



Alliance management capability and SMEs' international expansion: The role of innovation pathways

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ABSTRACT

Although alliance management capability (AMC) has been widely investigated as a firm-level performance driver, it is still unclear whether and how this distinctive type of relational capability can enhance small and medium-sized enterprises (SMEs) internationalization activity. By integrating the alliance capability literature and resource-based view (RBV), as well as using data collected from a sample comprising 248 SMEs in UK manufacturing industries, we address this gap by examining the mechanisms through which SMEs can expand their internationalization via collaboration. We found support for our contention that AMC enhances radical and incremental co-innovation in SMEs, culminating in the international expansion of these firms. Additionally, we reveal the moderating effects of alliance partner diversity on the AMC and co-innovation relationship. The results offer both theoretical and managerial insights, contributing to a better understanding of how SMEs can leverage AMC to drive their global expansion strategies.

1. Introduction

International expansion represents a crucial strategic opportunity for small and medium enterprises (SMEs) seeking to tap into global market potential (Ren et al., 2015). However, the current literature suggests that significant challenges await SMEs when they attempt to expand internationally, as these firms are likely to lack the resources and expertise needed to navigate foreign markets, face competition from larger, more established companies that have a stronger global presence, and suffer from logistical challenges, such as the need to comply with diverse regulatory frameworks across various countries (Brouthers et al., 2015; Gonzalez-Perez et al., 2016). To surmount these challenges, the burgeoning literature on SMEs asserts that SMEs can achieve international expansion via alliances (Ferrerias-Méndez et al., 2019; Ogasavara et al., 2016). Such alliances can enable the SMEs to utilize partners' resources and capabilities to accrue synergistic benefits that can compensate for their liabilities of 'smallness' and 'foreignness' when internationalizing (Wu and Ang, 2020).

However, empirical evidence shows that about half of these collaborations ultimately fail (Lunnan and Haugland, 2008) and many are typified by instability (Kale and Singh, 2009). Accordingly, researchers

devoted attention to investigate the firm-level factors that can shed light on why some SMEs can derive more significant benefits from alliance relationships compared to others (Wittmann et al., 2009; Zahoor et al., 2020). In this regard, alliance management capability (hereafter, AMC) emerged as a key contributor to the success and effectiveness of strategic alliances (Al-Tabbaa et al., 2022; Schilke and Goerzen, 2010; Schreiner et al., 2009). AMC refers to the ability of a firm to develop and maintain exchange relationships with external partners (Heimeriks et al., 2009). From the perspective of the resource-based view (RBV) (Barney, 1991), it is a valuable, rare, inimitable, and non-substitutable resource that provides the basis for sustained competitive advantage. By utilizing AMC, small resource-constrained firms can effectively manage alliance relationships and outperform in joint tasks (Robson et al., 2019).

An examination of the literature reveals that AMC can exert a positive influence on firm relational-centric performance (Kauppila, 2015; Yang and Meyer, 2019). Specifically, AMC has been associated with improved technology transfer (Leischnig et al., 2014; Rothaermel and Deeds, 2006), greater stability and trust within alliances (Robson et al., 2019; Yang & Meyer, 2019), and better value capture that leads to the establishment of competitive advantages (Wang and Rajagopalan, 2015). Yet, despite the development in this field, two specific gaps can

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be identified. *First*, our understanding of the role of AMC in supporting SMEs international expansion is still underdeveloped. That is, minimal research consideration has been given to investigate the role of AMC in the internationalization context (Robson et al., 2019, Sedzinauskienė et al., 2019, Zahoor et al., 2020), thereby limiting understanding as to how AMC can shape the internationalization prospect of SMEs (Puthusserry et al., 2018). In effect, the importance of this issue is heightened by the prevailing paradoxical debate on how SMEs can deal with environmental uncertainty and firm's task complexity when internationalizing (Dabić et al., 2020), while effectively managing the uncertainty and risk typically embedded in strategic alliances that are sought to tackle international market challenges (Lee et al., 2020, Puthusserry et al., 2020). Indeed, this issue is captured in the literature, where studies have emphasized the need for an accurate understanding of the role of alliance's various capabilities as an enabling factor for internationalization (Ciravegna et al., 2014, Ong et al., 2022, Stoian et al., 2017, Wormald et al., 2021). *Second*, while many studies have linked innovation with internationalization (Martínez-Román et al., 2019, Vendrell-Herrero et al., 2018), as well as, alliance/collaboration/network with innovation (Ardito et al., 2019, Elia et al., 2019, Zhang et al., 2021), the effect of AMC on the different types of co-innovation (namely radical and incremental) and how this combined effect can be translated into international performance within the small business setting is still underexplored (Battaglia and Neirotti, 2022, Davcik et al., 2021, Zahoor et al., 2020). As AMC involves a complex set of organizational routines geared towards learning and accumulating knowledge (Al-Tabbaa et al., 2019), understanding the differential role (and related contextual contingencies and partner-specific characteristics) of these routines on the innovation activity when targeting global markets can provide important insights to the SMEs literature (Ardito et al., 2019, Fredrich et al., 2022).

To address these gaps, we set our research question: *to what extent can AMC boost SMEs co-innovation that culminates in international expansion?* In answering this question, this study develops a conceptual model that builds upon the RBV theory and the alliance capability literature. The model conceptually connects AMC with co-innovation activity, then explicates their combined effect on SMEs' internationalization activity. We assessed the model's validity using a sample involving 248 SMEs in the UK manufacturing industries.

Overall, our research offers several theoretical contributions. *First*, the study provides a detailed account of the effect of AMC (as a specific relational capability) on SMEs international expansion. While many studies identify and examine different alliance-related enablers for internationalization (Niittymies and Pajunen, 2020, Zahoor et al., 2020), for example, network embeddedness (Al-Laham and Souitaris, 2008), managers' dynamic capabilities (Panibratov and Klishevich, 2020), alliance characteristics (Ardito et al., 2019), social network density and scope (Pinho and Prange, 2016), we advance the literature by comprehensively incorporating the effect of four different inter-organizational routines (namely coordination, learning, proactiveness, transformation) (Schilke and Goerzen, 2010) that underpin AMC as a driver for internationalization. In effect, reviewing the literature shows conceptual ambiguity when investigating AMC in the internationalizing setting. This is because existing studies adopt a simplified approach, for instance, by using the total number of alliances to proxy alliance capabilities (Li et al., 2018), which can lead to an inaccurate understanding of AMC's effect as its complex nature has been overlooked (Nielsen and Jolink, 2015, Zhang et al., 2021). This limitation was highlighted in the literature, where Degener et al. (2018) called for investigating the "other AMC" dimensions as they might have a substitutive effect. *Second*, by drawing on the RBV, we explain that AMC is not a direct driver for SME internationalization expansion, rather, AMC should be leveraged through appropriate mechanisms (i.e., strategic actions) to affect the expansion trajectories (Ketchen et al., 2007). More specifically, we showed that the AMC value can be unlocked via co-innovation activities, which are particularly significant for SMEs to meet the needs of

international markets (Albers et al., 2013, Devarakonda and Reuer, 2018, Hsu et al., 2013). While previous empirical studies have examined the effect of alliance strategy on innovation, which ultimately leads to internationalization performance of SMEs (Stoian et al., 2017, Mesquita and Lazzarini, 2008), these studies did not consider the intricate link between resources, actions, and performance. Therefore, our study offers important new insights by showing that alliance-based innovation activities serve as an important mechanism upon which SMEs can capitalize to leverage the value of their AMC for internationalization expansion.

Third, the study adds to the AMC literature by considering the moderating effect of alliance partner diversity. This is an important aspect of our model as the effect of this factor on alliance-related capabilities has not been addressed adequately in the literature (Jiang et al., 2023, Zahoor and Al-Tabbaa, 2020). In effect, earlier researchers have found that distinct alliance partners require a different level of AMC for new product development (Rothaermel and Deeds, 2006). However, research to date remains limited in conceptualizing and testing empirically the effect of partner diversity on the relationship between AMC and other firm-level performance variables such as innovation and/or internationalization (Cabello-Medina et al., 2020, Degener et al., 2018, Schilke and Goerzen, 2010). *Finally*, our study highlights the crucial role of AMC for SMEs in effectively leveraging external relationships, integrating knowledge embedded in these relationships, and driving innovation and international expansion for small firms (Sedzinauskienė et al., 2019, Zahoor et al., 2020). In essence, we demonstrate that SMEs' success in the dynamic global market hinges on their ability to capitalize on AMC as a key asset for enhancing collaborative innovation efforts and facilitating international expansion. By shedding light on this aspect, our research enriches the understanding of AMC's implications within the context of SMEs.

2. Alliance management capability: A critical reflection

In principle, AMC can be defined as a bundle of organizational processes and routines related to the management of alliances (Degener et al., 2018) that enable firms to realize better performance from the alliances and collaborations (Schreiner et al., 2009). This is why many studies regard AMC as a dynamic capability (Schilke and Goerzen, 2010), as it is "a path-dependent capability which is built over time through repeated engagements in strategic alliances" (Rothaermel and Deeds, 2006, p. 432). This capability, including its underpinning organizational processes and routines, not only allows partners to benefit individually from the alliance (e.g., gain access to a specific resource), but also to fulfill the collective objective of that alliance (e.g., co-development of a new product) (Al-Tabbaa et al., 2022, Nielsen and Jolink, 2015).

