Knowledge management in offshoring innovation by SMEs: Role of internal knowledge creation capability, absorptive capacity, and formal knowledge sharing routines

Abstract

Purpose – Despite the increased attention on knowledge management processes as important variables for firms to generate performance benefits within supply chain literature, little is known about how these variables could impact offshoring innovation (OI) relationships held by small and medium-sized enterprises (SMEs). Considering their growing importance, this study investigates the interplay between the internal knowledge creation capability, absorptive capacity, and formal knowledge routines in attaining OI performance benefits for SMEs.

Design/methodology/approach – Grounded in the knowledge-based view theory, this study forwards various hypotheses between the variables of interests. We test the hypotheses using survey data collected from 200 European SMEs that engage in offshore supplier relationships.

Findings – The findings suggest that internal knowledge creation capability is positively associated to absorptive capacity. Not only is absorptive capacity positively associated to OI performance outcomes but it also positively mediates the effect of internal knowledge creation capability on OI performance. Additionally, formal knowledge sharing routines negatively moderate the relationship between absorptive capacity and OI performance.

Originality – Our study contributes to the supply chain as well as SMEs innovation literature by empirically showing that through enhanced internal knowledge creation capability, absorptive capacity goes beyond merely accessing and assimilating the supplier's knowledge to achieve innovation gains. The results suggest that in order to succeed in gaining knowledge and subsequent performance benefits within OI, it is essential for SMEs to create and retain knowledge internally.

Keywords: SMEs, Offshoring, Outsourcing, Supply Chain Innovation, Knowledge Sharing, Absorptive Capacity, Knowledge Management.

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1. Introduction

A supply chain is essentially a social network within which relationships between upstream and downstream buyers-suppliers unfold (Choi et al., 2001, Choi and Wu, 2009). For buyer-supplier relationships, cooperation and/or collaboration form of relationship structures remain crucial to attain superior performance (Narayanan et al., 2015). Although extant supply chain literature has focused on various contexts of buyer-supplier relationships (e.g., Paulraj and Chen, 2007b, Huq et al., 2014, Narayanan et al., 2015), the complex nature of offshoring innovation (OI) within buyer-supplier inter-organisational relationships of SMEs remains elusive. OI is the act of transferring different elements of the innovation process to an offshore supplier in a given buyer-supplier relationship (Quinn, 2000, Gusenbauer et al., 2015, Haleem et al., 2018). Research on offshoring strategies debates that offshoring could provide SMEs with opportunities to enhance performance through the transfer and application of suppliers' knowledge (Gusenbauer et al., 2015, Haleem et al., 2018), thereby highlighting the significance that knowledge management holds for offshoring SMEs.

Knowledge management (KM) is critical for the success of OI activities of firms pursuing inter-organisational relationships (Di Gregorio et al., 2009, Khraishi et al., 2020). Consequently, supply chain innovation literature on buyer-supplier dyads has focused on the role of KM processes such as knowledge creation and knowledge sharing as primary mechanisms for inter-organisational learning (Azadegan et al., 2008, Zimmermann et al., 2016). The domain of KM

consists of various processes – these mainly include knowledge creation, knowledge storage or retention, knowledge transfer (Argote et al., 2003, Marques Júnior et al., 2020), and knowledge exploration as well as exploitation (Centobelli et al., 2019b). More specifically, research that focused on innovation development as a result of KM have highlighted specific processes – knowledge acquisition, knowledge storage, knowledge codification, knowledge sharing, and knowledge application (du Plessis, 2007, Costa and Monteiro, 2016, Sahibzada et al., 2020). In particular, a combination of connections between these processes along with various organisational variables such as human capital and firm size are argued to play a key role in generating innovations within numerous contexts (Costa and Monteiro, 2016, Pérez-Salazar et al., 2019, Song et al., 2021). In summary, these studies underline the significance of comprehending linkages between the various KM processes, organisational variables, and contextual considerations so as to generate performance outcomes.

When it comes to the role of KM within SMEs' supply chains, extant research emphasises that the integration and linkages between various KM processes are vital for SMEs' performance (Aboelmaged, 2014, Schoenherr et al., 2014, Pérez-Salazar et al., 2019). However, resource-constrained SMEs often need to develop their supply chain activities on collaborative, relational, and on long-term oriented relationships (Adams et al., 2012). For instance, SMEs' KM capability that consists of knowledge acquisition, conversion, application, and protection is said to manifest in explicit and tacit knowledge which could influence performance outcomes (Schoenherr et al., 2014). Centobelli et al. (2019a) and Marques Júnior et al. (2020) add that SMEs tend to adopt a combination of KM processes and systems to be effective and efficient, and therefore it is unlikely

for SMEs to adopt a standard set of KM process combinations to deliver optimal outcomes. Table 1 depicts major studies that investigate the role of various KM processes within the supply chain management (SCM) research domain of SMEs.

[Insert Table 1 about here]

As for offshoring activities, recent supply chain and operations management studies have paid particular attention to interfirm relationships involving offshoring SMEs (Gray et al., 2017, Seepana et al., 2021b). This increased focus on SMEs could be attributed to the need to address strategic issues and scale constraints (Zaridis et al., 2021) surrounding SMEs in globalized competitive markets (Singh and Kumar, 2020) and to assist in enhancing SMEs organisational capital (Musteen et al., 2017). However, the dearth of knowledge within supply chain literature obscures interpretations on the significance of specific KM processes for offshoring SMEs to generate performance benefits. Since KM processes are key to sustain supply chains including inter-organisational relationships (Pérez-Salazar et al., 2019, Batista et al., 2019), they could also be crucial for SMEs to gain outside knowledge from their supply chain partners (Schoenherr et al., 2014) to overcome their size and resource limitations (Gusenbauer et al., 2015) while improving performance outcomes such as innovations (Khraishi et al., 2020). To this end, our selection of variables - internal knowledge creation, knowledge sharing routines, and knowledge absorption using SMEs absorptive capacity – form a key part of the KM processes. We adopt the tenets of the knowledge based view (KBV) to develop the hypotheses around the variables of interest; KBV is the most appropriate theoretical lens as it rests on the notion that firms and their relationships

should be analysed based on their knowledge resources and capabilities (Grant, 1996, Schoenherr et al., 2014).

The rationale for the selection of these variables is attributed to the fact that there is either little or no evidence in the existing literature that can explain not only the underlying linkages between these variables but also how they can benefit SMEs in offshoring relationships. While the debates around the application of these variables within SMEs buyer-supplier or supply chain relationships often highlight their significance, they still fall short of explaining the structure of their potential linkages that could lead to better performance. Consequently, recent supply chain studies sought to expand the industry context of SMEs and investigate how various combinations of knowledge processes could affect SMEs' performance (Schoenherr et al., 2014, Aboelmaged, 2014, Mishra, 2019). In OI, knowledge sharing could refer to the exchange of knowledge between two organisations – the buyer and the offshore supplier (Haleem et al., 2018, Rodríguez and Nieto, 2016) – to achieve relational benefits and a competitive advantage (Dyer and Singh, 1998, Cai et al., 2013). While some studies indicate formal knowledge sharing procedures to have a positive impact on learning and relational outcomes (Janowicz-Panjaitan and Noorderhaven, 2008), others argue that excessive formalized knowledge sharing can result in decreased, or, even, adverse outcomes (Yang et al., 2014, Krylova et al., 2016). Additionally, to realize the benefits from the innovation tasks that are outsourced to offshore suppliers, SMEs must possess specific internal knowledge creation capabilities to leverage the offshore suppliers' knowledge (Azadegan et al., 2008, Camisón and Forés, 2010, Wuyts and Dutta, 2014) and consequently achieve innovation performance. To this extent, scholars debate the importance of a firm's internal knowledge creation

capability (IKCC) in integrating knowledge from innovative suppliers (Bengtsson et al., 2013) and the use of the firm's absorptive capacity to access, integrate and apply suppliers' knowledge with their internal knowledge base (Cohen and Levinthal, 1990, Zahra and George, 2002, Bengtsson et al., 2013). Yet, the link between these variables and potential OI performance remains ambiguious. Against this backdrop, we aspire to empirically investigate the impact of the interplay between IKCC, absorptive capacity, and knowledge sharing routines on the offshoring SME's ability to achieve innovation and success. The study views the outcome variable of offshore innovation as the ability of an offshore SME to generate new products/processes, improve existing products/processes, and take products to the market faster as a result of the firm's relationship with offshore suppliers (Rindfleisch and Moorman, 2001, Jean et al., 2012). Following Kwon and Suh (2004) and Rindfleisch and Moorman (2001), SME satisfaction is defined as the degree of overall satisfaction that an offshoring SME could achieve in the relationship with its partner.

By testing the relationships illustrated in the conceptual model (Figure 1), our study makes significant contributions to SCM research within the specific context of offshoring SMEs. *First*, extant SCM research investigated the effects of various combinations of knowledge management processes within SMEs' supply chains. For instance, Schoenherr et al. (2014), Aboelmaged (2014), and Batista et al. (2019) studied the performance effects of knowledge management capability (viewed as a combination of knowledge acquisition, sharing, application, and conversion) of SMEs. Whilst Capó-Vicedo et al. (2011), Scuotto et al. (2017), Yao et al. (2019), Tassabehji et al. (2019) focused on the performance effects of SMEs knowledge sharing, Kilpi et al. (2018) focused on the effects of SMEs knowledge application, and Liao and Barnes (2015) focused on SMEs

knowledge acquisition. Our study contributes to this line of SCM literature by demonstrating that the interactions between IKCC, external knowledge absorption, and knowledge sharing routines could have variable performance effects within SMEs offshore relationships.

Second, our reconceptualisation of the IKCC variable with characteristics of internal R&D, employee innovativeness, and management commitment to adoption brings in clarity to both the conceptualisation and application of IKCC within the SCM domain. To this end, our discussions and findings around the broader operationalisation of the IKCC variable adds to previous SCM studies (e.g., Narasimhan and Narayanan, 2013, Cassiman and Veugelers, 2006, Kamalahmadi and Parast, 2016) that rather view R&D to be the central characteristic.

Third, our theoretical model extends the applicability of KBV specifically to SMEs in OI relationships (Grant, 1996, Krylova et al., 2016). By applying the rationale of KBV to OI within buyer-supplier SMEs relationships, we purport that superior outcome is likely to be a result of the underlying interactive linkages between IKCC, absorptive capacity, and knowledge sharing between partnering SMEs. In particular, the result demonstrates not only an underlying linkage between SMEs SCM relationships (for e.g., KM – offshoring innovation), but specifically clarifies that SME's IKCC leads to offshoring innovation in the presence of absorptive capacity as a mediator. However, our result also cautions offshoring SMEs in that knowledge sharing routines are not always advantageous to attain innovations. This result further adds to the SCM research calls that seek to understand potential outcomes of the integration of various combinations of KM processes and organisation factors (Aboelmaged, 2014, Mishra, 2019) within various industry

contexts (Batista et al., 2019, Mishra, 2019) and how they could affect innovations and success within SMEs' SCM relationships.

Finally, our study also contributes to research on supply chain innovation by empirically showing that through IKCC, absorptive capacity goes beyond merely accessing and assimilating the supplier's knowledge to achieve relational innovation gains. In other words, our study extends evidence that buyers' IKCC will have an indirect effect on the likelihood of the continuation of OI relationships and their conduciveness to knowledge sharing.

