPs is to source labour that has the capability to learn and apply technical and project-related knowledge for software development. The majority of respondents cited the unavailability of the skills required to meet foreign clientele demands. They attributed this to the widening gap between academic training and the industry's needs. Managers also noted that they struggled to match jobs to workers, as most of the labour market comprised graduates from low-tier universities lacking the required skills. They highlighted the quality issues as noted by SSP#N:

> *"The exposure to computer science is ineffective. The exposure in universities is so basic that people cannot develop a successful career out of the educational experience. I think with the demand of the industry at the level we want to scale it, the human resources are lacking in Pakistan."*

The *skill shortage in demand-side knowledge*, as pointed out by the respondents, is attributed to the failure of educational and training institutions to provide any demand-side knowledge, including software architecture and user experience knowledge. One of the SSPs commented:

> *"Modern software interaction design requires skills in aesthetics (UI) and user experience (UX). UX skills are very hard to find in Pakistan. This knowledge comes from human-computer interaction or product design, and those disciplines are virtually non-existent in our current university curricula."*

4.1.2. Skilled labour turnover

Two major themes emerged from the interviews on skilled labour turnover: *voluntary turnover* and *brain drain*. Voluntary turnover, as responses highlighted, is the strong link between high turnover and a high level of flexibility in the context of the Pakistani labour market and the global software labour market in general. With the emergence of mobile-based applications, it has become easier to initiate freelancing. The responses also highlighted that there is a lack of regulatory environment through which they can be legally barred from freelancing. Although some employers put some restrictive conditions in their employees' contracts, they do not have the resources to monitor them.

> *"All these engineers are also into freelancing. So their focus is distributed. When we contract engineers, we ask them as part of the contract not to work for others or freelance" (SSP#K).*

Many vendors stated that most of their employees leave the organization to set up their own businesses. Because of such a high turnover, it becomes extremely difficult for vendors to retain the skilled labour required to build absorptive capacity.

Brain drain is another primary reason for the adverse labour market, which is partially due to the political instability in Pakistan and the increasing demand for talented labour abroad. These factors force and/or persuade the skilled labour to migrate out of the country, as expressed by one of the respondents:

> *"My gut feeling is that 80% of the top talent leaves the country and now we are left with the bottom 20%. So, if the talent pool is migrating that frequently then you won't be able to deliver quality products consistently" (SSP#D).*

Table 2
Aggregate dimensions and categories – absorptive capacity.

First-order categories	Second-order themes	Aggregate dimensions
• Lack of access to software developers frequently • Lack of access to experienced labour • Weak education system in software architecture/design • Lack of experienced software developers in the market	Skill shortage in solution knowledge	Skill shortage
• Lack of exposure of graduates to real-life software development projects • Outdated knowledge of the subject area • Lack of access to users and/or domain experts • Degree curricula not meeting industry requirements	Skill shortage in need knowledge	
• Migration of talent due to opportunities abroad • Graduates from top universities moving abroad • Migration of talent due to political uncertainty • Migration to better companies or more certain cities within the country	Brain drain	Skilled labour turnover
• Flexibility in labour market for individual contract jobs • Weak regulation and underdeveloped markets for contracts	Voluntary turnover	
• Formal training programmes • Coaching programmes	Formal training	Skill formation
• Direct interaction with experts •Feedback from experts • Working alongside experts on the project	Off-the-job training	
• Incubator training •Experimental projects • Technology-focused projects •Domain-focused projects	On-the-job training	
• Flat communication • Cross-department communication • Interdependent and coupled structure	Employee participation	Skill retention
• Autonomy and discretion in clientele projects • High employee voice and involvement	Employee empowerment	
• Employees have flexibility in inter-project transfer • Employees have flexibility to engage in part-time initiatives alongside the job	Flexible job design	
• Online learning and support for career development • Support for MBA degrees • Support for product-led start-ups	Career development	
• Developing demos • Receiving and implementing feedback • Reiterations	Online engagement using agile methodology	Agile engagement
• Communication on project progress • Understanding location-sticky requirements	Temporary F2F engagement	
• Domain knowledge • User knowledge • Market knowledge	Transferring need knowledge	Client involvement
• Feedback on user experience • Feedback on design • Feedback on domain	Client feedback	
• Industry trends and predictions • More efficient methods of software development	Scanning external environment	Knowledge acquisition
• Acquiring information on new trends • Acquiring knowledge through networking at conference	Conference attendance	
• Working with industry experts • Working with domain and platform experts • Working with consultants	Collaborating with experts	Knowledge assimilation
• Contributing towards open-source community • Brainstorming ideas between top management, project managers, and junior developers • Voluntary projects	Internal incubator	
• Developing a core framework to apply client requirements. • Applying domain knowledge and user knowledge for a software application	Project-level knowledge integration	Knowledge augmentation/ transformation
• Cultural integration of different project teams through socialization • Project rotation • Developing firm-level frameworks and standards • Inter-project transfer of domain and user knowledge	Firm-level knowledge integration	

4.2. Firms' responses to the institutional barriers

Vendor teams' ability to cope with institutional barriers was also categorized into two aggregate dimensions, namely *skill formation* (the practice of creating skilled labour inside the organization) and *skill retention* (the practice of retaining skilled labour).

