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Responsible innovation in emerging markets' SMEs: The role of alliance learning and absorptive capacity

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Abstract

This paper presents an examination of the role played by alliance learning in enabling emerging market small and medium-sized enterprises (SMEs) to develop responsible innovation. SMEs based in emerging markets face significant challenges due to their weak resource base and the limited support they receive from formal institutions. In such a context, we argued that alliance learning takes a more prominent role in enabling these firms to develop responsible innovation via their absorptive capacity and sense-making competency. Drawn from 176 survey responses from SMEs originating from Pakistan, our findings shed light on the vital role played by alliance learning in enhancing SMEs' responsible innovation. Specifically, the findings indicate that absorptive capacity acts as an important mechanism between alliance learning and responsible innovation. In addition, sense-making competency emerges as an important boundary condition and as a vital dynamic capability under which the effects of alliance learning on responsible innovation are stronger through the mediating mechanisms of absorptive capacity. These moderating-mediating findings contribute to the literature on dynamic capabilities and responsible innovation and provide important insights into the mechanisms and boundary conditions of responsible innovation in the context of emerging Asian markets.

Keywords Alliance learning · Absorptive capacity · Sense-making competency · Responsible innovation · SMEs · Pakistan

Responsible innovation represents a sub-set of sustainability-oriented innovation (Genus & Iskandarova, 2018; Halme & Korpela, 2014) as incorporating social, environmental, and economic objectives. It is defined as "*taking care of the future through collective stewardship of science and innovation in the present*" (Stilgoe et al., 2013, p. 1570). Responsible innovation is becoming increasingly important in policy circles due to its impact on society, with stakeholders increasingly demanding

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that firms become socially responsible. In such a context, a firm's ability to address societal issues can provide it with much-needed legitimacy and sustainable competitive advantage. Given the weak capacity of the state to address these issues, environmental issues can have far-reaching implications for the emerging Asian, African, and Latin American markets, requiring both large firms andsmall and medium-sized enterprises (SMEs) to address such challenges and find viable solutions. For example, the Asian Development Bank intends to connect research and innovation to the values of Asian society and place a strong emphasis on Grand Societal Challenges (GSCs), such as health, energy, climate change, science education, gender equity, and environmental responsibility (Park & Kim, 2020). The South East Asian research and innovation programs focus on responsible innovation by engaging all societal actors in research and innovation activities for societal needs and values (Ong, 2021). In Pakistan—a rapidly growing yet developing country, the government is undertaking structural reforms aimed at setting the country in the movement toward sustainable development by making use of cross-sectoral research and innovation (Government of Pakistan, 2019). Responsible innovation is at the core of the Pakistan Vision 2025 initiative, which is aimed at supporting research and innovation interaction to address GSCs (Government of Pakistan, 2018). This calls upon firms to be committed to responsible innovation in their policy formulation and day-to-day business operations (Scherer & Voegtlin, 2020; Voegtlin & Scherer, 2017).

Regarding responsible innovation, the extant research often tends to focus on multinational enterprises (MNEs) due to their large portfolios of resources (Chatterjee et al., 2021; van der Waal et al., 2021). However, MNEs often adopt policies that foster wrongdoing and unethical behaviors (Aïssaoui & Fabian, 2021). As such, it is "*not sufficient to consider the MNEs' intent alone*" (Prashantham & Birkinshaw, 2020, p. 1163); SMEs should be taken into account to fill the innovation gaps and protect communities and the planet (Courrent et al., 2018; Halme & Korpela, 2014). Given their importance in employment creation and economic growth (Hughes et al., 2018; Lim et al., 2020), SMEs are important players in tackling serious issues and grand challenges, and they play an extremely important role in responsible innovation. In Asia, SMEs make up more than 96% of all businesses, providing two-thirds of private-sector jobs and contributing 17% to 50% of national Gross Domestic Products (GDPs) (Yoshino & Taghizadeh-Hesary, 2018). Therefore, due to their closeness to grassroot actors and stakeholders, Asian SMEs are essential vectors to the achievement of responsible innovation (Khurshid & Snell, 2021; Loon & Chik, 2019). Moreover, Asian SMEs possess certain characteristics (e.g., flexibility and risk-taking) that are needed for responsible innovation (Courrent et al., 2018; Hadj, 2020).

However, Asian SMEs find making responsible innovation efforts particularly difficult due to their liability of smallness and lack of institutional support (Wellalage et al., 2019; Wu & Deng, 2020). The duality between the generation of scientific innovation and effects on social needs creates responsible innovation tensions (Brand & Blok, 2019). This requires SMEs to possess resources and capabilities sufficient to enable them to continuously address their responsible innovation mission (Ambos & Tatarinov, 2021). To date, however, scholars have failed to consider the resources and capabilities that might promote SMEs' responsible innovation in

dynamic marketplaces such as those observed across emerging economies (Lubberink et al., 2017; Voegtlin et al., 2021). This calls for more research to investigate the resources and capabilities that enable SMEs to develop responsible innovation (Foroudi et al., 2021; Veronica et al., 2020).

The strategic alliance literature suggests that, unlike large firms, which are more inward-looking and self-sufficient, SMEs often rely on alliance learning to survive and compete (Subramanian et al., 2018; Yoo et al., 2016). Alliance learning reflects the information and skills that SMEs acquire from their alliance partners, which include customers, suppliers, research institutions, and public sector organizations (Fredrich et al., 2019). These can act as an important resource for the strategic renewal of SMEs, enabling them to augment their weak capabilities stemming from their lack of internal resources for knowledge creation (Ahokangas et al., 2021). As such, alliance learning can help SMEs to handle the knowledge- and idea-related complexities involved in responsible innovation (Ambos & Tatarinov, 2021; Courrent et al., 2018). However, the mere availability of alliance learning is insufficient to ensure that SMEs will successfully internalize the related knowledge in ways suited for responsible innovation (Hughes et al., 2014). Indeed, the dynamic capability perspective (Teece, 2007; Teece et al., 1997) suggests that simple heterogeneity in SME resource endowment is not sufficient in the dynamic environment; the capabilities that enable SMEs to deploy and leverage resources in ways that match the market environment are the main source of interfirm performance differences (Makadok, 2001; Teece et al., 1997). In this sense, dynamic capabilities are seen as "*the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die*" (Eisenhardt & Martin, 2000, p. 1107). As such, we regard absorptive capacity as a unique dynamic capability that can explain the effects of alliance learning on SME's responsible innovation (Siachou et al., 2021).

More importantly, the dynamic capability literature suggests that SMEs need to possess complementary capabilities to effectively utilize any available resources in ways that are aligned with the market environment and consequently drive responsible innovation (Helfat, 1997; Teece, 2007). Accordingly, we suggested that a sense-making competency—i.e., a bundle of "*routines that shape what information is assimilated, how it is interpreted, and which actions are considered*" (Neill et al., 2007, pp. 731–732)—can complement an SME's absorptive capacity to drive responsible innovation. Stated differently, a sense-making competency can moderate the relationship between alliance learning and responsible innovation via absorptive capacity. When SMEs possess a strong sense-making competency, they can develop a good understanding of their environment and alliance relationships (Mattsson et al., 2015). Moreover, a strong sense-making competency facilitates the exchange of information with alliance partners, thereby promoting absorptive capacity for responsible innovation (De Marchi et al., 2018).

Against this background, we sought to answer the following research questions: "*What is the effect of alliance learning and absorptive capacity on SME responsible innovation?*" and "*To what extent does sense-making competency moderate the relationship between absorptive capacity and responsible innovation?*" To do so, we leveraged survey data from 176 SMEs based in Pakistan.

Our study makes three important contributions to the extant literature. First, it deviates from much of the literature focused on the conceptual understanding of responsible innovation (Scherer & Voegtlin, 2020; Stilgoe et al., 2013; Voegtlin & Scherer, 2017) and the empirical examination of large firms (Arslan & Tarakci, 2020; Leyva-de la Hiz et al., 2019). It does because, in contrast to such literature, it sought to obtain empirical evidence relevant to the underlying mechanisms of responsible innovation found in SMEs based in emerging markets. Second, by establishing links between alliance learning, absorptive capacity, and responsible innovation, our study contributes to our understanding of the hitherto underexplored relationship between alliance learning and responsible innovation in SMEs. Thus, it contributes to the responsible innovation literature by uncovering the underlying mechanisms through which alliance learning influences responsible innovation in SMEs. Third, it contributes to the dynamic capability literature (Teece, 2007) by offering a deeper understanding of the role played by complementary capabilities—i.e., absorptive capacity and sense-making competency—in enabling SMEs to develop responsible innovation in resource-constrained Asian environments. Specifically, our study framework explicates an understanding of how sense-making competencies play a moderating role in the relationship between absorptive capacity and responsible innovation. Fourth, our study utilized a unique sample—SMEs based in Pakistan (i.e., a rapidly growing Asian economy). In less developed countries—and particularly Asian ones—responsible innovation remains under-researched. The overwhelming focus on developed countries calls into question the generalizability of responsible innovation findings. Our study thus represents a step forward toward addressing this issue specifically in the context of resource-constrained SMEs.