Seeking to better understand this capability and unpack its extended effect, empirical studies (e.g., Schilke & Goerzen, 2010; Schreiner et al., 2009) have conceptualized AMC as a multi-dimensional construct consisting of various reinforcing dimensions (i.e., routines). While determining these dimensions can vary in the literature (i.e., researchers adopt them in various combinations), in this study, we adopted a more comprehensive view that takes into consideration the four most common types of inter-organizational capabilities that underpin AMC (Leischnig et al., 2014, Robson et al., 2019): coordination, learning, proactiveness, and transformation. Next, we discuss the essence of these four capabilities.

Inter-organizational coordination concerns the governance of an individual alliance. As argued by Schreiner et al. (2009), inter-organizational coordination aims to build and manage agreement regarding the task necessities within a particular alliance, the level of interdependence among partners involved, and the definition of operational procedures for executing collaborative tasks. Achieving this necessitates enacting clear lines of communication and effective decision-making processes, along with the implementation of systems

for efficient sharing of resources, and developing strategies for resolving conflicts or misunderstandings that may arise (Kohtamäki et al., 2018). By successfully managing inter-organizational coordination, trust and legitimacy among alliance partners would be strengthened, leading to effective alliance governance and performance (Shi et al., 2005). *Second*, inter-organizational learning refers to the extent to which a firm can obtain and exploit knowledge from alliance partners (Leischnig et al., 2014), which plays a central role for alliance success (Schilke and Goerzen, 2010). Inter-organizational learning typically involves the establishment and implementation of learning routines, encompassing systematic information processing and the dissemination of learning effects across all collaborating partners. Through these learning routines, organizations can tap into valuable insights, expertise, and best practices shared by their alliance counterparts (Oh and Kim, 2021), leading to enhanced innovation, adaptability, and competitive advantage (Nielsen and Jolink, 2015). By actively fostering inter-organizational learning, firms can unlock the full potential of their alliances, enabling them to stay agile and responsive to dynamic market demands while continually improving their overall performance and efficiency in collaboration efforts (Kohtamäki et al., 2018).

Third, inter-organizational proactiveness relates to a firm's ability to recognize unique alliance-related opportunities in their working environment (Sarkar et al., 2009). Having high alertness to the external environment allows firms to accomplish alliance reconfigurations ahead of competitors and thus be able to react faster to emergent opportunities and gain early mover advantages (Kauppila, 2015). It acts as a sensing routine, which in turn, enables firms to recognize market demands and new alliance opportunities to obtain resources (Yang & Meyer, 2019). Proactiveness can also involve identifying potential areas of conflict or misunderstanding and taking steps to prevent them, and continuously working to improve the effectiveness and efficiency of the alliance (Al-Tabbaa et al., 2019, Leischnig and Geigenmüller, 2018). *Finally*, alliance transformation refers to the ability of a firm to change alliance terms or modify routines over the alliance period (Schilke & Goerzen, 2010). While the initial goal of any alliance is to attain a perfect fit, this alignment is often challenging to achieve from the outset. As alliances progress and external circumstances change, it becomes essential for firms to be flexible and responsive in their approach (Wang and Rajagopalan, 2015). This adaptability allows them to address emerging challenges and capitalize on unforeseen opportunities, ensuring that the alliance remains viable and mutually beneficial (Leischnig et al., 2014). However, alliance transformation should not be regarded as a one-time event but an ongoing process that demands continuous evaluation, communication, and monitoring between the partnering firms (Schilke and Goerzen, 2010).

While the AMC research has investigated the mechanisms and conditions through which these capabilities can deliver alliance-level and firm-level value, see a summary in Table 1, reviewing this stream of literature shows a number of salient limitations. Importantly, the majority of existing studies concentrate on the relevance of AMC for technology transfer success and firm performance (Leischnig et al., 2014; Nielsen & Jolink, 2015). Though this perspective suggests that AMC promotes the utilization of partner's knowledge, this research failed to capture the relevance of AMC for collaborative innovation and international expansion (Robson et al., 2019). In this vein, Li et al. (2018, p. 831) argued that SMEs "tend to face more challenges in intentional expansion due to their lack of visibility and legitimacy" and thus proposed to investigate the effect of AMC on international expansion. In addition, there is a lack of understanding about the relevance of AMC in the setting of SMEs and small businesses more generally (Al-Tabbaa et al., 2022, Sakhdari et al., 2020). This is an important shortcoming because there are different challenges and requirements in each alliance setting (O'Dwyer and Gilmore, 2018). Accordingly, scholars called for more research to investigate how SMEs can exploit AMC to overcome alliance challenges and promote alliance and firm success (Arranz et al., 2016, Partanen et al., 2020).

Table 1

Summary of past research investigating the effect of AMC on firm- and alliance-level performance.

No	Study	Research focus	Independent variable	Dependent variable
Alliance-specific implications for AMC				
1	Schreiner et al. (2009)	AMC is a multidimensional construct that is linked to alliance-level outcomes	- AMC (as an antecedent)	- Degree of joint action (alliance-level)
2	Schilke and Goerzen (2010)	AMC positively impacts on alliance portfolio performance and mediates the performance effects of dedicated alliance structures and alliance experience.	- Alliance structure - Alliance experience	- Alliance performance
3	Heimeriks and Duysters (2007)	Explore how firms develop alliance capabilities by focusing on how differences in sources of AMC can explain performance heterogeneity.	- AMC (as a mediator between alliance experience and alliance performance)	- Alliance performance
4	Leischnig et al. (2014)	AMC can influence interaction quality, which in turn improves inter-organizational technology transfer.	- AMC (as an antecedent)	- Technology transfer success (alliance-level)
5	Al-Tabbaa et al. (2022)	AMC can mediate the relationship between the socioemotional wealth of family firms and their alliance success	- AMC (as mediator)	- Alliance success
6	Robson et al. (2019)	How the different AMC capabilities intersect to develop resource complementarity and trust, which can enhance the performance of international strategic alliances	- AMC (as an antecedent)	- International strategic alliances performance
7	Dhaundiyal and Coughlan (2022)	AMC can drive individual alliance performance in the post-formation stage	- AMC (as an antecedent)	- Individual alliance performance
8	Gao et al. (2017)	To what extent can AMC affect alliance stability and performance in horizontal alliances.	- AMC (as an antecedent)	- Alliance stability and performance
9	Mikami et al. (2022)	Seek to investigate the role of AMC in managing an alliance at the structural and behavioral level (i. e., micro-foundations).	- AMC (as an internal mechanism)	- Justice and trust, which affect alliance performance
Firm-specific implications for AMC				
1	Rothaermel and Deeds (2006)	The inverted U-shaped relationship	- AMC is a mediator between the	- New product development

(continued on next page)

Table 1 (continued)

No	Study	Research focus	Independent variable	Dependent variable
		between the total number of alliances and new product development is mediated by AMC.	number of R&D alliances and new product development	
2	Yang and Meyer (2019)	Alliance proactiveness can drive firm performance	- Alliance proactiveness as part of AMC	- firm performance
3	Kauppila (2015)	AMC is associated with co-exploration and co-exploitation which are related to firm performance.	- AMC (as an antecedent)	- Firm performance - Financial performance
4	Bouncken et al. (2022)	AMC can affect firms' innovation performance by enabling the firm to leverage alliance management resources.	- AMC (as a mediator between strategy formalization and innovation performance)	- Firm innovation performance
5	Schilke and Goerzen (2010)	AMC positively impacts alliance portfolio performance and mediates the performance effects of dedicated alliance structures and alliance experience.	- Alliance structure - Alliance experience	- Alliance portfolio performance (firm-level)
6	Duysters et al. (2012)	Alliance portfolio diversity is advantageous and disadvantageous for alliance portfolio performance. Alliance experience and AMC enables the firm to deal more effectively with the diversity in the alliance portfolio.	- AMC - Alliance portfolio diversity	- Alliance portfolio performance (firm-level)
7	Dubey et al. (2021)	Have examined the effect of AMC under the mediating effect of analytics capability as a driver for firm's operational and financial performance.	- AMC (as an antecedent)	- Firm's operational and financial performance.
8	Cabello-Medina et al. (2020)	Investigate the influence of AMC (only coordination and learning) on alliance portfolio performance	- AMC (only coordination and learning)	- Alliance portfolio performance (focus on innovation)
9	Degener et al. (2018)	Examine the moderating role of AMC on the relationship between portfolio diversity and firm innovation.	- AMC (only portfolio coordination and proactive partner selection) as a moderator	- Firm innovation

3. Research model and hypotheses development

In this study, we fundamentally propose that AMC is a critical capability that SMEs would need to internationalize¹ and gain advantages in global markets, as illustrated in Fig. 1. Yet, consistent with the RBV (Kraaijenbrink et al., 2010), we argue that the realization of AMC value for internationalization demands the deployment of specific strategic actions. This is aligned with Ndofor et al. (2011) contending that failure to include leveraging strategic actions when examining the effect of resources on performance can lead to underspecified models and invalid conclusions about the 'resource-performance' relationship. As both radical and incremental co-innovation has widely been regarded as an outcome of alliance (Arias-Pérez et al., 2020, Zhao et al., 2018, Zhong and Nieminen, 2015), as well as, they have been linked with firm international performance (Prashantham and Bhattacharyya, 2020, Yang, 2018), we propose these two activities as vital strategic actions through which SMEs can unlock the potential value of AMC (as resources) for improving internationalization expansion (as a firm-level performance).

