

# Pathways to innovation in Romanian software SMEs: Exploring the impact of interdependencies between internationalisation and knowledge sources

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## **Abstract**

This study explores the interdependent effects of internationalisation and sources of internal and external knowledge on the level of innovation. We present possible pathways that small innovative Romanian software product provider firms pursue to reconfigure their resources to be competitive beyond CEE. This product provider segment of the software development industry exhibits characteristics of innovation-driven economy in specific Romanian city-regions. We examine fourteen SMEs that develop their own products using fuzzy-set Qualitative Comparative Analysis. fsQCA allows us to methodologically differentiate between the distinct pathways to high-level and low-level innovation based on the sources of knowledge and the degree of internationalisation of the product market. We find that internationalisation accelerates the level of product innovation; but together with knowledge sources, it becomes a critical differentiator between high and low-level innovation products. We also find that while combining internal knowledge sources with internationalisation is an effective way for early and gradual internationalisers to introduce high-level innovation products, some internationalised firms rely on the advantages of early internationalisation to the exclusion of external knowledge sources. Moreover, if internationalised, local market-oriented firms can move beyond low-level innovation. Our findings extend the current understanding of the dynamics of SME internationalisation and innovation in the CEE context.

**Keywords:** product innovation, SME internationalisation, knowledge sources, Romania, software development industry, qualitative comparative analysis

## 1. Introduction

The relationship between innovation and internationalisation in small and medium-sized enterprises (SMEs) has attracted the attention of both international business and SME researchers, as it lies at the intersection of both literatures. A major debate in this field concerns the direction of this relationship: whether innovative SMEs are more likely to become internationalised, or whether internationalising improves SMEs' innovativeness. Knowledge plays a critical role in explaining how innovation encourages internationalisation: engaging in product innovation nurtures a strong innovative culture, which encourages firms to develop particular types of knowledge that will, in turn, help them internationalise faster, earlier, and/or perform better (Knight and Cavusgil, 2004). Innovation is seen as reflecting different kinds of learning abilities, reflecting different ways of exploiting sources of knowledge, which in turn supports internationalisation (Weerawardena et al., 2007). At the same time, internationalisation, i.e. some degree of exposure to foreign markets, promotes firms' learning, providing them with access to new sources of knowledge, which in turn enhances their product innovation performance, thus creating a virtuous cycle (Basile, 2001; Cassiman et al., 2010; Cassiman and Golovko, 2011; Golovko and Valentini, 2011; Filippetti et al., 2011; Filipescu et al., 2013).

The first part of this cycle – the role that innovation plays in encouraging internationalisation in SMEs – has been a focus of SME research that examines the direct effects of SMEs' innovation on their exporting decision or performance (Lachenmaier and Wößmann, 2006; Zucchella and Siano, 2014; Castano et al., 2016; Saridakis et al., 2019; Martinez-Roman et al., 2019; Falahat et al., 2020). These studies mostly rely on econometric analysis, examine the manufacturing sector, and find a strong relationship between innovation and internationalisation (generally measured in terms of exporting). More nuanced investigations of this part of the cycle are found in the 'born globals' (Knight and Cavusgil, 1996) and 'international new ventures' (Oviatt and McDougall, 1994) research, where product innovation acts as the driving force for SME internationalisation. These studies find that product innovation allows SMEs to enter new geographical markets with better – i.e. novel and of higher quality - products.

In this paper, we are interested in examining the second part of the cycle – the role that internationalisation plays in improving innovativeness in SMEs, which is comparatively less examined in the literature. The last decade has seen a growth of research interest in the effect of internationalisation on firm innovation performance both in SMEs (Alvarez and Robertson, 2004; Zahra et al., 2009; Frey et al., 2013; Love and Ganotakis, 2013; Ren et al., 2015; Genc et al., 2019) and in MNEs of advanced and emerging market economies (Kafourous et al., 2008; Dabic et al., 2012; Chang et al., 2019; Thakur-Wernz et al., 2019). This

stream of research provides growing evidence that internationalised firms are more innovative, since exporting encourages learning (Salomon and Shaver, 2005), and that knowledge plays a critical role in explaining this relationship by helping SMEs to develop knowledge and overcome barriers to innovation (Love and Ganotakis 2013). However, most studies in this area employ econometric analyses which, while allowing us to examine the single net effects of each factor (e.g. either knowledge source or internationalisation) on innovation, have two downsides. First, such analysis cannot clarify the combined effect of these two factors on innovation. In particular, how the interdependencies between internationalisation and internal and external knowledge sources affect the degree of product innovation is not examined. Second, existing studies call for research designs employing diverse analytical techniques and methods that reflect a 'realist' approach (Miles and Huberman, 1994) to enhance our understanding of the SME internationalisation process (Coviello and Jones, 2004; Paul and Rosado-Serrano, 2019). To address both criticisms, we employ fuzzy-set Qualitative Comparative Analysis (fsQCA), i.e. set-theoretic methodology which examines how certain interdependent factors jointly explain an outcome based on the conjunction principle of causal complexity (Schneider and Wagemann, 2012; Kraus et al., 2017; Parente and Federo, 2019; Haddoud et al., 2020; Douglas et al., 2020). Framed by these goals, we seek to explore possible pathways through which the interdependencies between internationalisation and sources of knowledge lead to high vs low levels of innovation.

We focus here on a particular context; product provider software development firms that are located in a city region in Romania and that internationalise at different speeds (early/rapid versus gradual/incrementally). Software product provider firms develop and commercialise their own products rather than operating as outsourcing or service support software companies, meaning they will innovate products at different degrees of innovativeness (low versus high) (Garcia and Calantone, 2002). We choose Romania for two reasons. First, Romania is part of Central and Eastern Europe (CEE) region and research in innovation and internationalisation in CEE SMEs is generally sparse (Lewandowska et al., 2016), with only a few studies examining CEE firms' internationalisation and software firms (Gittins et al., 2015; Lewandowska et al., 2016; Stoian et al., 2016), and none in relation to innovation. Second, Romania is one of the countries in Europe where half of the young firms internationalise as early as their inception (Eurofound, 2012; Cavusgil and Knight, 2015), thus offering a fertile field to investigate internationalisation in SMEs in general, CEE SMEs in particular. We chose the software development industry both because of its importance to the Romanian economy (for example, in 2016 the ICT sector per share of GDP put Romania in the 5<sup>th</sup> place among EU countries) and because of the high levels of innovations exhibited among the product providers within this sector. Although as a country Romania may still be classified as a factor-driven economy, recent research finds that specific sectors in specific city regions exhibit characteristics of an innovation-driven economy, closely embedded in global innovation networks (Fan et al., 2019). Our empirical evidence comes from such a software development economy in Cluj-Napoca, the second largest IT hub in Romania after Bucharest (the capital city). By 2019, Cluj-Napoca was characterised

both by the presence of multinational software development companies (MNCs), opening R&D intensive branches, and by a large number of software development local companies, including ICT integration solution providers (i.e. outsourcing external firms) and more recently an increasing number of innovative start-ups developing their own products and services (Fan et al., 2019). Therefore, we choose a sample of fourteen small product provider software development firms located in the Cluj-Napoca city region in Romania to examine their levels of innovation, internationalisation, and internal and external sources of knowledge.

We contribute to the SME innovation and internationalisation literature by examining the combined role that the speed of internationalisation, i.e. being early versus gradually internationalised, and the source of knowledge, i.e. internal or external, play in explaining the level of innovation in product provider software firms. More precisely, by capturing the interdependencies between internationalisation and sources of knowledge, we clarify the multiple pathways that they (i.e. together or alone) serve as antecedent causes in explaining how small software product provider firms achieve product innovation at different levels. While most existing studies in this area examined manufacturing and service SMEs, our research is one of the few studies to examine this interdependence for digital products in the software development industry, which arguably has idiosyncratic internationalisation characteristics (e.g. use of the internet) and innovation processes (i.e. dynamically continuous, Yoo et al., 2012). Therefore, this study extends our understanding of the dynamics of SME internationalisation and innovation in the CEE via the pathways firms take to reorganise and enhance their resources to become innovative and competitive beyond CEE.

The paper is structured as follows. The next section discusses the extant research in relation to SME internationalisation, knowledge and innovation, and puts forward the need to examine the interdependencies between internationalisation and knowledge sources in explaining innovation in SMEs. Sections 3 and 4 describe the setting of this study (product provider segment of the software development industry in a city region in Romania) and the research methodology respectively. In Section 5, the findings explain the different paths we found in our cases for achieving high and low-level innovation. The paper concludes with a discussion of the implications of our research for theory and practice.

## **2. Literature Review**

### **2.1. SME Internationalisation and Innovation**

Definitions of innovation emphasise the ability to commercialise a new product, service, processes, or business model that creates value for the originating firm (Tidd and Bessant, 2013; Edwards-Schachter, 2018). Innovation research often distinguishes between different kinds of innovation depending on the

degree of novelty/newness involved (Freel and Harrison, 2006; Saridakis et al., 2019). Radical innovation concerns a departure from existing products and services and often requires firms to acquire new knowledge and competencies to develop new technology, new product lines, or a new market. Incremental innovation concerns improvements in existing products and services, and often relies on existing knowledge and competencies that firms possess (Utterback and Abernathy, 1975; Pavitt, 1991; Tidd and Bessant, 2013; Sheng and Chien, 2016). Novelty is however relative to the target market, so research often distinguishes between ‘new to the market’ products representing radical, *highly innovative* products that are novel within a particular market context (e.g. to the target customers), and ‘improvements in existing products’ representing ‘*low innovative*’ products which exhibit incremental innovation relative to the target market (Garcia and Calantone, 2002; Mosey, 2005; Saridakis et al., 2019). Highly innovative products play a role in increasing domestic and foreign market shares by creating new windows of opportunity both in terms of products and markets, while low innovative products tend to perform well in domestic markets (Kleinschmidt and Cooper 1991). The ability of firms to manage both incremental and radical innovation is a key driver for SMEs’ success, long-term survival, and growth (Rhee et al., 2010; Rosenbusch et al., 2011). Moreover, while research finds that small businesses can survive and even flourish in competitive markets against large rivals (Handy, 2001), this survival is more likely when they develop new-to-market highly innovative products (Mosey, 2005).

