International EM SME Innovation Through Knowledge Management

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25-06-2020

Master Thesis International Business

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1 Introduction

Emerging markets nowadays face many challenges to overcome poverty and create prosperity. To achieve economic growth in order to enhance social stability, educational attainment and increased quality of life, innovation is the perfect tool to do so (McCord, 2011). Innovation is "the adoption of an idea or behaviour, pertaining to a product, service, device, system, policy, or programme, that is new to the adopting organization" (Damanpour & Gopalakrishnan, 2001, p. 53). This is still a very broad concept, therefore to be able to more thoroughly examine the influences on firm level innovation, this study distinguishes between two commonly used dimensions that best capture the elements of the abovementioned definition of innovation, namely process and product innovation. For the past decades, this distinction between process and product innovation has been one of the most common ones, and is widely supported by researchers (Damanpour & Evan, 1984; Ettlie & Reza, 1992; Barras, 1986). Product innovation is defined as "new products or services introduced to meet an external user or market need" (Barras, 1986, p. 172), and process innovation is defined as "new elements introduced into an organization's production or service operations (e.g., input materials, task specifications, work and information flow mechanisms, and equipment) to produce a product or render a service" (Ettlie & Reza, 1992, p. 818).

Innovation literature often distinguishes between process and product innovation, such as the study by Krishnan & Jha (2011) who found that emerging market firms often focus their innovation activities on process innovation and the adaption of existing technologies by using frugal approaches to offer affordable products & services. In line with this is the recent study by Krishnan & Prashantham who argue that emerging market small and medium enterprises (hereafter called EM SMEs) mostly conduct process innovation since this type of innovation is less expensive for these EM SMEs. On the other hand, they argue that this is a changing phenomenon because of the increase in technology based start-ups that tend to focus more on product innovation (Krishnan & Prashantham, 2018). It is thus interesting to further research the factors that influence an EM SME to perform process and/or product innovation.

While the fact that innovation is essential for economic growth is widely supported by many economists, it is still largely unclear which factors contribute to innovation in emerging markets, especially in SMEs (Ayyagari et al., 2011). SMEs are a heterogenous group in terms of size and sector diversity which makes it hard to clearly define an SME, generally they are defined by their amount of employees with a threshold between a 100 and 500 employees (Klewitz & Hansen, 2014). The EM SMEs operate in markets that are often characterized by high growth, and thrive on borrowing technology of developed countries through licensing, reverse engineering or foreign direct investments (Luo & Tung, 2007). As these emerging markets are in the process of catching up with developed markets, it is increasingly difficult to sustain growth by borrowing technology, since technology becomes too complex to be reverse engineered and developed countries might no longer be willing to

share their technology. This requires emerging market firms to increase their focus on innovation instead of adapting developed market innovations, indicating a shift from process to product innovation (Chang et al., 2006).

Since emerging markets are fast growing markets (Luo & Tung, 2007), are home to poorly functioning formal institutions (Ramamurti, 2012), and have the tendency to be volatile and complex, it is innovation that enables SMEs to respond to those market and regulatory uncertainties and develop new market opportunities (Zhang et al., 2007). Research has shown that innovative activities in emerging market MNE's have strongly increased in the past decade and are highly necessary in order to grow, however research on innovative activities is scarce for SMEs in these emerging markets (Ren et al., 2015), and SMEs in emerging markets innovate differently from MNEs due to (limited) access to finance, institutional hindrances and various other reasons, thus increasing the need for research on EM SME innovation (Radas & Božić, 2009). Krishnan & Prashantham argue that in recent years, innovation on EM SMEs has become significantly more important because of the rise of many technology based start-ups, increasing the need for more research on this topic (Krishnan & Prashantham, 2018). In line with this, Malik & Kotabe discuss a trend of firms in emerging markets, including SMEs, that increase their technological capabilities through innovation with the goal of enhancing their economic performance, and specifically underline the call of researchers to identify the capabilities that lead to innovation and superior performance in emerging markets (Malik & Kotabe, 2009).

This research focuses on a possible driver of innovation, namely knowledge. Current developed market academic literature suggests that new products, services and processes cannot emerge without ideas that lead to innovation, which means that new ideas are founded on the generation of new knowledge (Woodman et al., 1993), although it remains unclear if new knowledge generation is likewise important for EM SMEs. McAdam et al. (2006, p. 340) describe how knowledge creation in developed market MNEs consist of a process of knowledge acquisition and how this leads to organizational knowledge creation and opportunities for innovation, while arguing how current literature on this process is extremely limited. However literature on the effect of knowledge acquisition and creation on innovation is already scarce in developed economies, it is virtually absent for EM SMEs (Goedhuys, 2007), and thus it is unsure if this relationship exists at all for EM SMEs.

How knowledge is dealt with, both outside and inside the organisation, can be captured in a term that is often used in economic literature, namely "knowledge management" (Marshall et al., 1996). Thus, this study aims to examine the relationship between knowledge and innovation in EM SMEs by using the concept of knowledge management. There exist numerous definitions for the concept of knowledge management. In this study the definition introduced by Ruggles (1998) will be used: "Knowledge management is an approach to adding or creating value by more actively leveraging the know-how, experience, and judgment resident within and, in many cases, outside of an organization" (Ruggles, 1998, p. 87). This study will focus on the sourcing, acquisition and

embedding of knowledge, which are knowledge management practices as discussed by Ruggles, and are very similar to McAdam's idea of the earlier described process of knowledge acquisition and knowledge creation within firms (McAdam et al., 2006, p. 340).

SMEs in emerging markets have increasingly internationalized their activities (Schweizer, 2012), and now face different market influences compared to domestic SMEs (Sirmon et al., 2007). It is thus useful to examine the impact of the SME's environment in which it is active, on the relationship between knowledge management and firm innovation. In contrast to domestic firms, international firms are exposed to different influences. Consequently, international firms are for example influenced by knowledge spill overs abroad through FDI's, partnerships or simply export partners (Schmiele, 2013), as well do they have access to different sources of knowledge and funding (Davenport, 2005). This distinguishes international firms from domestic ones, although it is not clear if this has any influence on the relationship between knowledge management and firm innovation, as well as if this influence is positive or negative. This study aims to answer that gap in the international business literature.

This study aims to provide more insight into various gaps in the existing academic literature. The foremost gap is the lack of literature on the effects of knowledge management on firm level innovation. Some research has been done on this relationship (Escribano, Fosfuri, & Tribó, 2009; Popadiuk & Choo, 2006), but none of the existing literature focuses on the process of identifying, acquiring and combining knowledge and its influence on firm level innovation. The second literature gap is that of SME innovation in emerging economies. Various studies in emerging countries on this topic exist, but these mostly deal with large multinationals or large domestic firms. This leaves a clear gap on the drivers for firm level innovation of SMEs in emerging markets (Ayyagari et al., 2011). The third literature gap that this study aims to address lies in the internationalization literature, namely the influence of the market environment in which a firm is active on the relationship between knowledge management and firm level innovation.

Many studies have been conducted on how internationalization affects innovation, but none have researched this in relationship with knowledge management (Boermans & Roelfsema, 2014). Considering the aforementioned gaps in existing literature on drivers of innovation in EM SMEs, this leads to the following research question: *To what extent does knowledge management influence EM SME innovation?* This question is complemented with a second research question to address the influence of firm internationalization: *To what extent is the relationship between knowledge management and EM SME innovation moderated by firm internationalization?* A quantitative method will be used to answer both research questions, namely a binary logistic regression. The data that will be used to perform this research comes from the Innovation Research Fieldwork Report South Africa (2014), which is a survey from the collaboration between the Tilburg University and the Enterprise Analysis Unit (DECEA) of the Development Economics Group of the World Bank, including data from 497 South African small, medium and large firms in the manufacturing industry.

The contributions of this study are threefold. Firstly, this study contributes to an increasing amount of literature on knowledge management by examining a set of variables (the dimensions of knowledge management and innovation) that have not yet been studied, thus shedding new light on the relationship between them. Secondly, a contribution is made to the innovation literature by examining how firm innovation is influenced by knowledge management and how this relationship interacts with firm internationalization, literature on this is non-existent. Thirdly, this study contributes to the emerging market literature by researching drivers of innovation in EM SMEs, which adds to a growing body of literature on SMEs in emerging markets. This contribution is much needed considering the current lack of research in this area.

The structure of this report is as follows: The next section expands on relevant academic literature regarding firm level innovation, knowledge management and firm internationalization, followed by a theoretical framework that discusses the two research questions to address the literature gaps, and a set of hypothesis flowing from these research questions. Hereafter the next section discusses the methodology and presents the data, variables and empirical specification. This is followed by the results of the study, after which the contributions and conclusions will be discussed.

2 Literature Review

In this chapter, the concepts of this study will be discussed by drawing upon extant academic literature and critically discussing the literature gaps as mentioned in the introduction. Thereafter, the theoretical framework, based on the discussed literature and research questions, will be laid out in detail as a base for the quantitative analysis.

This review starts by discussing the concept of SME innovation in emerging markets and the dimensions process- and product innovation. This is followed by a review of existing literature on the definition of knowledge management and the dimensions of knowledge sourcing, knowledge acquisition and knowledge embedding. This chapter will be concluded by discussing the current academic literature on SME internationalization.

2.1 SME innovation

Innovation is commonly accepted as one of the key drivers of economic growth, which applies to domestic, international and global markets. Customers in all sorts of markets, including emerging markets, expect high quality and/or low costs products and services, and innovation is an important tool for firms to achieve this and meet customer needs (Hitt et al., 1997; Bradley et al., 2012). This study builds on the following definition of innovation: "the adoption of an idea or behaviour, pertaining to a product, service, device, system, policy, or programme, that is new to the adopting organization" (Damanpour & Gopalakrishnan, 2001, p. 53).

Innovation can be either incremental or radical (Ettlie et al., 1984). Radical innovation is often disruptive to the market and could even change the market, it often is a lengthy process which requires a great amount of resources and has a higher risk of failing than incremental innovation (Dewar & Dutton, 1986). Incremental innovation is the most commonly performed form of innovation since it is often introduced by SMEs, and costs less resources and managerial experience. It is innovation in small steps to increase or maintain a competitive advantage (Camisón-Zornoza et al., 2004).

Literature on SME innovation is abundant, and it is often argued that innovation is especially important for SMEs since introducing new products and services enables them to compete with more resourceful competitors who benefit from economies of scale and scope, while SMEs cannot and often lack resources to do so (Miller, 1983; Lumpkin & Dess, 1996). SMEs haven proven to be successful innovators despite their lack of resources by optimally leveraging the resources that they do possess (Vossen, 1998). SMEs with a strong innovative strategic focus often outperform their less innovative competitors, build stronger brands and can more easily attract highly educated employees (Rosenbusch et al., 2011).

The definition of innovation as proposed above by Damanpour & Gopalakrishnan, distinguishes between product innovation: "a product, service, device", and process innovation: "a

system, policy, or programme". Indeed, the success of innovations hinges on a firm's abilities to leverage process and/or product innovations, the two commonly used dimensions of innovation as distinguished by various researchers (Damanpour & Evan, 1984; Franko, 1989). Process innovation is defined as "new elements introduced into an organization's production or service operations (e.g., input materials, task specifications, work and information flow mechanisms, and equipment) to produce a product or render a service" (Ettlie & Reza, 1992, p. 818). The basic idea of process innovation as argued by Utterback & Abernathy, is that as a production process develops over time through innovation, the process itself is increasingly streamlined, encourages greater labour productivity and goes hand in hand with incremental changes in the internal organisation structure (Utterback & Abernathy, 1975).

Product innovation is defined as "new products or services introduced to meet an external user or market need" (Barras, 1986, p. 172). Utterback & Abernathy argue that product innovation arises with a specific goal, which can either be to introduce technically advanced products as the first firm on the market, to follow others by adapting and introducing product variations in response to pioneers, or to enter the market in a later stage by developing less expensive adaptions and focusing on cost minimization (Utterback & Abernathy, 1975). This last motive for product innovation is often connected to EM SMEs as an imitation strategy, for which EM SMEs copy and adapt products from developed markets firms (Chang et al., 2006).

Current academic literature on process and product innovation is somewhat conflicting and shows different patterns between emerging and developed markets. Damanpour & Gopalakrishnan find that in developed markets "product innovations are adopted at a greater rate and speed than process innovations, and a product–process pattern of adoption is more likely than a process–product pattern" (Damanpour & Gopalakrishnan, 2001, p. 45). Krishnan & Prashantham, (2018) find that emerging market firms tend to focus on process innovation due to lower costs, but as they progress into emerging markets this tends to shift to a priority on product based innovation due to technological advancement. The cost of innovation could be an obstacle for SMEs, more often than for resourceful MNEs, and these costs are often determined by external factors on which SMEs have little influence (Barney, 1991).

These external factors often create both advantages and disadvantages. An example of these external factors is given by Wu (2013), who argues that that EM SMEs benefit from moderate levels of institutional diversity since they can access new technologies at moderate costs, whereas high levels of diversity lead to high costs and low levels of diversity to a lack of opportunities to acquire new technologies, thus showing that such external factors can be both beneficial and detrimental for EM SME innovation.

Process and product innovation often require different forms of resources, which can either be sourced internally or externally. The availability of these resources are influenced by various factors such as formal and informal institutions, which influence the inflow of new resources into firms and

the exploitation of existing resources within these firms (Barasa et al., 2017). Reviewing process and product literature learns that currently there is a scarce amount of studies that explicitly research process and product innovation in emerging markets, and almost none of the studies focus on SMEs.