This choice (of innovation) is justified because the strategic intent of SMEs', to whether pursue a process of radical innovation or refine an existing one, is a primary motive for engaging in an inter-organizational relationship (Song and Thieme, 2009, Parida et al., 2012). In other words, SMEs would seek radical co-innovation and incremental co-innovation because these two approaches are conducive to their success domestically and globally (Lee et al., 2010, Rosenbusch et al., 2011), where the alliance is perceived as an important strategy for these innovation types to take place in SMEs (Brunswick and Vanhaverbeke, 2015, Maes and Sels, 2014). This study, therefore, specifies radical co-innovation and incremental co-innovation as two dominant activities that SMEs perform with their partners (Bouncken and Kraus, 2013). Particularly, radical co-innovation is defined as SMEs' strategic action to significantly transform the existing innovation practices by establishing alliances with complementary partners. Correspondingly, incremental co-innovation is defined as a strategic action that focuses on the refinement and reinforcement of existing competencies and knowledge through collaboration. We also propose that the presence of diversity in partners (as an internal condition) can strengthen the effect of AMC. Next, we present and discuss the foregoing arguments and establish their theoretical and empirical underpinning.

3.1. AMC and radical Co-innovation

In general, the dichotomy of radical vs. incremental is among the most distinct forms of innovation activity (Camisón-Zornoza et al., 2004). While radical innovation relates to ground-breaking developments that represent a major departure from existing capabilities in the firm and establish the basis for the revolutionary change in the

¹ In this research, we employ the terms 'international expansion' and 'internationalization' interchangeably, denoting the strategic endeavors pursued by firms to explore foreign markets and integrate their operations globally (Hohenthal et al., 2003; Hutzschenreuter et al., 2011). Extensive studies have established a positive correlation between international expansion and firm performance (Hsu et al., 2013; Hutzschenreuter et al., 2011; Fernández Olmos and Díez-Vial, 2015). This is because, such firms, including SMEs, would benefit from accessing larger customer bases and diverse revenue streams, fostering business growth and competitiveness, ultimately leading to improved profitability and heightened brand recognition. Additionally, engaging with international markets can have favorable economic implications by mitigating risks associated with overreliance on domestic markets (Yiu et al., 2007). While it is acknowledged that the relationship between internationalization and performance may be affected by various market and institutional conditions, we would like to clarify that these assessments fall beyond the scope of our current study. This association has already been extensively investigated in the existing literature.

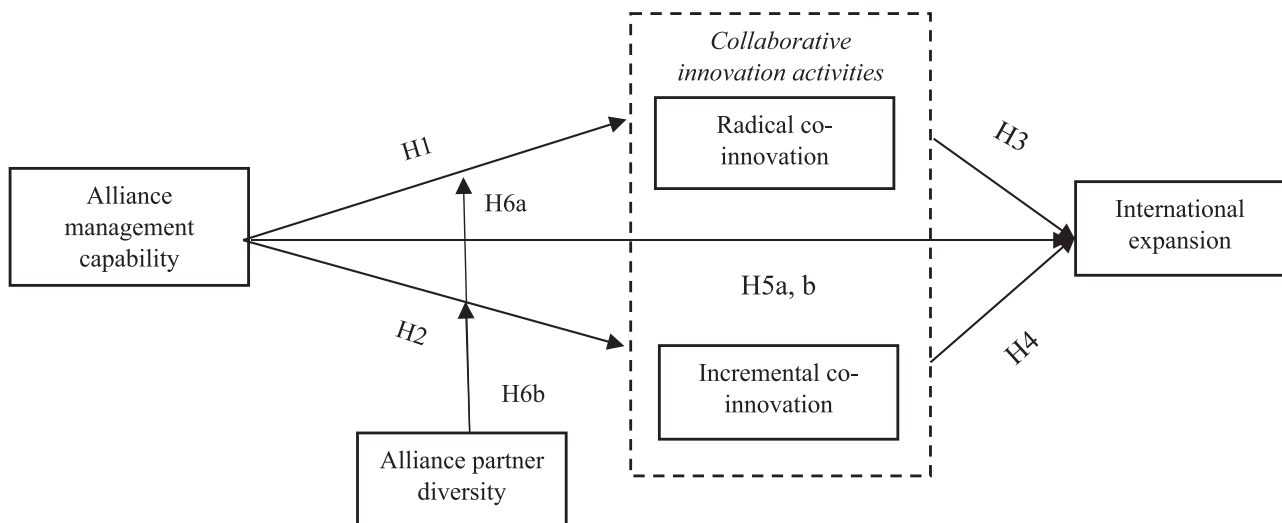


Fig. 1. Conceptual model of the study.

technologies (Stojčić, 2021), incremental innovation concern the developments of new products and services that are known to the market or minor improvements in the existing products (Parida et al., 2012).

A vast amount of research on the sources of radical innovation has stressed the importance of inter-organizational collaboration, particularly for firms in dynamic environments (Maes and Sels, 2014, Oerlemans et al., 2013). In particular, empirical evidence suggests that the ability to create and manage external relationships is important to manage the risks associated with the co-exploration process (Rothaermel and Deeds, 2006, Kauppila, 2015), which is an important step toward radical innovation (Lee et al., 2010). To explain how the AMC can influence SMEs' radical co-innovation action, we discuss the effect of the individual effect of AMC dimensions.

Inter-organizational coordination relates to the ability to identify and implement joint working procedures for efficient and appropriate task execution (Schreiner et al., 2009). Since SMEs are subject to resource constraints and environmental hostility (Sullivan-Taylor and Branicki, 2011), they might also suffer from coordination mechanisms due to boundary-spanning mechanisms, working conditions, roles, procedures and responsibilities (Huang et al., 2016). In such a case, SMEs are at a risk to impede the complementary actions taken by exchange members to achieve ground-breaking developments (Eberly et al., 2011); in some instances, the cost of failed coordination may even exceed the benefits of determined actions (Brunsson, 1982). In addition, radical co-innovation requires coordination capability as a centripetal force to develop knowledge that is tacit and of uncertain value (Narula, 2004, Hoang and Rothaermel, 2010).

Inter-organizational learning allows partnering firms to connect and share experiential knowledge (Beeby and Booth, 2000). It refers to the organizational routines to pursue the process of knowledge acquisition and improved performance (Walter et al., 2007). SMEs with well-developed learning rationality are more likely to adapt to partnering firms (Liao et al., 2003). Cohen and Levinthal (1990) suggest that the structure of knowledge within an organization, overlapping of such knowledge, and contact among individuals, all of these influence the acquisition and exploitation of knowledge. It implies that the development of learning capability permits an SME to better appreciate, understand and diffuse the information among collaborative partners. Considering the role of inter-organizational learning for radical co-innovation, scholars argue that an improved understanding of how to transfer and absorb information about novel technology from the origin organization to the destination organization can result in radical innovation (Chang et al., 2012). It has also been asserted that inter-organizational learning routines allow gaining mastery from academic

and research institutions. Thus, it improves the likelihood of researching at the technological frontier and develop patents for new-to-the-world products (Miotti and Sachwald, 2003), that in turn fuels radical innovation (Faems et al., 2005, Maes and Sels, 2014).

Inter-organizational proactiveness consists of routines that allow a firm to spot, interpret and pursue valuable opportunities in the environment (Micheli et al., 2020). It is an absolute skill that allows SMEs to accomplish reconfigurations ahead of competitors. Proactiveness allows SMEs to obtain potential partnering opportunities, taking pre-emptive actions in response to the perceived opportunity (Quinn, 2000), sense the environment to seize opportunities, reconfigure assets (Teece, 2007) and gain competitive advantage as resources become available (Hite and Hesterly, 2001). With respect to the role of inter-organizational proactiveness for radical co-innovation, it can be argued that alliance scanning allows SMEs to establish a portfolio of ties to a diverse body of potential partners (Zahoor and Al-Tabbaa, 2020). Particularly, the establishment of weak ties allows to access variable information and ideas that is the principal condition for radical co-innovation (Padula, 2008). Furthermore, the mastering of scanning capabilities by small firms serves as a prerequisite to bring the best candidate into relationship with specialised knowledge and strategic compatibility (Street and Cameron, 2007), which helps the partners to achieve the first-mover advantage and introduce revolutionary products (Varadarajan and Cunningham, 1995).