In SMEs, innovation is related to internationalisation, questioning the established SME internationalisation processes (such as the Uppsala model, Johansson and Vahlne, 1977), as innovative capabilities enable SMEs to advance, compete and differentiate themselves not only in their marketplace (Baregheh et al., 2009; Teece et al., 1997) but also in foreign markets (Saridakis et al., 2019), thus accelerating their internationalisation (Cavusgil and Knight, 2015). There is also a large stream of SME literature which has demonstrated mostly the positive effects of innovation on SME internationalisation (Monreal-Perez et al., 2012), where internationalisation is typically defined as exporting (Basile, 2001; Roper and Love, 2002; Lachenmaier and Wößmann, 2006; Pla-Barber and Alegre, 2007; Cassiman et al., 2010; Cassiman and Golovko, 2011; Zucchella and Siano, 2014; Castano et al., 2016; Lewandowska et al., 2016; Martinez-Roman et al., 2019; Falahat et al., 2020). Based on over 12,000 UK SMEs, Saridakis et al. (2019) find that innovative SMEs are more likely to export than non-innovative SMEs; however, the link between innovation and internationalisation differs according to the degree of novelty of the innovation.

The effect of innovation on SME internationalisation is better understood with a more granular definition of internationalisation in international business (IB) research, which differentiates between the speed, degree, and scope of SME internationalisation. In terms of speed, such research distinguishes between *early and rapid internationalisation* - ‘born globals’ (Knight and Cavusgil, 1996, 2004; Cavusgil and Knight, 2015) or ‘international new ventures’ (INVs) (McDougall et al., 1994; Oviatt and McDougall, 1994; see Madsen, 2013 for a comparison of the two concepts) and *gradual internationalisation* (Johansson and

Vahlne, 1977, 2009; see Paul and Rosano-Serrado 2019 for a literature review). IB research finds that the speed of internationalisation is a critical element to understand the relationship between internationalisation and innovation, as speed is related to the development of innovation capabilities of SMEs. For example, highly innovative firms operating in high technology sectors that developed a novel product targeting a niche market, because the product life cycle was short, have started internationalising almost from their inception (or within two to three years of their inception) to grasp the window of opportunity. Such rapid internationalisation has also been driven with a strong entrepreneurial orientation towards growth via international markets that characterise these highly innovative ‘born global’ SMEs when compared to the traditional gradually internationalising SMEs (Knight and Cavusgil, 1996; Cavusgil and Knight, 2015; Falahat et al., 2018).

*Early and rapid internationalisation* (i.e. born globals and INVs) is therefore characterised by a strong innovation culture, agility and flexibility in developing novel products or reinventing novel ways of serving their customers (Crick and Spence, 2005), and entering new markets in novel ways (Fan and Phan, 2007; Lopez et al., 2009; Leonidou and Samiee, 2012). This agility and flexibility to exploit new opportunities in different contexts accelerate their internationalisation (Cavusgil and Knight, 2015). Moreover, the short product development cycles of born globals/ INVs, such as in the software development sector, increases their risk of imitation and technological obsolescence (Oviatt and McDougall, 1994). This incentivises early internationalised SMEs to engage in rapid and simultaneous exploitation of their domestic and international markets so as to diversify their risk across different markets (Li et al., 2012). Such firms tend to facilitate their internationalisation through networks, cooperation, partnerships, and recruiting individuals with valuable international market knowledge, widely observed in knowledge-intensive sectors such as in software development (Bell, 1995; Bell et al., 2001; Petersen et al., 2003; Coviello, 2006).

In contrast, *gradually internationalised* SMEs (Johanson and Vahlne, 1977, 2009) tend to postpone entering foreign markets until they accumulate necessary knowledge and resources through experience in their home markets (Autio et al. 2000). This gradual, learning-based approach (Paul et al., 2017) is employed by traditional internationalisers (Kalinic and Forza, 2012; Baum et al., 2015), which tend to first export to foreign markets in close proximity, as they have more knowledge of near markets, before diversifying into distant markets in multiple regions (Johanson and Vahlne, 1977). According to McHugh (1999), software firms with ‘customer-centric’ products that target business-to-business markets tend to internationalise gradually.

As the role of innovation on SME internationalisation has become well established, an understanding of a ‘reciprocal causality’ (Filipescu et al., 2013) and a ‘dynamic virtuous cycle’ (Filipetti et al., 2011; Golovko and Valentini, 2011) between SME innovation and internationalisation has emerged. Research has moved on to examining the effect of internationalisation on SME innovation. Access to new knowledge through internationalisation facilitates the development of new and high-quality innovations (Alvarez and

Robinson, 2004, Salomon and Shaver, 2005; Love and Ganotakis, 2013), thus reinforcing SMEs' ability to compete both at home and in international markets (Hitt et al., 1997; Cassiman and Golovko, 2011). Internationalisation involves a process of learning and knowledge accumulation (Eriksson et al., 2000) that positively impacts the firm innovation by exposing SMEs to different markets with customers whose different tastes and preferences may force SMEs to improve, adapt and customise their products to new market conditions continuously (Zahra et al., 2000; Autio et al., 2000). In general, exporting may allow internationalised SMEs access to new knowledge, so-called 'learning by exporting' effect (Grossman and Helpman, 1991; Salomon and Shaver, 2005; Salomon, 2006, 2006b) that may not be available in their local environment. Exporting firms can get information directly from their foreign buyers/customers/consumers, suppliers, and competitors and benefit from their technical and managerial expertise as well as their networks (Lopez, 2005; Ibeh and Kasem, 2011; Silva et al., 2012; Kumar Jain et al., 2019). On the one hand, foreign buyers and suppliers may bring in information on what kind of product is sought after in the market and even the ideas/suggestions on how to make them (Rhee et al., 1984). These buyers also demand higher quality but lower-cost products and inadvertently help exporting firms to increase the standards of their products, which in turn leads to further product innovation. On the other hand, exporting firms deliberately put effort into accessing, using, and further developing the technical, technological, product, or market-related knowledge of their foreign contacts. Moreover, firms present in the foreign markets tend to observe the products available in these markets and follow the technological innovations in these foreign locations (Salomon, 2006). Through networking and other forms of social capital in foreign markets, firms may further access knowledge on the availability of the resources and opportunities in these markets (Coviello, 2006) or may acquire proprietary rights, e.g. software firms acquire international distribution rights for software or access to overseas contact networks (Bell et al., (2001).

The gradual internationalisation model suggests a process of incrementally accumulative 'experiential knowledge' of the foreign market. Experiential knowledge includes internationalisation knowledge, which refers to the firm-specific experience in managing international business activities, and market-specific knowledge as internationalisation brings in institutional, business network, and social network knowledge through new international markets (Hilmersson, 2014; Eriksson et al., 2000). It includes the first-hand feel of the customers, (e.g. the way they work, their organisation and decision-making, their preferences, needs, and demands regarding the firm's product), detecting the hindrances (e.g. specific practices and customs, laws and regulations), and grasping the opportunities (e.g. business contacts, the way networks are organised) the international market provides. This knowledge is gained through an interplay between increasing market commitment and market knowledge development as they enter and operate in a particular foreign market (Eriksson et al., 1997; Autio et al. 2000; Jones 2001). Once internationalisation starts, every time firms face a problem, they will seek solutions that will further enhance their knowledge and experience on that market (Johanson and Vahlne, 1990; Andersen, 1993). In the case of born globals/



INVs, internationalisation allows firms to direct their learning efforts to their foreign activities and therefore helps them to unlearn routines and overcome organisational rigidity, by reducing the reliance on established bonds with domestic clients, called 'learning advantage of newness' (LAN) (Autio et al., 2000; Sapienze et al., 2006; Zhou and Wu, 2014).

Existing empirical research suggests that increased presence in foreign markets fosters innovation performance (Salomon and Shaver, 2005; Liu and Buck, 2007; Love and Ganotakis, 2013), but the ways in which this effect happens have not been yet examined. Moreover, while we know that the speed of internationalisation is important, studies on the role of internationalisation on SME innovation do not examine the distinction in the pace of SME internationalisation and the implications that this distinction has on SME innovation. In this paper, we endeavour to explore potential differences in the levels of innovation among SMEs that internationalise from their inception (early internationalisers) and after establishing their business in their local market (gradual internationalisers).

## **2.2. Knowledge Sources, Innovation and Internationalisation in SMEs**

Knowledge is a critical concept in understanding forms of innovation. The nature of knowledge involved in developing a new product distinguishes between different degrees of product innovation novelty; e.g. in relation to markets or technology (Abernathy and Clark, 1985), or in relation to the architecture or components involved in the product (Henderson and Clark, 1990). However, more recently, research has shifted from examining the nature of knowledge to the source of knowledge and its role in explaining innovation performance. Research differentiates between two key types of knowledge depending on their source: internal to the firm, which is generated by the firms' own employees and typically involves in-house R&D, and external to the firm, which involves knowledge that is leveraged from the market or network relationships (Frenz and Ietto-Gilles, 2009).

Among the *internal sources of knowledge*, human capital (i.e. employees) is the major source of SME knowledge base (McKelvie and Davidsson, 2009). Entrepreneurial traits of the founder such as skills, professional and international education, training, and experience gained in diverse domains bring in new ideas and new practices as well as managers' and employees' competencies and technological knowledge boost and help sustain the innovativeness of the SMEs (Barkema and Vermuelen, 1998; Autio et al., 2000; Zahra and Nielsen, 2002; Coviello and Jones, 2004; Rialp et al., 2005; Zucchella et al., 2007; Sullivan and Marvel, 2011; Castano et al., 2016).