4.2.1. Skill formation

Our results revealed three themes directly related to vendor teams' ability to create skilled labour for both solution knowledge and need knowledge areas, namely formal training, on-the-job training, and off-the-job training. *Formal training* refers to the internal training programmes designed for developing the requisite technological and need knowledge-related skills. Many vendors provided generic skill development training programmes ranging from four months to one year in duration. These contribute towards solution knowledge AC. An excerpt from one of the interviewees is reproduced below:

> *"The employees that we hire, we must train them for one whole year. We invest a lot in creating that talent."*

Off-the-job training is also an important provision highlighted by the respondents. The responses revealed that vendors continuously collaborate with global experts to facilitate knowledge acquisition and assimilation in need knowledge. Global experts, inter alia, include game experts, consultants, and user experience and domain experts. For example, SSP#Q, while working with user experts on a project featuring global collaboration, was required to redesign and develop a PC application for a smartphone device. They collaborated with Android and IOS domain experts on this project. The interaction of external global experts and internal employees helped them integrate game art and game production knowledge.

On-the-job training is another provision highlighted by the respondents. Vendors often undertake small projects to understand the domain and user context. These measures train the employees to align and apply technical features according to the needs of the project. For

example, some vendors explained their strategy to provide services for small projects or small-size clients with the strategic intention of learning new technologies and/or domain/user contexts. As a result of these on-the-job training and off-the-job training skill formation practices facilitate development of need knowledge AC which in turn benefits the core firm to be able to get suppliers who understand their requirements and needs.

4.2.2. Skill retention

The analysis of the interviewees' responses identified three themes, namely *employee participation and empowerment*, *flexible job design*, and *career development*, to minimize labour turnover. *Employee participation and empowerment* are important human resources practices that are used to improve employees' confidence. An important mechanism of organizational learning is a structure through which the knowledge flows in an organization. Empirical analysis of the responses shows that the organizational structure of the organizations was flat. They provide ample opportunities to the newly inducted employees to participate in organizational decision-making, which gives them a sense of empowerment. They provide autonomy to define their work and demonstrate their leadership skills. Furthermore, departments were intensively coupled and interdependent with more decentralization. Authority sharing is found to be quite high in small teams where new and senior employees work together for a specific client, which provides a high scope of productive involvement and opportunities for learning.

> *"A person who may be just here for six months may have higher responsibilities, more leadership than his seniors may. We do not give as much value to experience as to the results, willingness to learn, willingness to innovate."*

A *flexible job design* is one of the prominent features of successful vendors, giving their employees more autonomy and flexibility to move around projects through job rotation. Such an opportunity also augments the on-the-job training. Moreover, it makes their job more interesting by allowing them to explore new avenues while working on different projects and in different departments in the same organization. This allows vendors to maintain the motivation of their employees and increase their commitment and learning within the organization. Vendors do not discourage existing employees' part-time initiatives in freelance offshore services. Sometimes employees face work-family conflicts and are forced to start freelancing, which contributes to the brain drain within the organization. By providing a flexible job design, which also provides flexible timing at work, employees are more satisfied with work-family balance. Such initiatives are only possible if the management is fully aware of the employees' problems. The openness in communication between different levels of hierarchy helped the employers to deal directly with this issue. Although different vendors have different opinions on how they have dealt with this issue, openness helps firms understand and match employees' goals with employers' expectations and act accordingly.

One of the firms commented:

> *"When these people go home at night and do freelancing work then they learn a lot of new things in the process, which helps our organization. Their limited time in the office sometimes becomes more productive."*

Career development is also highlighted as one of the factors contributing to the skills retention in these vendors. In the absence of a permanent solution to retain their key human resources, companies actively indulge in providing career opportunities for organizational growth. Many vendors provide their employees with opportunities for further education, including MBAs, specialist degrees, and further online courses to support their individual career development.

4.3. Inter-firm collaborative mechanism

Our findings identified two aggregate dimensions of inter-firm collaborative mechanisms between periphery vendors and their clients at core regions: client involvement and agile engagement. Our findings show (as detailed below) that inter-firm linkages are co-governed by both vendor teams and client teams rather than driven by a dominant party (for e.g. client in the core regions). However, power asymmetries did play an important role in the form of client involvement.