Finally, inter-organizational transformation counteracts the dilemma of innovation-promoting, facing technological discontinuities adequately and ultimately enabling firms to foster radical innovations on an ongoing basis (Herrmann et al., 2007). It is referred to the ability of partners to adapt to the transfer process in reacting to changed conditions (Leischnig et al., 2014). Adaptations (e.g., contract amendments, and changes in alliance governance mechanisms) profoundly require actions that one may never replicate. In terms of SMEs, they have behavioral strengths such as flexibility and the capacity to quickly adapt routines and strategies (Pascual Ivars and Comeche Martínez, 2015), which is a necessary condition to modify alliances throughout the alliance process (Reuer et al., 2002). Such transformations serve as a base to deal with the complexity of co-exploration and develop radical innovation (Lasagni, 2012, McAdam et al., 2010). Taking these together, we posit:

H1: In SMEs, AMC is positively associated with radical co-innovation.

3.2. AMC and incremental Co-innovation

As incremental co-innovation involves the reuse of existing knowledge and technologies for product and process innovation via alliance partners (Kauppila, 2010), AMC can allow SMEs to develop shared beliefs, enhance emotional closeness, and cognitive proximity with partners to contribute ideas and engage in incremental co-innovation (Obal et al., 2016). Next, we discuss the linkage between AMC dimensions and incremental co-innovation.

Inter-organizational coordination is a critical part of planning and controlling the external relationship. In an increasingly complex and uncertain environment, a consensus view of the future technology requires incremental co-innovation (Lichtenthaler, 2010), which demands the inter-organizational coordination capability to manage the integration mechanisms. Such coordination aids SMEs to leverage existing technologies and improves the synchronization of joint exploitative activities (Chen and Liu, 2020). In addition, Hoang and Rothaermel (2010) posit that investment in coordination capabilities simultaneously enables the identification of specific roles and execution of behaviors with minimal redundancy that are critical to transfer the prevailing knowledge for incremental innovation.

Inter-organizational learning aids SMEs to establish an existing technology as an industry standard (Oh and Kim, 2021). Particularly, it allows accessing the knowledge assets of partners to leverage complementarities across different and unique competencies along the value chain (Bresser et al., 2000), while allowing the partner to maintain the comparative knowledge advantage (Grant and Baden-Fuller, 2004). Considering the significance of inter-organisational learning specifically for incremental co-innovation, it has been argued that exploitation requires the diversity of knowledge with the ability to integrate different types of knowledge and utilize the knowledge to its full capacity (Grant and Baden-Fuller, 2004). Thus, inter-organizational learning with the ability to transform, systematize, coordinate and socialize the knowledge allows the increased incremental co-innovation for SMEs (Gebauer et al., 2012).

Inter-organizational proactiveness helps SMEs to achieve a competitive positional advantage despite the surrounding environmental uncertainty in the market (Kandemir et al., 2006, Schilke and Goerzen, 2010). Considering the relevance of proactiveness for incremental co-innovation, it can be argued that alliance scanning brings the best partners in the relationship to achieve co-exploitation and thereby incremental co-innovation. Furthermore, proactive scanning of partnering opportunities can allow the identification of partners with complementary knowledge, resources and strategic compatibility (i.e., a skill to integrate the capabilities of partners in firm's routines), which is a prerequisite for incremental co-innovation (Kandemir et al., 2006).

Finally, inter-organizational transformation is linked with the flexibility of partners to adapt the transfer process in reacting to changed conditions (Reuer and Zollo, 2000). Although incremental co-innovation may pursue perfect and unified interactions, such outcomes seldom appear from the beginning. New knowledge and know-how continue to develop as incremental innovations occur, and inter-organizational transformation is the foundation to change the alliance governance mechanisms and conditions for greater alliance continuity and also for incremental developments (Arias-Pérez et al., 2020). To the extent that higher inter-organizational transformation is available, one would expect that improved incremental co-innovation is likely to occur in SMEs due to extensive experimentation with new combinations, the creation of variation, and continuous improvements. Accordingly, it is proposed:

H2: In SMEs, AMC is positively associated with incremental co-innovation.

3.3. Radical Co-innovation and international expansion

Radical co-innovation enhances SMEs' competitiveness by offering

new functionalities and novel customer benefits, which result in increased market share and profitability (Azar and Ciabuschi, 2017). It is also vital for creating and maintaining a competitive distance from rivals (Hardwick and Anderson, 2019). Since radical co-innovation relies on up-to-date technologies and new information, it allows SMEs to respond to new market dynamics (Saridakis et al., 2019) and offer novel products that can differentiate SMEs from global competitors (Bagheri et al., 2019), thereby achieving international expansion (Kumar et al., 2012). Radical co-innovation can also enhance the reputation of SMEs and thereby promote their position internationally (Lew et al., 2013). In addition, previous literature shows that radical co-innovation allows an SME to sense new opportunities, embed the identified opportunities in the design of new products and processes, and develop breakthrough innovations that are valued by international customers (Boso et al., 2017). As Löfgren (2014) argued, radical co-innovation encourages an SME to gain new knowledge and learn from international customers and suppliers, thereby establishing and promoting their international presence. Similarly, Dai et al. (2014) argue that radical co-innovation encourages a firm to seek international partners to spread the cost of complex innovation endeavors, which in turn can reinforce their pursue to enter new markets. Therefore, we suggest:

H3: In SMEs, radical co-innovation is positively associated with international expansion.

3.4. Incremental Co-innovation and international expansion

Incremental co-innovation refers to minor product and process improvements via alliance partners (Ritala and Hurlmelinna-Laukkanen, 2013). While incremental co-innovation can be considered innovative to the firm itself (Martínez-Román and Romero, 2013), it can help SMEs to compete in the marketplace and gain international expansion (Saridakis et al., 2019). In this regard, research suggests that incremental co-innovation allows an SME to expand to foreign markets that are similar to their home country (Hsieh et al., 2019). Through operating in international markets, SMEs can gain international experience and learn about their products. Eventually, SMEs use this learning to incrementally improve their product offerings, which ultimately facilitate international expansion to distant markets (Chiva et al., 2014). Furthermore, incremental co-innovation increases the efficiency and reliability of products and processes based on customers' feedback that can benefit the international expansion (Lisboa et al., 2011). Because incremental co-innovation has synergy with an SME's existing product portfolio, it also helps a firm to achieve economies of scale and scope that are necessary to devote resources to international expansion. Thus, we propose:

H4: In SMEs, incremental co-innovation is positively associated with international expansion.

3.5. AMC and international Expansion: The mediating role of Co-Innovation activities

Extant research suggests that effective management of inter-organizational relationships opens up new avenues for SMEs through which to enter foreign markets and achieve internationalization performance (Torkkeli et al., 2012). However, scholars still have doubts about the competitiveness and internationalization of SMEs (Aragón-Sánchez and Sánchez-Marín, 2005, Child et al., 2022, Kuivalainen et al., 2012), which reveals the need to find effective strategic actions that enable the SMEs to exploit their AMC to gain position in the international market.

Strategic action is concerned with the process that firms need to undertake to achieve superior performance (Ketchen et al., 2007). Typically, resources are heterogeneous and include all assets, capabilities, processes and knowledge controlled by a firm to conceive and implement strategies (Barney, 1991, Porter, 1985). In contrast, strategic actions (for example, flexibility, imitability, cooperation, and

entrepreneurship) are the processes in which companies leverage capabilities to realize long-term performance (Leonidou et al., 2011, Miller, 1992). In other words, while resources (or capabilities) are tangible and intangible assets, strategic actions are distinct in that they describe the activities that a firm needs to undertake to leverage its resources.

Building on RBV, researchers have conceptualized strategic action as subjective responsiveness of organizations towards market intelligence and environmental changes (Garg et al., 2003). In principle, two types of strategic actions seem to have emerged. The first one can be regarded a network-based strategic action, emphasizing a manager's interpersonal ties and inter-organizational relationship (Powell, 1990). The second is market-based strategic action, concentrating on competitive resources and capabilities emphasized in traditional strategy research (e.g., production, financing, and marketing), which are independent of the firm's networks and relationships (Barney, 1991).

In the context of SMEs facing dynamic environments, different authors have debated over which is the more appropriate strategic action. Some view a network-based strategic action as a winning option in the absence of resource bundles and the liability of smallness (Gassmann and Keupp, 2007). Others complain that too much emphasis on collaboration is a hotbed of corruption and that the internal development of products may enable more firms to compete (Bougrain and Haudeville, 2002). While different strategic actions may be useful during different phases of the transitions, the RBV logic argues that the unique characteristics of resources give them the potential to make the most of appropriate strategic actions (Das and Teng, 2000, Murray et al., 2010). Put differently, the deployment of resources that do not match the implemented strategic action can lead to flawed inferences (Kazadi et al., 2016). This study posits that co-innovation activities to have a mediation effect that connects AMC to SMEs' international expansion.