Early studies, mostly taking an open innovation perspective, found that complementing internal knowledge sources with *external knowledge* (Caloghirou et al., 2004; Mention, 2011) increases innovation performance. Such external knowledge is embedded in social and (inter)personal relationships

(Johannisson, 1998; Baum et al., 2000; Ceci and Iubacci, 2012; Idris and Saridakis, 2018) with their friends (who can also be users of their product), consumers and customers. The activities of their competitors also create a stimulus for firms to develop new products or improve existing products.

Recent research however presents a more nuanced view. While the role of internal knowledge sources is critical for innovation performance, the role of external sources is less clear, suggesting whether there may be an interaction between internal and external sources (Frenz and Ietto-Gilles, 2009) or that it is the variety of sources (Deligianni et al., 2015; Rodriguez et al., 2017) that matter rather than simply the access to external sources. Van de Vrande et al. (2009) find that internationalised small firms, compared with internationalised medium-sized firms, seldom focus on external knowledge sources, which are limited to the relationships with customers in the form of user feedback or collaborator in product modifications and upgrades to keep up with competitors in the market. In Finnish software SMEs, Ojala (2009) finds that other strategic reasons might overtake the value of network relationships when the product is niche. Based on empirical evidence on 270 Chinese technology-based companies, Xie et al. (2015), and using Italian innovation survey, Ardito and Petruzzelli (2017) find an inverted U-shaped effect of business network ties and external knowledge sources respectively on innovation. They show that up to a certain level external sources facilitate innovations via creative thinking (e.g. Laursen 2012), but after that point, networks introduce complexities that outweigh the benefits. Chetty and Stangl (2010) observe in ten New Zealand software companies that diverse external networks are an important source of internationalisation and high-level innovation, whereas firms with limited external linkages mostly deliver innovation and internationalisation at incremental levels. This suggests that the effects of internal and external knowledge sources vary for different types of innovation, which may require different levels of creativity (e.g. improvements to the existing product versus new to the market). Moreover, the findings that suggest the need for complementarity between internal and external sources may not necessarily apply to all SMEs, for example, those that develop software or other forms of technology.

Knowledge is also crucial in explaining the relationship between innovation and internationalisation. Empirical studies suggest that newly established SMEs that have innovative capabilities are able to perform early and rapid internationalisation (Coviello and Munro, 1997; Freeman et al., 2006; Eurofound, 2012; Love and Ganotakis, 2013), and link this ability to the fact that such firms tend to have a wide range of internal and external sources of knowledge, including during the post-entry stage (Puthusserry et al., 2020). Access to internal and external sources of knowledge means these firms can focus on niche markets (Baronchelli and Cassia, 2014), choose differentiation strategies over cost leadership (Cavusgil and Knight, 2015), develop market orientation and market positioning strategies (Armario et al., 2008), and therefore internationalise early, i.e. born globals (Knight and Cavusgil, 2004).

SME internationalisation is also facilitated by prior knowledge of international markets (Oviatt and McDougall, 2005; Baronchelli and Cassia, 2014) that allows SMEs to overcome the liability of newness (à la

Stichcombe 1965), by the owner-manager's international experience to overcome the liability of foreignness (Zaheer, 1995) and by international networking to overcome the liability of outsidership (Johanson and Vahlne, 2009). All these liabilities are related to the lack of 'learning experience', suggesting gradually internationalised SMEs may also develop innovative capabilities by relying on their knowledge sources as much as early internationalised SMEs but incrementally.

Similar to innovation studies, internationalisation research distinguishes between externally (markets and networks) and internally-focused learning processes, leading to new knowledge that supports internationalisation in SMEs (Weerawardena et al., 2007). *Internal knowledge* includes both technological (Zahra et al., 2000) and non-technological (Eriksson et al., 2000; Deligianni et al., 2015) knowledge and supports firms to adapt to evolving conditions in their external environment (Nelson and Winter, 1982) and to pursue leading-edge innovative products that are critical to new and internationalised firms (Weerawardena et al., 2007; McKelvie and Davidsson, 2009). Manager's international experience positively influences the internationalisation decision not only to internationalise early (Zuchella et al., 2007) but also to help to develop foreign partners (Reuber and Fischer, 1997) to foster their innovation performance. Recent studies on SME internationalisation provide supporting evidence for the critical role competent employees play, particularly for the early internationalised SMEs vis-à-vis gradually internationalised SMEs (Onkelinx et al., 2016).

*External knowledge* sources provide SMEs knowledge of foreign market opportunities, test ideas, and gather information such as international business know-how (Mort and Weerawardena, 2006; Weerawardena et al., 2007; Zhou et al., 2007) and providing access to knowledge on financing, distributions channels, referrals, a pool of key contacts alongside markets and customers (Coviello, 2006). Research suggests that social and business relations and network partners of SMEs determine their market entry decisions (Ibeh and Kasem, 2011; Loane and Bell, 2006). Coviello and Munro (1997) and Moen et al. (2004) find networks to be important especially for small computer software firms, especially when deciding the first entry market. After being internationalised, SMEs' operating in diverse markets allows exposure to different consumers and customers (Eriksson et al., 2000). The knowledge of the target consumers and customers facilitates their sale of the product in a variety of markets (Edvardsson et al., 2010; Joshi and Sharma, 2004; Alajoutsijärvi et al., 2000). The evidence on Spanish exporting manufacturing firms suggests that consumer feedback leads to learning benefits to increase product innovation more than receiving technological knowledge (Salomon and Shaver 2005).

Moreover, the acquisition and absorption of external knowledge is a distinguishing capability (Inkpen, 1998; Kim and Inkpen, 2005; Escribano et al., 2009; Frenz and Ietto-Gillies, 2009; Sullivan and Marvel, 2011; Yoruk, 2019) that explains the differences in the innovation capabilities of internationalised and local market-oriented SMEs. While local SMEs may tend to display higher learning capacity due to their

knowledge gap from the technological frontier (Inkpen, 1998; Kim and Inkpen, 2005; Pellegrino and McNaughton, 2017), due to their low absorptive capacity, local SMEs most often fail to effectively exploit their learning capacity (Cohen and Levinthal, 1990; Zahra and George, 2002), affecting their capability to develop high-level innovation products and internationalise. Forsell (2010) provides evidence from a small Romanian software firm that had strong external connections with local agents (i.e. research institutes, universities, customers and other ICT firms) as well as access to local knowledge and skilled labour force. Once the firm was involved in an equity-based relationship (joint venture) with a foreign company to outsource software, it grew in terms of employment in two years but its software processes closely followed the foreign partner's processes, leaving no room for the Romanian firm to improve its innovation capabilities due to the lack of absorptive capacity.

In summary, the innovation success of internationalised SMEs depends on developing capabilities by means of internal and external sources of knowledge; together, separately, or in combination with other factors. Love and Ganotakis (2013) observe in UK new technology-based SMEs a difference between the patterns of high- and low-intensity innovation firms regarding their entry to and exit from export markets and link this finding to high-intensity innovators to be endowed with internal resources while low-intensity innovation firms rely on external linkages. They also find that when the knowledge sources are allowed for internationalisation helps high-level innovation in high-tech SMEs, but does not necessarily make them more innovation-intensive. Recent studies also examine the role of moderating (Zahra et al., 2009; Ren et al., 2015; Monreal-Perez et al., 2012) and mediating effects (Genc et al., 2019) of different knowledge types on the relationship between SME internationalisation and innovation. Zahra et al. (2009) find that social knowledge on the foreign markets SMEs enter strengthens the effects of international market scope (i.e. number of countries they internationalise into) on SMEs' product innovation. Ren et al. (2015) find that internationalisation has a positive effect on innovation performance only when SMEs' R&D or marketing capability is high. Marketing capability is important because it generates contact with customers and leads to learning which eventually yields product innovation. Genc et al. (2019) observe that market and entrepreneurial orientation mediate the better realisation of the potential innovation benefits of SME internationalisation. In this paper, we aim to contribute by extending our understanding of the interdependencies between SME internationalisation and sources of knowledge, and their impact on SME innovation.

### **3. Setting the Research Context**

Our study examines a particular sectoral and geographical context. Focusing on the software development industry in an emerging innovation-driven city region located in CEE offers an ideal setting to examine the impact of knowledge sources and internationalisation on innovation in SMEs.

### **3.1. Sectoral Context - Internationalisation and Innovation in Software Development Industry**

As discussed above, the extant empirical studies on the software industry focus either on SME internationalisation (e.g. Åijö et al., 2005; Ibeh and Kasem, 2011; Kumar Jain et al., 2019) or on SME innovation. Examining the software development industry will allow us to contribute to research on the interaction between SME innovation and internationalisation. Most existing studies examine the manufacturing industry, in which the observed internationalisation and innovation patterns cannot be necessarily applied to the software development sector due to the nature of the product (i.e. digital). Digital products mean that small software firms can grow faster with low transaction costs and entry barriers, i.e. the use of the online market (Tiessen et al., 2001; Jean and Kim, 2020) eliminates requirements for physical facilities for logistics when export behaviour is concerned. Instead, the digital product necessitates knowledge-based computing capabilities (e.g. website development), which could be harnessed by a small group of staff and can be adapted for specific markets. Access to international audiences is facilitated by internet platforms, thus meaning there is no difference between sales at local or international markets, eliminating the potential influence of 'physic distance' on the speed of internationalisation (Johanson and Vahlne, 1977), other than the 'quality' of product innovation (cf. Oesterle 1997). Second, a key aspect of digital products is that refinement and development do not happen only before product launch; but it continues throughout the product use (Yoo et al., 2012). The prevalence of agile methods in software development institutionalises practices such as rapid iterations and customer feedback leading to fast product change (Duc and Abrahamsson, 2016). Most software products are characterised by a relatively short life span (2-3 years) as they become outdated in two to three years when an upgraded version is introduced into the market (Bell, 1995; Autio et al., 2000). Therefore, (in)direct exporting becomes the most effective way of commercialising digital products rapidly in global markets (Bell, 1995).