[Insert Figure 1 about here]

2. Theory and hypotheses

2.1. Internal knowledge creation capability and absorptive capacity

The tenets of KBV suggest that an organisation's efficiency in external knowledge absorption depends upon its ability to add new knowledge to existing knowledge (Grant, 1996). Extant research alludes that IKCC could build the firm's ability to transfer, transform and integrate suppliers' knowledge (Grunwald and Kieser, 2007, Camisón and Forés, 2010, Grimpe and Kaiser, 2010). Researchers also highlight that high internal knowledge capability is not only effective for the transmission of supplier's knowledge into the buyer firm (Azadegan et al., 2008, Wu, 2008, Bengtsson et al., 2013), but also promotes further R&D outsourcing (Grimpe and Kaiser, 2010). Building on the foundations of Cohen and Levinthal (1990), these studies have consistently utilized internal knowledge creation as an essential antecedent for the exploitation of external knowledge. However, most of these studies have focused on investments in internal R&D as an

important aspect to cause internal knowledge creation (Grimpe and Kaiser, 2010, Cassiman and Veugelers, 2006, Lin et al., 2012).

Recent studies indicate that investments in R&D for internal knowledge creation need not necessarily capture other important elements of knowledge creation such as an organisation's innovation and learning behaviours as well as its communication systems which could help in building the firm's learning capabilities and expand its absorptive capacity beyond the effect of internal R&D expenditures (Camisón and Forés, 2010, Wuyts and Dutta, 2014, Bengtsson et al., 2013, Forés and Camisón, 2016). Accordingly, the rationale for adopting this extended view of IKCC lies in the argument that for firms to be able to integrate external knowledge from suppliers with different organisational innovation and learning systems, they must be able to understand, analyse and codify this knowledge before they can integrate it with their existing knowledge base (Camisón and Forés, 2010, Schildt et al., 2012). Developing such capabilities is vital to strengthening the firms' absorptive capacity (Camisón and Forés, 2010). In this sense, internal knowledge creation serves as a source for the development of absorptive capacity since such firms could build an internal capability to leverage suppliers' knowledge in generating superior products (Wuyts and Dutta, 2014). Therefore, absorptive capacity is likely to benefit from IKCC. In the case of SMEs, the broader conceptualisation of IKCC that goes beyond internal R&D investments offers an opportunity to explore and test the potential value of IKCC in increasing an SME's absorptive capacity in OI relationships. Given that internal R&D is informally structured in the case of SMEs (Rothwell and Dodgson, 1991), IKCC extends to encompass the SME's innovation and learning behaviour in addition to R&D investments. Consequently, SMEs with internal

knowledge creation capabilities can better develop their absorptive capacity. Thus, we hypothesize:

Hypothesis (H1): The higher the SME's internal knowledge creation capability, the higher its absorptive capacity.

2.2. The direct effect of absorptive capacity

KBV indicates that a firm's ability to transfer and apply external knowledge is determined by its absorptive capacity (Grant, 1996). Consistent with KBV tenets, extant literature argues that absorptive capacity allows firms to link their internal knowledge base with the suppliers' innovativeness (Cohen and Levinthal, 1990, Zahra and George, 2002, Bengtsson et al., 2013). This argumentation is likely to be true in the case of OI in SMEs since their OI strategies are motivated by a lack of internal innovation resources (Lewin et al., 2009), which mandates them to rely on offshore suppliers. Therefore, OI within SMEs implies that there are significant differences in knowledge bases between the SMEs and the offshore suppliers. The implicit assumption is that the offshore suppliers can perform the outsourced innovation tasks better, faster and cheaper than the SMEs (Quinn and Hilmer, 1994). The effectiveness of OI for an SME is then reflected in its ability to transfer and apply the offshore supplier's knowledge to achieve performance benefits such as product and process innovations (Grant, 1996, Zimmermann et al., 2016). In OI, absorptive capacity likely acts as an important capability that can allow the SME to create value from the OI relationship (Roldán Bravo et al., 2016). This view of absorptive capacity highlights the interactive aspects of knowledge sharing in OI (Dyer and Singh, 1998, Janowicz-Panjaitan and Noorderhaven, 2008, Grimpe and Kaiser, 2010). Accordingly, SMEs with high absorptive capacity could

participate in an intensive knowledge sharing process (Grunwald and Kieser, 2007, Forés and Camisón, 2016).

Firms with high absorptive capacity can understand the supplier's knowledge and its applicability (Camisón and Forés, 2010, Roldán Bravo et al., 2016). They could engage in active communication with the offshore supplier through knowledge sharing, feedback loops and problem-solving so as to maximize the potential benefits from the incoming knowledge (Seepana et al., 2021a). Similarly, SMEs with high absorptive capacity are expected to have the ability to convert the absorbed knowledge from the offshore supplier into key outcomes (Camisón and Forés, 2010, Grimpe and Kaiser, 2010) such as innovations. Nevertheless, as an important capability, absorptive capacity is argued to be critical for OI performance as it can assist in incorporating the supplier's knowledge for the purpose of new knowledge creation (Schildt et al., 2012).

KBV literature proposes that interfirm communication is fundamentally essential to achieving knowledge transferability between firms (Grant, 1996). In a similar vein, given the emphasis on knowledge sharing in OI relationships, high absorptive capacity could likely serve as a critical antecedent to the SME's satisfaction with the OI relationship (Paulraj et al., 2008, Roldán Bravo et al., 2016). The interactive element of absorptive capacity grants the SME access not only to the offshore supplier's knowledge, but also to its people, culture, and knowledge structure (Dyer and Singh, 1998, Janowicz-Panjaitan and Noorderhaven, 2008, Grimpe and Kaiser, 2010). Consequently, absorptive capacity also signals the SME's motivation to continue learning from its offshore supplier as long as good quality knowledge sharing is offered by the supplier (Grunwald

and Kieser, 2007). Although the SME's satisfaction with the OI relationship is not a sufficient condition for generating high OI performance, it is a necessary condition for the continuation of long and strategic OI relationships. Accordingly, we propose:

Hypothesis (H2a): The SME's absorptive capacity is positively associated with the SME's satisfaction with the OI relationship.

Hypothesis (H2b): The SME's absorptive capacity is positively associated with OI performance.

2.3. The mediating role of absorptive capacity

IKCC, as an organisational mechanism, is debated to be associated with the outcomes of OI relationships. For instance, Cassiman and Veugelers (2006) argue that good makers of innovation could also be good outsourcers of innovation given their ability to achieve direct assimilation of external knowledge without having to fully acquire such knowledge. Similarly, Wuyts and Dutta (2014) conjecture that IKCC has the potential to generate product innovation in technology alliances. Such potential outcomes are attributed to firms' integrative capabilities that their IKCC assists to build besides enhancing the effectiveness of their R&D (Grimpe and Kaiser, 2010, Bengtsson et al., 2013). Additionally, when a firm has the ability to create new knowledge in a particular knowledge domain within which the firm operates (Wuyts and Dutta, 2014) – OI in our case, the firm is better positioned to evaluate its overall knowledge base and create new knowledge that can contribute to the development of new products. In other words, the improved knowledge integration capabilities as well as effective R&D that are embedded within firms' IKCC can lead to enhanced performance outcomes. Along similar lines, IKCC within SMEs could be argued to lead to increased OI performance and their overall satisfaction within the OI relationship.

Hypothesis (H3a1): Internal knowledge creation capability is positively associated with the SME's satisfaction with the OI relationship.

Hypothesis (H3a2): Internal knowledge creation capability is positively associated with OI performance.

The extant literature associated with KM is said to be in agreement with the fact that paths linking various internal and external knowledge sources can lead to innovation performance (Cruz-González et al., 2015, Tzokas et al., 2015), and, ultimately to the firm's satisfaction. In this sense, a path that determines how various knowledge development variables effect the absorptive capacity of a firm and, in turn, how absorptive capacity leads to different performance benefits is debated in extant literature (Tzokas et al., 2015, Xie et al., 2018). However, these paths in which the knowledge channelling is carried out is likely to differ based on the firm's size. For instance, multi-national corporations (MNCs) that use (geographically) distributed knowledge channelling are said to have not achieved desired innovations (Singh, 2008). In contrast, other studies that focused on knowledge generation capacities within medium to large-scale firms suggest the potential for innovation generation to be dependent on differentiated paths in which knowledge complementarity is channelled (Cruz-González et al., 2015, Xie et al., 2018). These instances could suggest that the ways in which knowledge is channelled to generate innovation likely vary between large firms and SMEs. Therefore, the previous findings that posit links between various combinations of knowledge channelling and innovation generation could likely differ within SMEs, particularly those that are involved in OI relationships.

The proponents of KBV literature imply that a firm's ability to generate innovations largely depends on the firm's knowledge generation and knowledge absorption capacities (Xie et

al., 2018, Tzokas et al., 2015). Consistently, Zahra and George (2002) conjectures that absorptive capacity, nonetheless, is linked to the firm's creation of knowledge so as to develop and sustain competitive advantage. To realize the importance of the potential links between internal knowledge creation and absorptive capacity for performance benefits, SCM scholars adhering to the KBV allude that a firm's intention to collaborate with other firms leads the firm to create knowledge internally and use such knowledge for performance benefits (Kahn et al., 2006, Blome et al., 2014). Thus, these theoretical beliefs indicate a potential underlying relationship between IKCC and performance outcomes through absorptive capacity. Yet, if a firm does not possess the processes that can continuously create new knowledge, any future processes associated to supporting the firm's externally absorbed knowledge are bound to fail (Xie et al., 2018).

The beliefs from past research could be very much relevant to SMEs involved in inter-organisational relationships. For instance, Batista et al. (2019) noted that SMEs involved in food supply chains likely to view IKCC as a central knowledge hub which could facilitate their knowledge generation and capture activities. However, a SME's organisational internal knowledge that consists of its numerous ideas alone cannot facilitate relevant knowledge distribution across the firm to generate innovations and success. Although the development of product/process innovations is a central means of knowledge creation (Nonaka and Takeuchi, 1995), to obtain potential advantages of such a knowledge creation, firms with resource constraints are motivated to access collaborative knowledge using their supply chain partnerships (Capó-Vicedo et al., 2011) to completement innovation development efforts. In order to create new knowledge and associated performance benefits, supply chain partners including SMEs engage in interlinked KM processes

that could lead to relevant knowledge identification and absorption (Seggie et al., 2006, Capó-Vicedo et al., 2011, Khraishi et al., 2020). The underlying rationale is that a collaborating firm's internal knowledge creation capacity is likely guide the firm's absorptive capacity to identify, capture, and codify the relevant external knowledge (Forés and Camisón, 2016, Schildt et al., 2012) which could be processed further to generate intended performance benefits. For instance, internal R&D that is performed as a part of IKCC not only allows firms to create firm-specific knowledge, but also can affect their capability to capture, combine, and apply relevant external knowledge (Grimpe and Kaiser, 2010) to generate benefits such as innovations and subsequent success. External knowledge can be a key source of innovation and such knowledge becomes more valuable when supported by the firm's internal knowledge (Camisón and Forés, 2010). Hence, it is credible to argue that IKCC can be a significant enabler for absorptive capacity and potential outcomes of a SME's IKCC is likely to be channelled by the SME's ability to absorb external knowledge, which in turn, could lead to increased innovation generating capabilities. Therefore, within the context of SMEs in OI relationships, we postulate:

Hypothesis (H3b): Absorptive capacity mediates the impact of internal knowledge creation capability on SME's satisfaction with the OI relationship.