2.1.1 SME Innovation in Emerging Markets

Emerging markets are growing rapidly, and increasingly attract attention from researchers who study innovation, as innovation seems to be one of the driving forces for emerging market expansion in the global market (Zhang et al., 2007; McCord, 2011). Emerging markets are defined as "countries whose national economies have grown rapidly, where industries have undergone and are continuing to undergo dramatic structural changes, and whose markets hold promise despite volatile and weak legal systems" (Luo & Tung, 2007, p. 491).

The current literature on innovation uses various ways to describe to whom innovations must be new, such as Damanpour & Gopalakrishnan (2001) who argue that innovations must be new to the organization. Other researchers describe innovation as new to the firm and new to the market (Garcia & Calantone, 2002), but in the case of emerging markets this is not always applicable, since firms in emerging markets innovate differently from firms in developed countries (Bradley et al., 2012). Firms in emerging markets often lack the necessary internal capabilities and resources, such as high levels of technological and R&D capabilities, and a pool of multidisciplinary skills, that are needed to generate new-to-the-market innovations, which leads to emerging markets firms adopting and adjusting innovations that are already on the market (Mahemba & Bruijn, 2003). This means it cannot always be assumed that innovations in emerging countries are new to the market, which recently has led researchers to define emerging market innovation as either new to the firm, or new to the firm & market (OECD, 2015). Thus, this study uses the definition by Damanpour & Gopalakrishnan which only mentions innovations to be new to the firm, so that it always captures innovation in emerging markets and does not exclude firms that adapt innovations that are already present on the market, which is a common emerging market phenomenon (Krishnan & Jha, 2011).

Adapting existing innovations has always formed a significant share of innovation in emerging countries, although the literature also shows a different tend. EM SMEs invest more in innovation, and new-to-the-market inventions are increasingly being introduced which has even led to the export of these innovations towards developed countries, although this is still a rare phenomenon (Chang et al., 2006; Govindarajan & Ramamurti, 2011). Thus, however a large part of EM SMEs still perform innovation that is only new to the firm, there is an increasing amount of innovations being introduced that are also new to the market, due to SMEs leveraging the resources that are available to them and investing more in innovation (Wang & Kafouros, 2009).

According to various sources, there are over twenty different countries classified as emerging markets (Niebel, 2018; MSCI, 2020), such as China, India and Brazil. Many differences exist between these markets, but they all share similar motives for innovation, experience similar constraints and are characterized by rapid economic growth (Back et al., 2014). The rapid growth and increasing level of innovation in emerging markets, combined with the fact that research on EM SMEs is still scarce, makes it relevant to examine the innovation that is performed by SMEs in these markets (Ayyagari et al., 2011).

Innovation is widely accepted as the key factor to sustainable growth and a major source of competitive advantage (Barasa et al., 2017), however most of the literature focuses on developed countries and especially on large firms (MNEs). Since emerging markets are becoming increasingly important for the global market and offer many opportunities for foreign investment, while making up for half the world's population, it is important to understand how innovation comes about and what the sources of innovation in those markets are (Back et al., 2014). Literature on EM SMEs regarding innovation is increasing, and as beforementioned they often experience constraints such as a lack of resources in the form of capital or the availability of experienced managers (Oser et al., 2000).

Much attention is given to the resource constrains to innovation for EM SMEs, as it is important to identify these constraints in order to overcome them (Doern, 2009). Innovation requires educated personnel and this remains to be a scarce resource in emerging markets. SMEs often struggle to find personnel that has the knowledge and experience to developed new-to-the-market innovations, which is partly caused by poorly functioning institutions in these markets (Bradley et al., 2012). The disadvantages that EM SMEs experience in finding the necessary resources do not only come from within their country, but also from outside as foreign competition affects EM SME innovation. This causes innovation performance to vary with the degree of foreign competition; when foreign competition is high, foreign firms increasingly protect their critical resources and knowledge which makes it hard to imitate their product (Piperopoulos et al., 2018). Xia & Liu (2017) argue that external influences on firm resources do not necessarily have to be a disadvantage, but can also work advantageous as it encourages SMEs to innovate by themselves, and thus focus less on adapting existing innovations and more on introducing new-to-the-market innovations.

There are more advantages to be found for SMEs, as they do not only experience constraints to innovation for being located in an emerging country. Often, these firms have short decision making chains that increase the speed of introducing innovations, and since they mostly focus on a few product groups in niche markets, they benefit from avoiding MNEs in large markets by focusing their marketing on niche groups (Mahemba & Bruijn, 2003). EM SMEs are often found to have strong marketing capabilities as they have a good understanding of their target group's needs, and surprisingly enough these SMEs' strong marketing capabilities positively affects research and development capabilities which lead to increased innovation (Ren et al., 2015). Chang et al. (2006) argue that EM SMEs also experience advantages from group affiliation to supplement their resource

base, as they found that group affiliation encourages innovation through the sharing of knowledge and financial resources, and thus EM SMEs find solutions for the lack of resources (for being located in an emerging country) to support their innovation activities.

In regard to SME innovation in emerging markets, literature focusing specifically on the drivers that enable innovation is still scarce. Back et al. provide an overview of literature from 1999 to 2011 on drivers of innovation. Most of these studies focus on either large firms (Krishnan & Jha, 2011; Mahmood & Mitchell, 2004), governmental/financial organisations with the aim to enhance innovation performance (George & Prabhu, 2003) or a combination of both large firms and SMEs (Ayyagari et al., 2011; Wang & Kafouros, 2009; Claessens et al., 2006). What they have in common is a lack research on the drivers for EM SME innovation. Many of them do however, in line with Krishnan & Prashantham (2018) as mentioned in the introduction, call for more research on this subject.

There is however a small body of literature that does focus on drivers for SME innovation in emerging markets, distinguishing between external and internal drivers of innovation. External drivers come from outside the firm, and can for example be found in a large demand for very low cost products and services to serve customers at the base market pyramid, since MNEs avoid these target groups due to slim margins, SMEs can serve these markets instead (Karnani, 2007). In line with this, Prahalad & Ramaswamy (2004) found how the demand from people in unserved market segments drives EM SMEs to innovate by means of adaptive product/service innovations, adapting existing innovations in order to meet specific emerging market demands, such as turning electronic cash registers into portable registers for traveling merchants (Prahalad & Ramaswamy, 2004). Other external drivers of innovation can be found in firms drawing on external resources from partners and other firms with the aim to enhance innovation output (Mahemba & Bruijn, 2003). Internal drivers can be seen as the internal capabilities or resources an EM SME possesses, which can be used to introduce innovations (Govindarajan & Ramamurti, 2011). Examples are the experience and deep understanding of the local market, and know-how and capabilities to introduce products and services at ultra-low costs (Ramamurti & Singh, 2009). Robson et al. (2008) found that internal EM SME drivers such as the entrepreneur's level of education increase innovation performance, the higher the entrepreneur's level of education, the higher the innovation performance.

A common finding in current literature is that in emerging markets, SMEs tend to focus on process innovation at first, but later shift to an increased product innovation approach due to accumulation of knowledge and technological advancement (Krishnan & Prashantham, 2018). The same trend can be found in the study by Robson et al. (2008), who found that the higher an entrepreneur's level of education, the higher level of product innovation. More research that specifically focuses on the distinction between process and product innovation in EM SMEs and the driver that influence these types, can help increase the understanding of how SMEs innovate.

2.2 Knowledge management

2.2.1 Definition of Knowledge Management

Over the last few decades, researchers have been increasingly involved in the examination of knowledge management (Nonaka, 1994; Inkpen, 1996; Yew Wong, 2005; Escribano, Fosfuri, & Tribó, 2009. Alavi & Leidner (2001, p. 107) argue: "Knowledge and knowledge management are complex and multi-faceted concepts", which is something that is reflected in the literature, since until this day current literature on knowledge management remains heavily divided on the definitions of knowledge management (Barley et al., 2018).

Several researchers of knowledge management emphasize how is often unclear what the boundaries of knowledge management are, i.e. which managerial practices belong to knowledge management, and which do not (Alvesson & Karreman, 2001). In many studies that are focused on knowledge management, the concept is not even defined and it remains unclear what the authors exactly mean with it (Inkpen & Dinur, 1998; Fahey & Prusak, 1998; Madhavan & Grover, 1998). Other authors define knowledge management as "a process of continually managing knowledge of all kinds and requires a company-wide strategy which comprises policy, implementation, monitoring and evaluation" (Quintas, Lefrere, & Jones, 1997, p. 389) or "The systematic: underpinning, observation, instrumentation, and optimization of the firm's knowledge economies" (Demarest, 1997, p. 377).

These definitions have in common that they focus how knowledge must be managed within the firm itself, but do not discuss how knowledge is often found outside of the firm and then can be acquired to be embedded in the firm (Grimpe & Kaiser, 2010). It is thus more appropriate to adopt a definition that includes managing flows of both external and internal knowledge, which leads to the following definition: "Knowledge management is an approach to adding or creating value by more actively leveraging the know-how, experience, and judgment resident within and, in many cases, outside of an organization" (Ruggles, 1998, p. 87).

Despite the divergent definitions of knowledge management in academic literature, two literature streams can be distinguished. Swan et al. (1999) discuss two major streams of knowledge management literature, namely that of a "hard side" in which knowledge is managed through technical means (a focus on IT and information processing), and a "soft side" which focuses on managing knowledge through people and interactions. This distinction is also made by Hansen et al. (1999) who describe the "hard side" as practicing knowledge management through codification which focuses on information technology where knowledge is codified, stored in databases and easily accessible by all employees. The "soft side" of knowledge management is about socialisation, which relies on the idea of normative control. The distinction between the two streams of knowledge management, that of the hard and soft side, is most likely best described by Nokaka (1994) and Barley et al. (2018), in which they describe the "soft side" of knowledge management as "tacit knowledge" which is deeply rooted in action, commitment, and involvement in a specific context, and thus hard to codify. The "hard side"

of knowledge management is described as "explicit knowledge" that is transmittable in formal, systematic language.

What both of the knowledge management streams on tacit and explicit knowledge have is common, is that they see knowledge as a resource that must be managed, which makes knowledge management a knowledge based perspective as an extension to the resource based perspective, that focuses on exploiting a firm's resources to achieve sustainable competitive advantage (Barney, 1991). This knowledge based perspective suggests that the way a firm exploits its tangible resources is a function of the firm's know-how (knowledge), and this knowledge is embedded in the firm and manifests itself through a firm's culture, documents, systems, policies and individuals (Grant, 1996). Effective management of these knowledge based resources may produce long term sustainable advantages since they are hard to imitate, thus making knowledge management an important practice (Alavi & Leidner, 2001). The importance of knowledge management for sustainable competitive advantages is emphasized by several other authors (Okhuysen & Eisenhardt, 2002), which has led researchers to argue that in order to achieve sustainable competitive advantage, knowledge management must evolve and adapt constantly, meaning that knowledge must be sourced (either externally or internally) in order to respond to changes in the market (Langley et al., 2013).

2.2.2 Knowledge Management Practices

The management practices for managing internal and external knowledge, as discussed in the previous section, can be divided in various categories. Ruggles (1998) distinguishes several categories by examining existing academic literature on knowledge management, and studying how this actually turns into practice by looking at 431 European and US firms, and finds the sourcing of knowledge to be the most performed knowledge management practice, which includes sourcing knowledge from outside and inside the organisation. This is strengthened by Marshall et al. (1996) who argue that an important practice of knowledge management is the sourcing of knowledge from internal sources such as operations or R&D groups, or it can be sourced from outside the firm. Knowledge sourcing is defined as "improving how employees (and a firm's management) search and draw on expertise, experience, advice, and opinions" (Gray & Meister, 2004, p. 831). Knowledge can be sourced in various ways such as identifying and selecting technical knowledge through extensive contact with researchers at universities (external knowledge sourcing), or accessing written knowledge such as IT systems within the organisation (Gray & Meister, 2006). Cohen & Klepper (1996) argue that knowledge can be seen as a company resource and that sourcing the right knowledge is important for supporting other firm processes. Knowledge sourcing can prove to be a challenging management practice, since it is influenced by external factors such as the extent to which a company is dependent on partners or faces competition, or internal factors such as the management commitment to invest in knowledge sourcing (Bonanno & Haworth, 1998). Most of the academic literature on knowledge

sourcing discusses how it increases the volume of knowledge, its accessibility, and is mostly focused on external knowledge sourcing (Gray & Meister, 2004).

Another knowledge management practice is transferring knowledge to the organisation's unit where it is needed, this is the process of knowledge acquisition (Ruggles, 1998; Marshall et al., 1996). Knowledge acquisition is defined as "the transfer and transformation of problem-solving expertise from some knowledge source to a part of the organisation" (Byrd et al., 1992, p. 117). Knowledge acquisition can take place in various forms, knowledge can for example be acquired from external sources by hiring staff that bring new knowledge into the firm or, less occasional, from shifting knowledge within the firm (Davenport, 2005). Throughout academic literature that discusses knowledge acquisition, the acquisition of knowledge by a firm builds heavily on social capital since the acquisition of knowledge often stems from acquiring new employees (Kogut & Zander, 1992). Knowledge acquisition is also an important tool for companies to strengthen their capabilities by supplementing the insufficient internal knowledge base with external knowledge, which can be acquired through mergers and acquisitions (Dunlap et al., 2015). Yli-Renko et al. (2001) argue that the degree to which a company can acquire knowledge, depends on their external relationships with partners on who they rely, to supplement their own lack of internal knowledge that is needed to perform company processes with the aim to achieve a competitive advantage. The acquisition of knowledge is also seen as a driving factor of firm growth (Cohen & Levinthal, 1990), since knowledge acquisition creates new productive opportunities and helps firms to exploit these opportunities (Spender & Grant, 1996). In line with this, (Lane & Lubatkin, 1998) argue that to create such new productive opportunities through knowledge acquisition, a firm must have a thorough understanding of its own knowledge base in order to acquire the right supplementing knowledge to meet the demands of the firm's environment.