The software development industry is composed of two segments, i) the offshoring/nearshoring services and business process outsourcing companies and ii) the software product providers. While the former focuses on developing the products as specified by the (mostly foreign) clients, the latter are firms that invest in R&D, develop and commercialise their own products. In this paper, we specifically focus on the latter.

### **3.2. Geographical Context - Innovation-driven City Region Software Development Hub**

We examine the small software product providers located in the city region of Cluj-Napoca, the second-largest software development hub in Romania after Bucharest, the capital city. In 2019, Cluj-Napoca accounted for 78% of Romanian IT exports, with two in three companies focussing on software

development, and with 10,000 active software engineers and 1000 graduates every year.<sup>1</sup> The city region also finished second in the competition for the European Capital of Innovation 2020 Award, alongside Espoo (Finland), Helsingborg (Sweden), Valencia (Spain), and Vienna (Austria) (EU, 2020).

Romania - as other CEE countries - joined late in the expansion of the software outsourcing market, following the growth of the industry first in India during the 1980s and 1990s. By 2003, Romania was already the second country behind India in terms of the total number of software developers available for hire to support off-shoring (Gomes, 2003). The growth of the Romanian software development sector has continued into the last decade, both in terms of skilled human capital (in 2019 Romania ranked 6<sup>th</sup> in the world in terms of the number of certified IT specialist per capita, ahead of countries such as UK and Germany<sup>2</sup>) and in terms of the number of IT start-ups (which tripled during 2011-2016<sup>3</sup> and continued to grow between 2015-2019 as the number of software development companies increased by almost 60%<sup>4</sup>). As a result, in 2019, IT firms accounted for more than 6% of Romania's GDP (My-Gateway Project 2019), whose 7.7% were classified as high growth enterprises (OECD 2016). IT is one of the most dynamic sectors of the Romanian economy (Pantea, 2021). A range of government measures including the elimination of salary tax for software developers, and the introduction of a unique low tax on profit for ICT companies, combined with the benefits of joining the EU which include open foreign trade, free circulation of personnel as well as access to EU funding have stimulated this growth. While this growth involved mostly the expansion of outsourcing services, as demonstrated by the low rate of R&D spending in ICT (EU, 2019), there is also evidence that this sector, is becoming more innovative, and predominantly export-oriented (OECD 2016; Fortech, 2020), as demonstrated by the increasing number of innovative start-ups and successful scale-up firms (My-Gateway Project 2019).

A recent study on the city region of Cluj-Napoca points to evidence that over the last years the sector has become an innovation-driven economy, with a growing number of R&D intensive companies developing their products and services, in addition to the IT integration solution providers which operate primarily as outsourcing companies (Fan et al., 2019). The same study finds that the development of the sector and its move from outsourcing firms to branches of MNC or indigenous companies who invest in developing their own products and services was facilitated by skilled returnees from abroad. The study highlights poor local university-industry connections and a lack of ability to support their scaling up in the region. There is

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<sup>1</sup> [How the ICT Industry Is Growing in Cluj-Napoca, Romania – Team Extension – Insights](https://teamextension.blog/2019/08/06/ict-industry-growing-cluj-napoca-romania/), <https://teamextension.blog/2019/08/06/ict-industry-growing-cluj-napoca-romania/> [Team Extension 6/8/2019, accessed 05/04/2021].

<sup>2</sup> <https://teamfound.com/quick-guide-to-romania-it-and-software-industry/> [TeamFound 2021, accessed 05/04/2021].

<sup>3</sup> <http://investromania.gov.ro/web/doing-business/itc/> [InvestRomania 2019, accessed 05/04/2021].

<sup>4</sup> <https://softech.ro/cluj-napoca-custom-software-development-market-report/> [Softech, 13 April 2020, Cluj-Napoca Custom Software Development Market Report, accessed 05/04/2021]

evidence these shortcomings are beginning to be addressed, for example, the European Investment Bank (EIB) provided a loan of 21 million to Technical University of Cluj-Napoca (UTCN), the first loan of this type offered to support Romania Higher Education Programme (Emerging Europe, 2020), proving the recognised potential in sustaining innovation and software development. The disadvantages of weak and poorly developed local networks are overcome by the sector's strong integration into the global innovation networks (mostly European), which are found to facilitate its ability to support innovation by tapping into international sources of knowledge. Hence Cluj-Napoca city region with its recent growth and increasing commitment to innovation, despite poor local networks and reliance on international networks, offers an ideal context to study how internationalisation supports innovation.

## **4. Research Methodology**

### **4.1. The sample**

This study focuses on small software product provider firms established by Romanian entrepreneurs. Our sample includes fourteen companies (Table 1). When selecting our cases the two fsQCA key criteria of sufficient homogeneity to represent case characteristics and maximum heterogeneity related to conditions and present/absent outcomes have been taken into consideration (Rihoux and Ragin, 2008; Jordan et al., 2011; Kimmitt and Munoz, 2017).

There is a good variation among the age and size of the firms. Four of them are very young (between 1 to 3 years old), eight of them are young (between 4 to 6 years old), and two of them are relatively old at 14 years old. Six of them are micro firms, out of which five are owner-managers and EI-3 has seven employees. Eight of them are small companies whose number of employees ranges between fifteen and thirty.

**Table 1** The description of cases.

Company	Number of Employees	Age	Product	Product target market	Product Innovation	Market presence
El-1	27	6	Software platform - collaboration tool for creating and sharing app designs	Business-to-Business	New to the international market	International only
El-2	30	14	Enterprise software - airport software	Business-to-Business	New to the international market	International only
El-3	7	7	Enterprise software - educational simulation	Business-to-Business	Improvement in the international market	International only
El-4	22	2	Software platform – electronic payment	Business-to-Consumer and Business-to-Business	Improvement in the international market	International only
El-5	15	1	Enterprise software – digital security	Business-to-Business	Improvement in the international market	International only
GI-1	1	4	Software platform – e-fulfilment platform linking business with warehouses	Business-to-Business	New to local market / Improvement in the international market	Local then International
GI-2	12	6	Enterprise software - CRM for real estate agents	Business-to-Business	Improvement in the local market	Local then International
GI-3	12	3	Software platform – Point of Sale apps for SMEs, and allowing integration of other apps	Business-to-Business	New to the local market	Local then International



<b>GI-4</b>	1	4	Software platform - app linking restaurants with customers	Business-to-Consumer and Business-to-Business	New to local market / Improvement in the international market	Local then International
<b>L-1</b>	1	5	E-commerce - online photo retailer	Business-to-Consumer	New to the local market	Local
<b>L-2</b>	1	5	A website that aggregates property rental and selling postings	Business-to-Consumer	Improvement in the local market	Local
<b>L-3</b>	1	2	Enterprise software - CRM for real estate agents	Business-to-Business	Improvement in the local market	Local
<b>L-4</b>	27	14	Mobile Apps for personal services (KidsGarden, Clever Wash)	Business-to-Consumer	Improvement in the local market	Local
<b>L-5</b>	27	4	Financial mobile app to track expenses	Business-to-Consumer	Improvement in the local market	Local

**EI** - Early Internationalised firms, **GI** - Gradually Internationalised firms, **L** - Local firms.

The cases are developing a range of software products for both the consumer and business markets, and internationalised companies mostly target business markets while local companies mostly target consumer markets. L-4 and L-5 were originally set up as outsourcing facilities to international companies, and have recently diversified into developing and commercialising their own products in the local market.

The early internationalised companies internationalised from the inception, out of which two focus on EU markets (EI-3 and EI-5) and the other three have clients all over the globe (EI-1, EI-2, and EI-4). The gradually internationalised companies began internationalising when they were between two (GI-1) to five (GI-2) years old. Two of the gradually internationalised companies have just started to sell to their first EU clients shortly before we interviewed them (GI-4, Spain and GI-2, Cyprus). One of them has been expanding in the CEE region (GI-1, Moldova and Slovakia) while another more internationally (GI-3, Brazil and the Czech Republic).

#### **4.2. Method of analysis: Small-N fsQCA**

We use the set-theoretic approach fuzzy-set Qualitative Comparative Analysis (fsQCA) to conduct our analysis (Ragin and Davey, 2016). Recently, fsQCA is being increasingly used in business research including SME internationalisation (Felicio et al., 2016; Cobo-Benita et al., 2016; Munoz and Cohen, 2017; Gast et al., 2018; McKnight and Zietsma, 2018; Kraus et al., 2017; Ciravegna et al., 2018; Smith et al., 2019; Haddoud et al., 2020; Kadile and Biraglia, 2020; Yoruk and Jones, 2020). QCA presents the interdependence among the conditions in the form of combinations, also called configurations or pathways. Usually, more than one combination paves the way for achieving the outcome.

fsQCA is very suitable for our research since we are interested in exploring the possible pathways that are formed by interdependencies between internationalisation, external and internal knowledge sources and that jointly lead to higher levels of innovation rather than the quantified effect of these factors individually on the outcome. Moreover, this method allows us to match cases with specific pathways to innovation through which we can identify the underlying reasons behind the differences and similarities across cases.