Hypothesis (H3c): Absorptive capacity mediates the impact of internal knowledge creation capability on OI performance.

2.4. The moderating effect of formal knowledge sharing routines

The proponents of KBV suggest that a firm's ability to recognize, create, and transfer knowledge can result in competitive differentiation and superior advantage when appropriate routines are in place to accommodate the development and transfer of knowledge (Kogut and Zander, 1992).

Consistent with the KBV proponents, it is plausible to argue that firms' adoption of appropriate routines, in this case formal knowledge sharing routines, can complement the firms' absorptive capacities so as to combine knowledge sources to generate better performance and subsequent competitive differentiation.

This study considers formal knowledge sharing routines as the structured processes that regulate and coordinate the day to day management of knowledge sharing in OI relationships (Roy and Sivakumar, 2011). Knowledge routines could include not only written rules and procedures for accessing, exploiting, and protecting knowledge in OI relationships (Noordhoff et al., 2011, Roy and Sivakumar, 2011), but also the formalized learning, formal visits, and the use of shared information technology (IT) to accommodate the knowledge sharing (Kwon and Suh, 2004, Janowicz-Panjaitan and Noorderhaven, 2008). A key ability of formal knowledge sharing routines is to regulate shared knowledge (Kwon and Suh, 2004, Seepana et al., 2020). By regulating the knowledge sharing process, partners can create an environment conducive to knowledge sharing through the deliberate uncovering and combination of knowledge (Noordhoff et al., 2011, Seepana et al., 2020). Such routines are likely to guide firms in incorporating new knowledge sources from their partners, which in effect could complement the already available knowledge base at the firm's disposal (Cruz-González et al., 2015, Kumar et al., 2020).

Given that absorptive capacity generally requires information-processing demands with regards to absorption of external knowledge, it is argued to require high-levels of coordination of knowledge transfers between firms to assimilate as well as apply such knowledge for performance purposes (Lane et al., 2006); generally, for benefits such as innovation (Roldán Bravo et al., 2016).

The implementation of knowledge routines may accommodate these demands associated with absorptive capacity to allow the firms to assimilate, integrate, and apply the combinations of internal and external knowledge and utilize it for innovation benefits. KBV reckons the possibility of such a phenomenon (Grant, 1996) in that it suggests that after absorbing external knowledge firms should focus on utilizing effective mechanisms, such as knowledge routines, to quickly integrate such knowledge across the firms' boundaries (Kembro et al., 2014). Nonetheless, despite the important role of knowledge sharing routines, little is known about how offshore SMEs could utilize such routines to complement their absorptive capacities for performance benefits. Accordingly, we hypothesize:

Hypothesis (H4a): Formal knowledge sharing routines positively moderate the potential positive effect between absorptive capacity and SME's satisfaction.

Hypothesis (H4b): Formal knowledge sharing routines positively moderate the potential positive effect between absorptive capacity and OI performance.

3. Methodology

3.1. Data collection

We used an online survey to collect data from European SMEs that were actively practicing OI. The European economic statistics reported that with more than 2 million SMEs in the sector, the European SME manufacturing sector has reported €725 billion of value added in 2013 (Eurostat, 2016). According to the European innovation dataset, close to 50% of the SMEs have engaged in innovation activities between 2012 and 2014 (Eurostat, 2017). Additionally, based on the European Manufacturing Survey dataset, Dachs et al. (2006) also documented that nearly 50% of

Western European SMEs are involved in some sort of offshoring relationships; thus, signifying the importance of studying innovation within European SMEs that pursue offshore relationships.

The initial sampling frame consists of 2,384 firms. These firms are based in four developed European countries – The UK, France, Germany, and Italy. They operate in manufacturing sectors that include machinery, petroleum, equipment, pharmaceutical, metal and minerals, textile, and plastic and rubber. These firms are in relationships with suppliers who are located outside of the country where the firms are operating; this selection criteria fits into the offshore firm's selection context as suggested in extant research (Geishecker and Görg, 2013, Khraishi et al., 2020). Of these 2,384 firms, we eliminated 1,359 that did not fit with the EU definition of SME, which classifies SMEs as firms that employ a total of 10-249 employees, and has a turnover between €2 and €50 million (European-Commission, 2016). Out of the remaining 1,025 firms, we eliminated an additional 107 responses that were found to engage in captive OI arrangements. The decision to remove the responses from SMEs in captive OI arrangements is attributed to extant literature that argues that non-equity offshoring relationships are likely to be more attractive to SMEs when compared to captive settings due to the resource limitations that it could create (Rodríguez and Nieto, 2016). Besides, non-equity-based relationships do not require high-levels of alliance-specific investments compared to equity based relationships and are also less difficult as well as less expensive when it comes to exiting from the alliance arrangements (Globerman and Nielsen, 2007). These initial screening of responses have resulted in a reduced sampling frame of 918.

Surveys that concentrate on buyer-supplier relationships tend to focus on attaining responses from senior level or executive-level respondents. Generally, top executives in SMEs are

responsible for the management of strategic global supply chain relationships (Gusenbauer et al., 2015, Eng, 2016). Additionally, surveying senior managers from buying firms is a common practice in management research [e.g., (Paulraj et al., 2008, Lawson et al., 2015)]. Accordingly, the respondents to our survey-questionnaire include individuals who held positions such as CEOs and managing directors. We received a total of 223 responses. Out of these 223 responses, we have eliminated 23 responses that had either a high proportion of missing answers or failed attention check questions that were incorporated in the middle of the survey to ensure quality responses. Consequently, our final sample consisted of 200 SME responses with an effective response rate of 21.78% (200/918).

3.2. Survey development

Before answering the survey questions, the respondents were instructed to choose an active OI relationship involving a major offshore supplier. We selected our survey questions from extant empirical research. The various theoretical constructs were operationalized using multiple items. We pretested the survey instrument by sharing it with eight executives working in developed European manufacturing SMEs. In addition to completing the survey, these executives were also asked to give us their feedback on the understandability of the survey questions. We made minor modifications to the survey instrument following the feedback from these experts.

3.2.1. Measures

Internal knowledge creation capability (IKCC): Given that the study views IKCC to involve not only internal R&D, but also the organisation's innovation and learning behaviours, the

measures were adapted from Forés and Camisón (2016). Forés and Camisón (2016) built the IKCC construct using a six item scale. However, we adapted four items from the original six item scale to suit our study's context. The selected items compare the respondent SME with its partner concerning (1) employees' commitment to innovation at a personal level, (2) firm's capability to integrate employees with the firm's objectives of knowledge creation, (3) managers' adoption of change as natural and desirable, and (4) firm's capability to assign resources to R&D as shown in Appendix A. We deleted the first item related to employee contribution towards innovation (i.e., degree of employee's commitment to innovation at a personal level) as it did not meet the psychometric requirements during the CFA analysis. However, the second item of the IKCC construct (i.e., firm's capability to integrate its employees with the organisational objectives of knowledge creation and learning) addresses employees' contribution for knowledge creation and learning, and, thus towards innovation; it helps in accounting for the meaning left by the elimination of the first item.

Absorptive capacity: We utilized a four item scale from Forés and Camisón (2016) with each item representing absorptive capacity's acquisition, assimilation, transformation, and application capabilities. We adapted these items as shown in Appendix A to the OI context to explain the SME's capabilities of discovering, exploiting, and applying the offshore supplier's knowledge towards achieving product and process innovations.

Formal knowledge sharing routines: This construct was measured using four items examining the extent to which the offshoring SME relies on contractual knowledge exchange rules, follows written procedures in most aspects of knowledge sharing (Noordhoff et al., 2011) [items 1 and 2

from the Appendix A in order], establishes ground rules about knowledge exchange (Smeltzer, 1997) [item 3], and uses a common IT software to control knowledge sharing (Kwon and Suh, 2004) [item 4].

SME's satisfaction: Four items were adapted from existing studies to operationalize SME's satisfaction. These items represent relationship continuation [item 1 from the Appendix A in order] (Rindfleisch and Moorman, 2001, Kwon and Suh, 2004), relationship satisfaction [item 2] (Kwon and Suh, 2004, Krishnan et al., 2006), how pleased the SME is with the offshore supplier relationship [item 3] (Kwon and Suh, 2004), and the overall relationship satisfaction [item 4] (Kwon and Suh, 2004). These items are adapted to the offshore relationship context.

OI performance: Four items were adapted from existing studies to operationalize this construct. These items represent development of (1) new products or enhancing current/existing products [item 1], (2) new processes or enhancing current processes [item 2] (Jean et al., 2012); (3) new product speed to market [item 3] (Rindfleisch and Moorman, 2001), and (4) patent application rate [item 4] (Roy and Sivakumar, 2011).

Control variables: Since OI relationships are cooperative in nature, they can evolve and grow from transactional (short term) to collaborative (long term) relationships through the accumulation of relational trust and reduction of fears from opportunism (Vivek et al., 2009, Ring and van de Ven, 1994). Therefore, we identified relationship longevity and respondent's length of experience (manager tenure) with the SME outsourcing firm as our first two control variables. We measured longevity and manager tenure as the natural logarithm (Lincoln and Guba, 1985) of years of dyadic relationship and manager's years of experience respectively (Poppo and Zenger, 2002). We also

controlled for firm size (small or medium), SMEs' country, and industry technology intensity following OECD technology intensity and industry classifications (OECD, 2011).

3.3. Common method bias

Given that the management structure of SMEs is shallow, using a single respondent might not be an issue in research involving SMEs (Kull et al., 2018). The rationale is that such a management structure enables the key respondents to have an overall cognizance of what happens within their firm. But we conducted specific tests to assess whether common method variance was of concern. First, the Harman's one-factor test was used (Podsakoff et al., 2003). Our analysis resulted in four factors that accounted for 63.24% of the variance with the first capturing 37.07% variance. Additionally, we ran a confirmatory factor analysis (CFA) involving a single factor representing the single method. The model fit for CFA model was significantly worse when compared to our measurement model. Accordingly, we conclude that common method bias is not of concern (Sanchez and Brock, 1996).

3.4. Measurement instrument development

We assessed the measurement instrument using CFA. The CFA model was found to fit well with the underlying data. Specifically, we got satisfactory values for the various model fit indices: Normed $\chi^2 = 1.93$ (≤ 2.0); Comparative Fit Index (CFI) = 0.932; Tucker-Lewis index (TLI) = 0.911; Root Mean Square Error of Approximation (RMSEA) = 0.068; and Standardised Root Mean Square Residuals (SRMR) = 0.066. We also conducted the Fornell and Larcker (1981) test to establish whether our indicators exhibit discriminant validity. As evident from Table 2 and

Appendix A, the squared correlation values of all pairs of constructs are lower than the AVE values of the corresponding constructs.

[Insert Table 2 about here]

We used composite reliability (CR) to assess the reliability of the measurement items. All the constructs in the study have CR values more than 0.70 (Bagozzi and Yi, 2012). Also, with Cronbach's alpha for all constructs being greater than or equal to 0.7, the constructs' reliability is re-confirmed. Similarly, the AVE for all constructs, as shown in Appendix A is greater than or equal to 0.50. Taken together, we can conclude that the constructs of the study exhibit acceptable reliability and validity. In addition, we also assessed potential multicollinearity issues utilizing the variance inflation factor (VIF) test. The VIF values for the constructs used in our model are identified to be less than '5' (Hair et al., 1998) with the maximum value being '2.522'.