The last practice of knowledge management is that of knowledge embedding. Knowledge that has been successfully acquired, can then be embedded into products and processes through knowledge management (Ruggles, 1998; Marshall et al., 1996). Knowledge embedding is defined as "the process for a new practice area to become established in a firm's existing structure" (Anand et al., 2007, p. 415). Nonaka described this to be an integrative process where knowledge must spiral up to groups and even organizations, where it can be exploited to further the goals of the organization (Nonaka, 1994). Bresnen et al. (2004) argue that the successful embedding of knowledge within a company also heavily depends on the social structure of a company, as intangible knowledge (stored in the mind) is often transferred from one person to another through interaction. Literature on knowledge embedding is scarce, partly due to the fact that embedding knowledge into the organisation is a very specific process that is different for each company, which requires companies to use different knowledge embedding practices to successfully embed knowledge in their organization. (Swan & Clark, 1992).

2.3 SME internationalization

Over the past few decades, SMEs have increasingly internationalized their activities, which has led to a substantial increase of academic literature on this phenomenon (Schweizer, 2012). A firm's internationalization can be defined as "the outward movement of a firm's international operations" (Calof & Beamish, 1995, p. 116). International SMEs often share several characteristics, such as a lack of resources and experience (Lu & Beamish, 2001), as well as a strong focus on global niche markets (Knight, 2001). SME internationalization is different compared to MNE internationalization since they are often less competitive due to less advanced products, and lack the capital and experience for entering foreign markets (Meyer & Skak, 2002). The two main goals of internationalizing by SMEs are firm growth and increasing profitability (Oviatt & McDougall, 2004). Exporting is often regarded as the main form of internationalization for SMEs, since it requires less resources and is a fast way to enter foreign markets in comparison to FDI, which involves more risk, and requires more capital and experience (Lu & Beamish, 2006). Internationalization also increases the resource pool from which a company can acquire the necessary resources, such as knowledge stocks for research and development, to achieve a competitive advantage in either the domestic or foreign market (Sirmon et al., 2007).

Literature on developed country SME internationalization has increased significantly over the past few decades, this has much less been the case for literature on EM SME internationalization, and it is still largely unknown how these SMEs are being influenced after having internationalized (Tang et al., 2010). The literature that does exist on EM SME internationalization shows that the way SMEs from both developed and emerging countries internationalize are somewhat similar (Yiu et al., 2007), but EM SMEs often face more constraints, which can roughly be divided into resource constraints and higher barriers to internationalization due to poorly functioning institutions (X. Zhang et al., 2016). EM SMEs experience barriers to internationalization because of the underdeveloped, and often corrupt, formal and informal institutions in their home country, which slow down internationalization and increase the costs of going abroad (Deng & Zhang, 2018). EM SMEs often face severe resource constraints in the form of inaccessible and hard to find highly educated social capital, which decreases their possibilities of having a competitive advantage in foreign markets (George et al., 2016). Firms build up firm specific resources that are meant to provide a competitive advantage, but due to market volatility and uncertainty it is hard for EM SMEs to sustain these resources and use them to introduce innovations that result in profitable returns on investment (Barnard et al., 2017). SMEs in developed markets are often able to overcome the barriers to internationalization by acquiring new resources or receiving support from formal/informal institutions. SMEs in emerging markets often cannot, which means that only the SMEs who can successfully overcome these barriers will internationalize (Uner et al., 2013)

2.4 Theory development and hypotheses

2.4.1 Theoretical Framework

Innovation is one of the key drivers of firm growth and by many researchers is seen as the most important tool to achieve sustainable competitive advantages (Bradley et al., 2012). Innovation is mostly split up in process and product innovation (Damanpour & Evan, 1984). The importance of innovation for SMEs in emerging markets is just as evident as for large firms in emerging markets, although these SMEs face different circumstances such as a lack of resources and financing, and research on innovation of these SMEs remains to be scarce (Filatotchev et al., 2009). The result of the scarcity of academic literature on SME innovation in emerging countries is that until this day, it is largely unclear what the drivers of innovation for SMEs are exactly (Ayyagari et al., 2011). Many researchers argue that to for a firm to successfully innovate, it must possess the right knowledge to do so (Woodman et al., 1993), although it is unsure how knowledge influences firm level innovation due to the scarcity of literature in this area (McAdam et al., 2006), especially for SMEs in emerging markets for which academic literature on knowledge management is largely non-existent. Knowledge management distinguished three dimensions, namely the sourcing, acquiring and embedding of knowledge (Ruggles, 1998). This scarcity of literature of knowledge management on firm level innovation in EM SMEs creates a gap in existing literature, this study aims to contribute to filling this gap by answering the following research question: *To what extent does knowledge management influence EM SME innovation?* Moreover, SMEs in emerging countries that have internationalized face difference market influences compared to domestic SMEs and can draw resources from the global market (Meyer & Skak, 2002). However, how the internationalization of firms influences drivers of innovations is largely unknown, especially for knowledge management, and thus forms a knowledge gap in existing academic literature. This leads to the secondary research question: *To what extent is the relationship between knowledge management and EM SME innovation moderated by firm internationalization?*

2.4.2 Main relationship Knowledge Management-Innovation

As discussed in section 2.2.2, SMEs source knowledge from both outside and within the firm. This external and internal knowledge sourcing is the firm's ability to identify and access new sources of knowledge (Osoro et al., 2016). External knowledge sourcing concerns the firm's ability to identify and access knowledge from courses outside the company with the aim of identifying knowledge that adds to a company's resource base, where it then can be used for various purposes such as innovation (Escribano, Fosfuri, & Tribó, 2009). To perform process & product innovation, knowledge is needed as it is possibly one of the resources for successful process & product innovation (Damanpour & Gopalakrishnan, 2001), although existing literature does not discuss whether knowledge sourcing

positively influences process & product innovation. However, Cohen & Klepper (1996) describe that it is important for a firm to have external connections in order to source the necessary resources for process & product innovation, which indicates that a firm must have the right abilities to source resources such as knowledge. A firm's external environment (e.g. the intensity of the competition) influences the extent to which it is capable to source the necessary resources for process & product innovation (Bonanno & Haworth, 1998), and thus the firm is possibly dependent on its ability to source resources such as knowledge to perform process & product innovation. Likewise, a firm can source knowledge from within the organisation through knowledge dissemination, research and development, and internal education and training (Osoro et al., 2016), which in turn could positively influence process & product innovation. Allen (1986) discusses how a firms needs to possess the necessary skills in order to source knowledge to boost R&D activities, and since Cassiman & Veugelers (2006) propose that R&D activities are necessary for innovation, it can be assumed that the ability to source knowledge has a positive influence on innovation. Based on the assumption that a firm needs to be able to source knowledge in order to exploit it, two hypotheses are formed:

H1a*: A firm's ability to source knowledge has a positive influence on process innovation.*
H1b: *A firm's ability to source knowledge has a positive influence on product innovation.*

As discussed in section 2.2.2, firms that have identified the necessary knowledge which they need to add to their resource base after which it can be exploited, must first be able to successfully acquire this knowledge, whether the knowledge comes from inside or outside the company. Acquiring knowledge comes for example in the form of hiring highly educated personnel who bring new knowledge into the company (Davenport, 2005). Firms tend to acquire resources from outside the firm through company acquisitions or hiring qualified researchers with relevant knowledge to support internal processes (Cockburn & Henderson, 2003), which implies that firms need to possess adequate skills to acquire resources needed to perform process & product innovation. Cassiman & Veugelers (2006) describe how a firm's ability to acquire resources leads to high levels of process and product innovation, they mention for example the acquisition of highly educated personnel such as discussed by Cockburn & Henderson (2003), and as this highly educated personnel can be seen as a source of knowledge, it can be assumed that a firm's ability to acquire knowledge positively influences innovation. Dunlap et al. (2015) find that firms that acquire external knowledge through mergers and acquisitions, show higher levels of product R&D, which would lead to product innovation, and thus it can be assumed that knowledge acquisition has a positive influence on product innovation. Based on the assumption that a company cannot exploit knowledge without first successfully acquiring it, leads to the following hypotheses:

H2a: *A firm's ability to acquire knowledge has a positive influence on process innovation.*
H2b: *A firm's ability to acquire knowledge has a positive influence on product innovation.*

As discussed in section 2.2.2, firms that have sourced and acquired knowledge must then embed this knowledge into parts of the firm where it is needed. It is important for a firm to have the ability to successfully embed the acquired knowledge into the parts of the organization where it can be exploited the best, for example: A newly acquired IT specialist must be able to work with the companies IT systems, must be placed in a project team which first his qualities best etc. (Anand et al., 2007). Utterback & Abernathy (1975) Describe that product innovation is often connected to a firm's ability to embed their (high technological) resources in such a way that they best serve a firm's product innovation, which requires (among other factors) advanced technological knowledge, and implies that a firm must be able to successfully embed knowledge in order to perform product innovation. Process innovation requires a firm's management to allocate internal and external resources in such a way that it becomes embedded in the organization so that these resources best serve the process innovation goals of the firm (Bresnen et al., 2004). As earlier discussed, knowledge is regarded as a company resource (Damanpour & Gopalakrishnan, 2001), and thus it can be assumed that a firm's ability to embed knowledge positively influences process & product innovation. Lin & Chen (2006) find that knowledge embedding has a strong positive influence on product innovation in the case of product innovation that was performed in cooperation with other companies (group networks), this could indicate that knowledge embedding also has a positive influence on product innovation in case of single firm product innovation. The better a company can embed knowledge into the organisation, the more efficiently it can be used to innovate, which results in the following hypothesis:

H3a: *A firm's ability to embed knowledge has a positive influence on process innovation.*
H3b: *A firm's ability to embed knowledge has a positive influence on product innovation.*

2.4.3. Moderation: SME internationalization

As discussed in section 2.3, SMEs from emerging countries often face more severe barriers to internationalize compared to developed country SMEs. It can be however be important for a firm to internationalize, not only to access new markets, but also to gain new resources and experience (Sui & Baum, 2014), which can then be used to create a competitive advantage in both the home and foreign market (Gaur et al., 2014). This means that an SME that has internationalized has access to more sources of knowledge and more experience to acquire and embed this knowledge. The hypotheses below are grouped according to the independent variables of knowledge management, with the aim to develop clear hypotheses regarding the interaction effect of firm internationalization on the effect of knowledge management on innovation. In chapter four & five, these hypotheses will be grouped

according to the dependent innovation variables, since in those chapters the aim is to study the outcome effects on process & product innovation.

Knowledge sourcing

Battisti et al. (2014) argue that innovation followers often make use of external knowledge sourcing to supplement a lack of internal knowledge, and that internationalized firms have greater opportunities to source knowledge. Since Mahemba & Bruijn (2003) argue that EM SMEs are often innovation followers (e.g. by adapting or copying existing innovations), it can be assumed that internationalized EM SMEs experience a stronger effect of knowledge sourcing on process and product innovation. Santoro et al. (2019) find a positive relationship between knowledge sourcing and SME internationalization, and argue that firms that have internationalized are better able to source knowledge. Thus, it is assumed that firm internationalization strengthens the effect of knowledge sourcing on process and product innovation. Based on this academic literature, the following hypotheses are developed:

H4a: *The positive influence of knowledge sourcing on process innovation is stronger for EM SMEs that have internationalized*

H5a: *The positive influence of knowledge sourcing on product innovation is stronger for EM SMEs that have internationalized*

Knowledge acquisition

Firm internationalization allows firms in emerging markets to acquire knowledge through subsidiaries, takeovers or partners that are located in more advanced economies, which results in acquired knowledge that is not available in the home country (Awate et al., 2014), thus firms that have internationalized will possibly experience a stronger effect of knowledge acquisition on process and product innovation. Fletcher & Harris (2012) found that SMEs may not have relevant experience or useful networks, and rely on alternative sources to acquire knowledge, which are acquired though international human capital. Thus, it is assumed that firm internationalization strengthens the effect of knowledge acquisition on process and product innovation. Based on this academic literature, the following hypotheses are developed:

H4b: *The positive influence of knowledge acquisition on process innovation is stronger for EM SMEs that have internationalized*

H5b: *The positive influence of knowledge acquisition on product innovation is stronger for EM SMEs that have internationalized*