4.3.1. Client involvement

The analysis yielded 2 s-order themes that demonstrate the client's direct involvement in the software development process, namely a) transferring domain and user knowledge and b) client feedback. *Transferring domain and user knowledge* requires extensive interaction among the parties involved. There are two types of knowledge that international clients indirectly support through involvement and interaction with SSPs: domain knowledge and user knowledge. Domain knowledge varies from project to project according to their requirements. Vendors provided services to clients in diverse industries and sectors possessing idiosyncratic knowledge features and a value chain. Since a software product is developed to serve a client's business needs, vendors need to understand the client's business domain to the extent that it captures the needs of the end users. As a result, dependency of vendor teams over client teams is high to acquire domain knowledge. Moreover, end users play a significant role in defining the demands and changes in the software application. Vendors differentiate themselves not just in terms of their technical capabilities but more so due to their ability to understand and build high-quality user experiences in software applications. Vendor teams is dependent upon the client teams to provide insights into user's needs which in turn facilitate need knowledge acquisition.

Client feedback during the different stages of product development through the identification of problems or additional requirements plays a significant role in exercising power over vendor teams in the AC development process. The iterative nature of the software development process makes feedback an important and necessary feature of the whole process. Feedback is so crucial for the development of vendors' project progress that some vendors reported facing complete stagnancy in the project when clients delayed in providing the feedback.

Vendors reported that the feedback depends on the user and how easily the international client can access the end user. When the client is developing a software application for their own business, it is easier to access that feedback and provide the client with more clarity and authority over the supplier to redefine the requirements. From client team's perspective, feedback is another source of client's power and periphery's dependence upon core.

4.3.2. Agile engagement

Agile engagement facilitates vendor team to shift the power-relations in their linkages with client team. We found that agile engagement consists of 2 s-order themes: *online engagement using agile methodology* and *temporary face-to-face (F2F) engagement*. *Online engagement using agile methodology* is one of the cost-effective arrangements for international engagements. The efficiency of communication in the form of coordination processes drives learning inside the organization. Agile methodology ensures that vendors cope with geographical and cultural barriers and leverage project experiences into productive interactions. Agile methodology values dynamism and quick responsiveness more than formal procedures and planning. It helps to keep track of vendor teams' progress, keep the customer aware, and get instant feedback through regular coordination. Vendor teams take proactive measures to make sure clients are aware of the progress. For example, SSP#E used the scrum methodology (one of the agile methodology approaches) whereby the company engaged in stand-up meetings with international clients twice a week to demonstrate how clients' requirements for a social media app were being programmed and functioned through demos and prototypes. This knowledge helped international clients to understand the quality of the software app and provided relevant

feedback in terms of users' needs and experience.

Temporary F2F engagement, in addition to the online medium, is another international engagement mechanism. Many vendors have engaged in frequent international travels to create temporary F2F platforms for buyer-supplier engagement. For example, SSP#C has been working with an event management company for the last eight years on the design and development of a web enterprise application. The end users are the employees of the client. For the requirement analysis task, the senior team of SSP#C travelled to the client's country and engaged in an interactive process with the end users for a period of three months. This interactive process helped the team understand the core problems. During their visit, they engaged in a process of codification of the clientele's requirements. This helped them reduce the coordination frequency once they returned to Pakistan. Overall, agile engagement helps vendor teams understand client team's requirements (need knowledge) and transform those requirements into software app products. As a result, it has implications for power dynamics as will be discussed in section 5.

4.4. Vendors' contribution towards OSD teams' absorptive capacity development process

4.4.1. Knowledge acquisition

In terms of *knowledge acquisition*, our analysis yielded two main types of practices for successfully acquiring demand-side knowledge from international clients and sourcing other types of strategic knowledge, namely *acquisition through internal scanning and research process* and *acquisition through collaborating with external experts*. *Internal research and scanning* is an important aspect of successful vendors, as they have created dedicated departments to identify and scan the latest market and technological trends. The main function of these departments is research and development to provide novel ideas, design, and technical knowledge. Another source of knowledge acquisition is *attending conferences*. Vendors' participation in a relevant international conference gives them more exposure to upcoming technological trends and helps them in exploring new markets. For example, game developers learn new ideas from game-oriented conferences and community programmes where gamers from all over the world interact and share ideas with each other. As one of the owners expressed, "[y]ou do not keep a secret in the gaming world".