4. Results

To test our hypotheses, we utilized simple regression as well as the SPSS PROCESS macro designed by Hayes (2015) to perform mediation and moderated mediation analyses. We have included all the control variables in these analyses (see Table 3). As shown in Model 1 (Table 3) the path from IKCC to absorptive capacity is positive and statistically significant (b=0.552, p<0.001), which supports hypothesis H1. The path from the absorptive capacity to SME's satisfaction (Model 2) is significant (b=0.531, p<0.001), and supports H2a. Similarly, the path from absorptive capacity to SME's OI performance (Model 3) is significant (b=0.644, p<0.001), providing support for H2b. The effect of IKCC on SME's satisfaction (Model 2) is found to be insignificant (b=0.262, p>0.001). Similarly, the effect of IKCC on OI performance (Model 3) is

also found to be insignificant (b=0.023, p>0.001). Based on these results, we do not find support for hypotheses H3a1 and H3a2.

SPSS PROCESS macro is utilized to test the mediation hypotheses of H3b and H3c. The prediction for the hypothesis H3b is that absorptive capacity positively mediates the effect of internal knowledge creation capability on SME's satisfaction. The result provides support for the hypothesis in that the mediation effect of absorptive capacity (β = 0.530, p < 0.01, 95% CI [0.408, 0.652]) is found to be significant. The indirect effect (Effect/absorptive capacity = 0.279, 95% CI [0.117, 0.432]), partially standardized indirect effect (Effect/interdependence = 0.452, 95% CI [0.226, 0.611]), and completely standardized indirect effect (Effect/interdependence = 0.310, 95% CI [0.147, 0.439]) were all found to be significant. When it comes to the Hypothesis H3c, we hypothesized absorptive capacity to positively mediate the effect of internal knowledge creation capability on OI performance. The result provides support for this hypothesis in that the mediation effect of absorptive capacity (β = 0.669, p < 0.001, 95% CI [0.537, 0.802]) is found to be significant. The indirect effect (Effect/absorptive capacity = 0.352, 95% CI [0.206, 0.490]), partially standardized indirect effect (Effect/interdependence = 0.554, 95% CI [0.366, 0.711]), and completely standardized indirect effect (Effect/interdependence = 0.381, 95% CI [0.234, 0.511]) were all found to be significant.

To test the moderation role of formal knowledge sharing routines, we ran models 4 and 5 (Table 3) with the SME's satisfaction and the OI performance as the dependent variables, respectively. Contrary to our proposition, our result does not support the positive moderation effect of formal knowledge sharing routines. Instead, a negative and significant moderating effect is

found. As shown in the results, formal knowledge sharing routines negatively moderate the effect of absorptive capacity on the SME's satisfaction (Model 4) (b= -0.233, p<0.001). Also, the results confirm that formal knowledge sharing routines negatively moderate the relationship between absorptive capacity and OI performance (Model 5) (b= -0.143, p<0.01). To illustrate the interpretation of the moderating effects of formal knowledge sharing routines, we graphically plotted the interactions of absorptive capacity and formal knowledge sharing routines with SME's satisfaction and OI performance. The confidence bands presented in Figure 2 suggests that as the strength of knowledge sharing routines increases, the effect of absorptive capacity on performance outcomes of SME's satisfaction and innovation reduces. These confidence bands for the moderation effects are presented using the bootstrapping approach (Preacher et al., 2006); these results were based on 5,000 replications.

[Insert Table 3 about here]

[Insert Figure 2 about here]

Considering the fact that the conceptual model encompasses both the mediation as well as moderation variables, it emphasizes the necessity to test for a potential moderated mediation effect. The moderated mediation was tested utilizing the Hayes' index of moderated mediation (Hayes, 2015). Once again, SPSS PROCESS macro was utilized for the purpose of this test. The result suggests that the mediation effect of absorptive capacity (β = 0.318, p < 0.05, 95% CI [0.172, 0.465]) is significantly positive when the moderation effect of formal knowledge sharing routines on the relationship between absorptive capacity and SME's satisfaction (β = - 0.178, p < 0.001,

95% CI [- 0.261, - 0.096]) is significant. Overall, the index of moderated mediation was found to be negative and significant (index = - 0.094, 95% CI [- 0.177, - 0.025]). For the OI performance, the mediation effect of absorptive capacity (β = 0.543, p < 0.001, 95% CI [0.378, 0.710]) is positive and significant when the moderation effect of formal knowledge sharing routines on the relationship between absorptive capacity and OI performance (β = - 0.101, p < 0.05, 95% CI [- 0.193, - 0.007]) is significant. Overall, the index of moderated mediation was found to be negative and significant (index = - 0.053, 95% CI [- 0.108, - 0.008]) in the case of OI performance as well. These results indicate that the mediation role of absorptive capacity is negatively moderated by formal knowledge sharing routines. In other words, the mediation effect of absorptive capacity is conditional on the value of formal knowledge sharing routines.

5. Discussion and conclusions

This research makes numerous contributions to current SCM knowledge by investigating the underlying relationships between key KM processes of SMEs pursuing interfirm OI relationships and their impact on SMEs' satisfaction with their relationships as well as innovation performance. A key contribution of this study is to conceptualize IKCC differently. Hence, it underlines the need to adequately explain whether IKCC affects outcomes differently. Debates surrounding the IKCC construct within the SCM literature either remain inadequate or merely limited to conceptualizing it as an alternative to internal R&D. For instance, internally generated knowledge is viewed as a result of a firm's internal R&D which is further said to lead to effective and efficient operations and improved quality aspects (Dewar and Dutton, 1986, Soosay et al., 2008). Narasimhan and Narayanan (2013) suggest that when a firm's internal R&D strategy (internal knowledge creator)

is aligned to that of its partner, the firm is likely to better deploy internal capabilities to create and combine internal knowledge. Recent studies also mention internal knowledge as an important competency to generate performance outcomes (Kamalahmadi and Parast, 2016, Zimmermann et al., 2016). However, as much as past studies discuss about internal knowledge creation, they do not adequately explain what characteristics constitute IKCC. Therefore, IKCC, as a theoretical construct, lacks clarity within SCM literature. We contend that these inconsistencies could be attributed to the focus that is placed mainly on R&D as the key aspect for IKCC; such a focus undermines other important aspects. When uncertainties arise in firms' environment and the exchange of knowledge becomes intensive as in the case of R&D alliances, the result could impede firms' success, particularly in the case of SMEs (Mukherjee et al., 2013). Therefore, scholars emphasize the need to focus on other important characteristics such as employees' level of innovativeness and the management's willingness to adopt changes within IKCC to better conceptualise it (Wuyts and Dutta, 2014, Forés and Camisón, 2016). Given that such a conceptualisation of IKCC is equally important to supply chain literature in particular given the lack of clarity on IKCC within the domain, we adopt it in our study. IKCC with these characteristics is argued to potentially improve the firm's effectiveness in not only creating internal knowledge, but also enhancing its ability to exploit external knowledge (utilizing firm's absorptive capacity) (Bengtsson et al., 2013). Within the context of OI by SMEs, our findings offer support to these conjunctions in that our method of IKCC conceptualisation is found to have a positive effect on absorptive capacity.

The results also suggest that IKCC can indirectly lead to a higher OI performance through the buyer SMEs' absorptive capacity. This finding extends extant management studies wherein scholars debate that internally created knowledge could likely lead to innovation performance when combined with the offshore supplier's incoming knowledge (Camisón and Forés, 2010, Grimpe and Kaiser, 2010). This finding also adds to SCM literature that suggests that integrating internally developed knowledge with externally absorbed knowledge could lead to enhanced performance outcomes including increased innovations (Cassiman and Veugelers, 2006, Wu, 2008). More importantly, this result expands previous notions from SCM studies (Wu, 2008, Mishra, 2019) that suggest that successful knowledge creation is likely to be a result of knowledge conversions which is facilitated by various factors including the KM processes in a firm's supply chain. Specifically, internal knowledge stocks tend to positively effect external knowledge and subsequent knowledge integration (Singh and Power, 2014, Zhang et al., 2018) and as a result the knowledge integration could result in innovation benefits. Within offshore SME relationships context, our results clarify that SMEs ability to develop innovations with their offshore supplier is contingent upon their ability to internally create knowledge so as to be successful in absorbing relevant external knowledge.

Results from our mediation analysis further show that the relationship between IKCC and the SME's satisfaction with the OI relationship is fully explained through absorptive capacity. Consequently, IKCC, as a first order firm-specific knowledge management attribute, is linked to the SME's satisfaction with the relationship through absorptive capacity which could be considered as a second order firm-specific attribute of knowledge processes. These findings highlight that

knowledge sharing in inter-organisational OI relationships results from the interactions between partners' internal knowledge bases through absorptive capacity. Alternatively, the link between knowledge creation and absorption also validates the dual effects of absorptive capacity (Cohen and Levinthal, 1989) in both generating internal knowledge and at the same time enabling absorption of external knowledge so as to benefit the firms in innovation-oriented relationships. Overall, our results extend recent SCM studies which argue that SMEs, which are usually resource constrained, are likely to benefit from OI through higher knowledge exchanges with offshore suppliers provided they can build internal capabilities to integrate the suppliers' innovative knowledge (Haleem et al., 2018, Khraishi et al., 2020).

SCM scholars suggest that knowledge sharing is essential for SMEs supply chains given its potential to not only establish relationships, but also enable SME partners to create specific knowledge (Capó-Vicedo et al., 2011) and enhance innovation performance (Tassabehji et al., 2019). Knowledge routines essentially facilitate such knowledge sharing within SMEs' relationships (Khraishi et al., 2020, Capó-Vicedo et al., 2011) and improve the SMEs' willingness and reciprocity of knowledge exchanges across their supply chains (Yao et al., 2019). The idea that small firms can be disadvantageously positioned mainly due to their size cannot remain a drawback to SMEs' innovation activities. Given the potential benefits of knowledge sharing routines as a catalyst that can combine knowledge of partnering firms to improve their relationships as well as performance (Bates and Slack, 1998, Seepana et al., 2020), it appears plausible for SMEs to employ such routines. However, past studies maintain mixed views when it comes to the use of knowledge routines. On the one hand, both general management as well as

SCM studies indicate the importance for SMEs to implement routines, practices, and technologies to accommodate effective knowledge exchanges that could supplement firms' performance-enhancing absorptive capacity (Maes and Sels, 2014, Pattinson and Preece, 2014, Tassabehji et al., 2019, Yao et al., 2019). On the other hand, formal routines are also criticized for creating bureaucracy which could make knowledge transfers difficult between firms (Krylova et al., 2016). This ambiguity could be more pronounced in SMEs given the inherent limitations of functional expertise. Accordingly, SCM scholars seek clarity about the role of knowledge sharing processes within SMEs' dyadic relationships (Scuotto et al., 2017, Yao et al., 2019).