Knowledge embedding

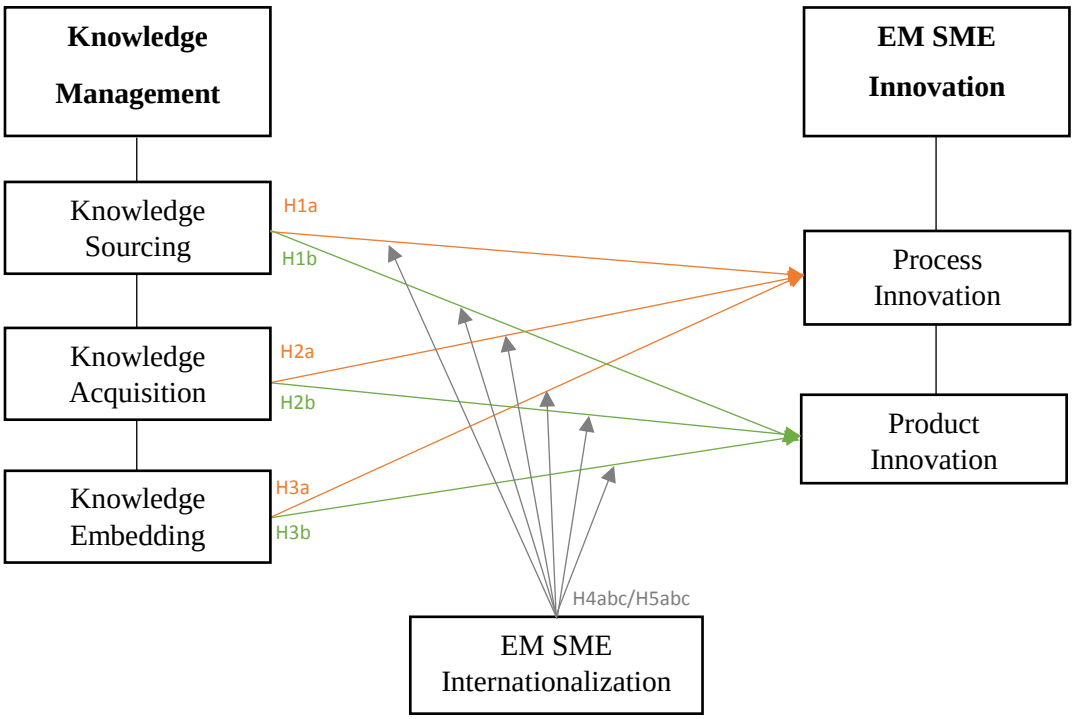
Andersson et al. (2016) argues that firms that have internationalized consist of employee teams that communicate efficiently which increases the speed in which knowledge is embedded, and knowledge is also embedded more successfully. Thus, it is assumed that firm internationalization strengthens the effect of knowledge embedding on process and product innovation. Based on this academic literature, the following hypotheses are developed:

H4c: *The positive influence of knowledge embedding on process innovation is stronger for EM SMEs that have internationalized*

H5c: *The positive influence of knowledge embedding on product innovation is stronger for EM SMEs that have internationalized*

2.4.3 Conceptual Framework

Taking into account both research questions, the dependent and independent variables, and the moderating variable, together with the hypotheses leads to the following conceptual framework:



3 Methodology

This chapter discusses the methodology and data that have been used to perform this study. The first section 3.1 discusses the data that was used to perform the statistical analysis. The second section 3.2 discusses the dependent, independent and moderator variables and their operationalization. The third section 3.3 discusses the intended data analysis procedure. The fourth section 3.4 discusses the limitations of this study and addresses the research ethics.

3.1 Data

In order to test the hypotheses as discussed in the previous chapter, this study uses data from a World Bank affiliated database. The World Bank is the world's largest institute for development cooperation. Their main activities are offering loans and battling poverty in emerging and developing countries, as well as gathering data that is needed to support their activities. This data is often gathered by carrying out multiple surveys in various countries at the same time, and which it is openly available in the World Bank databank.

The data used for this study comes from a survey from the World Bank in cooperation with Tilburg University, and this survey was carried out to gain a better understanding of what firms experience in the private sector and through interviews in the manufacturing sector. This survey, the Innovation Research Fieldwork Report South Africa (hereafter called the IRFRSA), aimed to capture data covering measures of firm performance, firm structure as well as business perceptions on the biggest obstacles to enterprise growth, and the business environment in general. The IRFRSA, comprising of n=497 observations, was carried out "To provide evidence on nature, role and determinants of innovation in emerging and developing countries, to generate information that will be used to identify projects and develop policies to promote innovation and to stimulate systematic policy dialogue on the importance of innovation as a driver of private sector development and economic growth at the global level" (The World Bank, 2014).

For the IRFRSA an external contactor hired by the World bank revisited business owners and top managers that were visited during previous research projects, to gather additional firm-level data on innovation and innovation-related activities. The survey was conducted throughout 2014. The aim of this survey was to get a better insight in the innovative activities and capabilities of manufacturing firms in several developing and emerging countries. Of those countries, this study focuses on the survey carried out in South Africa since it is a large emerging market and provides the necessary data to measure all variables that are being researched in this study. An important note is that this survey focuses on manufacturing firms and leaves out service firms which were originally included in the other innovation focused surveys that were performed as commissioned by the World Bank, thus no conclusions will be drawn on service firms. The survey was carried out by using stratified random

sampling, which is done as follows: "A stratified random sample is one obtained by separating the population elements into non-overlapping groups, called strata, and then selecting a simple random sample from each stratum" (Scheaffer et al., 1996, pp. 147). The sample consisting of 497 firms was drawn from a larger sample from previous research done by the World bank. The sample is stratified based on firm size and location, and location wise this survey covers 6 of the 9 South African provinces. The firms are distributed by size into three separate groups: small sized firms (1 to 50 employees), medium sized firms (51 to 200 employees) and large sized firms (201+ employees).

Since this study focuses on small and medium sized enterprises, it's important to see if they are sufficiently represented in the dataset. In case of a logistic regression analysis, sufficiently would mean having a sample size of over 200 observations, since with a sample size below 200 observations it would be too hard to find any significant effects at all and the dataset would lack in statistical power. A sample size of over a 1000 observations make statistical significance tests overly sensitive, which leads to almost any relationship being significant (Hair & Black, 2013, pp. 175). Looking at the data in SPSS it can be seen that out of the total sample of 497 firms, SMEs account for 96.7% of the sample size, with 61.2% firms being categorized as small and 35.5% firms being categorized as medium sized (table 6) This results in a total sample of 481 observations, and is thus within the limits as discussed above.

3.2 Variables

This section discusses the variables that will be examined in this study and how they are measured. As discussed in section 2.4, innovation is the dependant variable. Section 2.1 discussed how this study builds on the following definition of innovation: "the adoption of an idea or behaviour, pertaining to a product, service, device, system, policy, or programme, that is new to the adopting organization" (Damanpour & Gopalakrishnan, 2001, p. 53). Innovation has two dimensions as discussed in section 2.2.1, namely process innovation and product innovation. As discussed in section 2.4, knowledge management is the independent variable, and is defined in section 2.2 as "Knowledge management is an approach to adding or creating value by more actively leveraging the know-how, experience, and judgment resident within and, in many cases, outside of an organization" (Ruggles, 1998, p. 87). Knowledge management distinguishes three dimensions, namely knowledge sourcing as discussed in section 2.2.1, knowledge acquisition as discussed in section 2.2.2 and knowledge embedding as discussed in section 2.2.3. Finally, this study uses a moderator variable which examines the effect of firm internationalization on the relationship between knowledge management and innovation, as discussed in section 2.3.

3.2.1 Innovation: Process & Product Innovation

As discussed in section 2.1.1, process innovation is one of the dimensions of the dependent variable and defined as "new elements introduced into an organization's production or service operations (e.g., input materials, task specifications, work and information flow mechanisms, and equipment) to produce a product or render a service" (Ettlie & Reza, 1992, p. 818). This dependent variable was measured in the survey by asking the following question, labelled as E7: (1) "In fiscal year 2010/2011 thru 2012/2013, did this establishment introduce any methods of manufacturing products or offering services?", (2) "From fiscal year 2010/2011 thru 2012/2013, did this establishment introduce any innovative logistics, delivery, or distribution methods for inputs, products, or services?", (3) "From fiscal year 2010/2011 thru 2012/2013, did this establishment introduce any innovative supporting activity for processes, such as maintenance systems or operations for purchasing, accounting, or computing?" (IRFRSA 2014). The three answer options were merged into one answer to determine if a firm performed process innovation or not. This question was asked to the respondents in a closed format, resulting in either the value "1" if the question was answered with "yes", or the value "0" if the question was answered with "no". If a respondent answered with "yes", they would be asked a large number of questions on the specifics of the process innovation activities, these are however not relevant for measuring the dimension of process innovation, and will thus receive no further attention. If a respondent would respond with "no", no further questions regarding process innovation were asked. The question specifically asks for innovation that was done in three sequential years, since innovation is often not carried out regularly and could take multiple years to be completed, this way the researchers made sure that recent innovation was captured within the answer.

The second dimension of innovation as discussed in section 2.1.1, is product innovation. Product innovation is defined as "new products or services introduced to meet an external user or market need" (Barras, 1986, p. 172). This dependent variable was measured in the survey by asking the following three questions, labelled as E1: "In fiscal year 2010/2011 thru 2012/2013, did this establishment introduce any new or significantly improved product or service that are new to the firm, the local market or the world?", The three answer options "new to the firm, the local market or the world" were merged into one answer to determine if a firm performed product innovation or not. This question was asked to the respondents in the same manner as with process innovation. Again, a closed format was used and the value "1" indicates a "yes", the value "0" indicates a "no". If a respondent would respond with "no", no further questions regarding process innovation were asked. A third response on this question was also possible, namely "don't know" instead of yes or no, which has the value "2". However, out of 497 firms, there were only 2 firms with this response, which were reported as discrete missing values. The overview below shows the operationalization of the dependent variables.

Dependent Variable	*Definition*	*Operationalization*	*Variable type*
Label: E7 Process Innovation	New elements introduced into an organization's production or service operations to produce a product or render a service (Ettlie & Reza, 1992, p. 818).	Format: Closed question Answer "yes" = value "1" Answer "no" = value "0" Answer "don't know" = value "2"	Dichotomous variable (metrically scaled)
Label: E1 Product innovation	New products or services introduced to meet an external user or market need" (Barras, 1986, p. 172).	Format: Closed question Answer "yes" = value "1" Answer "no" = value "0" Answer "don't know" = value "2"	Dichotomous variable (metrically scaled)

Table 1: Operationalization of the dependent variables "innovation"

3.2.2 Knowledge Management: Knowledge sourcing

The first dimension of knowledge management is the knowledge sourcing, and as discussed in section 2.2.2 this dimension is defined as "improving how employees (and management) search and draw on expertise, experience, advice, and opinions" (Gray & Meister, 2004, p. 831). This independent variable was measured in the survey by asking a question together with five statements that together form the dimension of knowledge sourcing. The questions were presented to the respondent by showing a show card (show card 4 in this survey) with the following question, labelled as G1: "Using the response options on the card, to what extent do you agree or disagree with the following statements regarding this establishment's ability to identify and select knowledge?", after which the respondent would be presented with five statements. Osoro et al. explain knowledge sourcing as a process of identifying and selecting knowledge (Osoro et al., 2016, p. 277), this explains why the concept of knowledge sourcing is measured as "identifying and selecting" knowledge in the IRFRSA 2014. The five statements are as follows: G1a: "This establishment has extensive contact with researchers at universities", G1b: "This establishment has an active network of contacts with the scientific and research community", G1c: "This establishment regularly reads specialized journals and magazines to keep abreast of market and technical trends", G1d: "This establishment regularly conducts a technological audit" and G1e: "This establishment monitors the needs of its clients and customers". These statements were measured by using a 7-point Likert scale on which respondents could respond with "Completely disagree" given the value "1", to "Completely agree" given the value "7". In case the respondent would not know the answer they could respond with "don't know" given the value "-9", and if the statement did not apply to their situation/firm, they could respond with "does not apply" given the value "-7". A Likert scale is a measurement tool on which data is measured at an interval

level (Field, 2009). The overview below shows the operationalization of the independent variable "Knowledge sourcing".

Independent Variable	***Statement***	***Hypothesis***	***Operationalization***
Label: G1a	This establishment has extensive contact with researchers at universities	H1a & H1b: A firm's ability to source knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree
Label: G1b	This establishment has an active network of contacts with the scientific and research community	H1a & H1b: A firm's ability to source knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree
Label: G1c	This establishment regularly reads specialized journals and magazines to keep abreast of market and technical trends	H1a & H1b: A firm's ability to source knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree
Label: G1d	This establishment regularly conducts a technological audit	H1a & H1b: A firm's ability to source knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree
Label: G1e	This establishment monitors the needs of its clients and customers	H1a & H1b: A firm's ability to source knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree

Table 2: Operationalization of the independent variable "knowledge sourcing"

Important to check is if all of these items (statements) reflect the question that measures the variable knowledge sourcing, and thus check it's reliability. This means measuring the internal consistency of the items to see if they correlate, and together form the construct of knowledge sourcing. This can be done by using Cronbach's Alpha (Field, 2013). For all knowledge management variables, preliminary reliability tests will be run to assess the usability of the variables to compute a single variable to measure knowledge management, in chapter four more precise tests will be performed. Running a Cronbach's Alpha test in SPSS on item G1a to G1e shows that the alpha is a=0.758 (Appendix A) For a scale to be sufficiently internally consistent, Cronbach's Alpha needs to have a value greater than at least 0.6 (Field, 2013). This means that if the alpha is greater than 0.6, the items (statements) are strong enough correlated to form the construct of knowledge sourcing. As discussed above, the alpha is 0.758 and thus meet the minimum requirements of 0.6. It can be concluded that the items (statements) sufficiently measure the construct of knowledge sourcing. To improve the scale, Cronbach's Alpha should at least rise with 0.05 if an item is deleted. As can be seen in (Appendix A),

if item G1 (This establishment monitors the needs of its clients and customers) would be deleted, Cronbach's Alpha would increase with 0.051 to 0.809. This is a sufficiently large increase and thus in chapter 4, this item will be deleted.