Theoretical background

Responsible innovation

Responsible innovation is a complex and dynamic phenomenon aimed at socially desirable ends for value creation (Bacq & Aguilera, 2021). It takes into account different perspectives of innovation and considers a wide variety of stakeholders both inside and outside the scientific system that can be involved in innovation processes (Blok, 2019; Stilgoe et al., 2013) to assess policy implications and target government bodies (Owen et al., 2021). As such, responsible innovation refers to "*a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view on the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products*" (von Schomberg, 2011, p. 50). In this context, responsible innovation involves a proactive approach that encompasses, from the start, the establishment of structures and procedures to govern the innovation process (Brand & Blok, 2019) and to meet three types of responsibilities: (1) to do no harm (Lee & Petts, 2013), (2) to do good (Stahl & Sully de Luque, 2014), and (3) to engage in responsible governance (Scherer & Palazzo, 2011).

This understanding differs from social innovation, which involves "*innovative activities and services that are motivated by the goal of meeting a social need and that are predominantly diffused through organizations whose primary purposes are social*" (Mulgan, 2006, p. 146). Responsible innovation takes a broader perspective by considering a wider spectrum of actors—including private, public, and civil societies—and all possible collaborations between them (not being limited to specific organization types) (Scherer & Voegtlin, 2018). Moreover, for the societal acceptability of innovations, responsible innovation involves complex control processes at the corporate, societal, and global levels (Voegtlin & Scherer, 2017). Given the liabilities of smallness and newness that affect SMEs, this may present them with resource-related challenges in their efforts to do good (Lopes de Sousa Jabbour et al., 2020). As Ebrahim et al. (2014) argued, the challenges posed by responsible innovation for organizations lie in their ability to solicit ideas from and fulfil the demands of principal stakeholders. As SMEs—and particularly those operating in the Asian context—are resource-constrained (De et al., 2020; Khurshid & Snell, 2021), they need to seek appropriate ways to do good, avoid harm, and coordinate with stakeholders, thereby realizing responsible innovation.

Alliance learning and responsible innovation: The dynamic capabilities perspectives

Responsible innovation intends to have a positive impact on and to contribute to overcoming societal challenges (Long et al., 2020). However, researchers contend that not all organizations are willing and able to participate in it (Ambos & Tatarinov, 2021; Bacq & Aguilera, 2021). Indeed, responsible innovation is costly and can overstretch the resources of organizations and society as a whole (Scherer & Voegtlin, 2018). This poses significant challenges for resource-constrained firms, such as SMEs, to engage in responsible innovation despite their focus on sustainability (Gonzales-Gemio et al., 2020). In this regard, strategic alliances act as a viable option to enhance a firm's resource portfolio and provide solutions to societal challenges (Arslan & Tarakci, 2020). Strategic alliances enable SMEs to develop strategies that benefit both individuals and communities (Cacciolatti et al., 2020). In particular, strategic alliances promote alliance learning, which is crucial in the co-creation of value with partners through frequent exchanges of knowledge (De Marchi et al., 2018; Jean et al., 2010; Najafi-Tavani et al., 2020). Alliance learning relates to the joint activities undertaken between SMEs and their partners to acquire information and know-how to the end of creating value (Chang & Gotcher, 2007; Kale et al., 2000). The availability of novel information and skills that stem from alliance learning enables SMEs to remain successful in dynamic marketplaces (Xiao et al., 2020). As such, alliance learning has the potential to promote responsible innovation in SMEs.

Despite the plethora of evidence on the importance of strategic alliances in addressing societal issues (Arslan & Tarakci, 2020; Cacciolatti et al., 2020; Inigo et al., 2020), how alliance learning can promote responsible innovation in SMEs have hitherto remained unclear (Blok, 2019; Voegtlin et al., 2021). Our study

represents an attempt to fill this research gap by drawing insights from the dynamic capability perspective (Teece, 2007, 2014). Specifically, we proposed an "*evolutionary fitness view*, *which refers to how well a dynamic capability enables an organization to make a living by creating, extending, or modifying its resource base*" (Helfat & Peteraf, 2009, p. 98). We argued that alliance learning is an important channel to develop key capabilities due to the timely acquisition and leveraging of external knowledge. Alliance learning enables SMEs to extract and capture valuable relationship-specific knowledge to enhance responsible innovation. However, as the proponents of dynamic capability perspective contend, although it is vital to have access to valuable resources to achieve a competitive advantage, the mere possession of such resources is insufficient; to utilize them effectively, firms need to possess dynamic capabilities (Helfat & Peteraf, 2009; Teece, 2014). By that rationale, although alliance learning (i.e., a strategic resource) is important to achieve responsible innovation (i.e., a competitive advantage), its leveraging requires SMEs to possess and employ dynamic capabilities. Thus, we consider absorptive capacity to be a vital dynamic capability because it can enable SMEs to make sense of and utilize any available external knowledge for societal good by seeking responsible innovation (Apriliyanti & Alon, 2017; Pittz et al., 2019).

As defined by Cohen and Levinthal (1990), absorptive capacity relates to a firm's ability to recognize, assimilate, and apply external knowledge for value creation. When SMEs engage in alliance learning, their absorptive capacity is promoted through the analysis and application of any lessons drawn from externally acquired knowledge, which, in turn, enhance responsible innovation. Others view it as a range of skills that are required to deal with the tacit mechanisms of transferred technology (Mowery & Oxley, 1995) or as the ability to learn and solve problems (Kim, 1998). A more recent conceptualization considers absorptive capacity to be a dynamic capability made up of two unique dimensions—potential and realized absorptive capacity (Zahra & George, 2002). Potential absorptive capacity is related to the acquisition and assimilation of external knowledge (Zahra & George, 2002), which "*captures* Cohen and Levinthal's (1990) *description of a firm's capability to value and acquire external knowledge but does not guarantee the exploitation of this knowledge*" (p. 190). The latter (i.e., knowledge exploitation) requires absorptive capacity, which relates to a firm's ability to leverage the absorbed knowledge for value creation (Zahra & George, 2002). Thus, we view absorptive capacity as a second-order construct (Camisón & Forés, 2010; Sheng & Chien, 2016), the possession of which enables SMEs to deploy and leverage their alliance learning in ways that match the market environment and promote responsible innovation (Dzhengiz & Niesten, 2020). Stated differently, absorptive capacity mediates the relationship between alliance learning and SME responsible innovation. When SMEs engage in alliance learning, they accumulate external knowledge and integrate it with their internally available one (Najafi-Tavani et al., 2020), thus promoting their absorptive capacity to enhance responsible innovation.

More importantly, the dynamic capability perspective posits that competitive advantage is accrued not only from anyone specific capability but from its interaction with other complementary resources and capabilities (Teece, 1986, 2007). The extant literature also suggests that two capabilities could complement each other and

provide more capacity to meet any dynamic market needs, thus reinforcing competitive advantage (Donbesuur et al., 2020; Wei et al., 2020). As such, we considered the complementarity between absorptive capacity and sense-making competency. According to Li and Liu (2014), sense-making competency is the ability to *"develop cognitive maps, to sense and interpret the stimuli or change in the reference frameworks to effectively search for and analyze information from internal and external environment*" (p. 2794). We argued that sense-making competency complements absorptive capacity in the promotion of responsible innovation in SMEs. Put differently, the relationship between absorptive capacity and responsible innovation is moderated by SME sense-making competency.

Thus, as shown in Fig. 1, our study examined the mediating role played by absorptive capacity in alliance learning and responsible innovation. In addition, it investigated the moderating role played by sense-making competency at the alliance learning/responsible innovation nexus via absorptive capacity.