In that sense, we practice fsQCA as a case-based comparative method (Ragin, 1987; Cooper et al., 2012; Beynon et al. 2020; Yoruk and Jones, 2020). fsQCA's applicability and superiority as a comparative case study have been affirmed in several methodological studies (Häge, 2007; Stokke,

2007; Berg-Schlosser et al., 2009; Jordan et al., 2011; Greckhamer et al., 2013; Kroglund and Michel, 2014; Cooper and Glaesser 2016). By conceptualising cases as configurations of attributes fsQCA is able to provide statistically acceptable solutions in small sample sizes rendering sample representativeness less of an issue (Ragin, 2000; Fiss, 2011). The calibration process of attributes further reduces sample dependence (Misangyi et al., 2017). QCA is a non-parametric method and it does not assume data are drawn from a given probability distribution which permits the use of purposefully selected cases with maximum variety (Mahoney and Goertz, 2006; Berg-Schlosser and De Meur, 2009; Fiss, 2011; Kimmitt and Munoz, 2017). The detailed case knowledge of the researcher can be used as a strength in fsQCA conducted with small sample sizes (Berg-Schlosser et al., 2009; Jordan et al., 2011; Kroglund and Michel, 2014; Cooper and Glaesser, 2016; Misangyi et al., 2017) where there is qualitative backing of data with reference to rich case narratives that can be used to interpret results (Miller, 2018).

### **4.3. Data collection**

Data were collected in spring 2019 using semi-structured face-to-face interviews with the founders as the key informants (Coviello and Jones 2004). The interview guide is designed to discuss the background of the company, the founders, the main product, and the activities involved in their product development and commercialisation. For the purpose of this paper, we have coded the data concerning the nature of innovation, the knowledge sources they rely on during product development and commercialisation, and the markets targeted.

### **4.4. Measures, coding and set membership calibration**

#### *4.4.1. Outcome measure*

Since we focus on examining the geographical expansion from local to international markets, for our analysis the relative newness of innovation to market is crucial. Most innovation research does not take the locality of the market into account (e.g. Mosey, 2005). When considering internationalisation, locality matters, i.e. whether newness is relative to the local or international market that the firm targets. Following Mosey (2005), we differentiate between 'new to the market' products representing high-level innovation products and 'improvements in existing products' representing incremental levels of innovation. We thus included in the high-level of innovation products three distinct categories: (i) new to the international market, (ii) new to the local market,

and (iii) improvements in existing products vis-à-vis international market, and in the low-level of innovation, improvements vis-à-vis the local market. The distinction between (ii) and (iii) in the high-level innovation product category consists in the degree of innovation: while the second generally represents an adaptation of international products to the local market, the latter are improvements over international products that do not exist on the local market.

Understanding the type of innovation in our fourteen cases involved an in-depth assessment of the nature of the product. In the majority of cases, the entrepreneurs initially presented their product as new to the market. The nature of the semi-structured interviews however offered the advantage of allowing researchers to probe in-depth the nature of the product in all cases. In some cases, these follow-up responses confirmed the innovation as incremental in nature, where the product was then described as improving on existing products by offering enhanced functionalities rather than representing entirely new product categories either in the local or international market. In those cases, we coded the products as improvements rather than new to the market.

Based on the above-explained outcome measures, we test two solutions using fsQCA: (1) attaining high-level innovation products and (2) attaining low-level innovation products. Our data are of qualitative nature which can be calibrated into sets in QCA (Misangyi et al., 2017). Table 2 informs on the process of coding and calibration of data. Outcome measure has four categories and three ordinal levels due to coding of products new to the local market and improvements vis-à-vis international market as medium level since it is difficult to order them by the novelty of the product. The highest level is calibrated as fully in, the medium level as cross over point or neither fully in nor fully out, and the lowest level as fully out (Table 2).

#### *4.4.2. Independent measures*

Independent measures are called conditions in fsQCA (Ragin, 2000). Our model consists of three conditions, namely internationalisation, internal knowledge sources, and external knowledge sources.

For *internationalisation*, following the common terminology on early and gradually internationalised SMEs in the IB literature (Cavusgil and Knight, 2015; Johanson and Vahlne, 1977), we coded cases depending on the first market they targeted. 'International' if their product first and only is sold in the international market (i.e. early internationalisers), 'local to international' if their product was developed for the local market, but within two to five years it has begun to be commercialised

internationally (i.e. gradual internationalisers), and 'local' if the product was developed and is only sold within the local market (i.e. local firms). Internationalisation condition has three ordinal levels and the highest level is calibrated as in fully in, the midpoint level as cross over point or neither fully in nor fully out, and the lowest level as fully out (Table 2).

We used the traditional classification of the *sources of knowledge*, i.e. internal and external to the firm. We also draw upon Weerawardena et al. (2007). The entrepreneurs leverage these sources to gather ideas for new product development or support new product commercialisation. The *internal knowledge sources* refer to the ideas for new products or product improvements that come from the entrepreneur's knowledge of the international and local domain, prior entrepreneurial experience, industry-related prior knowledge, or from employees.

**Table 2** Description of measures based on the literature review, their coding and calibration.

<b>Measures for outcome and conditions</b>	<b>Attributes of measures and their codes</b>	<b><i>fsQCA calibration criteria for set membership</i> (fully in, crossover point, fully out)</b>
<i>Level of product innovation</i>	1 Improvements vis-à-vis local market 2 Improvements vis-à-vis international market 2 New to the local market 3 New to the international market	(3, 1.5, 1)
<i>Internationalisation</i>	1 Local 2 Local to international 3 International	(3, 1.5, 1)
<i>Internal sources of knowledge</i>	-Entrepreneur's knowledge of the international domain -Entrepreneur's knowledge of the local domain -Employees -Industry-related prior knowledge of the entrepreneur -Prior entrepreneurial experience	(5,2.5,0)
<i>External sources of knowledge</i>	-Customer -Partners -Competition -Friends and mentors -Investors	(5,2.5,0)

Entrepreneur's knowledge in international (or local) domain refers to the international (or local) market knowledge as a user of the product, to systematic monitoring of the users or the competition in the international (or local) market, and to knowledge gained through working in international (or

local) companies either abroad or in their Romanian subsidiaries. The latter exposes the Romanian entrepreneurs to the foreign business and innovation culture with knowledge spillovers from international companies into local businesses. Absorbing such externalities leads to Romanian start-ups that are capable of internationalising as early as their inception.

Prior entrepreneurial experience refers to previous work undertaken by the entrepreneur in an entrepreneurial organisation such as a family-owned small company, start-up, or to previous ventures of his/her own or with some friends/partners. Entrepreneurs with prior entrepreneurial experience also tend to display a risk-taking attitude in their ventures.

Entrepreneurs' industry-related prior knowledge refers to the technical knowledge of the computing software industry as a user or by working in the software industry for a considerable number of years before launching his/her start-up or by having IT knowledge through university education. As well as founder/owner-manager(s), the technical knowledge of the employees is a critical source for devising ideas for innovations and the product in the first place and/or carry out modifications and improvements in them.

Based on these, the internal knowledge sources condition has categorical, not ordinal, attributes. Therefore, when constructing this condition, we used the summation technique (Boyd et al., 2005; Gilbert and Campbell, 2015; Yoruk and Jones, 2020). For instance, the internal knowledge sources condition incorporates five attributes. We determined whether each of these attributes existed in the cases. We then summed up the existent attributes to code the condition. It will be in the form of a Likert scale indicator ranging from 0 to 5 which is calibrated according to Fiss (2011), i.e. full membership threshold was selected as the maximum value for a condition, full non-membership threshold was selected as the minimum value of 0, and the midpoint as the crossover point.

*External knowledge sources* include ideas originating from the actors in networks and markets. Network-related actors are friends, mentors (representing former business partners or employers that the entrepreneurs rely on as an external business advisor), and investors into the business. Market-related knowledge sources are customer/consumer feedback (which was present in all our cases), the actions of competitors in the market (either indirectly through the launch of new products, or directly through visiting/communicating with competitors), and business partners involved during the product commercialisation (e.g. banks or hotels to distribute the product to their customers). The summation logic applied to internal knowledge sources was applied to external knowledge sources condition.

## 5. Findings

We present our findings from fsQCA analyses, the solutions for attaining high-level and low-level innovation products respectively, in Tables 3 and 4. All fourteen cases appear on the truth table and explain six of the eight possible configurations. We operationalise the truth table by setting the frequency threshold at 1 and the consistency cut-off value at the minimum recommended value of 0.75 (Ragin, 2008).<sup>5</sup> Below, we further elaborate on causes for outcomes using our in-depth knowledge of the cases from interviews.

### 5.1. Pathways to high-level innovation

Table 3 presents two pathways (or configurations) for achieving high-level innovation products. The overall solution representing pathways 1 and 2 has an acceptable overall solution consistency value of  $\geq 0.75$ . Overall solution consistency denotes the extent that cases correspond to the set-theoretic relationship expressed in a solution (Fiss, 2011: 402). Raw consistency measures the degree to which configurations belonging to the solution are subsets of the outcome (Ragin, 2008: 85). For all configurations, raw consistency values are equal to or above 0.75 acceptable threshold value.

Overall solution coverage shows that pathways 1 and 2 jointly explain 81% of membership in the present outcome. Coverage informs what extent of the outcome is explained by each configuration (raw coverage and unique coverage) and by the solution as a whole (overall solution coverage) (Ragin, 2008: 85). Raw coverage measures the proportion of memberships by each condition in the outcome, whilst unique coverage measures the proportion of cases that follow the specific configuration leading to the outcome (Ragin 2008: 86). Unique coverage statistics suggest that pathway 2 is more significant than pathway 1 in terms of frequency of occurrence of the outcome, 0.21 against 0.09, respectively. Based on raw coverage statistics, conditions explain the configurations at 60% for pathway 1 and 72% for pathway 2.

In both pathway 1 and pathway 2, internationalisation emerges as critical in supporting the development of products characterised by a high-level of innovation. This suggests that targeting international customers encourages firms to focus their product development efforts on new functionalities to serve their customers in novel ways.

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<sup>5</sup> Consistency threshold serves to distinguish configurations that are subsets of the outcome from those that are not.

Pathway 1 is characterised by the presence of internationalisation and the absence of external sources of knowledge as core conditions, whereas the presence or absence of internal knowledge sources does not matter. Four companies represent this pathway: three of them early internationalised and one gradually internationalised. This pathway suggests that internationalisation alone can lead to a higher level of innovation even if the venture has no or scarce external knowledge sources to support its product development and commercialisation. We label Pathway 1 as the *Internationalisation Path to Innovation without reliance on external knowledge sources*.