4.4.2. Knowledge assimilation

Responses highlighted two main themes that explain the knowledge assimilation stage of absorptive capacity, namely *collaboration with external experts* and *internal incubator*. *Collaboration with external experts* also helped these successful organizations to effectively process the knowledge. These collaborations with external experts help create skilled labour and help the project team to process the new knowledge effectively. External experts provide feedback on the team's development. Domain experts like iOS or Android specialists help these vendors review the game and give productive feedback. In addition to collaboration with external experts, our analysis showed that vendors are also involved in collaborating with local and international software companies. These local and international companies acted as boundary spanners to the knowledge not immediately accessible to vendors. For example, SSP#Q's owner commented:

> *"With similar backgrounds, experience counts a lot because you have this tacit knowledge you have developed over time, and you have best practices you know you learned through experiences."*

Internal incubator is another strategy used by successful organizations to support their employees in processing knowledge. Since most of the vendors are small enterprises and working in adverse institutional conditions characterized by resource-constrained and unreliable external institutions, they have developed internal institutions to manage the knowledge acquisition process. Internal incubators make them aware of, and expose them to, new technologies in different domains and user contexts. Activities in the incubator include contributing towards an open-source community, discussing ideas among internal team members and external volunteers, and engaging in temporary projects. These activities help vendors to build an environment of acquiring new knowledge effectively. For example, SSP#B has created an incubated-training facility inside the organization where senior managers, developers, designers, and all the employees interact and discuss multiple ideas and contribute towards open-source community projects. SSP#B remarked:

> *"We have an incubator through which our employees can adapt multiple skills including new trends and emerging client needs. We build an incubator to facilitate those."*

4.4.3. Knowledge transformation

From the analysis of the interviews, we found knowledge transformation refers to those activities that integrate solution knowledge and need knowledge and transform it into an actual solution. Executives' responses mentioned two themes that are important, namely *project-level knowledge integration* and *firm-level knowledge integration*. *Project-level knowledge integration* helps firms to integrate supply-side knowledge with demand-side knowledge for new solutions. The success of this integration largely depends on vendors' ability to leverage and repeat the same knowledge in other similar projects. Vendors leveraging project experience to build long-term capabilities often intentionally invest in certain capabilities in one project and then repeat the same process in other projects. For example, SSP#E has developed structures through which the knowledge flows in the organization and facilitates learning. The organizational structures in vendors are found to be flat and open where new employees are given opportunities to demonstrate their leadership skills. Furthermore, departments are intensively coupled and interdependent. As a result of these project-level integration, core firms benefit from periphery vendors who are able to leverage a) the solution knowledge AC localised in the Pakistani institutions and internal firm environment and b) integrate those with need knowledge via global sources.

The second dimension of knowledge transformation is *firm-level knowledge integration*. As vendors get more experience in providing offshore services, they formalize their organization in terms of human resource processes and communication mechanisms. Vendors have evolved the processes of internal formalization of rules and regulations. Frequent and intensive coordination with clients drives SSPs to build communication systems that keep the communication ongoing. Similarly, internal communication also needs to be consistent. For example, SSP#C has formalized the training and quality assurance programmes within the organization in accordance with the ISO9001 standards. For this reason, the project managers and their teams are required to perform at certain quality standards to meet the standards of ISO9001. Furthermore, many vendors have evolved their organizational routines as the requirements of global clients have become more complex. For example, SSP#D initially had no formal human resource procedures, and employee training was dependent upon informal on-the-job training and the teaching of basic codes. However, with experience, SSP#D introduced strategic practices, including flexible projects, and rules have evolved. Established standards and flexible routines of periphery vendors benefits core firms via quality software app, excellent user experience and profitable returns on the software app.

5. AC development under adverse skill institutions

Our qualitative findings elucidate not only the major themes related to absorptive capacity development but also the linkages among these themes and the propositions we have developed. We have developed a framework explaining the relationship between different themes (see Fig. 1).