Interestingly, our results showing the lack of empirical support for the positive moderating role of formal knowledge sharing routines on the relationship between absorptive capacity and OI outcomes adheres to the stream of research (Krylova et al., 2016) that suggests that knowledge routines are not necessarily beneficial for partnering firms. This finding seems contradictory to the KBV rationale of using formal routines in achieving effective inter-firm knowledge transfer (Xie et al., 2018, Zimmermann et al., 2016). This counter-intuitive finding also contradicts supply chain research that conjectures (1) knowledge routines benefit the performance of relationships (Sivakumar and Roy, 2004, Maryam and Dorothy, 2001, Chang et al., 2012), and (2) such routines are essential for absorptive capacity to trigger continuous learning that can lead to innovations (Tu et al., 2006, Liu et al., 2013). However, our finding adheres with the views of Zacharia et al. (2011) that knowledge routines are not beneficial for firms engaged in episodic collaborations that lack long-term orientation. However, these studies were neither contextualized within SMEs nor OI relationships.

A plausible explanation for this contradictory result may rest in the opposing effects of formal knowledge sharing routines in promoting knowledge transfer. The effectiveness of absorptive capacity might be contingent upon factors such as similarities in the knowledge that is being exchanged. For instance, when partner firms operate in similar industries and use similar knowledge, the knowledge complementarity could create knowledge overlaps between the partners, which could eventually reduce the intensity of potential benefits (Lin et al., 2012). This seems to be reflected in our findings. With the build-up of knowledge similarities and subsequent knowledge redundancies (Kenny and Fahy, 2011), implementation of knowledge routines might not necessarily sustain the SME's supply chain relationships. Our findings only seem to validate these views in the context of offshoring SMEs.

The moderated mediation results further validate these views in that it suggests that an excessive degree of structured knowledge exchanges can result in decreased knowledge sharing. In other words, stronger formal knowledge routines will reduce the mediation effect of absorptive capacity between IKCC and the performance outcomes for SMEs in offshoring relationships. This finding also reveals that when various KM processes (i.e., knowledge creation, absorption, and sharing) parallelly operate to facilitate SMEs' buyer-supplier relationships, the performance outcomes of such relationships are not going to be conducive for the offshoring SMEs as evidenced in this study. This could be due to the fact that SMEs have limited functional expertise and abilities (Scuotto et al., 2017, Yao et al., 2019) to manage various knowledge processes simultaneously. Additionally, the complex nature of OI relationships might require more resources to manage the various KM processes parallelly; this could be even more challenging for SMEs. This finding

further adds to extant SCM literature on SMEs that debates on the potential performance benefits that various combinations of KM processes could generate (Schoenherr et al., 2014, Aboelmaged, 2014, Batista et al., 2019, Mishra, 2019). For instance, Aboelmaged (2014) mentioned that KM processes of knowledge acquisition, knowledge sharing, and knowledge application could lead to innovation performance, whereas Batista et al. (2019) suggest that knowledge creation, storage, application, and sharing could lead SMEs to better deploy the knowledge. However, these studies viewed a combination of KM processes as a standalone construct (i.e., knowledge management capability) rather than investigating the underlying linkages between each of the processes which our study has attempted to pursue.

6. Managerial implications

The insights from this study on SME offshoring buyer-supplier relationships are likely to provide managers with valuable information on the significance of key KM processes that can lead to OI performance outcomes. Our results show that SME managers need to comprehend not only the key KM processes, but also the structuring of the combinations of the processes that could facilitate interfirm offshoring relationships. Eventually, it is the timing and conditions (linkages) between these processes that influence not only the performance but also the continuation of the SMEs' offshore relationships. Therefore, providing managers with implications on the structure of KM process linkages could stimulate the managers' thoughtful decision making on their offshoring relationships to develop innovations and attain satisfaction in their relationships. Following our findings, we put forward three key implications for offshoring SMEs' managers.

First, our findings offer clarification as well as a renewed perspective for the SMEs' managers in that it suggests that merely performing internal R&D will not account for sufficiently useful internal knowledge creation that could generate innovation benefits. Importantly, managers must consider training employees to a level wherein the employees possess innovativeness and further ensure that the SME's management is willing to adopt changes. The internal R&D, highly innovative employees, and committed management combined together as building blocks of the IKCC could play a positive role in generating innovation performance as well as strengthening the OI relationships.

Second, our findings provide guidance to SME managers about leveraging their organisational capabilities within their SCM relationships. In particular, the findings show a path linking knowledge creation capability (IKCC) with absorptive capacity so as to attain OI performance benefits. It is vital for the managers of offshoring SMEs to focus on strengthening the linkage between IKCC and absorptive capacity given that the former can enable the latter to better integrate and apply the combination of external and internal knowledge sources to benefit the SME's performance. As evidenced in our findings, a stronger IKCC could ensure that it sufficiently assists to acquire relevant external knowledge to preserve opportunities for greater learning and promote the commitment of their employees towards innovation.

Third, the study suggests that SME managers with no or little experience in OI should be aware of the dual roles that knowledge sharing routines are likely to play in OI relationships. Although the formal knowledge sharing routines are argued to be effective in specifying and coordinating knowledge sharing in OI relationships, they might negatively impact the potential for

knowledge sharing due to enhanced bureaucracy and protocols which are difficult to strictly adhere to for the SMEs. This, as a result, encourages SME managers to make a thorough evaluation when it comes to the type and structure of knowledge sharing routines that are to be adopted to assist in knowledge exchanges within OI relationships. For example, tools such as utilizing the same information technology software could improve the coordination and quality of knowledge sharing in OI relationships (Paulraj and Chen, 2007a) with little worries about spillovers; alternatively, such tools and practices could also act as protection mechanisms for the knowledge that is being shared (Grimpe and Kaiser, 2010).

6.1. Limitations and future research

In conclusion, we would like to point out some of the limitations of our study. To start with, the conceptual model considers only the knowledge creation and sharing aspects and not the other KM processes of codification, application, and protection. Though we adhered to the notion of parsimony, inclusion of all the processes of KM could enlarge the scope of the model while limiting our ability to reach specific conclusions. While this could also be a potential reason why previous SCM studies have either combined several KM process into a standalone construct (Schoenherr et al., 2014, Batista et al., 2019) or limited their work to small number of knowledge processes (Tassabehji et al., 2019), this style of conceptualisation does limit our understanding of the underlying linkages between each of the KM processes.

Our research focuses on cross-sectional survey design to estimate the impact of several dyadic contingencies on relational performance and outcomes. This could mean that causality cannot be proven empirically. We collected data from one firm (buyer) of each offshoring SMEs

dyad relationship; this is a common dilemma in inter-organisational relationships (Robson et al., 2019) and may influence the interpretation of the results. Additionally, our respondents worked for manufacturing SMEs in Europe and the UK with an existing cross border OI relationship. Therefore, the results from our research may be bound to the geographical and industrial limitations of our final sample.

Consequently, we put forward the following directions for future research. *First*, a future research direction could be to explore designing a longitudinal study to test an inter-temporal based framework that would allow capturing the dynamic properties of OI relationships. While our results suggest that OI could lead to higher relational rents, it does not discuss the dynamic nature of interfirm relationships. OI relationships are not static; they may experience tactical and strategic shifts due to relational dynamics as well as market and technological changes. Therefore, OI relationships could follow evolving patterns where experience changes over time; this in turn may affect the reliability of the cross-sectional approximation of the effects of knowledge sharing mechanisms on OI performance. While performing a longitudinal study, it is advisable for future research to include the collection of data from the supplier firms as well. *Second*, future research could also look at the underlying linkages between other KM processes such as knowledge conversion, application, and protection to assess their complementary roles in leading to OI benefits for SMEs. *Third*, it would be interesting to examine whether the same results hold for in-country outsourcing innovation relationships within Europe and UK.

REFERENCES

ABOELMAGED, M. G. 2014. Linking operations performance to knowledge management capability: the mediating role of innovation performance. *Production planning & control,* 25**,** 44-58.

ADAMS, J. H., KHOJA, F. M. & KAUFFMAN, R. 2012. An Empirical Study of Buyer-Supplier Relationships within Small Business Organizations. *Journal of small business management,* 50**,** 20-40.

ARGOTE, L., MCEVILY, B. & REAGANS, R. 2003. Managing Knowledge in Organizations: An Integrative Framework and Review of Emerging Themes. *Management science,* 49**,** 571-582.

AZADEGAN, A., DOOLEY, K. J., CARTER, P. L. & CARTER, J. R. 2008. Supplier Innovativeness and the Role of Interorganizational Learning in Enhancing Manufacturer Capabilities. *Journal of supply chain management,* 44**,** 14-35.

BAGOZZI, R. P. & YI, Y. 2012. Specification, evaluation, and interpretation of structural equation models. *Journal of the Academy of Marketing Science,* 40**,** 8-34.

BATES, H. & SLACK, N. 1998. What happens when the supply chain manages you?: A knowledge-based response. *European journal of purchasing & supply management,* 4**,** 63-72.

BATISTA, L., DORA, M., TOTH, J., MOLNÁR, A., MALEKPOOR, H. & KUMARI, S. 2019. Knowledge management for food supply chain synergies - a maturity level analysis of SME companies. *Production planning & control,* 30**,** 995-1004.

BENGTSSON, L., LAKEMOND, N. & DABHILKAR, M. 2013. Exploiting supplier innovativeness through knowledge integration. *International Journal of Technology Management* 61**,** 237-253.

BLOME, C., SCHOENHERR, T. & ECKSTEIN, D. 2014. The impact of knowledge transfer and complexity on supply chain flexibility: A knowledge-based view. *International Journal of Production Economics,* 147**,** 307-316.

CAI, S., GOH, M., DE SOUZA, R. & LI, G. 2013. Knowledge sharing in collaborative supply chains: twin effects of trust and power. *International journal of production research,* 51**,** 2060-2076.

CAMISÓN, C. & FORÉS, B. 2010. Knowledge absorptive capacity: New insights for its conceptualization and measurement. *Journal of business research,* 63**,** 707-715.

CAPÓ-VICEDO, J., MULA, J. & CAPÓ, J. 2011. A social network-based organizational model for improving knowledge management in supply chains. *Supply Chain Management: An International Journal,* 16**,** 284-293.

CASSIMAN, B. & VEUGELERS, R. 2006. In Search of Complementarity in Innovation Strategy: Internal R&D and External Knowledge Acquisition. *Management science,* 52**,** 68-82.

CEGARRA-NAVARRO, J. G., SANCHEZ-VIDAL, M. E. & CEGARRA-LEIVA, D. 2011. Balancing exploration and exploitation of knowledge through an unlearning context: An empirical investigation in SMEs. *Management decision,* 49**,** 1099-1119.

CENTOBELLI, P., CERCHIONE, R. & ESPOSITO, E. 2019a. Efficiency and effectiveness of knowledge management systems in SMEs. *Production planning & control,* 30**,** 779-791.

CENTOBELLI, P., CERCHIONE, R. & ESPOSITO, E. 2019b. The mediating role of knowledge exploration and exploitation for the development of an entrepreneurial university. *Management decision,* 57**,** 3301-3320.

CHANG, C.-W., CHIANG, D. M. & PAI, F.-Y. 2012. Cooperative strategy in supply chain networks. *Industrial marketing management,* 41**,** 1114-1124.

CHOI, T. Y., DOOLEY, K. J. & RUNGTUSANATHAM, M. 2001. Supply networks and complex adaptive systems: control versus emergence. *Journal of operations management,* 19**,** 351-366.