Hypotheses development

Alliance learning and responsible innovation in SMEs

In the current dynamic environments, valuable knowledge resources are spread across networks. Firms of all sizes are thus now far more reliant on their network partners' knowledge and their own internal capabilities to develop responsible innovation aimed at addressing wicked problems. SMEs often enter into strategic alliances to combine their own specific knowledge with that of external partners (Ali et al., 2020; Thomä & Zimmermann, 2020). In particular, SMEs are motivated to engage in alliance learning and combine different sets of knowledge to achieve greater control or to avoid the negative effects of dynamic market environments (Najafi-Tavani et al., 2020). Furthermore, alliance learning is an important approach for promoting competitiveness and creating profits in relationships (Hao & Feng, 2018). As argued by Radziwon and Bogers (2019), SMEs should focus on capturing the knowledge and learning embedded in alliance relationships that support improvement in innovation (cf. Khan et al., 2019). This is particularly relevant for SMEs operating in Asian markets, which have limited resources, lack R&D activities, have no proprietary advantages, and are faced with weak institutional support (Puthusserry et al., 2020; Xiao et al., 2021). Alliance learning may be viewed as an

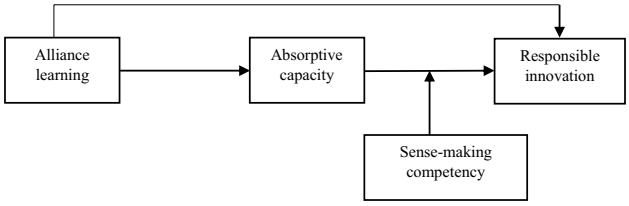

Fig. 1 The conceptual framework of the study

idiosyncratic resource for Asian-market SMEs (Huang et al., 2017; Yi et al., 2017) as, by entering into such arrangements, they can access complementary resources and knowledge suited to overcome any internal resource deficits (Xiao et al., 2020). Alliance learning also provides a means for improving responsible innovation in Asian-market SMEs (Ogbeibu et al., 2021). In this regard, De Marchi et al. (2018) suggested that environmental or social issues do not represent the core business of many organizations, which thus often lack the knowledge needed to foster responsible innovation. When SMEs engage in alliance learning, they are exposed to the innovative ideas of their alliance partners or take a lead from them to improve their own responsible innovation (Lin & Lin, 2016). Alliance learning also creates centers of excellence with new structures suited to disseminate knowledge and develop initiatives for responsible innovation (Ambos & Tatarinov, 2021). As such, we contended that alliance learning—in the form of knowledge exchange with external partners—will foster fruitful responsible innovation in Asian-market SMEs (Arslan & Tarakci, 2020; Yu et al., 2021). Based on the preceding discussion, we formulated the following hypothesis.

H1 Alliance learning is positively related to responsible innovation in SMEs.

The mediating role of absorptive capacity

Beyond our contention that alliance learning has implications for SME responsible innovation, there is still the need to understand the mechanisms that link these concepts (Kohtamäki et al., 2018; Thapa et al., 2019). This issue is of particular importance because any externally acquired knowledge can quickly become obsolete in dynamic environments, such as the resource-constrained Asian markets (Dubey et al., 2020; Zhang et al., 2020a). To respond to dynamic market changes, SMEs are required to efficiently convert their alliance learning into appropriate dynamic capabilities suited to the achievement of performance gains (Jiang et al., 2020). Absorptive capacity is also important for SMEs to overcome the *not invented here* syndrome and capture and create value from their alliance learning (e.g., Antons & Piller, 2014; Katz & Allen, 1982). This is consistent with the dynamic capability perspective (Teece, 2007), which suggests that SMEs need to possess dynamic capabilities suited to alter their resource base to gain competitive advantage. Specifically, the mere possession of alliance learning, as a resource, is insufficient to attain responsible innovation; the latent value of such a resource can only be realized through the possession of dynamic capabilities (Teece, 2012; Teece et al., 1997).

We considered absorptive capacity—i.e., the ability of SMEs to recognize, assimilate, and apply new external knowledge to commercial ends (Zahra & George, 2002)—to be an important dynamic capability suited to generate value (Williams & Shepherd, 2018). In terms of the importance of absorptive capacity, Cohen and Levinthal (1990) noted that R&D efforts end up being bottlenecks and preventing innovation if a firm fails to develop absorptive capacity. In line with this, the dynamic capability literature views absorptive capacity as an important capability that is firm-specific, path-dependent, and socially embedded about achieving performance

gains in dynamic marketplaces (Božič & Dimovski, 2019; Kotabe et al., 2014). SMEs, therefore, need to dedicate efforts to develop their absorptive capacity, which possesses strategic value for responsible innovation. Cohen and Levinthal (1990) argued that absorptive capacity is a function of a SME's prior knowledge; one that gives rise to the ability to recognize the value of new information. In this context, alliance learning is vital for SMEs to promote their absorptive capacity. Alliance learning enables Asian-market SMEs to integrate and exploit any complementary knowledge drawn from diverse sources in the external environment (Najafi-Tavani et al., 2020; Puthusserry et al., 2020). Accordingly, this provides a nurturing space for SMEs to cultivate their absorptive capacity by rebuilding their knowledge system (Mahmood & Mubarik, 2020; Moilanen et al., 2014). Alliance learning also facilitates the smooth process of combining internal and external knowledge to make them compatible and generate and cultivate absorptive capacity in SMEs (Martínez-Sánchez et al., 2020).

Furthermore, absorptive capacity is vital for SMEs to achieve responsible innovation; among the benefits, it can bring to SMEs are the ability to rapidly respond to social and environmental problems, attain first-mover advantages, and avoid any lock-in effects (Mennens et al., 2018; Presutti et al., 2019), which can ultimately enhance responsible innovation. Moreover, absorptive capacity enables SMEs to capture, transform, and exploit external knowledge for responsible innovation. For example, the availability of scientific knowledge from a university or research institute can make it possible for SMEs to reduce any societal problems and to do good or act as a source of responsible innovation (Dzhengiz & Niesten, 2020; Veronica et al., 2020). The exploitation of scientific knowledge also gives rise to new business model possibilities and technological developments for responsible innovation (Courrent et al., 2018). In particular, in the Asian market context, absorptive capacity enables resource-constrained and institutionally disadvantaged firms to manage any externally acquired knowledge and to apply it to community welfare for responsible innovation (Chatterjee et al., 2021; Ortas et al., 2013).

Based on all the above, we argued that the beneficial impact of alliance learning on SME responsible innovation can only be realized through absorptive capacity. The extant scholarship also indicates that the benefits of alliance learning are significantly weaker when the mechanisms necessary to translate often ambiguous external knowledge into useable outcomes are not sufficiently utilized (Ferreira & Fernandes, 2017; Najafi-Tavani et al., 2020). Access to external knowledge alone is inadequate for SMEs—particularly in Asian markets, which are characterized by a lack of institutional support and by the absence of proprietary knowledge (Xiao et al., 2021). The knowledge acquired through strategic alliances must be interpreted and absorbed to prevent unsuitable information from being acted on (Hughes et al., 2014). Importantly, routines about absorptive capacity are vital to determine the usefulness of external knowledge and to modify and exploit such knowledge to develop responsible innovation. When SMEs lack absorptive capacity, they find it difficult to translate into effective learning outcomes (i.e., responsible innovation) any significant amount of knowledge they may have gained from their external partners. Thus, those SMEs who fail to consider the vital role played by absorptive capacity at the alliance learning/responsible innovation nexus may misattribute the underlying

mechanisms of responsible innovation. Therefore, we argued that absorptive capacity can be an important mechanism through which alliance learning influences SME responsible innovation. Thus, we proposed the following hypothesis.

H2 The relationship between alliance learning and SMEs' responsible innovation is mediated by absorptive capacity.