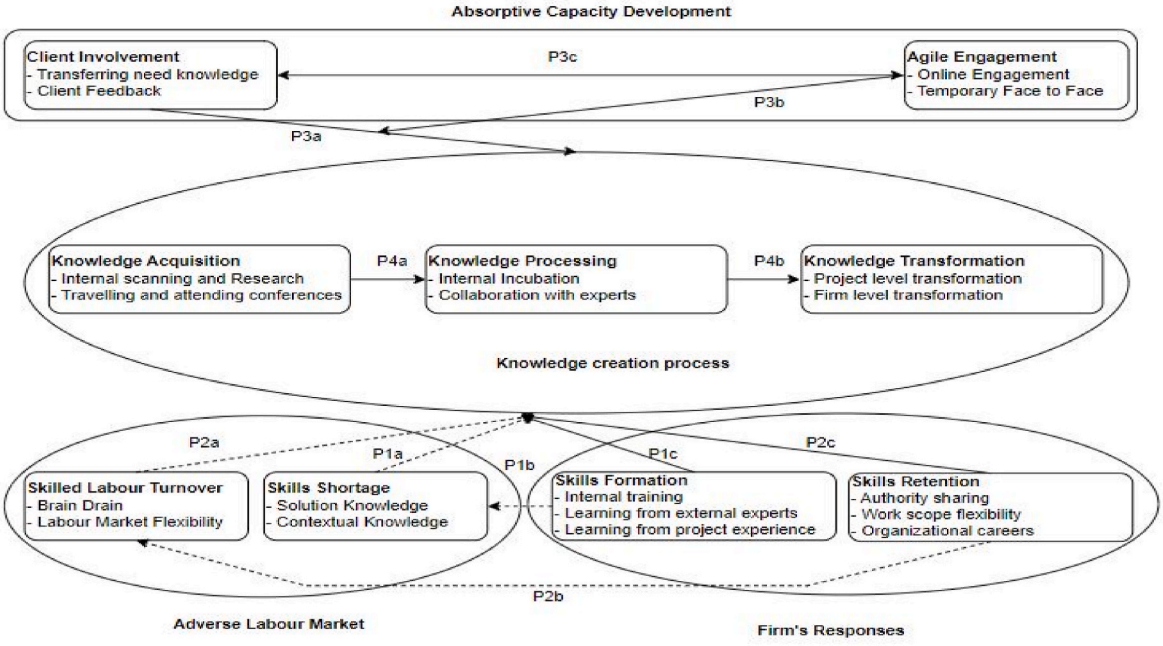

Fig. 1. Absorptive capacity under adverse institutional environment.

5.1. The role of skill shortage and skill formation in AC development

Vendors consistently deemed a) *skill shortage* (shortage of skilled entry-level or experienced labour that can be hired to acquire, process, and meet international clients' demands) and b) *skill turnover* (high turnover due to increasing migration and flexible employment contracts) as major factors in preventing their contribution to the development of OSD teams' absorptive capacity. We argue that the skill shortage within Pakistan's software industry negatively impacts vendors: a) acquisition and assimilation of need knowledge; b) acquisition and assimilation of solution knowledge; and c) transformation and integration of need knowledge and solution knowledge.

P1a: Skill shortage has a negative effect on periphery vendors' ability to acquire and assimilate need knowledge and contribute solution knowledge back to the core.

Skill formation practices (internal training, hiring experts, project experience) help periphery vendors to effectively acquire and process knowledge. Our analysis shows that formal training practices help vendors to acquire and process solution knowledge. However, it does not foster their ability to develop need knowledge, i.e., to apply software engineering and software design capabilities to a specific domain and/or user context. To acquire and process *need knowledge*, on-the-job training (experimental projects, internal incubators) and off-the-job training (engagement in, and exposure to, external experts) play a more significant role.

Once a vendor team successfully recognizes and assimilates both types of knowledge, they must integrate both forms of knowledge and transform them into an actual capability that can be exploited and transferred to the international clientele team. For this, vendors need project and product managers. Our data analysis showed that vendors develop project managers by encouraging their more trusted employees to experiment with their project management skills in temporary projects and lead the projects. Skill formation in project management facilitates knowledge transformation activities, including organizing knowledge at the project level and then transforming it into a firm-level capability. As a result of this process, core firm benefits from periphery vendors to be able to a) communicate and receive understanding of their requirements embedded in distinct institutional, user and knowledge environment b) receive quality app products and excellent user experience c) successful and profitable apps that lead to recurring relationships and projects Therefore, our next propositions are as follows:

P1b: Skill formation dampens the negative impact of skill shortage on periphery vendors' contribution towards OSD teams' absorptive capacity development.

P1c: Skill formation has a positive effect on periphery vendors' ability to contribute to OSD teams' absorptive capacity development.

5.1.1. Skilled labour turnover, skill retention, and AC development

The analysis showed that when vendors are successfully able to source and train skilled labour, there is a high probability that skilled labour will leave the organization for further opportunities. The data further highlighted that *flexibility in the labour market* and *brain drain* are the main factors that prevent vendors from benefiting from skilled labour.

P2a: Skilled labour turnover dampens the positive relationship between skill formation and vendors' ability to contribute to OSD teams' absorptive capacity development.

Responses indicate that *skill retention* practices help vendors cope with skilled labour turnover on the one hand and leverage skilled formation practices towards OSD teams' AC development on the other. *Employee participation and empowerment*, *career development*, and *flexible job design* develop a sense of belongingness and identity creation among organizational members. Employees feel more security and independence by being part of the organization rather than facing the costs of initiating their own business or finding jobs abroad. As a result, skilled formation practices are more likely to be more effective towards AC development for vendors who are successful in retaining skilled labour. In other words:

P2b: Skill retention practices dampen the negative impact of skilled labour turnover on periphery vendors' contribution to OSD teams' absorptive capacity development.