3.2.3 Knowledge Management: Knowledge Acquirement

The second dimension of knowledge management is the firm's ability to acquire knowledge, and as discussed in section 2.2.2 this dimension is defined as "the transfer and transformation of problem-solving expertise from some knowledge source to a part of the organisation" (Byrd et al., 1992, p. 117). This independent variable was measured in the survey by asking a question together with three statements that together form the dimension of knowledge acquirement. Similar to the previous dimension (section 3.2.2), the respondent would respond to a show card, this time with the following question, labelled G2: "To what extent do you agree or disagree with the following statements regarding this establishment's ability to acquire knowledge?", after which the respondent would be presented with three statements. The three statements are as follows: G2a: "This establishment is successful at acquiring the knowledge required to understand customer needs", G2b: "This establishment is successful at acquiring the knowledge required to identify market opportunities" and G2c: "This establishment is successful at acquiring the knowledge required to comply with the expectations of trading partners". The same type of Likert scale was used to measure the respondent's response, as well as the same fiscal three year approach as in section 3.2.2. The overview below shows the operationalization of the independent variable "Knowledge Acquirement".

Independent Variable	***Statement***	***Hypothesis***	***Operationalization***
Label: G2a	This establishment is successful at acquiring the knowledge required to understand customer needs	H2a & H2b: A firm's ability to acquisition knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree
Label: G2b	This establishment is successful at acquiring the knowledge required to identify market opportunities	H2a & H2b: A firm's ability to acquisition knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree
Label: G2c	This establishment is successful at acquiring the knowledge required to comply with the expectations of trading partners	H2a & H2b: A firm's ability to acquisition knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree

Table 3: Operationalization of the independent variable "knowledge acquirement"

To measure the internal consistency of the scale, the same approach as in section 3.2.2 was used. A reliability analysis was performed in SPSS, which resulted in a Cronbach's Alpha of 0.692 (Appendix A), For a scale to be sufficiently internally consistent, Cronbach's Alpha needs to have a value greater than at least 0.6 (Field, 2013). Appendix A shows Cronbach's Alpha cannot be increased by removing any items, thus no items will be removed.

3.2.4 Knowledge Management: Knowledge Embedding

The third dimension of knowledge management is the firm's ability to embed knowledge, and as discussed in section 2.2.2 this dimension is defined as "the process for a new practice area to become established in a firm's existing structure" (Anand et al., 2007, p. 415). This independent variable was measured in the survey by asking a question together with four statements that together form the dimension of knowledge embedding. Similar to the previous dimensions (section 3.2.2 & 3.2.3), the respondent would respond to a show card, this time with the following question, labelled G3: "to what extent do you agree or disagree with the following statements regarding this establishment's ability to recombine knowledge?", after which the respondent would be presented with four statements. The four statements are as follows: G3a: "This establishment's employees have the skills to fuse or link newly acquired knowledge with existing knowledge", G3b: "This establishment improves its knowledge management systems to better use or exchange information, knowledge and skills within the establishment", G3c: "This establishment has a department or coordinator that diffuses and disseminates knowledge within the establishment" and G3d: "In this establishment, different departments can work together easily". The same type of Likert scale was used to measure the respondent's response, as well as the same fiscal three year approach as in section 3.2.2 and 3.2.3. The overview on the next page shows the operationalization of the independent variable "Knowledge Embedding".

Independent Variable	*Statement*	*Hypothesis*	*Operationalization*
Label: G3a	This establishment's employees have the skills to fuse or link newly acquired knowledge with existing knowledge	H3a & H3b: A firm's ability to embed knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree
Label: G3b	This establishment improves its knowledge management systems to better use or exchange information, knowledge and skills within the establishment	H3a & H3b: A firm's ability to embed knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree
Label: G3c	This establishment has a department or coordinator that diffuses and disseminates knowledge within the establishment	H3a & H3b: A firm's ability to embed knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree
Label: G3d	In this establishment, different departments can work together easily	H3a & H3b: A firm's ability to embed knowledge has a positive influence on process/product innovation	7 point Likert scale 1 = strongly disagree to 7 = completely agree

Table 4: Operationalization of the independent variable "knowledge embedding"

To measure the internal consistency of the scale, the same approach as in section 3.2.2 and 3.2.3 was used. A reliability analysis was performed in SPSS, which resulted in a Cronbach's Alpha of 0.739 (Appendix A). This value meets the minimum threshold of an alpha of 0.6, and thus the scale of knowledge embedding is sufficiently internally consistent. A Cronbach's Alpha of 0.739 means a strong internal consistency (Field, 2013). In addition, Cronbach's Alpha cannot be improved, since removing items would result in a lower alpha (Appendix A).

3.2.3 SME Internationalization

As discussed in section 2.3, international SMEs operate under different conditions than SMEs with a domestic focus. It is therefore important to examine how the degree of internationalization affects the relationship between knowledge management and innovation. A firm's internationalization can be defined as "the outward movement of a firm's international operations" (Calof & Beamish, 1995, p. 116), thus in this study we measure the difference between domestic and international firms by any outward movement of a firm's activities. The best indicator of a firm's international activities in this study are a firm's export activities. Respondents in the IRFRSA 2014 were asked the following question to measure whether they had internationalized or not, labelled as B7: "Did this establishment

export (directly or indirectly) in fiscal year 2012/2013?", after which respondent could choose from 3 options. This question was asked to the respondents in a closed format, resulting in either the value "1" if the question was answered with "yes", or the value "0" if the question was answered with "no". This resulted in a dichotomous variable, which can directly be processed in the logistic regression analysis (Hair & Black, 2013). A third response on this question was also possible, namely "don't know" instead of yes or no, which has the value "-9". However, none of the respondents in survey used this option, which means this variable has no missing values.

The overview below shows the operationalization of the moderator variable "Firm Internationalization".

Dependent Variable	***Definition***	***Operationalization***	***Variable type***
Label: B7 International Firm	The outward movement of a firm's international operations" (Calof & Beamish, 1995, p. 116),	Format: Closed question Answer "yes" = value "1" Answer "no" = value "0" Answer "don't know" = value "-9"	Dichotomous variable (metrically scaled)

Table 5: Operationalization of the moderator variable "SME Internationalization"

3.2.4 Control Variables

This study uses five control variables, which are listed below. All of these variables have been used in a study by Barasa et al. (2016), which has a similar statistical analysis method and also focused on innovation in emerging markets.

Foreign ownership

Firms that are (partly) owned by a foreign entity are more often performing innovation activities due to a greater access to resources such as human capital and financial resources (Meyer & Nguyen, 2005). This variable is measured as the percentage of the firm owned by private foreign individuals, companies or organization. In the IRFRSA 2014 this variable was measured by the following question, labelled as A5: What percentage of this establishment is owned by: Private domestic individuals, companies, organizations?. Foreign ownership is expected to have a positive relation with process and product innovation (Dachs & Peters, 2014).

Formal training

Organizations that invest in employee training that is specifically focused on innovation practices, experience higher innovation performance than organizations that do not invest in this type of employee training (Sung & Choi, 2013). In the IRFRSA 2014 this variable was measured by the

following question, labelled as F1E: From fiscal year 2010/2011 thru 2012/2013 did this establishment provide formal training to any of its employees specifically for the development and/or introduction of innovative products or services and processes? This question was asked to the respondents in a closed format, resulting in either the value "1" if the question was answered with "yes", or the value "0" if the question was answered with "no". This resulted in a dichotomous variable. Formal training is expected to have a positive relation with process and product innovation (Baldwin & Johnson, 1996)

Firm size

Large organizations often have more possibilities to perform innovation due to a larger amount of capital resources compared to small firms (Ayyagari et al., 2011). Firm size is measured as the number of full-time permanent workers in the fiscal year 2012/2013, and was filled in by the respondent at the start of the survey in the IRFRSA 2014, labelled as D1. Firm size is expected to have a positive relation with process and product innovation (John E. Ettlie & Rubenstein, 1987).

Firm age

Older firms, just like large firms, possess a larger amount of financial resources and often employ personnel with more experience which results in a higher innovation performance compared to small firms (Ayyagari et al., 2011). In the IRFRSA 2014 this variable was measured by the following question, labelled as A1: In which year was the firm established? Age is calculated as the difference between 2014 and the year the firm was established. Firm age is expected to have a negative relation with process and product innovation (Huergo & Jaumandreu, 2004)

R&D

Organizations that perform research and development activities are connected to higher levels of innovation activities than firms that do not perform research and development (McGrath & Romeri, 2003). In the IRFRSA 2014 this variable was measured by the following question, labelled as F1A: From fiscal year 2010/2011 thru 2012/2013 did this establishment conduct intramural research (in-house) and experimental development? This question was asked to the respondents in a closed format, resulting in either the value "1" if the question was answered with "yes", or the value "0" if the question was answered with "no". This resulted in a dichotomous variable. R&D is expected to have a positive relation with process and product innovation (Mairesse & Mohnen, 2004)

3.3 Data analysis method

For analysing the variables as discussed in the previous section, a logistic regression analysis in SPSS will be used. Logistic regression analysis is a general statistical technique used to analyse the relationship between a single dichotomous dependent variable and several independent variables (Hair & Black, 2013). Logistic regression is a suitable analysis technique because there is one dichotomous dependent variable, three interval scaled (metrically scaled) independent variables and 1 dichotomous (metrically scaled) independent variable. However innovation is measured by two dichotomous dependent variables (process & product innovation), and the requirement for a logistic regression analysis is a maximum of one dependent variable, this does not cause any problems since both dependent variables will be measured separately in combination with the three independent variables (knowledge sourcing, knowledge acquiring & knowledge embedding) that measure knowledge management, and the independent moderator variable measuring firm internationalization.

The basic formulation for multiple regression is: $Y = \beta_0 + \beta_1 X_1 + \varepsilon$

When the variables for this study are inserted into the formula, the two following formulas are formed:

Process Innovation = β_0 + β_1KnowledgeSourcing + β_2KnowledgeAcquisition + β_3KnowledgeEmbedding + β_4KnowledgeSourcing*SMEInternationalization + β_5KnowledgeAcquisition SMEInternationalization + β_6KnowledgeEmbedding SMEInternationalization + ε

Product Innovation = β_0 + β_1KnowledgeSourcing + β_2KnowledgeAcquisition + β_3KnowledgeEmbedding + β_4KnowledgeSourcing*SMEInternationalization + β_5KnowledgeAcquisition SMEInternationalization + β_6KnowledgeEmbedding SMEInternationalization + ε

3.4 Research Ethics

The research ethics for this study are derived from the World Bank and Tilburg university, as the database that is used for this study was developed by these institutions. Both institutions are renowned organizations that highly value research ethics and therefore it can be assumed all data was gathered in an ethical manner.

4 Results

This chapter discusses the statistical analysis process of the dependent, independent and moderator variables as discussed in chapter three, followed by an examination of each variable's statistical outcome effects.

4.1 General statistics

The first step in analysing the data consists of examining the frequencies table, which shows general information about the data that will be processed, to see if there is a problematic number of missing values.

General Statistics

	Product Innovation	Process Innovation	Knowledge Sourcing	Knowledge Acquisition	Knowledge Embedding	International Firm	Foreign Owned	Formal Training	Research Development	Firm Age	Firm Size
Valid	479	478	481	481	481	481	481	473	473	481	464
Missing	2	3	0	0	0	3	0	8	8	0	17
Mean	,3194	,2343	3,5577	5,3708	4,7360	,3701	6,4297	,19	,24	16,3222	44,51
Median	,0000	,0000	3,5000	5,3333	5,0000	,0000	,0000	,00	,00	14,0000	32,00
Mode	,00	,00	1,00	5,00	5,25	,00	,00	0	0	14,00	25
Std.Dev	,46674	,42401	1,54412	,84162	1,25101	,48332	20,20724	,390	,426	12,89081	40,548
Varian.	,218	,180	2,384	,708	1,565	,234	408,333	,152	,181	166,173	1644,155
Min.	,00	,00	1,00	1,67	1,00	,00	,00	,00	,00	,00	1
Max.	1,00	1,00	7,00	7,00	7,00	1,00	100,00	1,00	1,00	104,00	200

Table 6: General statistics overview

First of all a missing value analysis is required to see if there are any missing responses in the survey dataset which could influence the results of the regression analysis. The frequency table shows that for all variables that measure knowledge management (all G1, G2 and G3 variables) and the variables that measure product innovation (all E1 variables) and process innovation (all E7 variables) there are no missing values. Product & process innovation, as well as firm size have missings with the value "9999", these will be declared as discrete missing values. For the internationalization variable (InternationalFirm) there are 3 missing values, missing data that exceeds 10% of the total amount of items is problematic (Hair & Black, 2013) which means these missing can be ignored, as they do not exceed the 10%. The minimum required amount of observations for a logistic regression is stricter than for a multiple regression where the minimum is 5 observations for every independent variable, while a logistic regression requires a minimum of 10 observations, the desired amount is 15-20 observations for every independent variable (Hair & Black, 2013). In this study that would mean a minimum of 180 observations, since there are 3 independent variables, five control variables and one moderating variable. 17 firms do not meet the requirements for a SME sized firm, which means they will be deleted, resulting in a total of 481 observations. With 481 observations, the sample size easily meets these requirements. Furthermore it can be seen that all of the observations meet the minimum and maximum values as they are supposed to: between 0 and 1 for the dichotomous variables, between 1 and 7 for the Likert scale measured variables, the oldest firm is 104 years old and the firms are all

within the earlier discussed size range for SMEs with a size between 1 and 200 employees. Secondly, the data must be checked for outliers. Outliers are a type of observation that have large residual values and can have a large impact on the results of a regression analysis: they significantly differ from the rest of the observations and thus can disproportionate influence the regression analysis outcomes (Hair & Black, 2013). They do however not always cause problems to the regression analysis outcomes, which makes it important to check what causes the outliers. Outliers were detected for several variables by calculating Z-scores for the dependent, independent and moderating variable, which were then visualized in a boxplot. A boxplot example can be seen in Appendix B representing variable G2, in which items 84, 140, 422, 468 & 478 are identified as non-critical outliers, and item 19 as critical outlier. Further investigating item 19 shows that it has the value "0" representing the lowest possible score in the 7-point Likert scale, which is a score that was expected does not cause any problems to the regressions analysis outcomes. The same effect occurs for all other boxplots: none of the critical outliers are unexpected and are in line with the scale on which they were measures by their surveys, thus no further action is taken.