In SMEs, AMC is an organizational capability that is much needed to establish and effectively manage alliances, and thus being able to realize relational gains (O'Dwyer & Gilmore, 2018). However, the possession of AMC does not necessarily lead to a better international performance in the highly dynamic and ever-changing global environment (Bamel et al., 2021, Freixanet and Renart, 2020). Yet, in such a situation, co-innovation activities can be vital for SMEs to outperform their international competitors (as discussed earlier) and achieve success in international markets. As demonstrated in the AMC literature (Kohtamäki et al., 2018; Zahoor et al., 2020), a key antecedent that can foster co-innovation activities is AMC. Due to the availability of AMC, SMEs can identify partners with complementary knowledge, coordinate their activities with partners, and gain fine-grained knowledge from partners (Schilke & Goerzen, 2010). This will foster both radical and incremental co-innovations among alliance partners and lead SMEs to achieve international expansion. This complex relationship can be understood from RBV which calls to investigate processes between resources and performance (Kraaijenbrink, et al., 2010).

This leads us to the proposition that SMEs' AMC will have a positive impact on international expansion by improving their co-innovation activities. Therefore:

H5a: In SMEs, radical co-innovation mediates the relationship between AMC and international expansion.

H5b: In SMEs, incremental co-innovation mediates the relationship between AMC and international expansion.

3.6. The moderating role of alliance partner diversity

As argued by Oerlemans et al. (2013), innovation tasks are significantly influenced by the diversity of partner portfolios, wherein complex R&D activities require variant managerial and technical abilities that can be compiled externally from the portfolio (Carnabuci and Operti, 2013). Alliance partner diversity refers to the variety of different types of partners that a company works with in the context of alliances or strategic partnerships, which can include suppliers, customers,

competitors, and research institutions (Cabello-Medina et al., 2020). This diversity can bring benefits such as fostering creativity and providing new solutions to problems, as well as creating opportunities for learning and knowledge creation (Degener et al., 2018). It can also contribute to innovation and enhance a company's ability to adapt to change. Diversity of partners' base can also involve heterogeneity in terms of the geographic locations, cultures, and capabilities of the partners involved, which can further broaden the scope of external knowledge and relational resources available to the company (Capaldo and Petruzzelli, 2014b). We extend the above argument by proposing that alliance partner diversity can have a moderating effect on the association between AMC and co-innovation activities.

At a high level of diversity, SMEs would be able to obtain new ideas and knowledge held by a diverse set of partners. Due to the importance of combining diverse knowledge, AMC would be much needed to help the SMEs absorb and benefit from such diverse knowledge (Parida et al., 2016). However, higher alliance partner diversity would also bring additional coordination and communication risks, complexities in building trust and ensuring compliance (Capaldo and Petruzzelli, 2014a), and increased organizational distance (Cabello-Medina et al., 2020, Martínez-Noya and García-Canal, 2021). This, in turn, requires further alliances capabilities to manage external collaborations and use them effectively to advance co-innovation.

More specially, at a low level of partner diversity, the relationship between AMC and actions of radical and incremental co-innovation is likely to be weaker (in comparison to high diversity). That is they will require limited alliance management efforts as partners are well-connected, have cognitive proximity, and have developed good alliance experience as being interacting with a limited number of partners (Kang et al., 2007, Sampson, 2007). By contrast, a high level of alliance partner diversity will entail SMEs to gain access to diverse ideas and knowledge that are provided by a wide range of alliance partners (Messeni Petruzzelli and Murgia, 2021). In this regard, AMC will allow SMEs to effectively integrate and absorb knowledge from diverse alliance partners and use it to develop radical and incremental co-innovation. Therefore, high partner diversity is expected to increase the impact of AMC on strategic action due to enhancement in the breadth of perspective, cognitive resources, and the need for further problem-solving capacity (Goerzen and Beamish, 2005). Also, actors from diverse functional groups provide complementary knowledge and tacit skills (Messeni Petruzzelli and Murgia, 2020) that are necessary to develop radical products by employing capabilities to manage the relationships (van Beers and Zand, 2014, Petruzzelli, 2011). In other words, high partner diversity allows firms to benefit more from the high level of AMC by utilizing the capabilities at an optimal level resulting in better coordination mechanisms and gaining access to currently most relevant resources, and ultimately, in higher innovation activity. Based on these arguments, we posit that:

Hypothesis H6a: Alliance partner diversity positively moderates the relationship between AMC and radical co-innovation, such that higher levels of alliance partner diversity strengthen the relationship between AMC and SMEs radical co-innovation.

Hypothesis H6b: Alliance partner diversity positively moderates the relationship between AMC and incremental co-innovation, such that higher levels of alliance partner diversity strengthen the relationship between AMC and SMEs incremental co-innovation.

4. Methodology

4.1. Research setting

We collected data from internationalizing SMEs operating in the manufacturing sector of the UK. Our sample choice is justified for the following reasons. First, SMEs are considered as the backbone of the UK economy as they contribute to 47% of their revenue and account for 60% of all private jobs (Business, 2021). At the start of 2021, there were

5.9 million SMEs in the UK, representing 99.9% of private businesses (Business, 2021). Given their pivotal role in the economy, the UK government upgrades support for SMEs to nurture collaborations and boost exporting (Support, 2022). Hence, UK SMEs make an interesting context to study the relevance of alliance management capability for their international expansion. Second, innovation is a key component of the manufacturing industry to tackle the challenges and improve production quality and processes (Magistretti et al., 2022). By engaging in effective collaborative relationships, manufacturing SMEs can get access to a wider range of information sources to develop their products (Radacic et al., 2020). Furthermore, the manufacturing industry is a prominent business sector of the UK, which is considered as the ninth largest nation in the World. Also, UK manufacturing sector employs 2.7 million people, accounts for 45% of total exports, and presents 69% of R&D (Manufacturer, 2022). As such, it is appropriate to study how UK manufacturing SMEs exploit alliance management capability to manage alliance relationships to support collaborative innovation activities and international expansion.

4.2. Sampling and data collection

Data were collected by using an online survey. The population of this study was defined using four criteria: (1) firms with less than 250 employees as commonly used threshold to characterize UK SMEs (Dada and Fogg, 2014, Love et al., 2016); (2) firms that are independent entities and not part of any bigger group; (3) firms operating in the manufacturing industry; (4) firms with an international focus, earning a significant portion of sales from export operations (Boso et al., 2019). These criteria were used to identify the sample from the FAME (Financial Analysis Made Easy) database, which allows the users to access information on 3.8 million companies related to key contact details, size, industry, and exporting (Eldridge et al., 2021, Herbane, 2019). Based on the four criteria, 1200 firms were identified with complete contact information.

An online questionnaire was designed using the Qualtrics platform, which is widely used for data collection across the research functions (Hartmann et al., 2020). The web-link of the questionnaire was sent to 1200 sampled firms. After two follow-ups, we received 248 valid responses, representing a response rate of 20.67%. The response rate is in line with comparable studies using senior executives and managers as key informants (Giotopoulos et al., 2017). Furthermore, following Armstrong and Overton (1977), we compared the early respondent group with the late respondent group based on demographic information and other main variables. The results of the *t*-test revealed no significant difference between the two groups, suggesting that nonresponse bias is not an issue in this study. Furthermore, we verified the knowledge of key informants by asking three questions on a 7-point Likert scale ('very low knowledge' and 'very high knowledge'): (1) knowledge about product and service of the firm; (2) knowledge about alliance management system; and (3) knowledge about international activities. The mean scores for the first, second, third questions were 5.67, 6.21, and 5.13. These outcomes suggest that key informants were competent in providing the necessary knowledge for this study.

The respondents had an average work experience of 3 years. The average number of full-time employees was 97.13, suggesting that firms are medium-sized. The participating firms had been in operation for 20.51 years. The responding firms operate in the high technology industry (39.1%), high technology industry (32.7%), and low technology industry (28.2%).

4.3. Construct measurement

We developed the variable measures based on prior literature studies. All the variables were measured using multi-item scales based on 7-point Likert scale. We thoroughly pre-tested the survey in order to refine the questionnaire and to gain valid and reliable scales (Miao et al.,

2016). First, six experts in the field of strategy commented on the extent to which each item is representative of the relevant construct. Second, a pre-test with executive MBA students was then followed to assess participants' understanding of questions. Finally, the survey was piloted with twelve senior executives to obtain feedback on the clarity of the questionnaire and test run the survey process. The expert panel, pre-testing, and piloting technique resulted in minor modifications in the language of the questionnaire. Details about the measures are provided in Table 2.

Alliance management capability is a firm's ability to manage strategic alliances for resource attainment (Leischnig et al., 2014). It was operationalized as a higher second-order construct consisting of four first-

Table 2
Details of measures, validity and reliability.