P2c: Skill retention practices strengthen the positive relationship between skill formation practices and periphery vendors' contribution to OSD teams' absorptive capacity.

5.1.2. Client involvement, agile engagement, and absorptive capacity

The responses suggest that due to the adverse skill environment, vendors are dependent upon their linkages with foreign clients to acquire and process need knowledge. International clients share this knowledge to ensure that vendors are able to develop software solutions in line with the requirements of the client. Power asymmetries exist in intense client involvement that contribute towards knowledge transfer from core firm to periphery vendors.

Agile engagement plays dual role. First it supports the transfer of need knowledge from core firm (international clients) to vendors. Second, it facilitates the transfer of solution knowledge from the periphery vendors to core firms (international clients). In terms of knowledge acquisition, agile methodologies, including frequent online interactions, transparency in progress, and stand-up meetings, act as an effective medium for clients to transfer the required knowledge and for vendors to understand this knowledge, which in turn helps vendor teams to further research the clients' domain, collaborate with experts, and leverage upon their internal incubators. Similarly, temporary face to face interaction facilitates tacit interaction between client and vendor about the nature of the user, their requirements, and how the application outlook will fit into the user experience. Internally, client involvement is complemented by internal team-level scan and research. Internal scan and research help vendor teams to get a research-based understanding of the clients' domain and the general behaviour of app users in a particular market. Similarly, agile engagement and client involvement support vendor teams in developing knowledge assimilation capabilities. In order to *process the knowledge*, it is crucial for vendors to interact with international clients in a way that keeps the communication smooth despite geographical and cultural barriers. This mainly occurs when vendors (in interaction with external experts and internal incubators) develop software application demos (also known as "sprints") and engage with international clients via online platforms. In response, clients provide the periphery vendor team with feedback explaining the extent to which the vendors have understood clients' requirements and the context. This back-and-forth process supports vendors' knowledge assimilation activities.

Finally, client involvement and agile engagement facilitate the *knowledge transformation*. Vendor teams engage iteratively with international clients, demonstrating how the software looks like when requirements and domain knowledge are integrated through software architecture and software engineering activities. In response, international clients provide feedback to the vendor team about the quality of the software application from the perspective of the end user. This back-and-forth process minimizes the chances of failures and allows clients to monitor the project.

P3a: A high level of client involvement positively affects the transfer of need knowledge from client to SSP, which in turn positively affects periphery vendors' contribution to OSD teams' absorptive capacity.

P3b: Agile engagement strengthens the positive relationship between client involvement and periphery vendors' ability to contribute to OSD teams' absorptive capacity.

The relationship between client involvement and agile engagement is dynamic and iterative in nature, which affects the nature of knowledge acquired and processed by vendors. For example, when a client explains the needs of their end users and domain context via an online medium, vendors may initially struggle to comprehend, necessitating repeated explanations. The repeated interactions and, most importantly, post-delivery client feedback on a particular articulation and visualization of the software application, as shown by the periphery vendors further develop the software development process. As a result of this recursive process between agile engagement and client involvement, we witness a dual overlapping process a) core to periphery transfer of need knowledge, b) periphery to core transfer of solution knowledge, c) periphery vendors' provision of software app solutions that leverages local and global sources towards core firms.

P3c: Agile engagement and client involvement recursively impact each other through iterative interactions and feedback loops.

5.1.3. Knowledge acquisition, knowledge assimilation, and knowledge transformation

The responses showed that vendors' contribution to OSD teams' AC development is sequential, and each stage is an antecedent to the next stage. Knowledge acquisition activities (internal scanning and conference attendance) identify relevant knowledge that needs to be processed via external collaborations and internal incubators. Similarly, vendor teams' knowledge assimilation activities (external collaboration and internal incubators) provide vendors with the ability to understand the specific need knowledge and solution for the specific clientele project. These activities and capabilities are antecedents to vendors' capacity to integrate demand-side knowledge with supply-side knowledge and transform them into software solutions. As a result, the OSD AC benefits the core firm Based on this evidence, and given the mediatory nature of the knowledge process activities/capabilities, our next proposition is as follows:

P4a&b: Knowledge acquisition activities/capabilities positively affect the development of knowledge assimilation activities/capabilities, which in turn positively affect the development of knowledge transformation activities/capabilities.

6. Implications

We responded to the call for a more contextualized understanding of absorptive capacity by unpacking a) the interconnection between industry-related features of software services provision and an adverse skill environment for periphery vendors and b) how this interconnection shapes periphery vendors' internal and external practices towards AC development and contribution back to the client in the core region (Boschma, 2022; Meyer, 2015; Tsui, 2006; Whetten, 2009).