**Table 3** Pathways for high-level of innovation products.

Pathways/Configurations	1	2
INTERNATIONALISATION	●	●
INTERNAL KNOWLEDGE		●
EXTERNAL KNOWLEDGE	Θ	
Raw coverage	0.60	0.72
Unique coverage	0.09	0.21
Raw consistency	0.91	0.88
Overall solution coverage	0.81	
Overall solution consistency	0.88	
Cases with greater than 0.5 membership in configuration	EI-1 EI-2 EI-3 GI-1	EI-1 EI-3 EI-4 EI-5 GI-1 GI-2 GI-3 GI-4

● Core causal condition (present); Θ Core causal condition (absent). Blank spaces denote 'don't care'.

EI – Early internationalised; GI – Gradually internationalised firm.

Truth table frequency cut-off = 1, consistency cut-off = 0.86. Combination of intermediate and parsimonious solutions is presented.

Pathway 2 exhibits the presence of internationalisation complemented by the presence of internal knowledge sources within the firm. All internationalised companies, except EI-2, represent this pathway. For these firms, having access to external knowledge sources does not matter to achieve high-level innovation. This pathway highlights the complementarity between internationalisation and internal knowledge sources for attaining high-level product innovation in the firm. We label pathway 2 as the *Internationalisation Path to Innovation coupled with internal knowledge sources*.



Three of the internationalised cases, namely EI-1, EI-3, and GI-1, appear in both pathways. This finding highlights the equifinality principle in QCA which states that there may be more than one way to achieve the same outcome (Fiss, 2007; Gresov and Drazin, 1997) meaning these three firms can choose from either pathway to achieve high-level innovation products.

#### *5.1.1. Internationalisation Path to Innovation without reliance on external knowledge sources*

All the internationalised cases in this pathway identify new technology solutions that can address a gap in the international market and are too sophisticated for the domestic market. EI-3 took advantage of an unsatisfied need for customised simulation solutions first in the international education sector, and then later expanding more widely to the business sector. EI-1 creates a new market niche in software collaborative design, before moving into the business market and expanding the product to encompass visualisation software as their original market becomes crowded. EI-2 developed a new niche in the airport technology market, a software that facilitates real-time communication between airport staff and passengers, which appeals to large airports with significant passenger traffic. GI-1, as the only gradually internationalised case in this pathway, has a niche product that emerged from the entrepreneur's knowledge of the industry as a user.

The lack of domestic demand due to the underdeveloped local market for a niche product drove the internationalisation of early internationalised cases: local universities had little demand for simulation in general (EI-3), and there was little domestic demand for airport software (EI-2) or collaborative software design (EI-1). Moreover, both having niche products and keeping up with their updated versions allow these firms to enjoy high concentration in their markets (EI-2), or first-mover advantages in a specific market (EI-1). Hence, neither of these companies rely on external business partners, mentors, or investors to support their product innovation, but only on customers both to promote their product to others and to improve their product innovation performance through relying on customers' feedback. The use of customer feedback, recommendations, and word of mouth is a method common among SME customers (Leonidou et al., 2007). Romanian customers (not its niche product) are also influential in driving GI-1's internationalisation. They are SME retailers that operate in the CEE market (e.g. Slovakia and Moldavia) and thus need GI-1's product (logistics hubs with digital solutions). Being the only gradually internationalised company that expanded markets in close proximity may explain why GI-1 does not rely on external knowledge sources as the gradually internationalised SMEs in pathway 2.

EI-2 differs from all the firms in our sample whose presence or absence of its internal knowledge sources makes no difference to its high-level innovation performance. The venture is the oldest (at 14 years) and the largest in our sample. The original product stems from a decade-long specialism of the founder in airport technologies (i.e. specific knowledge of the industry) and his work experience in a large international airport (i.e. knowledge of international markets). These might explain why at this point EI-2 relies less on internal knowledge sources (e.g. compared with younger, smaller firms, whose founders play a more central role with their specific knowledge of markets or technologies). EI-2's product has extended into seven modules in fourteen years. The main component in keeping the innovation capability within EI-2 at high levels seems to be its continuing geographical expansion to airports from all over the world with a well-defined niche product, despite the lack of extending its external knowledge sources beyond customers.

#### *5.1.2. Internationalisation Path to Innovation coupled with internal knowledge sources*

EI-1, EI-3, and GI-1 appear in both pathways to high-level innovation products, meaning they have two options to choose from. Appearing in pathway 2 indicates they have internal knowledge in place, yet whether they use it or not depends upon their choice of either pathway.

Pathway 2 suggests that all the internationalised cases (i.e. except EI-2) rely strongly on their internal knowledge sources. The entrepreneurs of the early internationalised cases (except EI-4) had direct experience in, and therefore knowledge of, international markets. They either worked in the industry internationally (EI-3), or for an international company based in Romania but targeting the international market (EI-1), or previously setting up a company that developed products for international clients (EI-5), all of which enabled them to spot the opportunities by being close to their potential clients. Moreover, in early internationalised cases (except EI-5), the employees have a significant bearing on product innovation processes within the firm. They initiate ideas for new product development as well as turning them into reality with their technical skills, indicating an innovative culture within the early internationalised SMEs having already been established (Knight and Cavusgil, 2004). Similar to Pathway 1's cases, an underdeveloped local market not ready for a 'niche' product instigated the internationalisation of EI-4 and EI-5. EI-5 took advantage of the changes in the EU legislation of GDPR, and the urgency of many European-based organisations to comply with it to develop a digital security product, but electronic payment was deployed neither by local customers nor merchants. EI-4 took advantage of the emergence of a disruptive market in fintech applications and developed an e-payment app, for which there was little domestic demand.

However, the internal knowledge sources of the early internationalised firms in pathway 1 and pathway 2 differ. EI-1 and EI-3, on the one hand, have a background in IT and prior knowledge of their target market as a user respectively. A group of software developers who worked in the same IT MNC founded EI-1. Their product was first targeted to software developers, then to software firms. EI-3's founder used a similar simulation solution while at university, and then worked for an international competitor before returning to Romania and established his own company to develop a similar, but customised, product. EI-4 and EI-5, on the other hand, have knowledge of local markets and prior entrepreneurial experience in other sectors. A serial entrepreneur with a number of previous ventures in various sectors founded EI-4, and EI-5 is the second venture of the owner-manager. Neither had an IT background, but they are endowed with marketing skills (EI-4) and managerial work experience in MNCs and small enterprises (EI-5), which they leveraged in setting up their business. The presence of either user or IT-specific knowledge opens more avenues for early internationalised firms to innovate, as they appear in both paths. The lack of such knowledge means early internationalised firms are dependent on leveraging other internal knowledge sources to understand the technology and/or the market to continue innovating high-level products after being internationalised.

EI-4 and EI-5 bear more similarities to the gradually internationalised firms than to the early internationalised firms in pathway 1. Gradually internationalised firms, similar to EI-4 and EI-5, have strong prior experience and industry-related knowledge of the entrepreneur (except GI-4, for the latter only). They also have strong local market knowledge. GI-3's founder had direct knowledge of the local market need/gap, had the local entrepreneurial experience of setting up businesses, and worked in an IT MNCs that helped access products for the international market. GI-4 founders are also serial entrepreneurs with experience in setting up IT businesses in different sectors and have experience working in the local market (restaurants where they launched their first product in the local market). Despite appearing with EI-1 and EI-3 in both pathways, the internal knowledge sources GI-1 relies on are similar to those of gradually internationalised firms. The four founders of GI-1 have prior entrepreneurial experience in other businesses, prior knowledge of the specific market they operate, and knowledge of the local domain. Gradually internationalised firms in general lack knowledge in the international domain (except GI-2) and their ability to integrate employees into innovation processes (except GI-4) significantly lag behind early internationalised firms, which might have affected their innovation capabilities initially and delayed their internationalisation process, but do not prevent their high-level innovation products since being internationalised.

GI-2 is an exception among gradually internationalised firms that our analysis places in the high-level innovation path despite its product is originally characterised by low-level innovation. Their original product first launched in 2014 is a CRM (customer relationship management) system that targets the

real estate companies' management of their clients rather than serving the buyers and sellers of properties. While their product could have entered the international markets at the outset, they have strategically chosen first to achieve a dominant position in the local market. They viewed international markets as being characterised by different needs, requiring significant innovation in their product. This was in stark contrast with the other gradual internationalising firms, where the product was either developed from the outset with the international market in mind (GI-3) or where the customer needs were seen as being homogenous across domestic and international (GI-1 or GI-4). Nevertheless, only by revamping the product, they geographically expanded their markets. The analysis suggests that being internationalised the venture has a strong presence of internal knowledge sources and is not shy of external knowledge sources to support its high-level innovation products if it chooses to do so. Three founder entrepreneurs of GI-2 have knowledge of the international domain among themselves through their experience of working in an MNC based in Romania in the real estate market and working for a large IT company in the US.

## 5.2. Pathways to low-level innovation

Table 4 presents configurations for achieving low-level innovation products, i.e. incremental products vis-à-vis the local market. This solution is acquired by negating the process for high-level innovation products solution. The overall solution representing configurations 3 and 4 has an acceptable overall solution consistency value of  $\geq 0.75$ . For individual configurations, raw consistency values are also above 0.75 acceptable threshold value.

**Table 4** Pathways for low-level of innovation products.

Pathways/Configurations	3	4
INTERNATIONALISATION	$\ominus$	$\ominus$
INTERNAL KNOWLEDGE		●
EXTERNAL KNOWLEDGE	●	
Raw coverage	0.56	0.55
Unique coverage	0.08	0.06
Raw consistency	0.91	0.98
Overall solution coverage	0.62	
Overall solution consistency	0.92	
Cases with greater than 0.5 membership in configuration	L-1 L-2 L-4 L-5	L-3 L-4 L-5

● Core causal condition (present); ⊖ Core causal condition (absent). Blank spaces denote 'don't care'. L – Local firms

Truth table frequency cut-off = 1, consistency cut-off = 0.89. Combination of intermediate and parsimonious solutions is presented.