The moderating role of sense-making competency

External market changes make it difficult for resource-constrained SMEs to spot opportunities (Hamel & Prahalad, 1990). Hence, coping with dynamic environments represents a key challenge for SMEs (Hernández-Linares et al., 2021; Wang et al., 2013). A sense-making competency—which reflects the capacity to identify external and internal stimuli and to explore market opportunities and threats (Santoro et al., 2019)—offers one such coping mechanism. As such, it is an important resource for SMEs to sense and filter any strategic opportunities to address changing market environments (Teece, 2012). Indeed, in the weak institutional environments and high dynamism that characterize Asian markets (De et al., 2020; Lopes de Sousa Jabbour et al., 2020), SMEs must utilize a sense-making competency to effectively understand and react to the external environment (Li & Liu, 2014). Particularly, a sense-making competency is vital to identify GSCs, generate ideas, and put in place the mechanisms that facilitate SME responsible innovation (Voegtlin & Scherer, 2017). Furthermore, such a competency adds to a society's sense of uncertainty and ignorance, while revealing new opportunities for the shaping of agendas for socially-robust research and responsible innovation (Stilgoe et al., 2013). However, a sense-making competency needs to be combined with other proactive learning approaches in order to retain any identified opportunities and shape responsible innovation (Genus & Iskandarova, 2018; Scherer & Voegtlin, 2020). When SMEs possess a sense-making competency, they can attain a first-mover advantage by converting their learning and knowledge into responsible innovation that aids sustainable development (Scherer & Voegtlin, 2020). This suggests that the level of a SMEs' sense-making competency could play a crucial role in influencing the relationship between alliance learning and responsible innovation through absorptive capacity. We thus assumed that alliance learning will lead to stronger responsible innovation via absorptive capacity when SMEs exhibit high levels of sense-making competency.

First, any investment made by SMEs in combining different dynamic capabilities, such as a sense-making competency, makes them vigilant in detecting market changes more actively and extensively than their counterparts (Hernández-Linares et al., 2021). Such capabilities can enable the enactment of the vital knowledge absorption routines by which SMEs can achieve responsible innovation. Furthermore, those SMEs that are capable of recognizing any external and internal stimuli and of identifying any external market opportunities are better able to determine the nature of the knowledge that should be absorbed and how such knowledge should be utilized to enhance responsible innovation (Bouguerra et al., 2020). A greater

sense-making competency supports the absorptive capacity of SMEs by augmenting any efforts made to assimilate and exploit the external knowledge that can meet dynamic market and social needs and promote responsible innovation. Therefore, the interaction of a sense-making competency and an absorptive capacity has greater potential to give rise to responsible innovation. This is in line with the dynamic capability perspective, which suggests that complementary capabilities, rather than any single one, can lead to greater firm competitive advantage (Donbesuur et al., 2020; Wei et al., 2020).

Second, a sense-making competency can promote the learning process (Matarazzo et al., 2021) by supporting SMEs in capturing any useful knowledge and enhancing learning from a vast majority of partners, including, customers, suppliers, government bodies, and research institutes (Eisenhardt & Martin, 2000). SMEs can thus engage in alliance learning by acquiring, interpreting, and disseminating information from a broad range of sources that challenge conventional ideas. Those firms that use their sense-making competency to foster alliance learning can become well-prepared to obtain and integrate any relevant knowledge to utilize it for responsible innovation (Teece, 2014). This suggests that a sense-making competency can act as a vital boundary condition for the realization of the indirect effect of alliance learning on responsible innovation. A sense-making competency helps SMEs to identify opportunities and utilize their absorptive capacity by leveraging the value of alliance learning for responsible innovation. This indicates that an absorptive capacity can act as a crucial underlying mechanism between alliance learning and responsible innovation, and that this mediation effect is stronger when SMEs have high levels of sense-making competency.

Thus, we suggested the following moderated mediation hypothesis to explicate the relationship between alliance learning and responsible innovation; one in which an absorptive capacity acts as a mediator and a sense-making competency affects this mediation effect.

H3 A sense-making competency moderates the indirect relationships between alliance learning and SME responsible innovation in such a way that the indirect effect, mediated by an absorptive capacity, is stronger at higher levels of sense-making competency.

Methods and context

We tested our conceptual model by drawing survey data from SMEs based in Pakistan. Following the Pakistani government's Small and Medium Enterprise Development Authority's (SMEDA) policy (Saleem, 2008) policy, we defined SMEs as independent enterprises with fewer than 250 employees. This is a commonly used criterion, given the difficulties that are usually encountered in accessing the financial data of SMEs in the Asian context—and particularly in Pakistan (Mubarik et al., 2016; Rasheed et al., 2017)—as highlighted by previous research (Radulovich et al., 2018; Zhang et al., 2012). Two factors informed our choice of Pakistan as our research setting. First, following the structural reforms introduced by its government

(CEPEC, 2021), Pakistan has become one of the fastest-growing Asian economies. The IMF has projected the country's gross domestic product (GDP) growth rate to be 4% in 2020–2021 (Geo, 2021). In this regard, SMEs represent the core segment that lays the foundations of Pakistan's economic growth, GDP increase, and job creation. The 3.3. million SMEs operating in Pakistan represent 90% of all the country's businesses, employing 80% of the labor force and contributing 40% of the annual GDP (SMEDA, 2021). This suggests the tremendous potential contribution SMEs can make to progressing the economy of Pakistan. Second, Pakistan is showing commendable commitment to the 2030 Agenda for Sustainable development, since being the first country to endorse it globally in 2015 (SDG Pakistan, 2021). SMEs play an important role in achieving sustainable development by favoring inclusive and sustainable industrialization, promoting sound community relations, and fostering innovation (OECD, 2017). The growing importance of sustainable development makes it important to understand how Pakistani SMEs achieve responsible innovation.

Sampling and data collection

Given the difficulty in identifying any single relevant database in developing countries, including Pakistan (Mahmood & Mubarik, 2020), we relied on multiple sources to build our sampling frame. These included the Business Directories and Pakistan Chamber of Commerce databases, from which we identified 650 firms. We then contacted them by telephone to determine whether or not they met our study's criteria—i.e., (1) having fewer than 250 employees and (2) having formed strategic alliances with domestic partners. Out of our original list of 650 firms, 312 qualified and were thus selected for our study. Subsequently, we approached their owners/chief executive officers, senior managers, and middle managers in person with our questionnaire. While this approach is often expensive and time-consuming, it is most effective in developing countries, like Pakistan, where postal surveys are often fruitless due to a lack of trust by SMEs (Khan et al., 2019). The data were collected from July 2020 to January 2021. Local research assistants were hired to administer the questionnaire, and were briefed on it accordingly (Njinyah Sam, 2018). The fieldwork produced a total of 176 useable questionnaires, representing an effective response rate of 56.41%. The respondents' details are presented in Table 1. Given that Pakistan is a former British colony, and English is widely spoken and written in business environments, we administered our questionnaire in the English language (Khan, 2020; Khan et al., 2020).

Measures

Multiple-item scales were used to measure the constructs used in our study. All the main variables were measured using a seven-point Likert scale. Table 2 presents all the scale items along with their reliability and validity estimates.

Alliance learning was considered in terms of the acquisition of critical skills or knowledge from alliance partners (Fredrich et al., 2019). It was measured using three items adopted from Kale et al. (2000) and Schilke and Goerzen (2010).

Table 1 Characteristics of the respondent firms

Description	Number	Frequency %
Industry		
Information and communication technology	32	18.2%
Textile/clothing	16	9.1%
Cotton products	23	13.1%
Sports products	27	15.3%
Machinery	40	22.7%
Electrical products	24	13.6%
Support service activities	9	5.1%
Others	5	2.8%
Firms' size		
Small	72	40.9%
Medium	104	59.1%
Firms' location		
Lahore	45	25.56%
Islamabad	37	21.02%
Karachi	25	14.20%
Sialkot	19	10.80%
Faisalabad	16	9.09%
Multan	13	7.39%
Gujranwala	13	7.39%
Sargodha	8	4.55%
Respondents' role		
Owners/CEOs	117	66.5%
Senior management	41	23.3%
Middle management	18	10.2
Respondents' tenure		
< 3 years	61	34.7%
3–5 years	93	52.8%
> 5 years	22	12.5%

Absorptive capacity refers to the routines and processes by which firms acquire, assimilate, transform, and exploit any information residing outside their boundaries (Gölgeci & Kuivalainen, 2020). Following the previous literature (Lau & Lo, 2015; Soo et al., 2017), we conceptualized absorptive capacity in terms of its potential and realized dimensions. Five items measured potential absorptive capacity by assessing a firm's ability to acquire and assimilate new external knowledge (Sheng & Chien, 2016); conversely, four items captured realized absorptive capacity as a firm's ability to transform and apply any newly acquired knowledge (Sheng & Chien, 2016).

A sense-making competency is the capacity of a firm to sense and interpret information drawn from the external environment (Neill et al., 2007). It was measured using five items adopted from Li and Liu (2014).