Constructs	Factor loadings
Alliance management capability (Source: Schilke & Goerzen, (2010))	
<i>Inter-organizational coordination (CA = 0.81; CR = 0.82; AVE = 0.60)</i>	
COD1 Our activities with our partners are well coordinated.	0.75
COD2 We ensure that our work is synchronized with the work of our partners.	0.86
COD3 There is a great deal of interaction with our partners on most decisions	0.72
<i>Inter-organizational learning (CA = 0.89; CR = 0.89; AVE = 0.67)</i>	
LRN1 We have skills to learn successfully from our partners.	0.92
LRN2 We have the managerial competencies to absorb new knowledge from our partners.	0.87
LRN3 We have effective routines to analyze the information obtained from our partners.	0.74
LRN4 We can successfully integrate our existing knowledge with new information acquired from our partners.	0.73
<i>Alliance proactiveness (CA = 0.83; CR = 0.84; AVE = 0.57)</i>	
PRT1 We strive to prevent our competition by entering into alliance opportunities.	0.76
PRT2 We often take the initiative in approaching firms with alliance proposals.	0.74
PRT3 Compared to our competitors, we are proactive and responsive in finding and "going after" partnerships.	0.83
PRT4 We actively monitor our environment to identify alliance opportunities.	0.70
<i>Alliance transformation (CA = 0.81; CR = 0.81; AVE = 0.58)</i>	
TRN1 We are willing to put aside contractual terms to improve the outcome of our alliances.	0.77
TRN2 When an unexpected situation arises, we would rather modify an alliance contract than insist on the original terms.	0.79
TRN3 Flexibility, in response to a request for change, is characteristic of our alliance management process.	0.73
Radical co-innovation (Source: Kauppila (2015) and Lin et al. (2013)) (CA = 0.79; CR = 0.79; AVE = 0.55)	
RI1 The important driver of our alliance is to use new, breakthrough technologies.	0.77
RI2 The intent of our alliance is to create radical new ideas or ways of doing things.	0.75
RI3 Our alliance helps us to come up with creative ideas that challenge conventional ideas.	0.70
Incremental co-innovation (Source: Kauppila (2015) and Lin et al. (2013)) (CA = 0.77; CR = 0.77; AVE = 0.53)	
II1 The aim of our alliance is to improve efficiency.	0.72
II2 We can rationalize our business operations with alliance.	0.76
II3 Our alliance facilitates the improved quality of existing innovations.	0.71
International expansion (Source: Zahra et al. (2000)) (CA = 0.83; CR = 0.85; AVE = 0.58)	
IEX1 Entering new international markets.	0.71
IEX2 Expanding international operations.	0.74
IEX3 Supporting business activities dedicated to international operations.	0.88
IEX4 Financing business activities dedicated to international operations.	0.71

Note: CA = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted.

order dimensions: 1) inter-organizational coordination, 2) inter-organizational learning, 3) alliance proactiveness, and 4) alliance transformation (Leischnig et al., 2014). All the constructs were measured using this study using multi-item scales adapted from Schilke and Goerzen (2010).

Collaborative innovation activities consist of radical co-innovation and incremental co-innovation. While the former refers to the introduction of breakthrough products and processes via alliance partners (Kobarg et al., 2019), the latter concerns the minor changes in existing products and processes through alliance partners (Bouncken et al., 2018). Following Kauppila (2015), we measured radical co-innovation using three items and incremental co-innovation using three items.

International expansion refers to the extent of international market activities of SMEs (Felzensztein et al., 2015). It was measured using four items developed by Zahra et al. (2000). This scale is validated by previous international business studies to measure the intensity of an SME's foreign expansion activities (Yiu et al., 2007).

Alliance partner diversity relates to the diversity of the partner with which a firm allies (Martínez-Noya & García-Canal, 2021). We operationalized alliance partner diversity by asking firms to answer whether they formed an alliance with any of these partners: customers, suppliers, competitors, research institutes, commercial laboratories, universities, and others. Using the responses to this question and following de Leeuw et al. (2014), alliance partner diversity was created by taking the ratio of the number of partner types maintained by the firm and the maximum possible number of partner types (i.e., 7) and then squaring the result.

We included several *control variables* to account for exigencies that might affect the hypothesized model. Considering the study context and in line with the International Business research that focus on the small businesses domain (Assadina et al., 2019), we included firm size, firm age, international experience, industry, and alliance experience as control variables. Firm size was measured as the number of full-time employees, firm age was measured as the number of years since the business was established in the UK, and the international experience was measured as the number of years doing business abroad. To help correct for skewness, we used the natural logarithm for the three variables. We measured alliance experience as the number of alliances a firm has formed over the last three years. The dummy variable was used to categorize the industries into high technology (1), medium technology (2), and low technology (3).

4.4. Measure validation

We assessed all the multi-item scales in confirmatory factor analysis (CFA) using the AMOs 26.0 and maximum likelihood (ML) estimation. The model fit was assessed using the normed Chi-square (χ^2)/degree of freedom (DF) test and several heuristic fit indices (Bagozzi & Yi, 2012). The psychometric literature suggests that the normed chi-square (i.e., χ^2/DF) should be ideally < 2.00, comparative fit index (CFI) \geq 0.90, normed fit index (NFI) \geq 0.90, root mean square error of approximation (RMSEA) \leq 0.07, and standardized root mean square residual (SRMR) \leq 0.07 (Bagozzi and Yi, 2012). We assessed three sets of measurement models. The first set included four dimensions of alliance management capability: inter-organizational coordination, inter-organizational learning, alliance proactiveness, and alliance transformation. The second set contained scales that measured radical co-innovation, incremental co-innovation, and IE. The third set assesses the full measurement model by including the constructs in the first and second sets. As evident in Table 3, the results of CFA suggest a very good to excellent model fit. The full measurement model suggests a very good model fit: $\chi^2/df = 1.15$; RMSEA = 0.02; NFI = 0.95; CFI = 0.99; and SRMSR = 0.04.

Furthermore, Table 2 results provide support for the convergent validity because all the standardized factor loadings were significant and positive (Bagozzi & Yi, 2012). The convergent validity of scales is also confirmed as all the factor loadings were greater than the

Table 3
Measurement models and fit indices.

Measurement models	χ^2/df	p-Value	RMSEA	NFI	CFI	SRMSR
Set 1	1.19	0.13	0.03	0.96	0.99	0.04
Set 2	1.23	0.20	0.03	0.97	0.99	0.03
Set 3	1.15	0.07	0.02	0.95	0.99	0.04

Note: Set 1: inter-organizational coordination, inter-organizational learning, alliance proactiveness, alliance transformation; Set 2: radical co-innovation, incremental co-innovation, international expansion; Set 3(full measurement model): all items retained in set 1 and set 2 were modeled simultaneously.

recommended threshold value of 0.50 (Kline, 2016). In addition, we estimated the values of Cronbach alpha and composite reliability, which were well above the recommended threshold of 0.70 and 0.60 respectively (Kline, 2016). Discriminant validity is supported because the values of average variance extracted (AVE) exceeded the recommended cut-off value 0.50 (Bagozzi & Yi, 2012). Also, following Fornell and Larcker (1981) recommendation, the square root of AVE for each construct is greater than the correlation between each pair of constructs, as shown in Table 4.

The common method bias (CMB) concern may arise given the cross-sectional nature of this study. Therefore, we followed statistical procedures to assess the CMB (Podsakoff et al., 2003). Specifically, we estimated three competing models. Model 1 was a method-only model where all the items were loaded onto a single latent construct: $\chi^2/df = 4.47$; RMSEA = 0.12; NFI = 0.67; CFI = 0.72; and SRMSR = 0.08. Model 2 was a trait-only CFA where all the items were loaded onto respective latent constructs: $\chi^2/df = 1.14$; RMSEA = 0.02; NFI = 0.96; CFI = 0.99; and SRMSR = 0.04. Model 3 was a method-and-trait model where a common factor was introduced linking all the items in Model 2. Accordingly, the fit indices of three models were compared to determine which one fits the data well. The results suggest that Model 2 and Model 3 are better than Model 1, and that Model 3 is not substantially better than Model 2, thus confirming that CMB does not describe our study findings.

5. Structural model results

The conceptual model of the study was analyzed using the structural equation modeling (SEM) technique and ML estimation in AMOS 26.0. We estimated a structural model with all the main variables of the study and control variables. Subsequently, the fit indices for the structural model indicate a good model fit: $\chi^2/df = 1.24$; RMSEA = 0.03; NFI = 0.96; CFI = 0.98; and SRMSR = 0.03. Fig. 2 presents the results of hypotheses testing and suggests that all the paths are statistically significant.

Several control variables had significant effects on IE. In particular, Fig. 2 shows that larger firms attained higher IE. The industry dummy was negatively related to IE, which suggests that firms in the low-technology industry had a weaker international expansion rate. We also included control paths for radical and incremental co-innovations. We only find marginal support for the industry dummy that is positively associated with radical co-innovation.

Consistent with hypothesis 1, alliance management capability exhibited a strong significant impact on radical co-innovation ($\beta = 0.67$, $p < 0.001$). Thus, hypothesis 1 is confirmed. The study in hypothesis 2 argues that alliance management capability is positively related to incremental co-innovation. The results in Fig. 2 show that the path from alliance management capability to an incremental co-innovation is significant and positive ($\beta = 0.48$, $p < 0.001$), thereby providing support for hypothesis 2. Hypothesis 3 relates to the positive effect of radical innovation for IE. We found in Fig. 2 that the effect of radical co-innovation on international expansion is positive and significant ($\beta = 0.33$, $p < 0.001$), thus leading support to hypothesis 3. Finally, the path

Table 4
Descriptive statistics and correlation estimates.