Thirdly, the reliability tests which were performed in chapter three, must be rerun after cleaning the data during the missing value analysis to see if the scale is still internally consistent. Performing a reliability test on the variables G1 measuring knowledge sourcing shows that Cronbach's Alpha has slightly decreased from 0.758 to 0.756 (Appendix C), and that the scale still is internally consistent. Cronbach's alpha can be improved by removing the last item, which will result in a significant improvement. In chapter four, it was suggested that items which had a low internal consistency score should be removed if it would improve the scale. After removing the last item, Cronbach's Alpha increased to 0.808 (Appendix C), and could not be improved any further. Performing a reliability test on the G2 variables measuring knowledge acquisition shows that after data cleaning, Cronbach's Alpha has slightly decreased from 0.699 to 0.691 (Appendix C). Cronbach's Alpha cannot be improved but the scale is still is sufficiently internally consistent. Performing a reliability test on the G3 variables measuring knowledge embedding shows that after data cleaning, Cronbach's Alpha has slightly decreased from 0.739 to 0.737 (Appendix C), and that the scale is still internally consistent. Cronbach's alpha cannot be improved by removing any items.

4.2 Factor Analysis

As the reliability tests in section three showed, all three dimensions of knowledge management have underlying variables which form a reliable and internally consistent scale. In order to check if these variables accurately reflect the scale (knowledge scouring, knowledge acquisition & knowledge embedding) they are supposed to measure, and to reduce the dataset to a more manageable size, a factor analysis is conducted.

The first factor analysis is performed for "knowledge sourcing", consisting of all of the G1

variables (minus the last G1 variable that was removed in the previous step). All data output of the following outcomes can be found in Appendix D. To determine if a factor analysis is an appropriate analysis method with regard to the data, a KMO test and a Bartlett's test are performed. The KMO test checks whether a factor analysis is appropriate by analysing proportion of variance in the variables that might be caused by underlying factors. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO test) is sufficiently high with a value of 0.706, and thus meets the critical value requirement of 0.5 (Field, 2013). Bartlett's test of Sphericity tests whether the variables in the factor analysis are sufficiently related to perform a factor analysis. Bartlett's test is significant with an alpha of 0.00, and thus meets the critical value requirement of an alpha smaller than 0.05 (Field, 2013). The KMO test and Bartlett's test both determine that a factor analysis can be performed for the abovementioned variables. The principal axis factoring method is used as extraction method, and shows that the communalities after extraction are sufficiently high with values above 0.20, meeting the minimum requirements (Field, 2013). One factor is extracted, explaining 63.557% of the variance, which is based on an eigenvalue greater than 1 (Field, 2013). A scree plot also shows that two factors explain most of the variance, based on an eigenvalue greater than 1. Factor loadings are sufficiently high, meeting the minimum value of 0.3 (Field, 2013), To combine the variables into 1 variable that will measure "knowledge sourcing", a summated scale is created. Summated scales are used to "represent the multiple aspects of a concept in a single measure" (Hair & Black, 2013, p. 122). The new variables is labelled as "Knowledge_Sourcing".

The second factor analysis is performed for "knowledge acquisition", consisting of the G2 variables. All data output of the following outcomes can be found in Appendix E. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO test) is sufficiently high with a value of 0.654, and Bartlett's test is significant with an alpha of 0.00. The KMO test and Bartlett's test both determine that a factor analysis can be performed for the abovementioned variables. The communalities after extraction meet the minimum requirements of 0.20. One factor is extracted with an eigenvalue over 1, explaining 61.927% of the total variance, which is confirmed by the scree plot, showing only one factor with an eigenvalue above 1. Factor loadings are sufficiently high, meeting the minimum value of 0.3 (Field, 2013). Since the three G2 variables all load on one factor, one summated scale consisting of these variables is created. The new variable is labelled as "Knowledge_Acquisition".

The third factor analysis is performed for "knowledge embedding", consisting of the G3 variables. All data output of the following outcomes can be found in Appendix F. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO test) is sufficiently high with a value of 0.806, and Bartlett's test is significant with an alpha of 0.00. The KMO test and Bartlett's test both determine that a factor analysis can be performed for the abovementioned variables. The communalities after extraction meet the minimum requirements of 0.20. One factor is extracted with an eigenvalue over 1, explaining 56.746% of the total variance, which is confirmed by the scree plot, showing only one factor with an eigenvalue above 1. Factor loadings are sufficiently high, meeting the minimum value

of 0.3 (Field, 2013). Since the four G3 variables all load on one factor, one summated scale consisting of these variables is created. The new variable is labelled as "Knowledge_Embedding".

4.3 Assumptions

In order to perform an accurate logistic regression analysis, the data needs to meet several assumptions. A total of three assumptions will be tested before the logistic regression analysis itself will be conducted.

4.3.1 Metric data

For performing a logistic regression analysis, all data must be metrically scaled (Hair & Black, 2013). The variables in this study consists of 2 types of metrically scaled data. The first type are dichotomous variables which include variables Product_Innovation, Process_Innovation and InternationalFirm. Dichotomous variables are regarded as being both categorically and metrically scaled, and thus meet the requirements. The second type of data, which include the variables Knowledge_Sourcing, Knowledge_Acquisition and Knowledge_Embedding, is data that has been measured by a Likert scale. Likert scales are classified as measured on an interval level, which means they are metrically scaled (Field, 2013). This means all variables in this study meet the requirements of metrically scaled data.

4.3.2 Linearity

In a normal regression, it is assumed that the dependent variable has a linear relationship with the independent variables. In a logistic regression this is impossible since the dependent variable is a categorically scaled variable (consisting of only values of 0 and 1), even though it is also regarded as a metrically scaled variable. To still test the assumption of linearity, not the original variables are tested but the logit of the independent variables are tested in relationship to the dependent variables. This is done by transforming every variable into its natural log, and then test this variable against the original variable in a logistic regression (Field, 2013). All data output of the following outcomes can be found in Appendix G. If any of the interaction terms between the original variable and the log transformation is significant, thus having an alpha of $p < .05$, the assumption is violated and the data has to be improved by for example creating polynomials. A linearity test has been performed for both dependent variables. Product innovation does not have any significant interaction terms between the original independent variables and the log transformations, as they have a p value of respectively 0,692, 0,651 and 0,954. Also, Process innovation does not have any significant interaction terms between the original independent variables and the log transformations, as they have a p value of respectively 0,212, 0,336 and 0,618. This means the data meets the assumption for linearity.

4.3.3 Multicollinearity

Just like a normal regression analysis, multicollinearity can cause problems for a logistic regression analysis. If the independent variables are too tightly correlated, this will negatively influence the outcomes of the analysis. Multicollinearity cannot be tested within a logistic regression, but must be tested within a linear regression with the same dependent and independent variables as during the logistic regression. Multicollinearity can be detected by performing a collinearity test and looking at the tolerance values, which should not be smaller than 0.1 and the VIF values, which should not be smaller than 10 (Field, 2013). All data output of the following outcomes can be found in Appendix H. A collinearity test has been performed for both dependent variables. For product innovation, all VIP values lie above 1 and all tolerance values lie above 0.5, thus meeting the requirements. For process innovation, all VIP values also lie above 1 and all tolerance values lie above 0.5, thus meeting the requirements. This means the data meets the assumption for not having multicollinearity.

4.4 Binary Logistic Regression: Hypotheses

Hypotheses testing is done in three steps following the hypotheses as discussed in chapter 3, by using three logistic regression analyses. The first analysis will test hypotheses H1a, H2a & H3a concerning the effect of knowledge management on process innovation. The second analysis will test the hypotheses H1b, H2b & H3b regarding the effect of knowledge management on product innovation. Both test will also include a table that shows the analysis outcomes with the exclusion of the control variables in order to examine their influence on the hypotheses. The third analysis will test the hypotheses of the interaction effect of firm internationalization on the relationship between knowledge management and innovation.

4.3.4 Main relationship: Knowledge management & process innovation

This section discusses the results of the hypotheses testing regarding the effect of knowledge management on process innovation by testing the following hypotheses:

H1a: A firm's ability to source knowledge has a positive influence on process innovation.
H2a: A firm's ability to acquire knowledge has a positive influence on process innovation.
H3a: A firm's ability to embed knowledge has a positive influence on process innovation.

A binary logistic regression was performed with process innovation as the dichotomous dependent variable process innovation, and the metrically scaled independent variables of knowledge management, together with the five control variables. All data output of the following outcomes can be found in Appendix I. The model is statistically significant $\chi 2$ (chi-square) = 224.650, p = .000. The model explained 57.9% of the total variance on the dependent variable process innovation, and has a 87.3% prediction success.

Process Innovation	*B*	*S.E.*	*Wald*	*df*	*Sig.*	*Exp(B)*
Knowledge Sourcing	-,033	,117	,079	1	,779	,968
Knowledge Acquisition	-,317	,242	1,719	1	,190	,728
Knowledge Embedding	,397	,191	4,313	1	,038	1,487
Foreign Owned	-,004	,009	,229	1	,632	,996
Formal Training	1,707	,440	15,022	1	,000	,181
Research/Development	2,368	,411	33,166	1	,000	,094
Firm Age	,002	,014	,019	1	,892	1,002
Firm Size	-,759	1,328	,327	1	,567	,468

Table 7: Main relationship knowledge management & process innovation

Hypothesis H1a was **not supported** as there is no significant effect of knowledge sourcing on process innovation (p = 0.779). This means that a firm's ability to source knowledge has no effect on the process innovation that was performed by these companies.

Hypothesis H2a was **not supported** as there is no significant effect of knowledge acquisition on process innovation (p = 0.190). This means that a firm's ability to acquire knowledge has no effect on the process innovation that was performed by these companies.

Hypothesis H3a was **supported** as there is a positive significant effect of knowledge embedding on process innovation (p = 0.38). This means that a firm's ability to embed knowledge has a positive effect on the process innovation that was performed by these companies, implying that a company is 148.7% more likely to perform process innovation when their ability to embed knowledge is raised by one unit (odds ratio 1.487). The strength of this effect is of medium strength $\beta = 0.397$.

Excluding control variables

The model was also tested excluding the control variables. All data output of the following outcomes can be found in Appendix M. This resulted in a statistically significant model $\chi 2$ (chi-square) = 17.333, p = .001 for process innovation. The model explained 5.5% of the total variance on the dependent variable process innovation, and has a 76.6% prediction success.

Process Innovation	*B*	*S.E.*	*Wald*	*df*	*Sig.*	*Exp(B)*
Knowledge Sourcing	-,015	,077	,036	1	,850	,986
Knowledge Acquisition	-,097	,161	,364	1	,546	,908
Knowledge Embedding	,450	,130	11,990	1	,001	1,568

Table 8: Main relationship knowledge management & process innovation, excluding control variables

It can be seen that the exclusion of the control variables does not affect the hypotheses for process innovation, as in this model still only knowledge embedding is positive significant. This implies that the control variables do not significantly influence the outcomes of the hypothesis.

4.3.5 Main relationship: Knowledge management & product innovation

This section discusses the results of the hypotheses testing regarding the effect of knowledge management on product innovation by testing the following hypotheses:

H1b: A firm's ability to source knowledge has a positive influence on product innovation.

H2b: A firm's ability to acquire knowledge has a positive influence on product innovation.

H3b: A firm's ability to embed knowledge has a positive influence on product innovation.

A binary logistic regression was performed with product innovation as the dichotomous dependent variable, and the metrically scaled independent variables of knowledge management, together with the five control variables. All data output of the following outcomes can be found in Appendix K. The model is statistically significant $\chi 2$ (chi-square) = 325.262, p = .000. The model explained 70.7% of the total variance on the dependent variable product innovation, and has a 68.9% prediction success.