Table 2 Measurement details

Constructs and indicators	Factor loadings
Alliance learning (Cronbach's alpha = .91, CR = .91, AVE = .78) Source: Kale et al. (2000) and Schilke and Goerzen (2010)	
Our firm effectively acquired important knowledge from its alliance partners	.85
Our firm effectively acquired critical capabilities or skills from its alliance partners	.89
Our firm effectively improved by learning from its alliance partners	.90
Absorptive capacity	
Potential absorptive capacity (Cronbach's alpha = .92, CR = .92, AVE = .69) Source: Sheng and Chien (2016)	
We have frequent interactions with clients and competitors to acquire new knowledge	.88
We collect industry information through informal means (e.g. talks with trade partners and industry friends)	.87
We are quick to recognize any shifts in our markets (e.g. competition, regulation, demography)	.91
New opportunities to serve our clients are quickly understood	.76
We quickly analyze and interpret any changing market demands	.72
Realized absorptive capacity (Cronbach's alpha = .90, CR = .90, AVE = .69) Source: Sheng and Chien (2016)	
We record and store any newly acquired knowledge for future references	.78
We quickly recognize the usefulness of any new external knowledge to the existing one	.87
We constantly consider how to better exploit knowledge	.85
We clearly known how to implement new products and services	.82
Responsible innovation (Cronbach's alpha = 0.93, CR = 0.92, AVE = 0.60) Source: Stilgoe et al. (2013) and Wickson and Carew (2014)	
Our firm includes formal processes of future casting at various points throughout its innovation processes	.78
Our firm actively seeks input and feedback from a range of stakeholders during its innovation processes	.83
Our firm adapts at a range of points during its innovation processes in response to stakeholder feedback	.83
Our firm encourages transformative mutual learning during its innovation processes	.81
Our firm considers social and environmental issues during its innovation processes	.78
Our firm adapts at a range of points during innovation processes in response to stakeholders' feedback	.68
Our firm openly communicates with stakeholders during its innovation processes	.73
Our firm complies with the highest-level governance requirements and voluntary codes of conduct during its innovation processes	.77
Sense-making competency (Cronbach's alpha = .90, CR = .90, AVE = .64) Source: Li and Liu (2014)	
We are able to perceive any environmental change before our competitors	.77
We can fully understand the impact of the internal and external environments	.79
We can feel any major potential opportunities and threats	.87
We have a perfect information management system	.81
We have good observation and judgment abilities	.77

CR Composite reliability; *AVE* Average variance extracted

Responsible innovation relates to the degree to which innovation processes are aligned with societal values and needs by engaging with stakeholders (Genus & Iskandarova, 2018; Halme & Korpela, 2014). To measure it, eight items were drawn from the works of Stilgoe et al. (2013) and Wickson and Carew (2014).

We controlled for firm size, firm age, and industry. Firm size was measured using the natural logarithm of the number of employees. Firm age was captured using the natural logarithm of the years since a firm was founded. The industry was measured as a dummy variable: 0 = manufacturing and 1 = services.

Informant evaluation

Following previous studies (e.g., Boso et al., 2019; Morgan et al., 2012), we assessed the respondents' competencies using a seven-point Likert scale on three key areas: (1) knowledge of their firms' practices; (2) knowledge of their firms' products/services; and (3) knowledge of the asked questions. We obtained a minimum score of 6.2, which was well above the mid-scale point (Heide & Weiss, 1995), thereby suggesting the respondents' adequate competency.

Bias assessment

We assessed the threat posed by non-response bias and common method bias (CMB). First, we assessed non-response bias by comparing early and late respondents. The *t*-test results suggested no statistical difference between early and late respondents in the characteristics of the firms and their scores on the study variables, indicating that non-response bias was not a concern in the study.

Second, CMB may exist because the data for dependent and independent variables are gathered from single informants. We controlled for CMB using procedural measures at the questionnaire development stage (Podsakoff et al., 2003). Specifically, we improved the items' specificity and answer options to minimize any ambiguity and unfamiliarity. In addition, we ensured the participants the confidentiality with which we would treat their responses, provided them with clear instructions to complete the questionnaire, and assured them that there were no right or wrong answers. Additionally, we performed statistical tests to assess CMB. Particularly, we performed Harman's one-factor test using unrotated component analysis (Podsakoff et al., 2003). The results showed that no single dominant factor emerged and that the first factor explained only 31.97% of the 74.39% variance, thus enabling us to assume that CMB was not an issue in the data. In addition, following the previous literature (Boso et al., 2013; Jean et al., 2015), we estimated three models: a method-only one (M1), a trait-only one (M2), and a method-and-trait one (M3). The comparison of the three models (Table 3) suggested that M2 and M3 were better than M1, and that M3 was not substantially superior to M2. We thus concluded that CMB did not pose a major threat in our study.

Table 3 Assessment of common method bias

Model	$\chi 2$/DF	CFI	NFI	RMSEA	SRMR
M1: method-only model	6.74	.55	.52	.18	.16
M2: trait-only model	1.17	.97	.92	.03	.04
M3: method-and-trait model	1.15	.98	.92	.03	.04
Model comparison		$\Delta\chi 2$	ΔDF	*P*	Conclusion
M1-M2		1396.67	10	.001	M2 > M1
M1-M3		1406.29	14	.001	M3 > M1
M2-M3		2.81	3	.42	M2 = M3

Results

The data was analyzed by taking a covariance-based structural equation modelling (CB-SEM) approach in AMOS 26.0 and by using a Maximum Likelihood estimation procedure. We selected CB-SEM as the appropriate data analysis technique because it combines various multivariate analysis techniques—for example, regression analysis, confirmatory factor analysis (CFA), and path analysis (Cheung, 2015). CB-SEM is also suited to provide more accurate estimates of model parameters because it accounts for any measurement errors in both the independent and dependent variables (Zhang et al., 2020b). Furthermore, it enables the testing of a series of models and the identification of the one that is theoretically most accurate and parsimonious (Burnham & Anderson, 2013). We tested our data in two stages: measurement model assessment and structural model assessment.

Measurement model assessment

We used a CFA procedure to validate the multi-item scales. A five-factor CFA model was found to have a good fit with the data: $\chi 2$/DF = 1.44, CFI = .98, NFI = .97, RMSEA = .04, and SRMR = .04 (Hair et al., 2018). Then, we assessed internal reliability, via Cronbach's alpha, and composite reliability. Both the Cronbach's alpha and composite reliability values for all constructs were found to be above the minimum threshold of .70 (Kline, 2015). Item reliability was assessed using factor loadings. As shown in Table 2, all factor loadings were found to be higher than the acceptable level of .60 and significant (Hair et al., 2018), suggesting that reliable measures were being used in the study. Convergent validity was assessed by estimating the average variance extracted (AVE). The AVE values for all constructs were found to be above the threshold of .50 (Bagozzi & Yi, 2012), suggesting a high level of convergent validity. Finally, we assessed discriminant validity by comparing the squared-terms of the AVE with the correlation between each pair of constructs (Fornell & Larcker, 1981). The results (Table 4) showed that the squared-term of the AVE value for each construct was greater than the correlation between each pair of

Table 4 Descriptive statistics and inter-constructs correlations

Constructs	Mean	SD	1	2	3	4	5	6	7	8
1. Alliance learning	4.77	1.71	**.88**							
2. Potential absorptive capacity	5.21	1.32	.13^{+}	**.83**						
3. Realized absorptive capacity	5.22	1.30	.31***	.31***	**.83**					
4. Sense-making competency	4.99	1.47	.24**	.28***	.32***	**.80**				
5. Responsible innovation	4.94	1.23	.18*	.20**	.30***	.36***	**.78**			
6. Firm size$^{\#}$	1.76	.44	-.01	.15^{+}	.09	.26**	.17*	1.00		
7. Firm age$^{\#}$	1.09	.26	-.01	.08	-.12	-.07	.13	-.14^{+}	1.00	
8. Industry†	1.26	.44	.12	-.04	-.07	-.01	.02	.07	.05	1.00

Bold values on the diagonal are squared-terms of AVE; Significance levels: $+p<.10$, $*p<.05$, $**p<.01$, $***p<.001$; # = natural logarithm transformation of the original values; † = dummy variables

constructs, while the inter-construct correlations were found to be lower than .60. These results supported discriminant validity (Hair et al., 2018).