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Inter-organizational coordination	5.44	0.99	0.78												
2. Inter-organizational learning	5.44	1.03	0.58 ^{***}	0.82											
3. Alliance proactiveness	5.32	0.96	0.51 ^{***}	0.52 ^{***}	0.76										
4. Alliance transformation	5.36	0.91	0.51 ^{***}	0.41 ^{***}	0.52 ^{***}	0.76									
5. Radical co-innovation	5.36	0.96	0.47 ^{***}	0.37 ^{***}	0.41 ^{***}	0.45 ^{***}	0.74								
6. Incremental co-innovation	5.24	0.94	0.50 ^{***}	0.49 ^{**}	0.49 ^{**}	0.47 ^{**}	0.45 ^{***}	0.73							
7. International expansion	5.09	0.92	0.43 ^{**}	0.02	0.09	0.08	0.08	0.42 ^{**}	0.76						
8. Firm size [#]	1.81	0.46	0.10	0.06	0.09	0.08	0.08	0.14 [*]	0.14 [*]	1.00					
9. Firm age [#]	2.79	0.68	0.06	0.07	0.08	0.08	0.07	0.12 [†]	0.17 ^{**}	0.17 ^{**}	1.00				
10. Industry ⁺	1.89	0.81	-0.127 [*]	-0.12 [†]	-0.128 [*]	-0.140 [*]	-0.03	-0.01	-0.16 ^{**}	0.09	-0.05	1.00			
11. International experience [#]	1.97	0.65	-0.05	0.01	0.03	-0.03	0.02	-0.06	0.03	0.17 ^{**}	0.69 ^{***}	-0.02	1.00		
12. Alliance experience	2.02	1.12	0.10	-0.02	-0.01	0.03	0.05	-0.01	-0.09	-0.03	-0.05	-0.07	1.00		
13. Alliance partner diversity	0.80	0.16	0.10	0.07	0.09	-0.02	0.14 [*]	0.24 ^{***}	0.06	0.00	0.12	-0.02	0.02	-0.02	1.00

Notes: Bold values in diagonal are square roots of AVE; S.D. = Standard deviation; # = Natural logarithm transformation of the original values; + = Dummy variable; Significance levels: † p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.

from incremental co-innovation to international expansion was significantly positive ($\beta = 0.29, p < 0.001$). Thus, hypothesis 4 is confirmed.

In addition, we test the mediating effect of collaborative innovation activities for alliance management capability and international expansion relationships, as proposed in Hypothesis 5. We adopted Bootstrap technique (Zhao et al., 2010) and Sobel's (1982) test to determine the significance of the mediation effect. First, we employed bootstrapping technique using 95% confidence interval (CI) with 5000 bootstrap resamples in PROCESS macro. The results suggest the significant indirect effect for radical co-innovation ($\beta = 0.10$) and incremental confidence ($\beta = 0.09$), thereby supporting H5a and H5b respectively. Moreover, the confidence intervals for radical co-innovation (Low CI = 0.02; High CI = 0.18) and incremental co-innovation (Low CI = 0.01; High CI = 0.16), do not contain zero, thereby confirming that mediation effects exist. Second, the results of Sobel's (1982) test show that alliance management capability promotes the international expansion of SMEs via radical co-innovation ($Z = 2.71; p < 0.01$). In addition, the relationship between alliance management capability and international expansion is channeled through incremental co-innovation ($Z = 2.74; p < 0.01$). Thus, the results confirm the mediating effect of collaborative innovation activities.

Hypothesis 6 is divided into two parts (hypothesis 6a and hypothesis 6b) that relate to moderating effect of alliance partner diversity (APD). For hypothesis 5a, we found that APD positively moderates the relationship between AMC and radical co-innovation ($\beta = 0.19, p < 0.001$) such that the association between AMC and radical co-innovation is stronger at higher levels of APD ($\beta = 0.69, p < 0.001$) as compared to lower levels of APD ($\beta = 0.27, p < 0.001$). Hence, hypothesis 6a is confirmed. Relatedly, we tested hypothesis 6b and found support as the interaction term between AMC and APD is positively and significantly related to incremental co-innovation ($\beta = 0.14, p < 0.01$). Specifically, the linkage between AMC and incremental co-innovation is stronger at a higher level of APD ($\beta = 0.58, p < 0.001$) as compared to lower levels of APD ($\beta = 0.19, p < 0.01$).

We further analyzed the nonlinear moderation effect of APD to understand the turning point of the relationship. To do this, we created the quadratic term APD^2 . The results suggest the presence of nonlinear moderation because the co-efficient of the quadratic moderation term was significant. This suggests that the AMC and APD^2 interaction term is positively and significantly related to radical co-innovation ($\beta = 0.21, p < 0.01$) but insignificantly related to incremental co-innovation ($\beta = 0.07, p > 0.10$). This confirms that the U-shaped moderation effect of APD exists for AMC and radical co-innovation relationship. Specifically, the effect of AMC on radical co-innovation varies as a non-linear function of the APD.

The results of the hypotheses with the conclusion are summarized in Table 5.

6. Discussion and implications

The overarching aim of this study is to investigate the effect of AMC on international performance and specify the mechanism through which the value of these capabilities can be unlocked to advance the international expansion of SMEs. In addition, we tested the effect of partner diversity as a contextual condition that can influence the effect of AMC. We validated our model and predictions with data collected from 248 SMEs in UK manufacturing industries.

Overall, the analysis indicates that co-innovation activity plays an important mediating role, acting as a significant intermediate mechanism between AMC and SMEs' international expansion. While many studies explored the impact of AMC on firms various performance variables (as summarized in Table 1), the specific linkages between such capabilities and international expansion are still not well established. Thus, by linking AMC with radical and incremental co-innovation, then examining the mediating effect of co-innovation on SMEs' international expansion, we extend our understanding on the relationship between

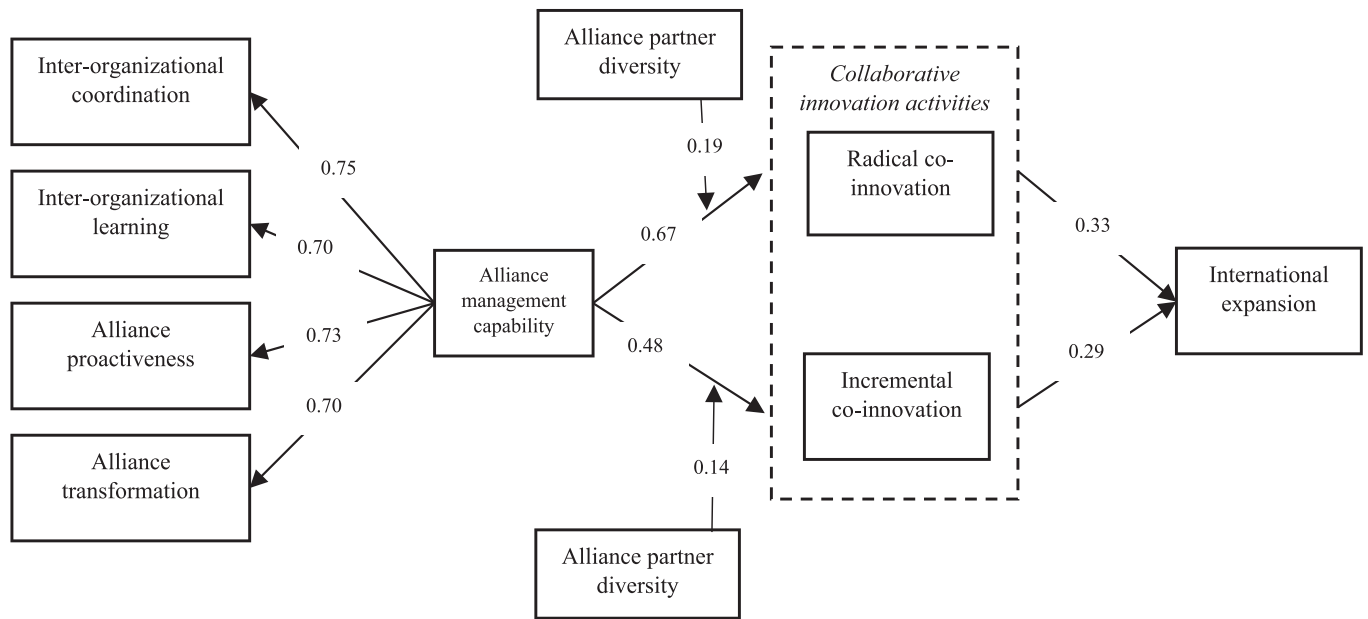


Fig. 2. Results of hypotheses testing.

Table 5
Summary of results.