CHOI, T. Y. & WU, Z. 2009. Triads in Supply Networks: Theorizing Buyer-Supplier Relationships. *Journal of supply chain management,* 45**,** 8-25.

COHEN, W. & LEVINTHAL, D. 1990. Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly,* 35**,** 128-152.

COHEN, W. M. & LEVINTHAL, D. A. 1989. Innovation and Learning: The Two Faces of R & D. *The Economic Journal,* 99**,** 569-596.

COSTA, V. & MONTEIRO, S. 2016. Key knowledge management processes for innovation: a systematic literature review. *VINE journal of information and knowledge management systems,* 46**,** 386-410.

CRUZ-GONZÁLEZ, J., LÓPEZ-SÁEZ, P. & NAVAS-LÓPEZ, J. E. 2015. Absorbing knowledge from supply-chain, industry and science: The distinct moderating role of formal liaison devices on new product development and novelty. *Industrial marketing management,* 47**,** 75-85.

DACHS, B., KINKEL, S. & WASER, B. R. 2006. Offshore outsourcing production-A European perspective. Frequency, target regions and motives.: European Manufacturing Survey Bulletin.

DEWAR, R. D. & DUTTON, J. E. 1986. The Adoption of Radical and Incremental Innovations: An Empirical Analysis. *Management science,* 32**,** 1422-1433.

DI GREGORIO, D., MUSTEEN, M. & THOMAS, D. E. 2009. Offshore Outsourcing as a Source of International Competitiveness for SMEs. *Journal of international business studies,* 40**,** 969-988.

DU PLESSIS, M. 2007. The role of knowledge management in innovation. *Journal of knowledge management,* 11**,** 20-29.

DYER, J. & SINGH, H. 1998. The relational view: cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management review,* 23**,** 660-679.

ENG, T.-Y. 2016. An empirical study of Chinese SME grocery retailers' distribution capabilities. *Supply Chain Management: An International Journal,* 21**,** 63-77.

EUROPEAN-COMMISSION 2016. Annual Report on European SMEs 2015 / 2016: SME recovery continues. Luxembourg.

EUROSTAT 2016. Eurostart yearbook Luxembourg (LU): European Union.

EUROSTAT 2017. *Eurostat yearbook [*Online]. Luxembourg (LU): European Union.

FORÉS, B. & CAMISÓN, C. 2016. Does incremental and radical innovation performance depend on different types of knowledge accumulation capabilities and organizational size? *Journal of Business Research,* 69**,** 831-848.

FURLAN, A., GRANDINETTI, R. & CAMUFFO, A. 2007. How do subcontractors evolve? *International journal of operations & production management,* 27**,** 69-89.

GEISHECKER, I. & GÖRG, H. 2013. Services offshoring and wages: Evidence from micro data. *Oxford economic papers,* 65**,** 124-146.

GLOBERMAN, S. & NIELSEN, B. B. 2007. Equity versus non-equity international strategic alliances involving Danish firms: An empirical investigation of the relative importance of partner and host country determinants. *Journal of international management,* 13**,** 449-471.

GRANT, R. M. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal,* 17**,** 109-122.

GRAY, J. V., ESENDURAN, G., RUNGTUSANATHAM, M. J. & SKOWRONSKI, K. 2017. Why in the world did they reshore? Examining small to medium-sized manufacturer decisions. *Journal of operations management,* 49-51**,** 37-51.

GRIMPE, C. & KAISER, U. 2010. Balancing Internal and External Knowledge Acquisition: The Gains and Pains from R&D Outsourcing. *Journal of management studies,* 47**,** 1483-1509.

GRUNWALD, R. & KIESER, A. 2007. Learning to Reduce Interorganizational Learning: An Analysis of Architectural Product Innovation in Strategic Alliances. *The Journal of product innovation management,* 24**,** 369-391.

GUSENBAUER, M., MASSINI, S. & FINK, M. 2015. Innovation Offshoring by Small and Medium-Sized Enterprises – Establishing the Research Gap. Cham: Springer International Publishing.

HAIR, J. F., ANDERSON, R. E., TATHAM, R. L. & BLACK, W. C. 1998. *Multivariate Data Analysis, with Readings,* Englewood Cliffs, NJ, Prentice-Hall.

HALEEM, F., FAROOQ, S., WÆHRENS, B. V. & BOER, H. 2018. Offshoring experience and performance: the role of realized drivers and risk management. *Supply Chain Management: An International Journal,* 23**,** 531-544.

HAYES, A. F. 2015. An Index and Test of Linear Moderated Mediation. *Multivariate Behavioral Research,* 50**,** 1-22.

HUQ, F. A., STEVENSON, M. & ZORZINI, M. 2014. Social sustainability in developing country suppliers: An exploratory study in the ready made garments industry of Bangladesh. *International journal of operations & production management,* 34**,** 610-638.

JANOWICZ-PANJAITAN, M. & NOORDERHAVEN, N. G. 2008. Formal and informal interorganizational learning within strategic alliances. *Research policy,* 37**,** 1337-1355.

JAYAWICKRAMA, U., LIU, S., HUDSON SMITH, M., AKHTAR, P. & AL BASHIR, M. 2019. Knowledge retention in ERP implementations: the context of UK SMEs. *Production planning & control,* 30**,** 1032-1047.

JEAN, R.-J. B., KIM, D. & SINKOVICS, R. R. 2012. Drivers and Performance Outcomes of Supplier Innovation Generation in Customer-Supplier Relationships: The Role of Power-Dependence. *Decision sciences,* 43**,** 1003-1038.

KAHN, K. B., MALTZ, E. N. & MENTZER, J. T. 2006. Demand collaboration: Effects on knowledge creation, relationships, and supply chain performance. *Journal of business logistics,* 27**,** 191-221.

KAMALAHMADI, M. & PARAST, M. M. 2016. A review of the literature on the principles of enterprise and supply chain resilience: Major findings and directions for future research. *International Journal of Production Economics,* 171**,** 116-133.

KEMBRO, J., SELVIARIDIS, K. & NÄSLUND, D. 2014. Theoretical perspectives on information sharing in supply chains: a systematic literature review and conceptual framework. *Supply Chain Management: An International Journal,* 19**,** 609-625.

KENNY, B. & FAHY, J. 2011. Network resources and international performance of high tech SMEs. *Journal of small business and enterprise development,* 18**,** 529-555.

KHRAISHI, A., HUQ, F. & PAULRAJ, A. 2020. Offshoring innovation: An empirical investigation of dyadic complementarity within SMEs. *Journal of business research,* 118**,** 86-97.

KILPI, V., LORENTZ, H., SOLAKIVI, T. & MALMSTEN, J. 2018. The effect of external supply knowledge acquisition, development activities and organizational status on the supply performance of SMEs. *Journal of purchasing and supply management,* 24**,** 247-259.

KOGUT, B. & ZANDER, U. 1992. Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. *Organization science (Providence, R.I.),* 3**,** 383-397.
KRISHNAN, R., MARTIN, X. & NOORDERHAVEN, N. G. 2006. When does trust matter to alliance performance? *Academy of Management Journal,* 49**,** 894-917.
KRYLOVA, K. O., VERA, D. & CROSSAN, M. 2016. Knowledge transfer in knowledge-intensive organizations: the crucial role of improvisation in transferring and protecting knowledge. *Journal of knowledge management,* 20**,** 1045-1064.
KULL, T. J., KOTLAR, J. & SPRING, M. 2018. Small and Medium Enterprise Research in Supply Chain Management: The Case for Single-Respondent Research Designs. *Journal of supply chain management,* 54**,** 23-34.
KUMAR, V., JABARZADEH, Y., JEIHOUNI, P. & GARZA-REYES, J. A. 2020. Learning orientation and innovation performance: the mediating role of operations strategy and supply chain integration. *Supply Chain Management: An International Journal,* 25**,** 457-474.
KWON, I. W. G. & SUH, T. 2004. Factors Affecting the Level of Trust and Commitment in Supply Chain Relationships. *Journal of Supply Chain Management,* 40**,** 4-14.
LANE, P., J., KOKA, B., R. & PATHAK, S. 2006. The Reification of Absorptive Capacity: A Critical Review and Rejuvenation of the Construct. *The Academy of Management review,* 31**,** 833-863.
LAWSON, B., KRAUSE, D. & POTTER, A. 2015. Improving Supplier New Product Development Performance: The Role of Supplier Development: Improving Supplier NPD Performance. *The Journal of product innovation management,* 32**,** 777-792.
LEWIN, A. Y., MASSINI, S. & PEETERS, C. 2009. Why are companies offshoring innovation? The emerging global race for talent. *Journal of international business studies,* 40**,** 901-925.
LEVY, M., LOEBBECKE, C. & POWELL, P. 2003. SMEs, co-opetition and knowledge sharing: the role of information systems. *European Journal of Information Systems,* 12**,** 3-17.
LIAO, Y. & BARNES, J. 2015. Knowledge acquisition and product innovation flexibility in SMEs. *Business process management journal,* 21**,** 1257-1278.
LIN, C., WU, Y.-J., CHANG, C., WANG, W. & LEE, C.-Y. 2012. The alliance innovation performance of R&D alliances—the absorptive capacity perspective. *Technovation,* 32**,** 282-292.
LINCOLN, Y. S. & GUBA, E. G. 1985. *Naturalistic enquiry,* Newbury Park, Sage.
LIU, H., KE, W., WEI, K. & HUA, Z. 2013. The impact of IT capabilities on firm performance: The mediating roles of absorptive capacity and supply chain agility. *Decision Support Systems,* 54**,** 1452.
MAES, J. & SELS, L. 2014. SMEs' Radical Product Innovation: The Role of Internally and Externally Oriented Knowledge Capabilities. *Journal of small business management,* 52**,** 141-163.
MARQUES JÚNIOR, E., GOBBO, J. A., FUKUNAGA, F., CERCHIONE, R. & CENTOBELLI, P. 2020. Use of knowledge management systems: analysis of the strategies of Brazilian small and medium enterprises. *Journal of knowledge management,* 24**,** 369-394.
MARYAM, A. & DOROTHY, E. L. 2001. Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS quarterly,* 25**,** 107-136.
MISHRA, N. 2019. Knowledge management practice for effective operations in SMEs. *Production planning & control,* 30**,** 795-798.
MUKHERJEE, D., GAUR, A. S., GAUR, S. S. & SCHMID, F. 2013. External and internal influences on R&D alliance formation: Evidence from German SMEs. *Journal of Business Research,* 66**,** 2178-2185.

MUSTEEN, M., AHSAN, M. & PARK, T. 2017. SMEs, Intellectual Capital, and Offshoring of Service Activities: An Empirical Investigation. *Management international review,* 57**,** 603-630.

NARASIMHAN, R. & NARAYANAN, S. 2013. Perspectives on Supply Network-Enabled Innovations. *Journal of supply chain management,* 49**,** 27-42.

NARAYANAN, S., NARASIMHAN, R. & SCHOENHERR, T. 2015. Assessing the contingent effects of collaboration on agility performance in buyer–supplier relationships. *Journal of operations management,* 33-34**,** 140-154.

NONAKA, I. & TAKEUCHI, H. 1995. *The knowledge-creating company : how Japanese companies create the dynamics of innovation,* New York ;, Oxford University Press.