Structural model assessment

We used SEM to analyze the hypothesized relationships structural model. The results revealed that the hypothesized structural model fit the data well: $\chi 2/DF = 1.24$, CFI = .98, NFI = .95, RMSEA = .04, and SRMR = .03. The predictability of the structural model was assessed using R^2. The R^2 values for absorptive capacity and responsible innovation were respectively found to be .18 and .17, both thus higher than the threshold of .10 (Falk & Miller, 1981). To test our hypotheses, we examined the significance of the path estimates for the four paths in the hypothesized model.

In H1, we argued that alliance learning would be positively related to responsible innovation in SMEs. The results showed a positive and significant relationship between alliance learning and SME responsible innovation ($\beta = .21$, $t = 2.60$, $p < .01$), thereby supporting H1.

H2 proposed that the relationship between alliance learning and responsible innovation would be mediated by absorptive capacity. To test this hypothesis, we followed Baron and Kenny's (1986) four steps mediation technique. First, we found the direct relationship between alliance learning and responsible innovation to be positive and significant ($\beta = .21$, $t = 2.60$, $p < .01$), as shown in Fig. 2a. Second, we found a positive and significant relationship between alliance learning and absorptive capacity ($\beta = .29$, $t = 4.02$, $p < .001$). Third, we found the relationship between absorptive capacity and responsible innovation to be positive and significant ($\beta = .32$, $t = 4.07$, $p < .001$). Fourth, we added absorptive capacity (i.e., mediating variable) to examine whether the mediator would reduce the direct effect of the alliance learning on responsible innovation. The results showed that the direct relationship between alliance learning and responsible innovation disappears ($\beta = .12$, $t = 1.56$, $p = .12$) when absorptive capacity is added, while the effect of absorptive

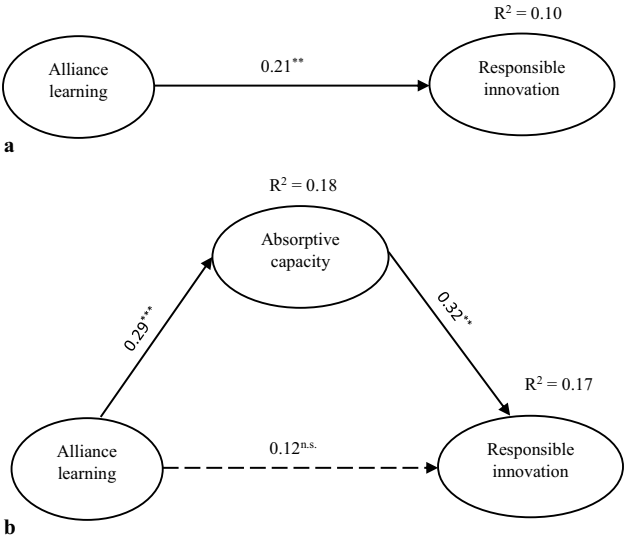

Fig. 2 **a.** The assessment of the direct effect, **b.** The assessment of the mediation effect

capacity on responsible innovation was found to remain significant (β = .28, $t = 3.51$, $p < .001$). Figure 2b summarizes the results.

In addition to these four steps, we tested the mediation effect by using a Bootstrapping technique and the Sobel test. First, we examined the mediation effect by using a bias-corrected bootstrapping procedure in PROCESS macro model 4 (Hayes, 2017). The indirect effect of absorptive capacity was found to be positive and significant (Estimate = .08 at the 95% confidence interval: .01, .18), thereby suggesting a mediation effect. Second, the results of the Sobel test suggested that absorptive capacity plays a mediating role between alliance learning and responsible innovation (Sobel = 2.62, $p = .01$). Accordingly, these results confirmed the mediation effect, thus supporting H2.

In H3, we argued that the indirect positive effect of alliance learning on responsible innovation through absorptive capacity would be strengthened in the presence of a strong sense-making competency. The interaction term between absorptive capacity and sense-making competency was found to be positive and significant for responsible innovation (β = .25, $t = 3.45$, $p < .001$). To further validate the moderated-mediation effect, we used PROCESS macro model 14 with 5,000 bootstrap samples (Hayes, 2013). The results showed that, for sense-making competency, the conditional indirect effect of alliance learning is positive and significant (Estimate = .02 at the 95% confidence interval: .00, .05). Specifically, the indirect effect of alliance learning was found to be positive but non-significant under conditions of weak sense-making competency (Estimate = .03 at the 95% confidence interval: -.03, .11) but to be positive and significant in the presence of a strong sense-making competency (Estimate = .09 at the 95% confidence interval: .02, .18). This showed that sense-making competency strengthens the indirect effect of alliance learning on responsible innovation via absorptive capacity, lending support to H3. To better

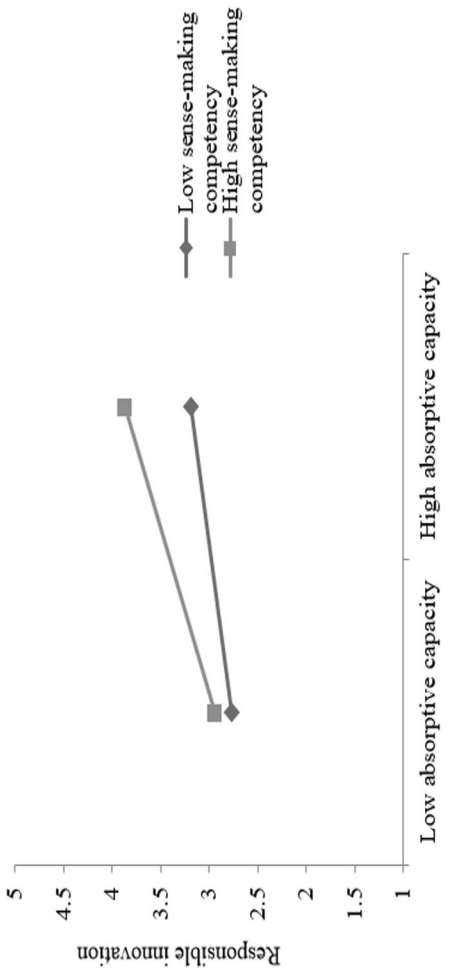

Fig. 3 The interaction between absorptive capacity and sense-making competency

illustrate the moderation effect, we created an interaction plot at one standard deviation and below mean values (see Fig. 3).

Post-hoc analyses

We conducted several additional tests to confirm the robustness of our findings. First, additional contingencies could have caused the modes analyzed to be affected by heterogeneity issues (Zhang et al., 2020b). Small-sized firms can generate better responsible innovation due to their alliance learning to absorptive capacity for such innovation. Similarly, compared to younger ones, older firms tend to possess more resources, market reputation, and community linkages suited to support responsible innovation. Furthermore, competitive technology-intensive industries tend to engage more in research activities and might consider GSCs in their activities to achieve responsible innovation (Halme & Korpela, 2014; Long et al., 2020). Therefore, we performed a multi-group analysis for firm size, firm age, and industry—which have been shown to potentially be related to innovation outputs (Xiao et al., 2021)—and for our respondents' profiles.

For firm size, we divided our sample into two groups: (1) small-sized firms (those with fewer than 50 employees) and (2) medium-sized firms (those with between 50 and 249 employees) (Saleem, 2008). Among our 176 sample firms, we found 72 to be small-sized and 104 to be medium-sized. The results of the Chi-square difference test suggested that the two groups differed at the model level ($\Delta\chi 2 = 26.41$, $\Delta DF = 12$, $p < .01$). The results of the group comparison showed that their path coefficients were different. As shown in Table 5, the hypothesized paths were more significant for small-sized firms than for their medium-sized counterparts. This highlights that small-sized firms rely more on alliance learning, which improves their absorptive capacity and subsequently leads to responsible innovation; hence confirming the mediation effect of absorptive capacity. However, the results for our medium-sized firm subsample suggest that absorptive capacity has no mediation effect on the alliance learning/responsible innovation nexus.