Hypothesis Number	Path	Results	Conclusion
H1	Alliance management capability → Radical co-innovation	0.67***	Supported
H2	Alliance management capability → Incremental co-innovation	0.48***	Supported
H3	Radical co-innovation → International expansion	0.33***	Supported
H4	Incremental co-innovation → International expansion	0.29***	Supported
H5a	Mediating role of Radical co-innovation	0.12*	Supported
H5b	Mediation role of Incremental co-innovation	0.10*	Supported
H6a	Alliance partner diversity as a moderator for Radical co-innovation	0.19***	Supported
H6b	Alliance partner diversity as a moderator for Incremental co-innovation	0.14**	Supported

SMEs’ alliance capabilities, co-innovation and international expansion. Such results on SMEs’ external innovation activities demonstrate that developing AMC plays a critical role not only in managing complex external relationships (Robson et al., 2019), but also to facilitate knowledge sharing and joint working procedures for radical and incremental co-innovation (Bouncken et al., 2018).

6.1. Theoretical contribution

The findings of the study offer several theoretical implications in the context of SMEs. Importantly, the study extends the studies that used the RBV as a theoretical lens in the IB literature (e.g., Hessels and Parker, 2013, Lu et al., 2010, Magni et al., 2021) by developing and empirically validating a model that identifies the effect of AMC (as a specific relational capability) on SMEs international expansion. Following the RBV, while AMC are regarded as resources vital for the creation of a firm’s competitive advantage, mere possession of resources is not sufficient condition to develop the competitive advantage or create value (Sirmon

et al., 2007, Barney and Arian, 2001). To realize the value potential of resources, firms need appropriate actions to exploit the resources (Sirmon and Hitt, 2003, Ray et al., 2004). Therefore, this study adds to the body of knowledge by investigating how SMEs can capitalize on strategic actions (radical and incremental co-innovation) to leverage the value of AMC for internationalization performance. Specifically, while the literature has investigated the role of AMC for innovation and internationalization (as in Table 1) (Ritter and Gemünden, 2003, Bougrain and Haudeville, 2002, Tolstoy and Agndal, 2010), the interplay between AMC, strategic actions and internationalization performance has received scant attention. AMC promotes the effective governance of alliances to support radical and incremental co-innovations. Thus, SMEs can become knowledgeable and utilize collaborative innovation activities for improved international expansion. While some studies have ignited debates on whether alliance management capability drives the internationalization of SMEs (Sedziniuskiene et al., 2019; Zahoor et al., 2020), our findings confirm that AMC can promote international expansion through collaborative innovation activities. By doing so, the

first empirical support was found for the significant mediating effect of radical and incremental co-innovation for the relationship between AMC and internationalization performance.

In addition, while previous studies have either included a few of alliance capabilities, or adopted a simplified approach for accounting for AMC (e.g., total number of alliances) (Li et al., 2018), we offered a more detailed account by including the four most comment dimensions of AMC while testing their effect on SMEs internationalization. More specifically, we contribute to the extant AMC literature by empirically testing the AMC construct and its dimensions (that are inter-organizational coordination, inter-organizational learning, alliance transformation, and alliance proactiveness) in the context of SMEs. Despite extensive research in the AMC literature acknowledges the second-order nature of AMC construct (Kauppila, 2015, Leischnig et al., 2014) and identifies a number of its constituent dimensions (Schilke and Goerzen, 2010, Schreiner et al., 2009), there is a dearth of research to integrate the AMC's dimensions in one study, particularly in the context of SMEs. While the critical importance and advantages of IOC for SMEs has long been recognized, the apparent benefits of AMC for IOC of SMEs has been a neglected area of research. Thus, the study widened the scope of AMC research and provided sufficient evidence for the appropriateness of AMC for small-sized firms. The findings also confirm the package nature of AMC that makes alliance management capability particularly relevant for SMEs.

Moreover, our research reveals that collaborative innovation activities significantly influence SMEs' international expansion. Specifically, our findings demonstrate the importance of both radical co-innovation and incremental co-innovation in facilitating international expansion. These activities provide SMEs with novel products and processes, enabling them to outperform their international competitors (Lew et al., 2013). This contribution is noteworthy as it enhances the existing internationalization literature by establishing a clear link between complex collaborative innovation activities and the international expansion of SMEs (Agostini and Nosella, 2019, Audretsch and Guenther, 2023). Notably, SMEs would rely on their radical and incremental co-innovation activities to derive success in international markets. By integrating knowledge and developing innovative products and processes, SMEs can effectively outperform competitors in the global landscape (Nordman and Tolstoy, 2016).

Our research also contributes to the alliance literature with the findings of alliance partner diversity. Although partner diversity is well-known to drive innovation (Messeni Petruzzelli, 2008), its impact on the relevance of alliance capabilities and collaborative innovation remains very limited. The findings show that partner diversity influences the link between AMC and radical co-innovation as well as AMC and incremental co-innovation. This implies that the contribution of AMC would differ under varying level of alliance partner diversity. Two perspectives can be used to interpret these results. On one hand, the familiarity perspective (Schreyögg and Kliesch-Eberl, 2007, Schilke, 2014) emphasizes that radical co-innovation often involves new and complex elements, and thus SMEs need to break free from the rigidity trap by engaging in diverse partner relationships and leveraging their AMC. On the other hand, the learning perspective (Bower and Hilgard, 1981) suggests that low partner diversity may limit SMEs' exposure to different ways of working with partners, potentially leading to redundant learning opportunities. Consequently, alliance partner diversity acts as a moderator, influencing the positive relationship between AMC and radical co-innovation. At low levels of alliance partner diversity (i.e., the left tail of the U-shaped relationship), this positive relationship is weakened. Conversely, at medium to high levels of alliance partner diversity (i.e., the right tail of the U-shaped relationship), the positive relationship between AMC and radical co-innovation is amplified. This U-shaped moderation reveals that the interplay among AMC, alliance partner diversity, and radical co-innovation is more intricate than a simple linear relationship.

Finally, we further contribute by considering the context of SMEs,

which constitute 90% of businesses and account for 50% of global employment (Bank, 2021). Despite their substantial presence, SMEs have received limited attention in the mainstream discussion on AMC, even though scholars acknowledge that SMEs actively engage in collaborative innovation activities (Kim and Hemmert, 2016, Pullen et al., 2012). Our study highlights the vital role of AMC for SMEs to effectively harness external relationships, integrating relational-embedded knowledge and efficiently applying it to drive innovation and international expansion by small firms (Sedzinauskiene et al., 2019, Zahoor et al., 2020). As such, we show that SMEs' success in the dynamic global market depends on their ability to leverage AMC as a crucial asset for enhancing their collaborative innovation endeavors and facilitating international expansion. By shedding light on this aspect, our research contributes to a more comprehensive understanding of AMC's implications in the context of SMEs.

6.2. Implications for practice

From a practical and policymakers' perspective, this study provides guidance regarding the success of collaboration relationships. Managers can analyze the alliance management routines of their own company, which helps in deciding if alliances are a success-promising option for the company. On the other hand, weak management routines that require further improvement can be detected and developed. The adherence of these alliance management routines is shown to have a significant association with strategic action. Based on this knowledge, managers will be able to fine tune their alliance management routines and significantly improve their joint actions. In particular, inter-organizational coordination, alliance bonding and alliance proactiveness are core routines to establish alliance transformation and inter-organizational learning routines. SMEs need to have a corporate culture that is characterized by high alertness with the external environment. Alliance proactiveness routines can help managers to identify the potential opportunities in the external environment. SMEs should possess effective routines to establish close ties with partners and facilitate the bonding routines. With respect to alliance transformation, SMEs are characterized as flexible, but they need openness to transform the existing practices and alliance structures if required. In addition, SMEs need adequate routines to transfer the knowledge across organizational boundaries and thus improve inter-organizational learning. By developing the routines for coordinated interactions, SMEs can develop AMC that lead to efficient strategic actions, which in turn improve internationalization performance.

Moreover, the findings of this study suggest that managers should develop value creation mechanisms. It helps to realize the strategic objectives that are mutually beneficial for allying partners. For instance, radical and incremental co-innovation are strategic action that are based on the value creation mechanism. In addition, SMEs' managers should always strive towards developing AMC by considering the nature of strategic actions. The immediate insight from this finding for managers is that where possible, alliance department/managers should benchmark the value of AMC for strategic action considering its complexity.

6.3. Limitations and future recommendations

Our study has some limitations that offer avenues for future studies. First, the sample of our study consists of manufacturing SMEs as well as a single country focus (UK). These features of our data limit our ability to generalize to other developed country and emerging market contexts. Indeed, the nature of alliance management capability, collaborative innovation activities, and international expansion relationships can vary in different industrial contexts. We suggest that future studies can consider other industry contexts such as retail and services as well as other countries, to increase the generalizability of our study findings. The developing economy context also provides an opportunity to further explore this subject. Also, our study uses cross-sectional data that may

impede the understanding of mediation effects. In this endeavor, future studies can use longitudinal data to analyze the conceptual model of our study. Our research also uses managerial perceptions to measure the study's variables due to difficulty in obtaining objective data about alliance management capability and international expansion, especially in SMEs. The use of objective data could enhance the contribution of future studies.

CRedit authorship contribution statement

Omar Al-Tabbaa: Conceptualization, Methodology, Investigation, Writing - Original Draft, Writing - Review & Editing, visualization, Supervision, Project administration. **Nadia Zahoor:** Conceptualization, Formal analysis, Methodology, Writing - original draft.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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