Overall solution coverage shows that configurations 3 and 4 jointly explain 62% of the membership in the present outcome. Raw coverage statistics inform that conditions explain the configurations at 56% for configuration 3 and 55% for configuration 4.

Both pathways are characterised by the absence of internationalisation, suggesting that the lack of internationalisation withholds the innovative capabilities of companies at the incremental level of products. In the absence of internationalisation, knowledge sources on their own i.e. embedded in either the local markets (Pathway 3) or the company (Pathway 4) can only provide low-level innovation activities. This suggests either internal or external or both knowledge sources can support incremental innovation, depending on the knowledge endowment of the companies. All cases that fit in these pathways are locally active small software companies. Cases in Pathway 3 have strong external knowledge sources (L-1, L-2), cases in Pathway 4 have strong internal knowledge sources (L-3), and two cases are strong in both knowledge sources and fit in both pathways (L-4, L-5).

L-4 and L-5 are also the only cases that are outsourcing companies serving the international market, which have invested only recently into efforts to develop their own product. Engaging in own product development is an expected by-product of being an outsourcing company, a phenomenon observed in the global value chain literature (Ernst, 2008; Gereffi et al., 2005) because the knowledge sources of outsourcing companies are rather distinct and strong compared to the other local cases. They learn directly from their international clients and their products. They also leverage external sources of knowledge by actively engaging in external start-up events and collaborate with external mentors (L-4). While both cases recognise the risks of relying on outsourcing activity in the long term, outsourcing serves as a source of constant and secure source of income for SMEs, upon which over time the SMEs tend to become dependent and find it hard to move away, however much they would like to diversify their revenues with the sale of their own products. Therefore, cases like L-4 and L-5, despite having the potential to internationalise both in terms of strength of knowledge and type of product (Business-to-Consumers), might not be strongly motivated to internationalise yet and make a conscious decision of staying local until they organically grow in their domestic market and finance international involvement mainly by their own financial resources. Stoian et al. (2016) report that it took a Romanian software outsourcing company fourteen years to internationalise on those grounds.

L4 and L5 also differ in their approach to engaging in their own product development. L-4 creates separate spin-off companies where employees are dedicated to product development, whereas L-5 maintains product development as part of its day-to-day business activities, with employees working simultaneously on both outsourcing and product development. It is also important to note that the kind of products they engage in (mobile apps) are relatively simple, do not involve substantial innovation, and draw from personal knowledge of the market as a consumer (i.e. car wash or nursery app). Both cases see product development primarily as a learning tool about the process involved in product innovation, facilitating their move from outsourcing to product innovation (Gereffi, 1999); yet they pay little attention to whether there is indeed a real gap in the domestic market.

In contrast, the identification of a gap in the local market drove the product development of all the other local companies. Both L-1 and L-3 take an existing product in the international market and adapt it to the local market. The difference between them consists in the kind of knowledge they leverage to do so. L-3 founder leverages his own deep knowledge of the product and the market he gained during ten years of work experience in international and local domains. He draws inspiration in developing his product from his prior experience working in a Swiss-based real estate company. He also has similar experience working in a Romanian real estate company, which gives him knowledge of the needs of the local market. L-3 is reasonably successful due to adapting an internationally tested software to the local market. Their product is not novel in the local market, but it does provide significant new functionalities. L-3 thus combines the lack of internationalisation with a strong reliance on internal knowledge sources (Pathway 4). L-1's founder in contrast has only general managerial knowledge and relies on external knowledge sources such as monitoring competitors and external subcontractors in developing its product (Pathway 3). L-1's product involves an online platform that sells photo-related products to individual customers. It was an adaptation of existing business models of international competitors to the specific needs of the Romanian market. At the time of its introduction in the local market, L-1 was the first to implement cloud technology to deliver photo retail services in Romania. Hence, L-1 is another exception that our analysis places in the low levels of innovation despite its product being a new-to-the-local-market product. While their core businesses exploit the specificity of the local market, it is also what keeps them in the local market rather than pursuing internationalisation.

The least successful local case is L-2, a property aggregator, partly due to the amount of competition in this particular market. Its entrepreneur signals a significant lack of knowledge other than the local market knowledge. There is evidence of engagement with the start-up competitions and collaboration with other start-ups, but the entrepreneur seems to go blind to the market competition and therefore limits his monetisation ability. His unrealistic idea of the product also hampers his ability to manage

the amount of manual work involved in cleaning the data for the software to work. He, therefore, lacks the ability to sustain the product in the local market, let alone expand the product to other markets.

SMEs that engage in outsourcing activities (like L-4 and L-5) might benefit from partial exposure to international markets when they are capable of balancing the development of internal and external knowledge within their company. However, recent studies on ICT GVCs in the Chinese context argue that for most SMEs, too much reliance on external sources of knowledge is detrimental to their ability to develop internal knowledge and ultimately reduces their innovation capacity (Grimes and Yang 2017, Grimes and Sun 2014). Our findings on local firms that are not part of GVCs suggest that exclusive focus on either internal or external knowledge sources might also reduce the innovation capacity of firms to low-level innovation products. This particularly holds true for L-1, L-2, and L-3 that are all 'one-man band' cases. L-1 and L-3 subcontract IT experts to help with product development rather than growing their business with an internal team of software developers. They make a conscious choice of running a potential risk of knowledge of subcontractors to fall behind the current technological and market developments. L-2 takes a risk by not realising the importance of developing his capabilities that may keep his firm more abreast of the competition. As a result, the choices they make hamper their ability to envisage an expansion to their business beyond their local market.

## **6. Discussion and Conclusion**

This research offers a new approach to studying the role of internationalisation and knowledge in fostering innovation in SMEs. Previous literature established the importance of internal and external knowledge sources for the development of firm innovation capabilities as well as the sole effect of internationalisation. Moving beyond the single, moderation or mediation effect of internationalisation and knowledge sources on product innovation in SMEs, we proxy the real-life phenomenon by analysing the impact of interdependent relationship between internationalisation and distinct types of knowledge sources on the level of product innovation. Using a topical analysis method, fsQCA, we analysed fourteen small Romanian software product provider firms and demonstrated that there is more than one pathway to innovation. We found that the presence/absence of internationalisation and different knowledge sources create four distinct paths to achieving high vs low-level of innovation products, distinguishing between internationalised and local small product provider software firms as well as among internationalised firms (i.e. early and gradual internationalisers). Our study, the first to examine these multiple pathways in a novel way, significantly advances existing research by

demonstrating that the interdependencies between internationalisation and knowledge sources emerge as a critical differentiator between high and low-level innovation products. Our approach highlights the firm heterogeneity in small Romanian software product provider firms and its importance in shaping firm strategies and SME policies.

While our findings accord with the extant research that underscore the relationship between SME internationalisation and innovation, they extend beyond confirming. First, while all internationalised cases in our analysis are characterised by high-level innovation products, we find that without internationalisation local market-oriented firms cannot move beyond low-level innovation products even if some of them present potential to do so; thus confirming existing findings that SME internationalisation leads to innovation (Salomon and Shaver, 2005; Liu and Buck, 2007; Love and Ganotakis 2013). Second, our findings of all our early internationalisers developing a niche product before being internationalised corroborate previous contentions arguing that the high-level innovative behaviour allows niche product development and drives early internationalisation to niche markets (Zucchella et al., 2007; Baronchelli and Cassia, 2014; Cavusgil and Knight 2015). Third, once internationalised, our early internationalised cases continue developing their high-level innovation products; thus confirming the early internationalised firms present a virtuous cycle (Filipescu et al., 2013; Filipetti, Frenz, and Ietto-Gilles, 2011; Golovko and Valentini, 2011).

Our results, however, go a step further to show that internationalisation affects the high-level innovation products in all internationalised software product provider SMEs irrespective of whether they internationalised early or gradually. More precisely, product innovation at high levels is as relevant for gradually internationalised software product provider firms as it is for early internationalised ones once they internationalised. The differences between early and gradually internationalised Romanian software product providers lie in their choices of 'pathways' to high-level innovation. These pathways define the way these small software product providers reorganise their knowledge sources alongside their international activities to achieve high-level innovation. The analysis of these pathways thus enhances our understanding of the conditions under which internationalisation allows firms to continue and/or achieve their high-level innovation (cf. Miller 2018).

Our findings revealed **two pathways to high-level innovation products** in internationalised small Romanian software product provider firms, one with *strong internal knowledge sources* (Pathway 2) and the second one *without external knowledge sources* (Pathway 1). We find more variation among the early internationalised small Romanian software firms concerning the pathways they took than



their gradually internationalised counterparts. Gradually internationalised software firms are homogeneous; all display internal knowledge sources such as prior entrepreneurial experience, knowledge on local domains, and prior knowledge on the industry that endorse the development of their high-level innovation products (Pathway 2). The early internationalised firms that require internal knowledge sources alongside their internationalisation (Pathway 2) to achieve high-level innovation products (EI-4, EI-5) share similarities with the gradually internationalised firms, such as prior entrepreneurial experience (e.g. serial entrepreneurs) and knowledge on local domains. The early internationalised firms that opt-out of external knowledge sources (Pathway 1), however, present a strong innovative culture within the firm (Knight and Cavusgil, 2004). In line with the findings of Sullivan and Marvel (2011) and Onkelinx et al. (2016), case evidence from EI-1, EI-2, and EI-3 show that these firms nurture innovation internally through effectively managing their employees' and operationalising the entrepreneur's prior knowledge of a specific market and experience in international markets to create synergies and organisational knowledge within the firm.