For firm age, we followed previous studies (Adomako et al., 2019; Withers et al., 2011) and used the mean score to split our sample into two: (1) younger firms (i.e., less than 13 years old) and (2) older firms (i.e., 13 years old and older). Our sample of 176 firms was thus split into two: 99 younger firms and 77 older ones. The Chi-square difference test was found to suggest no significant difference between the two groups ($\Delta\chi 2 = 5.88$, $\Delta DF = 14$, $p > .10$). However, a comparison of the path coefficients suggested a difference between them (see Table 5). Specifically, our subsample of younger firms was found to be more reliant on alliance learning to develop their absorptive capacity. In contrast, our older firms were found to make greater use of their absorptive capacity for their responsible innovation. Interestingly, we found that absorptive capacity mediated the effect of alliance learning on responsible innovation only in our older firm subsample.

In terms of industry, we split the sample into eight groups: information & communication technology (ICT) (32 firms), textile/clothing (16), cotton products (23), sports products (27), machinery (40), electrical products (24), support services

Table 5 Comparison based on firm size, firm age, industry and respondents' profile

Description	Classification	R^2		Paths		
		Absorptive capacity	*Responsible innovation*	*Alliance learning → Absorptive capacity*	*Absorptive capacity → Responsible innovation*	*H2: Alliance learning → Absorptive capacity → Responsible innovation*
Overall model		.11	.17	$.29^{***}$	$.28^{***}$	$.12^{*}$
Firm size	***Small-sized firms***	.25	.23	$.50^{***}$	$.44^{***}$	$.22^{**}$
	Medium-sized firms	.06	.14	$.19^{*}$	$.17^{+}$	$.02^{n.s}$
Firm age	***Young firms***	.11	.13	$.31^{**}$	$.21^{*}$	$.03^{n.s}$
	Older firms	.14	.2	$.27^{*}$	$.40^{**}$	$.09^{*}$
Industry	***Information & communication technology***	.07	.45	$.26^{***}$	$.28^{***}$	$.08^{*}$
	Textile	.08	.57	-.28	$.67^{**}$	$-.19^{n.s}$
	Cotton products	.04	.36	.21	.03	$.01^{n.s}$
	Sports products	.07	.28	.27	.27	$.08^{n.s}$
	Machinery	.03	.03	.19	.16	$.03^{n.s}$
	Electrical product	.8	.07	$.89^{***}$	$.37^{*}$	$.33^{*}$
	Support services	.09	.2	.31	-.42	$-.13^{n.s}$
	Others	.54	.7	$.73^{*}$	$.88^{*}$	$.64^{***}$
Respondent profile	***Owner/CEOs***	.10	.24	$.26^{**}$	$.37^{***}$	.10*
	Senior management	.15	.14	$.36^{*}$	$.03^{n.s}$	$.03^{n.s}$
	Middle management	.33	.27	$.20^{n.s}$	$.34^{n.s}$	$.05^{n.s}$

Significance levels: $+p<.10$, $*p<.05$, $**p<.01$, $***p<.001$; n.s. = non-significant

activities (9), and others (5). The results of the chi-square difference were found to suggest significant differences between industry groups ($\Delta\chi 2 = 68.23$, $\Delta DF = 21$, $p < .001$). Furthermore, as shown in Table 5, the path differences were found to suggest that absorptive capacity mediates the association between alliance learning and responsible innovation only in the ICT, electrical products, and other groups. These results confirm that some industries are more committed to alliance learning to enhance their absorptive capacity, which, in turn, leads to responsible innovation in SMEs.

For respondents' profiles, we divided our sample into three groups: CEOs/owners (117 respondents), senior managers (41), and middle managers (18). The Chi-square difference test was found to suggest the absence of any significant difference between groups in terms of the respondents' profiles ($\Delta\chi 2 = 8.97$, $\Delta DF = 16$, $p > .10$). However, the path analysis comparison (Table 5) was found to indicate differences between CEOs/owners, senior managers, and middle managers. While alliance learning was found to be positively and significantly related to absorptive capacity in both the CEOs/owners and senior managers groups, the effect of absorptive capacity on responsible innovation was only found to be significant in the CEOs/owners. More importantly, the mediating effect of absorptive capacity was found to exist only in the CEOs/owners group. These results are interesting as the actions of top managers toward responsible innovation are important in resource-constrained environments. SMEs are often managed by their CEOs and owner-managers and, unlike in large and diversified firms, middle managers play a limited role in making any key strategic decisions (Liu & Xi, 2021; Raes et al., 2011; Zor et al., 2019).

Second, we tested the mediating effect of both potential and realized absorptive capacity on the relationship between alliance learning and responsible innovation. Interestingly, the results were found to show that the indirect effect of alliance learning on responsible innovation via potential absorptive capacity is positive but non-significant (estimate = .02, at the 95% confidence interval: − .01 to − .08), suggesting the absence of any mediation effect of potential absorptive capacity. However, the mediating role of realized absorptive capacity for the relationship between alliance learning and responsible innovation was found to be positive and significant (estimate = .09, at the 95% confidence interval: .02 to .19). This suggested that realized absorptive capacity mediates the relationship between alliance learning and responsible innovation. Overall, absorptive capacity, as a multi-dimensional construct, has a greater power ($R^2 = .18$) to determine responsible innovation than its constituent dimensions of potential absorptive capacity ($R^2 = .08$) or realized absorptive capacity ($R^2 = .13$) alone.

Discussion

Over the past decade, responsible innovation has gained prominence in relation to addressing the triple bottom line (i.e., people, profit, and planet) in ways suited to satisfy the concerns of all stakeholders (Singh et al., 2021). Therefore, the primary aim of our study was to examine and broaden our understanding of how SMEs operating in Asian-market achieve responsible innovation, given the large scale GSCs

affecting such markets. As firms in emerging markets lack the necessary resources and capabilities, alliances provide them with important opportunities to develop their capabilities and resultant innovation. In our study, we zoomed in on the role of alliance learning on responsible innovation in the context of SMEs operating in Pakistan. We also integrated absorptive capacity as an important underlying mechanism suited to enhance alliance learning and the development of responsible innovation. Furthermore, as there may be other important boundary conditions that shape the impact of absorptive capacity and alliance learning on responsible innovation, we explored sense-making competency as one such condition in explaining responsible innovation. Our findings indicate that alliance learning is a key determinant of SME responsible innovation. More importantly, we found that the relationship between alliance learning and responsible innovation is mediated by SME absorptive capacity. We also found that, in the presence of a strong sense-making competency, the indirect effect of alliance learning on responsible innovation via absorptive capacity is stronger. Therefore, our findings contribute to the literature in several important ways.

Theoretical contributions

The findings of our study make important contributions to the extant literature. First, it extends our understanding of the role played by alliance learning in facilitating SME responsible innovation. The alliance literature has traditionally argued that to remain competitive, resource-constrained SMEs often obtain a great deal of knowledge and information from their alliance partners (Hilmersson & Johanson, 2020; O'Dwyer & Gilmore, 2018). However, to date, the literature has restricted itself to understanding the implications of alliance learning for SME responsible innovation (Inigo et al., 2020). In extending the literature, we show that those SMEs that engage in alliance learning are more likely to improve their responsible innovation. This is particularly important in Asian markets in that, in that context, alliance learning helps SMEs to mitigate the effects of weak institutional structures and to learn about GSCs (De et al., 2020; Zhang et al., 2020a), consequently enhancing SME responsible innovation.

Second, we extend the SME literature by highlighting the importance of absorptive capacity in the relationship between alliance learning and responsible innovation (Hadj, 2020). By integrating insights drawn from the dynamic capability perspective and the literature on responsible innovation, we developed unique and vital insights that had not hitherto been considered, hence opening up a new dimension for empirical work. Thus, our study broadens the understanding of the relationship between alliance learning, absorptive capacity, and responsible innovation, particularly in the context of Asian-market SMEs. Consistent with the dynamic capability perspective, we demonstrated that the mere availability of alliance learning is not sufficient for responsible innovation (Teece, 2007), and that SMEs must utilize their absorptive capacity as a dynamic capability to leverage the value of such learning. Specifically, although alliance learning provides SMEs with new knowledge, such firms must understand the value of any externally acquired knowledge in order to

assimilate and exploit it for responsible innovation (Ali et al., 2020). Thus, in the dynamic Asian context, SMEs must use alliance learning to promote their absorptive capacity, which, in turn, will lead to responsible innovation. This is an important contribution that extends the findings of the dynamic capability perspective and adds to the debate on responsible innovation in the Asian market context (Chatterjee et al., 2021; Khurshid & Snell, 2021).