This study contributes to the existing literature in two ways. First, our study identifies and explicates the factors that facilitate the flow of need knowledge and solution knowledge to develop absorptive capacity in an adverse skill environment (Boschma, 2022). While existing research on absorptive capacity has primarily focused on core regions, further theorizing is needed to understand how periphery regions can develop absorptive capacity despite poor institutions (Khan, Rao-Nicholson, & Tarba, 2018). Drawing upon literature on institutional voids, we identified key skill-related challenges (adverse skill environment characterized by skill shortages and skilled labour turnover) that software service providers in Pakistan face, particularly in the software development GVC. We showed that in the context of the software development GVC where interaction between core and periphery actors is significant, the adverse skill environment creates far greater challenges for periphery vendors (Garud & Nayyar, 1994).

To address these concerns, this study identifies and explicates key actions and practices that are shaped by contextual specificities of periphery vendors. In the process of addressing the skill shortage and skilled labour turnover barriers, periphery vendors developed new ways of connecting to international clients via agile engagement, knowledge acquisition, knowledge assimilation, and knowledge transformation. The propositions and framework we presented here, therefore, advance our understanding of suppliers in GVC literature in unpacking how disadvantaged suppliers (see Choksy et al., 2018) manage to bypass the institutional volatility and contribute to knowledge generation in GVCs (Choksy et al., 2018, 2022; Sinkovics et al., 2019). Our findings show

that periphery vendors, through their evolved AC, become adept at bridging local knowledge with global needs, thereby providing core firms with software requirement analysis, quality app products and excellent user experience c) successful and profitable apps that lead to recurring relationships and projects. This capability is especially valuable in the current global economy, where understanding varied consumer needs and local market dynamics is critical (Ladesma-Chaves & Jorge Arenas-Gaitan, 2023). The innovative problem-solving approaches that periphery vendors develop in response to local constraints can inject fresh perspectives and creativity into the operations of core firms. Such innovations, emerging from necessities in the periphery, may result in cost-effective and efficient solutions, thus enhancing the competitive edge of core firms. Our findings illuminate the development of absorptive capacity (AC) in peripheral-based suppliers, marking a paradigmatic shift from a traditionally unidirectional flow of knowledge and resources to a more reciprocal and synergistic exchange. This evolution not only enhances the dynamics within the global value chains (GVCs) but also confers substantial benefits on the core lead firms based in developed markets (Cuervo-Cazurra & Pananond, 2023). Transcending the conventional linear model, this transformation fosters a more integrated and collaborative framework, enriching the entire GVC ecosystem through a balanced and mutually beneficial process of knowledge and resource exchange.

Second, past research has conceptualized the locus of absorptive capacity as residing primarily inside the firm, underpinned by idiosyncratic processes and routines (Cohen & Levinthal, 1990; Lane et al., 2006; Zahra & George, 2002) in core regions. This inward-looking lens has implicitly assumed the unilateral direction of knowledge flow where a firm can simply absorb external knowledge, assimilate it, and transform it to commercial ends without considering the role of external factors in co-creating knowledge. This is particularly problematic when the need knowledge is distant and absent from the local environment (Cohen & Levinthal, 1990; Epede & Wang, 2022). Our findings suggest that periphery vendors from an adverse skill context can co-create AC development with clients in core regions. Our analysis indicates that to absorb need knowledge and transfer solution knowledge, a double feedback loop is needed to bridge the gap between periphery and core teams' AC development. Furthermore, recursive interaction between the periphery vendors and other external agents from core regions also contributes to AC development. In an adverse skill context, absorptive capacity cannot be perceived as a separate unit of analysis but rather as a symbiotic component between core and periphery actors throughout the different stages of AC development. In contrast to technological knowledge, need knowledge is "more unstructured, more uncertain, more latent, stickier, and harder to transfer" (Autio et al., 2013; Bongsun et al., 2016; Nickerson et al., 2007; Schweisfurth & Raasch, 2018, p. 689; Slater & Narver, 1998; von Hippel, 1994). Thus, our work proposes that in the presence of institutional voids, AC development, particularly within service GVCs, occurs via mutual flow of knowledge between core and periphery entities. In line with previous literature, periphery vendors compensate for the adverse skill environment through their linkages with inter-firm and other foreign collaborations for need knowledge (Khan, Lew, & Marinova, 2018; Sinkovics et al., 2019). Moreover, these periphery vendors enhance the AC of OSD teams by leveraging their existing capabilities in solution knowledge and adaptive capacity to integrate need knowledge and solution knowledge.