The two pathways our internationalised SMEs, early or gradually internationalised, took to high-level innovation products suggest that the external knowledge sources do not represent a marked advantage for innovation in the case of software product provider firms. Instead, consistent with the previously observed behaviour of high-tech SMEs (Frenz and Ietto-Gillies, 2009; Love and Ganotakis, 2013), we observe a higher reliance on internal sources of knowledge alongside internationalisation activity. All, except one (EI-2), internationalised SMEs, whether early or gradually internationalised, leverage their internal knowledge sources in complementarity with their internationalisation to support their high-level innovation performance. As case evidence in Section 5.1.2 shows, internal knowledge sources in such product provider software SMEs commonly derive from their prior experience in and knowledge of international markets, allowing them to continually spot arising opportunities in these markets for developing high-level innovation products. Strong reliance on internal sources in lieu of external sources may indicate internationalised small Romanian software product provider firms gaining control of their own innovation and business management capabilities. Our findings suggest that in this sector, internationalisation activity, providing firms with exposure to diverse knowledge in the international markets (e.g. Autio et al., 2000; Eriksson et al., 1997, 2000; Lopez, 2005; Salomon 2006, 2006b; Sapienze et al. 2006, Silva et al., 2012; Zhou and Wu, 2014), might undermine the previously recognised importance of external knowledge sources in SME internationalisation and innovation (e.g. Caloghirou et al. 2004, Coviello, 2006, Chetty and Stanlg, 2010; Ceci and Iubaci, 2012; Idris and Saridakis, 2018).

Our findings have implications for existing research on the role of external knowledge sources, such as networking, which is seen as a key capability for internationalisation and innovation (Inkpen and Tsang, 2005). For instance, Chetty and Stangl (2010) find a positive relationship between diverse external links and high-level innovation and internationalisation in software SMEs. However, similar to Frenz and Ietto-Gillies (2009), our findings suggest that when combined with the effect of internationalisation, the effect of external knowledge sources on a high level of innovation is less clear-cut. In line with the existing research on the importance of networks for innovation, our findings point to a reliance on external knowledge sources before or at the early stages of internationalisation (cf. Coviello and Munro 1997; Moen et al., 2004; Loane and Bell, 2006; Ibeh and Kasem, 2011; Jiang et al., 2020), which may help our firms to develop a niche product and with initial entry decisions. In contrast with this line of research, we find that this reliance does not continue after internationalisation, and networking does not seem to have an impact on high-level innovation. This finding aligns with recent findings pointing to an inverted-U-shape relationship as to the contribution of external networks on product innovation over time (Ardito and Petruzzelli, 2017; Xie et al., 2015). We find that for some internationalised small Romanian software product providers the presence of external knowledge sources might not be as relevant as internal knowledge sources or their lack becomes a condition for achieving high-level innovation products (see also Ojala, 2009). In line with van de Vrande et al. (2009), a closer investigation of external knowledge sources of these firms demonstrates easy access to, and the intensive use of, user/customer feedback and close monitoring of their competitors. For instance, EI-2 stresses the sole importance of customer feedback and EI-1 emphasises the importance of keeping an eye on the competition for constantly adjusting/enhancing their product specifications. We also notice that these firms compensate for the absence of external knowledge sources with specific knowledge of the market (Joshi and Sharma, 2004), particularly when there are first-mover advantages due to niche products (Ojala, 2009) or high market concentration (Ardito and Petruzzelli, 2017). Moreover, the ability to rely on networking to source knowledge to support innovation is dependent on the availability of knowledge actors, who are scarce in the relatively young Romanian software development sector, especially for companies targeting an international market. However, Hitt et al. (2000) found that CEE firms (in Romania and Poland) were especially aware that the capability for quality (i.e. skills transfer in technical and managerial issues) was a major factor in international partner selection. As a result, in contrast to strong arguments about the complementarity between internal and external sources to increase innovation performance (Caloghirou et al, 2004; Mention, 2011; Puthusserry et al., 2020), our results indicate that when internationalisation is taken into account the lack of such complementarity may enable some internationalised firms in software development sector to develop high-level innovation products.

Our findings also show that the lack of internationalisation means local product provider software SMEs cannot benefit fully from their internal and/or external knowledge sources to promote their innovation performance (Pathways 3 and 4). With no access to diverse knowledge through foreign markets and customers, the chances for local market-oriented firms that rely only on external knowledge sources to improve their innovation capabilities are nil (Pathway 3) unless they strengthen their internal knowledge (Yoruk, 2019), as through absorptive capacity they can more effectively utilise their external knowledge (Cohen and Levinthal, 1990; Zahra and George, 2002; Kim and Inkpen, 2005; Escribano et al., 2009). In the absence of internationalisation, reliance on external knowledge sources means the firm is trying to catch up with its competitors (Pathway 3), while reliance on internal knowledge sources means the firm seeks to manage internal innovation processes and cope with the competition within their existing local markets (Pathway 4) (Liu, 2010; Xie et al., 2015). The local cases that engage in software outsourcing to international customers (L4 and L5) possess both internal and external knowledge sources, and despite displaying capability to move from outsourcing to product innovation, they are seemingly held back from being internationalised. First, both cases are a testament to the fact that strong internal knowledge gained from business experience with international clients does not correspond to the experience and knowledge gained in the business run in the international markets when it comes to innovating products at a high level. Second, their outsourcing activities, while providing them familiarity with the international domain and upkeep their internal knowledge development, curb their innovativeness merely because they are not short of capabilities, but short of resources such as time and human capital is taken away from the core business of production for outsourcing. The deployment of resources between outsourcing and own product development activities comes as a trade-off and a key challenge in developing their own products forcing them to rationalise their product development rather than allowing them to pursue all kinds of ideas. Therefore, our findings suggest that if internationalised via promoting their own products, some local market-oriented firms can move beyond low-level innovation; otherwise, small Romanian product provider software firms deliberately stay local to exploit the gap in their domestic market.

Our findings have implications for the internationalisation and innovation strategies of small software product provider firms. We observe two trends emerging in the software development industry led by internationalised and local firms. On the one hand, small internationalised software product provider firms reap the benefits of internationalisation by taking advantage of the nature of the industry and set out their business with the intention to internationalise, whether as early as their inception or gradually. Such firms are generally endowed with strong internal knowledge, but they

also have access to external knowledge sources when they need them (either before or after being internationalised). These software product providers are highly motivated and continue to develop high-level innovation products after they internationalise. Our findings demonstrate that firms pursuing these strategies do not lose the momentum of their innovativeness after internationalisation, contrary to Love and Ganotakis (2013) study which found that high-intensity innovators choose to cease exporting to regain hold of the ever-changing market information. This may be due to SMEs in different sectors pursuing different strategies, and calls for further in-depth research about SME internationalisation and innovation beyond early internationalised SMEs to encompass gradually internationalised SMEs. On the other hand, small local market-oriented software product provider firms focus their attention on their local/national market. We find that although some of these firms have the potential to internationalise they purposefully decide to stay local to exploit the opportunities local markets offer. This behaviour of these local software firms entices interest for further research.

The practical implications of our research for managers of SMEs point to specific configurations of internationalisation and knowledge sources that can drive the selection of their firm strategies. Particularly for the internationalised small Romanian software product providers, different pathways inform the entrepreneurs of the options they have in leveraging different knowledge sources to support their high-level innovation and in triggering changes in firm innovation strategies; more precisely, highlighting the need to focus on internal rather than external knowledge sources, or even excluding external knowledge sources altogether.

Our research is also relevant to policy-makers interested in devising interventions to support innovation in the Romanian software development industry. Our findings highlight the need for such policies to consider the interdependency between internationalisation and knowledge sources and the opportunity to follow different pathways. In addition, specific efforts can be placed on ascertaining the right areas in which local and internationalised software firms need subsidies, tax relief, skill development programs, and so on. Our results demonstrate that staying local might be a choice but not necessarily a deterrence for developing innovation capabilities in the software product provider segment. Hence, public policies would be instrumental in developing the ability of local firms to encourage high-level innovation products. Fan et al. (2019) emphasise that in the case of Cluj-Napoca the local government played a role in incorporating the city region into global networks as they are considered the most effective way to increase a latecomer's innovative capabilities; however, such policies helped to advance the outsourcing segment of the software development industry. Our findings generate implications for the next steps in developing strategies for the product provider

segment of the industry, particularly in improving the innovative capabilities of small firms that choose to stay local.

This study is a first exploration of the possible pathways to SME innovation which examines the interdependencies between two significant factors that explain high vs low-level innovation, namely internationalisation and sources of knowledge. Therefore, it is not without limitations.

First, we use a small sample size, and hence we expect our findings to serve as the first exploration of potential future research rather than claiming generalizability to the entire population of Romanian software product provider software firms. We anticipate that our findings will encourage more in-depth research on the relationship between internationalisation and innovation in SMEs by taking the interdependencies among influential factors into account, and by embracing new methodologies that provide robust results as quantitative analyses while opening up new perspectives to the analyses' outcomes.

Second, our sample captures only small firms in relatively early stages of their development with regard to internationalisation (i.e. exporting), so our findings do not present the full domain of SME internationalisation in terms of the degree of internationalisation or medium-sized companies. While young and small firms may be typical of the relatively young Romanian (and CEE) software development industry, as the industry matures, it would be important to understand whether the patterns we observe remain true over time. Future research can broaden the scope to include other firm age and sizes, and modes of entry to foreign markets.

Third, due to the reliance of the software development sector on skilled human capital, the ability of Romanian firms to continue on their current paths will largely depend on the continued availability of a specialised labour force in this sector. The more the sector develops, the higher the competition for talent will be. The changes in the human resource base in the software development sector in relation to its ability to support SME internationalisation and innovation are an important area to consider for future research in Romania and the CEE region.

Finally, while our sample reflects a broad group of innovative SMEs, it nevertheless involves only firms that innovate. Further research can also include firms that fail to innovate at any level and shed light on causes of innovation failure.

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