NOORDHOFF, C. S., KYRIAKOPOULOS, K., MOORMAN, C., PAUWELS, P. & DELLAERT, B. 2011. The bright-side and dark-side effects of embedded ties in business-to-business innovation. *Journal of marketing,* 75**,** 34-52.

OECD 2011. Technology Intensity Definition.

PATTINSON, S. & PREECE, D. 2014. Communities of practice, knowledge acquisition and innovation: a case study of science-based SMEs. *Journal of knowledge management,* 18**,** 107-120.

PAULRAJ, A. & CHEN, I. J. 2007a. Environmental Uncertainty and Strategic Supply Management: A Resource Dependence Perspective and Performance Implications. *Journal of Supply Chain Management,* 43**,** 29-42.

PAULRAJ, A. & CHEN, I. J. 2007b. Strategic Buyer–Supplier Relationships, Information Technology and External Logistics Integration. *Journal of Supply Chain Management,* 43**,** 2-14.

PAULRAJ, A., LADO, A. A. & CHEN, I. J. 2008. Inter-organizational communication as a relational competency: Antecedents and performance outcomes in collaborative buyer–supplier relationships. *Journal of Operations Management,* 26**,** 45-64.

PÉREZ-SALAZAR, M. D. R., AGUILAR-LASSERRE, A. A., CEDILLO-CAMPOS, M. G., JUÁREZ-MARTÍNEZ, U. & POSADA-GÓMEZ, R. 2019. Processes and measurement of knowledge management in supply chains: an integrative systematic literature review. *International journal of production research,* 57**,** 2136-2159.

PODSAKOFF, P. M., MACKENZIE, S. B., LEE, J.-Y. & PODSAKOFF, N. P. 2003. Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *Journal of applied psychology,* 88**,** 879-903.

POPPO, L. & ZENGER, T. 2002. Do formal contracts and relational governance function as substitutes or complements? *Strategic management journal,* 23**,** 707-725.

PREACHER, K. J., CURRAN, P. J. & BAUER, D. J. 2006. Computational Tools for Probing Interactions in Multiple Linear Regression, Multilevel Modeling, and Latent Curve Analysis. *Journal of Educational and Behavioral Statistics,* 31**,** 437-448.

QUINN, J. B. 2000. Outsourcing Innovation: The New Engine of Growth. *MIT Sloan management review,* 41**,** 13.

QUINN, J. B. & HILMER, F. G. 1994. Strategic outsourcing. *Sloan management review,* 35**,** 43.

RINDFLEISCH, A. & MOORMAN, C. 2001. The Acquisition and Utilization of Information in New Product Alliances: A Strength-of-Ties Perspective. *Journal of marketing,* 65**,** 1-18.

RING, P. S. & VAN DE VEN, A. H. 1994. Developmental Processes of Cooperative Interorganizational Relationships. *The Academy of Management review,* 19**,** 90-118.

ROBSON, M. J., KATSIKEAS, C. S., SCHLEGELMILCH, B. B. & PRAMBÖCK, B. 2019. Alliance capabilities, interpartner attributes, and performance outcomes in international strategic alliances. *Journal of World Business,* 54**,** 137-153.

RODRÍGUEZ, A. & NIETO, M. J. 2016. Does R&D offshoring lead to SME growth? Different governance modes and the mediating role of innovation. *Strategic management journal,* 37**,** 1734-1753.

ROLDÁN BRAVO, M. I., RUIZ MORENO, A. & LLORENS-MONTES, F. J. 2016. Supply network-enabled innovations. An analysis based on dependence and complementarity of capabilities. *Supply Chain Management: An International Journal,* 21**,** 642-660.

ROTHWELL, R. & DODGSON, M. 1991. External linkages and innovation in small and medium-sized enterprises. *R & D management,* 21**,** 125-138.

ROY, S. & SIVAKUMAR, K. 2011. Managing Intellectual Property in Global Outsourcing for Innovation Generation: Managing Intellectual Property in Global Outsourcing. *The Journal of product innovation management,* 28**,** 48-62.

SAHIBZADA, U. F., LATIF, K. F., XU, Y. & KHALID, R. 2020. Catalyzing knowledge management processes towards knowledge worker satisfaction: fuzzy-set qualitative comparative analysis. *Journal of knowledge management,* 24**,** 2373-2400.

SANCHEZ, J., I. & BROCK, P. 1996. Outcomes of Perceived Discrimination among Hispanic Employees: Is Diversity Management a Luxury or a Necessity? *Academy of Management journal,* 39**,** 704-719.

SCHILDT, H., KEIL, T. & MAULA, M. 2012. The temporal effects of relative and firm-level absorptive capacity on interorganizational learning. *Strategic management journal,* 33**,** 1154-1173.

SCHOENHERR, T., GRIFFITH, D. A. & CHANDRA, A. 2014. Knowledge Management in Supply Chains: The Role of Explicit and Tacit Knowledge. *Journal of business logistics,* 35**,** 121-135.

SCUOTTO, V., CAPUTO, F., VILLASALERO, M. & DEL GIUDICE, M. 2017. A multiple buyer - supplier relationship in the context of SMEs' digital supply chain management. *Production planning & control,* 28**,** 1378-1388.

SEEPANA, C., HUQ, F. A. & PAULRAJ, A. 2021a. Performance effects of entrepreneurial orientation, strategic intent and absorptive capacity within coopetitive relationships. *International journal of operations & production management,* 41**,** 227-250.

SEEPANA, C., KHRAISHI, A., PAULRAJ, A. & HUQ, F. A. 2021b. Offshore outsourcing of innovation by SMEs: a 4F perspective of governance.

SEEPANA, C., PAULRAJ, A. & HUQ, F. A. 2020. The architecture of coopetition: Strategic intent, ambidextrous managers, and knowledge sharing. *Industrial marketing management,* 91**,** 100-113.

SEGGIE, S. H., KIM, D. & CAVUSGIL, S. T. 2006. Do supply chain IT alignment and supply chain interfirm system integration impact upon brand equity and firm performance? *Journal of business research,* 59**,** 887-895.

SINGH, J. 2008. Distributed R&D, cross-regional knowledge integration and quality of innovative output. *Research policy,* 37**,** 77-96.

SINGH, P. J. & POWER, D. 2014. Innovative knowledge sharing, supply chain integration and firm performance of Australian manufacturing firms. *International journal of production research,* 52**,** 6416-6433.

SINGH, R. K. & KUMAR, R. 2020. Strategic issues in supply chain management of Indian SMEs due to globalization: an empirical study. *Benchmarking : an international journal,* 27**,** 913-932.

SIVAKUMAR, K. & ROY, S. 2004. Knowledge redundancy in supply chains: a framework. *Supply Chain Management: An International Journal,* 9**,** 241-249.

SMELTZER, L. R. 1997. The Meaning and Origin of Trust in Buyer-Supplier Relationships. *International Journal of Purchasing and Materials Management,* 33**,** 40-48.

SONG, S., SHI, X., SONG, G. & HUQ, F. A. 2021. Linking digitalization and human capital to shape supply chain integration in omni-channel retailing. *Industrial management + data systems,* 121**,** 2298-2317.

SOOSAY, C. A., HYLAND, P. W. & FERRER, M. 2008. Supply chain collaboration: capabilities for continuous innovation. *Supply Chain Management: An International Journal,* 13**,** 160-169.

TASSABEHJI, R., MISHRA, J. L. & DOMINGUEZ-PÉRY, C. 2019. Knowledge sharing for innovation performance improvement in micro/SMEs: an insight from the creative sector. *Production planning & control,* 30**,** 935-950.

TU, Q., VONDEREMBSE, M. A., RAGU-NATHAN, T. S. & SHARKEY, T. W. 2006. Absorptive capacity: Enhancing the assimilation of time-based manufacturing practices. *Journal of Operations Management,* 24**,** 692-710.

TZOKAS, N., KIM, Y. A., AKBAR, H. & AL-DAJANI, H. 2015. Absorptive capacity and performance: The role of customer relationship and technological capabilities in high-tech SMEs. *Industrial marketing management,* 47**,** 134-142.

VIVEK, S. D., RICHEY, R. G. & DALELA, V. 2009. A longitudinal examination of partnership governance in offshoring: A moving target. *Journal of world business : JWB,* 44**,** 16-30.

WU, C. 2008. Knowledge creation in a supply chain. *Supply Chain Management: An International Journal,* 13**,** 241-250.

WUYTS, S. H. K. & DUTTA, S. 2014. Benefiting from alliance portfolio diversity: The role of past internal knowledge creation strategy. *Journal of management,* 40**,** 1653-1674.

XIE, X., ZOU, H. & QI, G. 2018. Knowledge absorptive capacity and innovation performance in high-tech companies: A multi-mediating analysis. *Journal of business research,* 88**,** 289-297.

YANG, S.-M., FANG, S.-C., FANG, S.-R. & CHOU, C.-H. 2014. Knowledge exchange and knowledge protection in interorganizational learning: The ambidexterity perspective. *Industrial marketing management,* 43**,** 346-358.

YAO, X., HUANG, R. & SONG, M. 2019. How to reduce carbon emissions of small and medium enterprises (SMEs) by knowledge sharing in China. *Production planning & control,* 30**,** 881-892.

ZACHARIA, Z. G., NIX, N. W. & LUSCH, R. F. 2011. Capabilities that enhance outcomes of an episodic supply chain collaboration. *Journal of Operations Management,* 29**,** 591-603.

ZAHRA, S. & GEORGE, G. 2002. Absorptive capacity: a review, reconceptualization, and extension. *Academy of Management review,* 27**,** 185-203.

ZARIDIS, A., VLACHOS, I. & BOURLAKIS, M. 2021. SMEs strategy and scale constraints impact on agri-food supply chain collaboration and firm performance. *Production planning & control,* 32**,** 1165-1178.

ZHANG, M., QI, Y., WANG, Z., PAWAR, K. S. & ZHAO, X. 2018. How does intellectual capital affect product innovation performance? Evidence from China and India. *International journal of operations & production management,* 38**,** 895-914.

ZIMMERMANN, R., D.F. FERREIRA, L. M. & CARRIZO MOREIRA, A. 2016. The influence of supply chain on the innovation process: a systematic literature review. *Supply Chain Management: An International Journal,* 21**,** 289-304.