Product Innovation	***B***	***S.E.***	***Wald***	***df***	***Sig.***	***Exp(B)***
Knowledge Sourcing	-,562	,138	16,493	1	,000	,570
Knowledge Acquisition	-,865	,283	9,356	1	,002	,421
Knowledge Embedding	1,184	,243	23,821	1	,000	3,267
Foreign Owned	,003	,010	,120	1	,729	1,003
Formal Training	1,984	,495	16,047	1	,000	,137
Research/Development	3,622	,491	54,390	1	,000	,027
Firm Age	-,020	,016	1,679	1	,195	,980
Firm Size	,433	1,317	,108	1	,743	1,541

Table 9: Main relationship knowledge management & product innovation

Hypothesis H1b was **not supported** as there is a negatively significant effect of knowledge sourcing on product innovation (p = 0.000). This means that a firm's ability to source knowledge has an effect on the process innovation that was performed by these companies, but the effect is negative, implying that a company is 57% less likely to perform product innovation when their ability to source knowledge is raised by one unit (odds ratio 0.570). However, the strength of this effect is of moderate strength $\beta = -0.562$.

Hypothesis H2b was **not supported** as there is a negatively significant effect of knowledge acquisition on product innovation (p = 0.002). This means that a firm's ability to acquire knowledge has an effect on the process innovation that was performed by these companies, but the effect is negative, implying

that a company is 42.1% less likely to perform product innovation when their ability to source knowledge is raised by one unit (odds ratio 0.421). The strength of this effect is of large $\beta = -0.865$.

Hypothesis H3b was **supported** as there is a positive significant effect of knowledge embedding on product innovation ($p = 0.00$). This means that a firm's ability to embed knowledge has a positive effect on the product innovation that was performed by these companies, implying that a company is 326.7% more likely to perform process innovation when their ability to embed knowledge is raised by one unit (odds ratio 3.267). This effect has a large strength $\beta = 1.184$

Excluding control variables

The model was also tested excluding the control variables. All data output of the following outcomes can be found in Appendix M. This resulted in a statistically significant model $\chi 2$ (chi-square) = 42.765, p = .000 for product innovation. The model explained 12.3% of the total variance on the dependent variable process innovation, and has a 69.2% prediction success.

Product Innovation	***B***	***S.E.***	***Wald***	***df***	***Sig.***	***Exp(B)***
Knowledge Sourcing	-,196	,072	7,389	1	,007	,822
Knowledge Acquisition	-,186	,152	1,501	1	,221	,831
Knowledge Embedding	,716	,129	30,720	1	,000	2,046

Table 10: Main relationship knowledge management & product innovation, excluding control variables

It can be seen that however knowledge acquisition is not significant in this model, this does not affect the hypotheses for product innovation, as in this model still only knowledge embedding is positive significant. This implies that the control variables do not significantly influence the outcomes of the hypothesis.

Summarized, this means that the main hypotheses h1a, h1b, h2a and h2b were not supported, but the main hypotheses h3a and h3b were supported.

4.3.6 Moderated relationship: Internationalization

This section discusses the results of the hypotheses testing regarding the effect of firm internationalization on the relationship between knowledge management and process & product innovation. Note that this is an interaction effect, which means it does not directly affect the outcome variable (innovation) but rather tests if firm internationalization affects the relationship between the predictor and outcome variable, which could lead to significant stronger or weaker effects.

For these hypotheses to be supported, two effects are of importance: (1) the effect must be statistically significant, (2) the effect must be positive, (3) the effect must be stronger than the positive significant effect that already existed without the moderator variable (in this study that only applies to

knowledge embedding, as seen in 4.3.5), or the effect must be positive significant where earlier results without the moderator were insignificant (knowledge sourcing & acquisition). For these hypotheses to be tested, two separate logistic regression analyses were performed: one for process innovation, and one for product innovation. In both analyses, interactions term were created between the metrically scaled independent variables of knowledge management and the dichotomous independent variable International_Firm.

Process Innovation

The following hypotheses regarding process innovation will be tested:

H4a: *The positive influence of knowledge sourcing on process innovation is stronger for EM SMEs that have internationalized*

H4b: *The positive influence of knowledge acquisition on process innovation is stronger for EM SMEs that have internationalized*

H4c: *The positive influence of knowledge embedding on process innovation is stronger for EM SMEs that have internationalized*

All data output of the following outcomes can be found in Appendix J. The model testing for process innovation is statistically significant $\chi 2$ (chi-square) = 322.255, p = .000. The model explained 59.7% of the total variance on the dependent variable product innovation, and has a 86.4% prediction success.

Process Innovation	***B***	***S.E.***	***Wald***	***df***	***Sig.***	***Exp(B)***
Knowledge Sourcing	-,225	,234	,921	1	,337	,799
Knowledge Acquisition	,346	,331	1,088	1	,297	1,413
Knowledge Embedding	-,183	,314	,341	1	,559	,833
Foreign Owned	-,003	,009	,086	1	,769	,997
Formal Training	1,927	,461	17,454	1	,000	,146
Research/Development	2,234	,417	28,720	1	,000	,107
Firm Age	-,001	,015	,009	1	,922	,999
Firm Size	-1,019	1,401	,529	1	,467	,361
International Firm by Knowledge Sourcing	,271	,273	,989	1	,320	1,312
International Firm by Knowledge Acquisition	,919	,358	6,576	1	,010	,399
International Firm by Knowledge Embedding	,872	,392	4,955	1	,026	2,392

Table 11: Moderated relationship knowledge management & process innovation

Hypothesis H4a was **not supported** as there is no significant interaction effect on the relationship between knowledge sourcing and process innovation (p = 0.320). This means that EM SMEs that have internationalized do not show an increased level of process innovation through their ability to source knowledge, in contrast to firms that have not internationalized and remained domestic. In other words,

a firm that has internationalized does not perform more process innovation through their ability to source knowledge compared to domestic firms.

Hypothesis H4b was **supported** as there is a positive significant interaction effect on the relationship between knowledge acquisition and process innovation ($p = 0.010$). This means that EM SMEs that have internationalized show an increased level of process innovation through their ability to acquire knowledge, in contrast to firms that have not internationalized and remained domestic. In other words, a firm that has internationalized performs more process innovation through their ability to acquire knowledge compared to domestic firms. The results imply that an internationalized firm is 239.2% more likely to perform process innovation when their ability to embed knowledge is raised by one unit (odds ratio 2.392), in contrast to firms that are domestic. The strength of this effect is large $\beta = 0.872$.

Hypothesis H4c was **supported** as there is a positive significant interaction effect on the relationship between knowledge embedding and process innovation ($p = 0.026$). This means that EM SMEs that have internationalized show an increased level of process innovation through their ability to embed knowledge, in contrast to firms that have not internationalized and remained domestic. In other words, a firm that has internationalized performs more process innovation through their ability to embed knowledge compared to domestic firms. The results imply that an internationalized firm is 39.9% more likely to perform process innovation when their ability to acquire knowledge is raised by one unit (odds ratio 0.399), in contrast to firms that are domestic. The strength of this effect is large $\beta = 0.919$.

Product Innovation

The following hypotheses regarding product innovation will be tested:

H5a: *The positive influence of knowledge sourcing on product innovation is stronger for EM SMEs that have internationalized*

H5b: *The positive influence of knowledge acquisition on product innovation is stronger for EM SMEs that have internationalized*

H5c: *The positive influence of knowledge embedding on product innovation is stronger for EM SMEs that have internationalized*

All data output of the following outcomes can be found in Appendix L. The model testing for product innovation is statistically significant $\chi 2$ (chi-square) = 329.549, $p = .000$. The model explained 71.3% of the total variance on the dependent variable product innovation, and has a 88.6% prediction success.

Process Innovation	*B*	*S.E.*	*Wald*	*df*	*Sig.*	*Exp(B)*
Knowledge Sourcing	-,672	,251	7,199	1	,007	,511
Knowledge Acquisition	-,293	,393	,556	1	,456	,746
Knowledge Embedding	,656	,368	3,167	1	,075	1,926
Foreign Owned	,004	,009	,157	1	,692	1,004
Formal Training	2,067	,504	16,810	1	,000	,127
Research/Development	3,532	,493	51,376	1	,000	,029
Firm Age	-,024	,016	2,175	1	,140	,976
Firm Size	,165	1,397	,014	1	,906	1,179
International Firm by Knowledge Sourcing	,157	,283	,306	1	,580	1,170
International Firm by Knowledge Acquisition	,823	,430	3,660	1	,046	,439
International Firm by Knowledge Embedding	,823	,467	3,107	1	,078	2,277

Table 12: Moderated relationship knowledge management & product innovation

Hypothesis H5a was **not supported** as there is no significant interaction effect on the relationship between knowledge sourcing and product innovation (p = 0.580). This means that EM SMEs that have internationalized do not show an increased level of product innovation through their ability to source knowledge, in contrast to firms that have not internationalized and remained domestic. In other words, a firm that has internationalized does not perform more product innovation through their ability to source knowledge compared to domestic firms.

Hypothesis H5b was **supported** as there is a positive significant interaction effect on the relationship between knowledge acquisition and product innovation (p = 0.046). Just like the hypothesis H4b for process innovation this means that EM SMEs that have internationalized show an increased level of product innovation through their ability to acquire knowledge, in contrast to firms that have not internationalized and remained domestic. In other words, a firm that has internationalized performs more product innovation through their ability to acquire knowledge compared to domestic firms. The results imply that an internationalized firm is 43.9% more likely to perform process innovation when their ability to acquire knowledge is raised by one unit (odds ratio 0.439), in contrast to firms that are domestic. The strength of this effect is large $\beta = 0.823$.

Finally, hypothesis H4c was **not supported** as there is no significant interaction effect on the relationship between knowledge embedding and product innovation (p = 0.78), implying that a firm that has internationalized does not perform more product innovation through their ability to embed knowledge compared to domestic firms.

Summarized, this means that the hypothesis H4a was not supported for process innovation, but the hypotheses H4b and H4c were supported. H5a and H5c were not supported for product innovation, but the hypothesis H5b was supported.

5 Discussion

This chapter discusses the findings of the statistical analysis, the contributions to the literature and managerial implications, and the limitations and avenues for future research.

5.1 Discussion of the findings

This section discusses the findings of the logistic regression analyses by drawing on relevant academic literature. Firstly, the findings with regard to the main relationships between knowledge management and innovation will be discussed, followed by the effects of the control variables. Secondly, the effects of the moderating relationship will be discussed.

5.1.1 Main relationship: Knowledge Management - Process Innovation

Knowledge Sourcing – Process Innovation

As illustrated in section 4.3.4, the relationship between knowledge sourcing and process innovation proved to be insignificant, implying that there is no effect of knowledge sourcing on process innovation. This is in contrast to hypothesis H1a, which proposed that the relationship would be significant, based on existing academic literature. Non significance of the effect could have been caused by the high number of respondents that replied negatively to survey questions measuring the firm's ability to source knowledge. As can been seen in table 6 (section 4.1), compared to knowledge acquisition and knowledge embedding, knowledge sourcing has a much lower mean. This indicates that a large group of respondents perceives their firm not able to successfully source knowledge, which could have led to a non-significant effect in the relationship with process innovation.

Another possible explanation for the non-significant effect, is that even though a firm's ability to source knowledge is expected to have a positive influence on firm processes, this is not always true (Rulke et al., 2000). Gray & Meister (2004) found that knowledge that has been sourced by SME management, does not always align with the needs of the individual employee. Especially highly skilled employees do not benefit from wrongly sourced knowledge (e.g. hiring an engineer whose knowledge does not align nor complement the existing R&D team, who are responsible for innovation), and thus knowledge sourcing could have a negative influence on firm processes. Possibly the most important explanation comes from Vega-Jurado et al. (2009), who specifically examined the effects of process innovation in the EM SME manufacturing industry. They found that "process innovation is largely driven by the acquisition of knowledge "embodied" in machinery and equipment and that cooperation with external agents has no significant effect" (Vega-Jurado et al., 2009, p. 661), implying that the sourcing of intangible knowledge, on which the IRFRSA 2014 survey was mainly

focused, does not sufficiently contribute to process innovation, and thus could lead to a non-significant effect.

Knowledge Acquisition - Process Innovation

As discussed in section 4.3.4, the relationship between knowledge acquisition and process innovation proved to be insignificant, implying that there is no effect of knowledge acquisition on process innovation. This is in contrast to hypothesis H2a, which proposed that the relationship would be significant, based on existing academic literature. A possible explanation can be found in the study by Yli-Renko et al. (2001), who argue that an intensive competitive landscape decreases the ability of an SME to acquire knowledge, and also decreases experience in acquiring knowledge. This implies that a firm's ability to acquire knowledge is influenced by the intensity of the competition and may prohibit the firm from acquiring the necessary knowledge in order to perform process innovation. Since this study could not measure the intensity of the competition with the available data, it could not be examined if the intensity of the competition negatively influences the ability to acquire knowledge to such extent, that this results in a non-significant relationship between knowledge acquisition and process innovation. In other words, the relationship between knowledge acquisition and process innovation may be non-significant due to intense competition, but this could not be measured.

Another possible explanation is the positive significance of the control variable R&D, because Cassiman & Veugelers (2006) discuss how the effect of knowledge acquisition on innovation is correlated with R&D. Thus, because this control variable is positively significant, it could function as a substitute variable causing the knowledge acquisition variable to be insignificant. This argument regarding the importance of R&D on the relationship between knowledge acquisition and innovation is also discussed by Berchicci, (2013), who found that SMEs with high levels of R&D capacity were much more able to successfully acquire the necessary knowledge to perform innovation activities, as they were able to use fewer valuable partners from which they could assimilate a large amount of useful knowledge, compared to companies with a low R&D capacity. Because the variable R&D is measured on a dichotomous level, nothing could be said about the R&D capacity of the firms, which means there is possibly a large number of firms with a low R&D capacity which could have caused the non-significant effect. Another possible explanation lies in the already existing knowledge base that is present within the EM SME (internal knowledge); EM SMEs that possess diverse knowledge sources will not benefit from acquiring external knowledge in regard to process innovation. This is because the external knowledge often does not align with, or supplements existing internal knowledge, but instead external knowledge acquisition will work counterproductive (Zhou & Li, 2012).