Third, our findings add to the previous dynamic capability research (Hernández-Linares et al., 2021; Li & Liu, 2014; Santoro et al., 2019) by uncovering the moderating role played by sense-making competency. We show that, in the presence of high levels of sense-making competency, the mediated effect of alliance learning on responsible innovation via absorptive capacity will be stronger. Although the complementarity between dynamic capabilities regarding the achievement of sustained competitive advantage has been suggested anecdotally (De Marchi et al., 2018; Makadok, 2001; Teece, 2012), it is still not at present understood. In this regard, we suggest that a stronger SME sense-making competency can interact with absorptive capacity in regard to utilizing alliance learning to promote responsible innovation. In other words, the effect of absorptive capacity on responsible innovation is bolstered in the presence of high levels of sense-making competency.

Fourth, we add to the SME literature by empirically considering the group differences based on firm size, firm age, industry, and respondent profiles. Our findings suggest differentiated patterns for the relationships between alliance learning, absorptive capacity, and responsible innovation concerning small vs. medium-sized firms, younger vs. older firms, and knowledge-intensive (e.g., ICT and electrical products) vs. non-knowledge-intensive (e.g., textile and cotton products) industries. Our empirical evidence supports the greater reliance of small-sized firms on alliance learning for absorptive capacity and responsible innovation; a specific trait that is partially due to the limited resources possessed by such firms and the lack of institutional support found in Asian markets. Furthermore, we found that older firms utilize absorptive capacity to leverage alliance learning for responsible innovation in Asian SMEs. This suggests that older firms are better equipped to engage in responsible innovation by the virtue of their more established routines and structures, which discipline alliance learning and absorptive capacity (Anderson & Eshima, 2013). In terms of industry, our results confirm that knowledge-intensive industries are more likely to exploit alliance learning and absorptive capacity to enhance their responsible innovation. Knowledge-intensive industries are equipped to more promptly understand future scientific developments and to deal with any conflict and uncertainty arising in Asian societies (van Oudheusden, 2014).

Practical implications

Our findings also offer important practical implications. First, they provide guidance suited to aid Pakistani SMEs in improving their responsible innovation by utilizing alliance learning (Mahmood & Mubarik, 2020). In particular, our study shows that alliance learning can be a valuable resource for SMEs to promote knowledge and shape their absorptive capacity for responsible innovation (Fredrich et al.,

2019; Gonzales-Gemio et al., 2020). As Pakistani SMEs generally lack resources and are affected by weak institutional support (Khan, 2020), they need to rely on external partners to develop their dynamic capabilities—such as their absorptive capacity—and consequently enhance their responsible innovation. Thus, Pakistani SME managers would be advised to pay particular attention to investing in alliance learning to enhance their capability to absorb and exploit the fine-grained knowledge necessary to achieve responsible innovation. Second, our study shows that a sense-making competency strengthens the positive effect of alliance learning on responsible innovation via absorptive capacity (Mattsson et al., 2015). Pakistani SME managers should observe that the possession of a sense-making competency is advantageous to identify GSCs and spot any opportunities (Khan & Lew, 2018; Malik & Kotabe, 2009), which can interact with their absorptive capacity to the end of internalizing any available external knowledge for the promotion of responsible innovation (López-Pérez et al., 2017). Thus, SMEs should invest in nurturing their sense-making competency, which may help them to overcome their liability of smallness and any institutional constraints while ensuring sustainable development. Third, we found that alliance learning leads to responsible innovation via absorptive capacity. This suggests that to transform alliance learning into responsible innovation, employees must demonstrate learning adaptability (Rafique et al., 2018). The requirement of absorptive capacity from workers could leave many from participating in the production process, thereby leaving an employment gap in Pakistan (Azeem et al., 2020; Thompson, 1990). Therefore, SMEs must invest in the training and development of employees in order to enhance their learning and absorption capacities, which in turn lead to responsible innovation.

Our findings also provide useful insights to Asian-market policy makers. As they are keen to promote sustainable development (Park & Kim, 2020)—and the growth of SMEs is a priority among their policy agenda items (Lopes de Sousa Jabbour et al., 2020; Saleem, 2008)—such policy makers need to offer institutional support and expose SMEs to strategic alliances to enable them to exploit their alliance learning to nurture their absorptive capacity. This, in turn, will lead to responsible innovation. Policy-makers should offer special incentives to those SMEs that engage in responsible innovation by connecting these firms to research institutions, community organizations, and government bodies suited to support their socially responsible activities.

Limitations and future research directions

Despite its unique contributions, our study has some limitations that offer opportunities for future research. First, we collected our survey data in Pakistan, a developing yet fast-growing country in Asia. Although Pakistan shares some characteristics with other Asian countries, future studies should consider other developing countries endowed with unique contextual characteristics—such as Vietnam, Bangladesh, Nepal, Singapore, and Indonesia—and allow for additional theory development. Second, our study explored the hypothesized relationships in the context of SMEs, as the majority of the businesses in Pakistan fall under this category. Future studies could compare SMEs with large firms to establish how the latter leverage any alliance

learning to develop their absorptive capacity and responsible innovation. While large firms are more resourceful and are likely to have a greater absorptive capacity, SMEs are more flexible and can easily integrate external partners in learning. Therefore, these aspects could be addressed by future researchers. In a similar vein, future studies could explore how varying industrial contexts explain the relationships examined. Third, our study relied on self-reported data drawn from SMEs in Pakistan. Future studies based on objective data may help to uncover any variations in alliance learning and absorptive capacity and their effects on responsible innovation. Relatedly, while responsible innovation is an established concept in Western countries (Arslan & Tarakci, 2020; Owen et al., 2021), future studies could develop scales specific to the developing countries' context. Fourth, although we considered alliance learning and absorptive capacity as antecedent mechanisms of responsible innovation, the exploration of alternative mechanisms—such as entrepreneurial orientation—could advance the field further. For example, future research could examine the importance of digital technologies, strategic agility, human resource slack, and business model innovation in promoting responsible innovation. Furthermore, future research could consider any organizational design suited to help SMEs to best leverage their resources and capabilities for the achievement of responsible innovation (cf. Malhotra et al., 2021). Fifth, our results can be considered to be specific to the context of Pakistan, but also, more generally, to Asia and other similar markets, given that the SMEs found in similar markets in Africa and Latin America and in other Asian markets also face resource constraints and weak institutional support, and that alliances can be extremely valuable for SMEs to engage in responsible innovation. Therefore, future research could test the relationships put forward in this study across other similar markets in Africa and Latin America. Sixth, top management teams also play important roles in innovation activities; thus, future studies could pay greater attention to the actions and strategies taken by top management teams regarding responsible innovation. Such studies could draw upon key insights from the micro-foundations (cf. Felin et al., 2015; Foss, 2011; Nuruzzaman et al., 2019) and upper echelons theory (e.g., Hambrick & Mason, 1984) and examine the roles played by different cadres of managers—such as top, middle and functional ones—and how they enact responsible innovation. Finally, our study considered firm size, firm age, and industry as control variables. Future studies could introduce these variables as potential moderators and examine their effects on responsible innovation.

Conclusion

The SMEs in Asia are considered vital for responsible innovation as they are located closer to grassroot actors and stakeholders (Khurshid & Snell, 2021; Loon & Chik, 2019). The Asian SMEs are also characterized by flexibility and risk-taking, which are crucial for responsible innovation (Courrent et al., 2018; Hadj, 2020). Despite these characteristics, it is difficult for Asian SMEs to attain responsible innovation given their liability of smallness and limited institutional support (Wellalage et al., 2019; Wu & Deng, 2020). Therefore, our study aimed to investigate the factors that may influence responsible innovation. Our study proposed the mediating role played by

absorptive capacity in the relationship between alliance learning and SME responsible innovation. Furthermore, we argued that the indirect link between alliance learning and SME responsible innovation would be moderated by a sense-making competency. Our findings suggest that absorptive capacity plays a significant and positive mediating role in the relationship between alliance learning and SME responsible innovation, and also show that a sense-making competency positively moderates such relationship.

Overall, the findings of our study contribute to the strategic alliance and responsible innovation literature by illustrating the impact of alliance learning on responsible innovation via absorptive capacity of SMEs based in emerging Asian markets. Further, we contribute to the dynamic capability literature by considering complementary capabilities – that are absorptive capacity and sense-making competency – in enabling SMEs to develop responsible innovation in resource-constrained environments of Asia. Our findings show that sense-making competency moderates the relationship between absorptive capacity and responsible innovation.

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