Appendix A

	AMOS item Loadings
Internal Knowledge Creation Capability (α = 0.71; CR = 0.74; AVE = 0.50)	
In comparison with our competitors, our firm strength in the:	
(1 = much worse than our competitors – 7 = much better than our competitors)	
Degree of employees' commitment to innovation at a personal level*.	
Firm's capability to integrate its employees with the organizational objectives of knowledge creation and learning.	0.593
Degree to which managers consider change as natural and desirable.	0.634
Firm's capability to efficiently assign resources to the R&D development.	0.862
Absorptive capacity (α = 0.76; CR = 0.77; AVE = 0.52)	
To what extent do you agree with the following in relationship with your partner:	
(1 = strongly disagree – 7 = strongly agree)	
We are oriented towards discovering the offshore supplier knowledge opportunities.	0.791
We have the capability to use and exploit the offshore supplier new knowledge in the workplace and respond quickly to business environment changes.	0.701
We have the capability to adapt technologies designed by the offshore supplier to our particular need*.	
We have the capability to put the offshore supplier technological knowledge into product and process patents.	0.682
Formal Knowledge Sharing Routines (α = 0.73; CR = 0.74; AVE = 0.50)	
To what extent do you agree with the following in relationship with your partner:	
(1 = strongly disagree – 7 = strongly agree)	
We rely extensively on contractual rules in controlling day-to-day knowledge sharing with the offshore supplier.	0.791
We follow written procedures in most aspects of knowledge sharing with the offshore supplier*.	
Our relationship with the offshore supplier has well established ground rules about knowledge sharing.	0.713
We use a common IT (software) to control and coordinate innovation knowledge sharing with the offshore supplier.	0.603
SME's Satisfaction (α = 0.79; CR = 0.81; AVE = 0.59)	
To what extent do you agree with the following in relationship with your partner:	
(1 = strongly disagree – 7 = strongly agree)	
We intent to continue the relationship with the offshore supplier.	0.910
We are satisfied with the offshore supplier performance*.	
We are very pleased with our working relationship with the offshore supplier.	0.763
Generally, we are very satisfied with our overall relationship with the offshore supplier.	0.604
Offshoring innovation (α = 0.70; CR = 0.74; AVE = 0.50)	
Please estimate the extent of the following benefits this relationship has brought for 'your company	
(1 = no such benefits – 7 = very high benefits)	
As a result of our relationship with the offshore supplier, we have created new products and/or enhanced our current products.	0.912
As a result of our relationship with the offshore supplier, we have created new processes and/or enhanced our current processes.	0.643
As a result of our relationship with the offshore supplier, we have increased our new product speed to market.	0.521
As a result of our relationship with the offshore supplier, we have increased our patent application rate*	

*Items deleted due to having not met the psychometric requirements.

Figure 1: Conceptual model

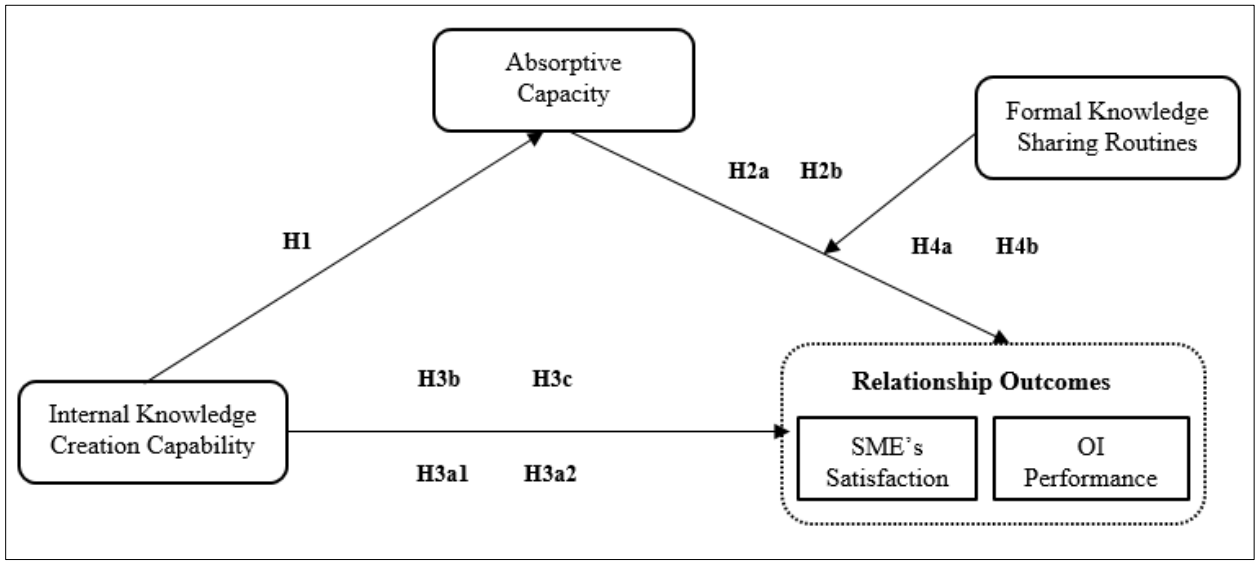
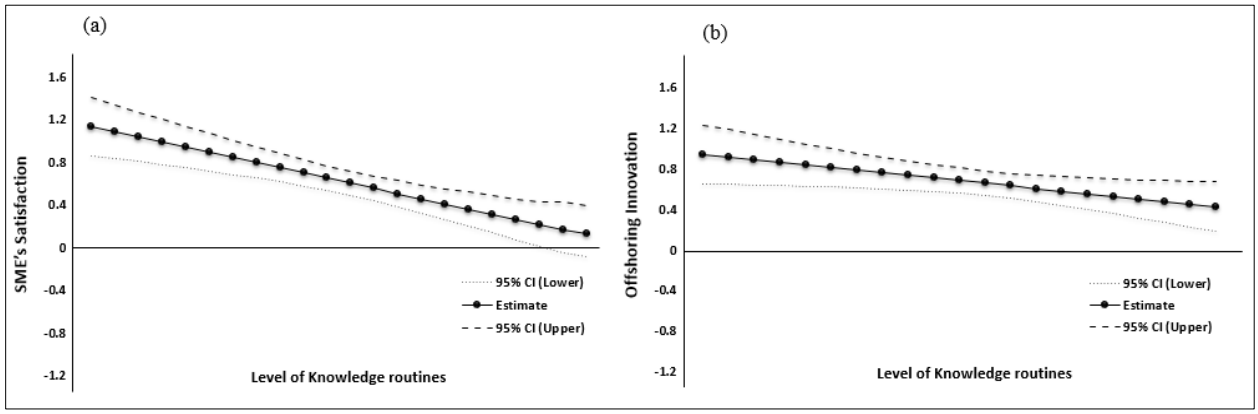


Figure 2: Plots of moderation effects at different levels of formal knowledge routines



Note: (a) Conditional indirect effect of absorptive capacity on SME's satisfaction at different levels of formal knowledge sharing routines;

(b) Conditional indirect effect of absorptive capacity on offshoring innovation performance at different levels of formal knowledge sharing routines.

Table 1: Major studies on knowledge management (KM) processes within SCM research domain of SMEs

Authors	KM processes	Key findings	Unit of analysis and context
(Wu, 2008)	Knowledge creation	Achieving successful knowledge creation is a result of knowledge conversion process that is facilitated by various factors involved in the firm's supply chain.	Firm level; sample SMEs from High-tech industries
(Levy et al., 2003)	Knowledge retention/storage	Resilience of SMEs requires knowledge retention through flexible workforce, strategic thinking, and top management support.	Firm-level; sample UK SMEs that employ Information systems.
(Jayawickrama et al., 2019)		Elements such as knowledge retention tools, documentation, human capital, and understanding of knowledge retention challenges support the knowledge creation of ERP packages and business processes.	Firm-level; sample UK SMEs that employ ERP packages.
(Capó-Vicedo et al., 2011)	Knowledge transfer/sharing	Proposes a social network based model that helps to establish network relationships to improve knowledge exchanges between companies across supply chain to create specific knowledge.	Network-level relationships; sample Spanish SMEs
(Scuotto et al., 2017)		SMEs' knowledge sharing activities could lead to better use of ICTs with their SCM.	Dyad supplier-buyer relationships; Diverse set of industries
(Yao et al., 2019)		Knowledge sharing is conducive to SMEs' emissions reduction and such a knowledge sharing could lead more firms to show willingness to share knowledge.	SMEs in alliance; sample manufacturing SMEs
(Tassabehji et al., 2019)		The smaller size of SMEs facilitates knowledge sharing that consists knowledge donation (sending) and knowledge collection in their production and planning process to improve innovation performance.	Firm level; sample SMEs of creative industries
(Seepana et al., 2021b)		Knowledge sharing routines and joint actions help strengthen relationship between complex contracts and innovation.	Interfirm relationship; sample SMEs of various industries
(Liao and Barnes, 2015)	Knowledge acquisition	Knowledge acquisition mediates between relationship quality and innovation flexibility.	Firm level; sample SMEs of various manufacturing industries
(Furlan et al., 2007)	Knowledge codification	Knowledge codification drives subcontractor development and enlarges	Firm level; sample subcontractors/SMEs of various industries

		their supply chains and capabilities portfolios.	
(Kilpi et al., 2018)	Knowledge application	Application of external knowledge mediates supply base as well as market knowledge acquisition and supply performance.	Manufacturing firm; Sample of Finnish SMEs.
(Cegarra-Navarro et al., 2011)	Knowledge exploration and exploitation	Effects of both knowledge exploration and exploitation on firm's performance is mediated through unlearning contextual factors.	Firm level; sample Spanish SMEs of Metal sector.
(Schoenherr et al., 2014)	Knowledge management capability (combination of various KM processes): Acquisition, conversion, application, and protection	SC knowledge management capability manifests in explicit and tacit knowledge in that tacit knowledge highly influences SC performance than explicit.	Firm level; sample of importing SMEs
(Aboelmaged, 2014)	Acquisition, sharing, and application	Knowledge management capability leads to innovation performance which in turn has a positive effect on operational performance.	Firm level; a combination of manufacturing and service sample SMEs based in UAE.
(Batista et al., 2019)	Creation, storage, application, and sharing	Support to sustainability initiatives is dependent on the extent of SMEs' deployment of knowledge management processes.	Firm level; sample of SMEs operating in food sector.

Table 2: Descriptive statistics and correlations

Construct	1.	2.	3.	4.	5.
1. Internal Knowledge Creation Capability	1.000				
2. Absorptive Capacity	0.471*	1.000			
3. Formal Knowledge Sharing Routines	0.230**	0.435**	1.000		
4. SME's Satisfaction	0.335*	0.601**	0.417**	1.000	
5. OI Performance	0.397**	0.598**	0.363**	0.503**	1.000
Mean	3.762	5.602	5.662	5.710	5.638
Standard Deviation	0.636	0.651	0.627	0.617	0.634

N = 200; $p < 0.01$

Table 3: Regression – Direct and interaction effects

	Absorptive capacity Model 1	SME's Satisfaction Model 2	OI Performance Model 3	SME's Satisfaction Model 4	OI Performance Model 5
Predictors					
Manager tenure	0.015	-0.021	0.035	0.014	0.048
Relationship longevity	-0.111	0.163*	0.084	0.110*	0.052
Firm size	-0.009	0.034	0.072	0.026	0.038
Low-Medium Technology	-0.097	-0.095	-0.090	0.095	0.065
Medium-High Technology	-0.002	0.031*	-0.023	0.035	-0.096
High Technology	-0.045	0.100	0.057	0.097*	-0.041
United Kingdom	-0.061	-0.129*	0.086	-0.107	0.101
France	-0.106	-0.076	0.128	-0.069	0.133*
Germany	-0.094	-0.250**	0.042	-0.210**	0.066
Italy	-0.147	-0.131*	0.110	-0.122*	0.109
Internal Knowledge Creation Capability (IKCC)	0.552***	0.262	0.023	0.272	0.026
Absorptive Capacity (AC)		0.531***	0.644***	0.338***	0.521***
Formal Knowledge Sharing Routines (FKSR)				0.106*	0.080
AC * FKSR				-0.233***	-0.143*
Model summary					
R^2	0.317	0.550	0.462	0.591	0.480
Adjusted R^2	0.284	0.526	0.434	0.565	0.446
F-stat	11.730***	23.061***	26.250***	23.061***	20.361***

The regression coefficients are reported as beta values.
N=200. * p<0.05; ** p<0.01; *** p<0.001