In the realm of absorptive capacity (AC) development, the influence of governance and power dynamics plays a pivotal role, particularly in the context of vendor teams operating in adverse institutional settings. The conceptual framework of our study acknowledges that governance structures in the form of client involvement and agile engagement within global value chains (GVCs) significantly dictate the exchange of information and resources, thereby shaping the trajectory and efficacy of AC development in peripheral vendors. These governance mechanisms, coupled with the prevailing power dynamics between core and periphery regions, often determine the nature and extent of knowledge transfer and resource allocation. We argue that co-governance linkages between periphery-core firms rather uni-polar relations dictated by core firms that shape AC development. We argue that by recognizing and strategically navigating these governance and power structures, peripheral vendors have been able to leverage on their linkages with core firms and contribute towards OSD's AC development. This insight also serves as a guiding principle for core firms and policymakers in developed markets to foster more equitable and effective collaborations with peripheral vendors, aiming to create a more balanced and mutually beneficial global business ecosystem.

This study, rooted in the context of Pakistan, provides an essential lens through which European Management scholarship can view and understand the complexities and dynamics of global business interactions (Bongsun et al., 2016; Manuela et al., 2021; Tsolakis et al., 2023; Zilber, 2015). The insights gained from examining the contribution of periphery vendors towards OSD AC development including European core firms (See Table 1), this research highlights critical considerations for European businesses that are increasingly engaging with diverse global value chains. The findings underscore the importance of adaptability and cultural sensitivity for European businesses operating in or with countries like Pakistan. Our study illuminates the potential benefits that such engagements can bring, including access to innovative solutions and a more profound comprehension of non-Western markets, which are increasingly important for European businesses looking to sustain their competitiveness in a globalized economy.

6.1. Practical implications

Based on the qualitative model, managers can derive several practical implications to address the skill shortage and skilled labour turnover, enhance internal strategies, and strengthen client relationships via agile methodology and client involvement. The first step for managers is to assess the nature of the skill shortage and skilled labour turnover within their organization, identifying the specific areas where talent gaps exist. To address a skill shortage, managers should focus on targeted recruitment efforts, establish partnerships with educational institutions, and provide incentives to attract skilled professionals. Simultaneously, managers need to understand the underlying barriers contributing to skilled labour turnover, such as migration and flexible employment contracts, and develop retention strategies that prioritize employee satisfaction, career development, and competitive compensation. Managers also need to not only consider the internal strategies and client relationships but also the broader context of governance and power dynamics within which their organizations operate. Understanding these dynamics can help managers better position their firms within the GVC, leveraging their unique capabilities and knowledge to negotiate more equitable exchanges of knowledge and resources.

6.2. Limitations and future research

We have explained the absorptive capacity development process in the context of a developing economy: Pakistan. However, no claim is made that the absorptive capacity presented in this paper is exhaustive since the extent to which the processes described in this research apply to other contexts can only be ascertained through further testing and investigation. By selecting and examining these types of firms, future research may explore in more depth the extent to which the related processes are compatible or can be made so.

Future research may also extend our efforts to examine the specific micro-level routines firms engage in developing and exercising the firm's absorptive capacity. Intermediary firms can also play an important role in the development of the absorptive capacity of firms based in adverse institutional settings; thus, future studies could pay more attention to the role of intermediaries in the development of absorptive capacity.

In summary, there is a noticeable research gap when it comes to emerging markets, especially in the context of Pakistan, as compared to the extensive studies conducted in Western settings. Limited research has been carried out aimed at understanding absorptive capacity in such economies. Consequently, it's crucial for both industry professionals and academics in Pakistan and similar contexts to update their frameworks, expectations, and methodologies. Specifically, there's a need to explore how specialized service providers in peripheral areas, working under challenging conditions, can acquire essential knowledge from their core-region clients and offer them solution-driven knowledge to improve the absorptive capacity of software development teams. Therefore, our research aims to augment existing studies on global value chains and absorptive capacity by shedding light on this underexplored market.

Firms from the periphery regions are continuously evolving and enhancing their capabilities, indicating a shift from the simple replication of knowledge from the core regions to innovative products development (Bell & Figueiredo, 2012), achieved through regular and effective collaboration (Fan, 2006; Wang et al., 2014). This study focuses on the interplay between periphery and core knowledge creation and on the absorptive capacities of the independent firms in the periphery regions. Future research might examine the relationships between core-region parent firms and their subsidiaries in the periphery region. Such studies are of paramount importance in examining the role of national business systems, especially when the spatial division of labour makes it difficult for them to acquire the relevant skills in core regions, where the majority of knowledge demands occur. Particularly in the context of the global value chains, which involve not only technology transfers but also become sources of knowledge spillover. This spillover occurs not only from core to periphery but also in the opposite direction i.e., periphery-core, through extensive innovation networks and collaboration, with core regions often being the primary beneficiaries due to their superior knowledge absorption and utilization capabilities.

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