Knowledge Embedding - Process Innovation

As discussed in section 4.3.4, the relationship between knowledge embedding and process innovation proved to be positively significant, implying that there is a positive effect of knowledge embedding on

process innovation. These findings are in line with Anand et al. (2007), Utterback & Abernathy (1975) and Bresnen et al. (2004), who discussed how a firm (SME) must be able to successfully embed knowledge that has been sourced and acquired, into the organisation in order to possibly enhance innovation. Bresnen et al. (2004) specifically mention knowledge embedding in regard to process innovation, and how this could lead to higher levels of process innovation. Thus, this study confirms the propositions made by the abovementioned authors and states that a firm's ability to embed knowledge has a positive influence on process innovation.

5.1.2 Main relationship: Knowledge Management - Product Innovation

Knowledge Sourcing – Product Innovation

The relationship between knowledge sourcing and product innovation proved to be negatively significant, implying that there is a negative effect of knowledge sourcing on product innovation. This is in contrast to hypothesis H1b, which proposed that the relationship would be significant, based on academic literature. Almost no literature makes a distinction between process & product innovation in relationship to knowledge sourcing. Vega-Jurado et al. (2009) do makes this particular distinction. They argue that knowledge sourcing does not have a positive influence on product innovation, because the process of knowledge sourcing is fully replaced by cooperation with external partners through outsourcing of EM SME processes, if an EM SME's own knowledge proves insufficient. In this case, the ability to source knowledge does not matter, as the entire process for which external knowledge was needed, is outsourced to another company. Thus, this could mean that knowledge sourcing could have a negative effect on product innovation, if EM SMEs try to source knowledge instead of outsourcing it as argued by Vega-Jurado et al. (2009). Ardito & Messeni Petruzzelli (2017) also examined the relationship between knowledge sourcing and product innovation and found that when SMEs have a strong focus on knowledge sourcing (e.g. are very able to perform knowledge sourcing), the search breadth is often so extensive that the necessary knowledge becomes hard to find, and thus negatively influences product innovation. This implies that even if firms are very well able to source knowledge, their knowledge sourcing might prove unfruitful due to their focus being too broad, and the process of knowledge sourcing taking up too much time, which results in a negative effect. The findings of Gray & Meister (2004) also apply to product innovation in relation with knowledge sourcing; knowledge that is sourced but does not align with highly skilled employees which are responsible for innovation activities could work counterproductive, and thus explain the negative significant effect. Related to this argument is the study by Alvarez & Iske (2015), that find that external knowledge sourcing is often a substitute for an EM SME's own internal knowledge, and thus does not complement their own internal knowledge, but rather works counterproductive, which could explain the negative significant effect.

Knowledge Acquisition – Product Innovation

The relationship between knowledge sourcing and product innovation proved to be negatively significant, implying that there is a negative effect of knowledge acquisition on product innovation. This is in contrast to hypothesis H2b, which proposed that the relationship would be positively significant, based on academic literature. Again, almost no literature makes a distinction between process & product innovation in relationship to knowledge sourcing. Dunlap et al. (2015) find a direct negative influence of knowledge acquisition on product innovation when companies acquire knowledge through joint ventures, meaning that companies who participate in joint ventures with the aim to acquire external knowledge to enhance product innovation, often experience a decreased level of product innovation. The authors give no explanation for this, as they call it, "curious" effect, but propose it to be an interesting subject for future research. This negative effect could be a possible explanation for the negative significant effect of knowledge acquisition on product innovation, although the available data does not allow to distinguish companies that do or do not participate in joint ventures, which makes it impossible to examine this effect. Other than this possible explanation, current academic knowledge does not provide answers on the negative significant effect of knowledge acquisition on product innovation.

Knowledge Embedding – Product Innovation

The relationship between knowledge embedding and product innovation proved to be positively significant, implying that there is a positive effect of knowledge embedding on product innovation. These findings are in line with Anand et al. (2007), Utterback & Abernathy (1975) and Bresnen et al. (2004), who discussed how a firm must be able to successfully embed knowledge that has been sourced and acquired, into the organisation in order to possibly enhance innovation. Lin & Chen (2006) argue that product innovation is positively influenced by knowledge embedding in the case of EM SMEs performing product innovation through cooperation in group networks. This study could not examine this effect, but it may be that the effect of knowledge embedding on product innovation is positively significant because the firms in this study perform product innovation in cooperation with other firms.

5.1.3 Control variables

The control variables did not change in their significance levels throughout all tests, those that were significant, proved to be significant throughout all analyses, and vice versa for the insignificant control variables. As expected formal training and R&D proved to be positively significant. Firm size, firm age and foreign ownership turned out to be insignificant and had no influence on process & product innovation.

5.1.4 Moderating Relationship: Internationalization

This section discusses the outcomes of the moderating effect of firm internationalization on the relationship between knowledge management and innovation.

Process Innovation

Hypothesis H4a, regarding the moderating interaction effect on the relationship between knowledge sourcing and process innovation, proved to be insignificant. This is in contrast to the hypothesis that assumed the effect would be positively significant. A possible explanation for the insignificance of the effect could be the location of the EM SME in the host country, as Cantwell & Mudambi (2011) argue that firms that are located outside of concentrated industrial areas (agglomeration areas), will rather source knowledge from either these concentrated industrial areas or other host country locations, and not source knowledge internationally. Tan & Meyer (2011) discuss how in emerging markets, firms are often not as agglomerated as in developed markets, but more scattered throughout the country. This could explain how the firms that were examined in this study (in South Africa), that are not located in agglomerated areas would rather source knowledge from other areas within South Africa instead of sourcing knowledge internationally, which could lead to the insignificant interaction effect.

Hypothesis H4b, regarding the moderating interaction effect on the relationship between knowledge acquisition and process innovation proved to be positively significant, which confirms the hypothesis that assumed the effect would be positively significant. This is in line with the findings of Awate et al. (2014) and Fletcher & Harris (2012) who discussed positive relationships between knowledge acquisition and firm internationalization, through the acquisition of external knowledge by either acquiring foreign firms or acquiring foreign human capital.

Hypothesis H4c, regarding the moderating interaction effect on the relationship between knowledge embedding and process innovation proved to be positively significant, which confirms the hypothesis that assumed the effect would be positively significant. This is in line with Andersson et al. (2016) who found that international firms are better able to embed knowledge through efficient communication, because of experience resulting from international communication. They also argue that that knowledge is embedded faster in these international SMEs.

Product Innovation

Hypothesis H5a, regarding the moderating interaction effect on the relationship between knowledge sourcing and product innovation, proved to be insignificant. This is in contrast to the hypothesis that assumed the effect would be positively significant. A possible explanation for the non-significance of the effect lies in the work of Li & Tang (2010), who found that international SMEs that are characterized by a high degree of vertical integration, often experience negative results from external knowledge sourcing in combination with product innovation. They argue that firms that are

internationally vertically integrated, source knowledge from within the industry in which they are integrated. Knowledge that is sourced internationally does often not complement their existing knowledge base, and thus has a negative influence on their product innovation performance.

Hypothesis H5b, regarding the moderating interaction effect on the relationship between knowledge acquisition and product innovation proved to be positively significant, which confirms the hypothesis that assumed the effect would be positively significant. This is in line with the findings of Awate et al. (2014) and Fletcher & Harris (2012) who discussed positive relationships between knowledge acquisition and firm internationalization, as mentioned in section on process innovation. This finding is also in line with Davenport (2005) who argues that SMEs that are internationally active, show high levels of product innovation through international knowledge acquisition. This is because SMEs are often focused on niche markets and thus are in need of specific knowledge, which can more easily be acquired on the international market than the domestic market.

Hypothesis H5c, regarding the moderating interaction effect on the relationship between knowledge embedding and product innovation, proved to be insignificant. This is in contrast to the hypothesis that assumed the effect would be positively significant. A possible explanation can be found in the study by Zahra et al. (2009), who argue that international EM SMEs often find it difficult to embed knowledge that is acquired internationally with the aim to enhance product innovation, because this knowledge comes in different forms (different languages, systems), and is thus harder to embed.

5.2 Contributions to the literature and managerial implications

This section discusses the contributions to the literature of this study, followed by the managerial implications.

Contributions to the literature

This study makes three contributions to the academic literature. Firstly, it contributes to the literature on knowledge management. By examining three different dimensions of knowledge management, this study examines the effect of several steps in the knowledge management process, namely that of sourcing knowledge, acquiring knowledge and then embedding knowledge within the firm. Most studies concerning knowledge management examine only one dimension, which could lead to the impression that other knowledge management practices are not as equally important or unnecessary for successful knowledge management. By examining knowledge management in combination with innovation, this study sheds more light on the drivers of innovation. This study found that knowledge embedding in EM SMEs has a positive significant influence on process and product innovation performance, which could lead to a better understanding of how firms should incorporate knowledge

management practices into their daily business. This finding emphasizes the importance of knowledge management to increase EM SME innovation performance.

Secondly, this study contributes to the literature on SME innovation in emerging markets. As discussed, there is an increasing body of literature on innovation in emerging markets, although most of the current focuses on large firms and MNEs. This study contributes to the EM SME innovation research by examining which drivers enhance innovation performance, and found that EM SMEs benefit from using knowledge embedding to enhance both process and product innovation performance, and benefit from using knowledge acquisition in the international context. These findings help to grow understanding of what management practices are necessary to successfully enhance SME innovation performance in emerging markets.

Thirdly, this study contributes to literature on EM SME internationalization. Current literature does not examine the dimensions of knowledge management and its influence on EM SME innovation in combination with firm internationalization, which this study shed more light on. This study showed that internationalization can be a valuable advantage for EM SMEs, as it helps to enhance process and product innovation performance by using knowledge acquisition practices to acquire external knowledge internationally.

Managerial implications

The results of this study have implications for government agencies and companies. Firstly, the results regarding the main effects of knowledge management on innovation imply that knowledge management only partly positively influences innovation performance for EM SMEs. This study found that the embedding of knowledge by EM SMEs can enhance both process and product innovation performance, and thus EM SMEs that use such knowledge management practices could experience a positive influence on their process and/or product innovation. Especially the positive effect of knowledge embedding on product innovation could result in strongly enhanced innovation performance. One of the knowledge management practices that also proved to enhance EM SME innovation performance is knowledge acquisition, in combination with internationalization. This could be a reason for EM SMEs to start the process of internationalizing in order to acquire the knowledge they need for performing process and/or product innovation

As mentioned, knowledge management only partly positively influences innovation performance, as this study found that knowledge sourcing does not seem to significantly enhance EM SME's innovation performance, and thus companies should rather focus on knowledge embedding practices. Knowledge acquisition proved to not influence process innovation, but does negatively influence product innovation, and thus companies should be cautious to use knowledge acquisition if their aim is to enhance innovation performance. The same effect was found for the relationship between knowledge acquisition and product innovation, where knowledge acquisition was found to

have a negative influence.

Secondly this studies has implications for government agencies both in emerging and developed countries. As this study found that EM SMEs benefit from internationalization to acquire the knowledge they need for both process and product innovation., there is a role for emerging market government agencies to support the process of SME internationalization by reforming legislation and taking down barriers to export. EM SMEs often experience extensive bureaucratic processes which discourage internationalization, or face barriers by host countries. This is why there also is an implication for developed country government agencies, who could reduce import barriers to support EM SME internationalization, which could lead to increased innovation performance. This helps EM SMEs to grow, which ultimately leads to increased welfare in emerging markets.

5.3 Limitations and avenues for future research

This section discusses the contributions to the literature as presented in the introduction, followed by the managerial implications.

Limitations

This study has several limitations. Firstly, this study was carried out by examining survey data from firms in the manufacturing industry and therefore no conclusions can be drawn with regard to other sectors such as the service sector. Secondly, much of the data resulting from the survey was captured in dichotomous variables, which only tell if a company has performed a specific activity or not, but do not indicate to what extent a company performs such activities. Thus, it was difficult to more thoroughly examine the data in order to separate highly innovative firms from low innovative firms in order to get more accurate results on the effect of knowledge management on innovation. Thirdly, the unexpected results regarding the complete insignificance of the effect of knowledge sourcing on innovation could have been caused by the data set in which a relatively low amount of respondents perceived their firm to knowledge sourcing practices, which could have led to the insignificance of the effect, besides the possible explanations as given in section 5.1.1 and 5.1.2. Thus the effect between knowledge sourcing and innovation could prove significant if another dataset was used.

Avenues for future research

As this study found that knowledge management only partly has a positive influence on innovation performance, and this could have important implications for management practices, more research on the variables that were used in this study should be done. This can be done by examining the datasets from other similar surveys that were performed in emerging markets commissioned by the World

Bank, after which conclusions can be drawn if the results of this study remain the same for other emerging markets. As mentioned in section 5.1.1, Vega-Jurado et al. (2009) argue that process innovation is mostly driven by knowledge embodied in machinery and equipment, thus it would be interesting to examine the effects of process management in service industries where machinery and equipment possibly are less present in the innovation process. As mentioned in the previous section, the data in this study contained various dichotomous variables which offers only limited options to draw conclusions about the intensity in which firms perform innovation, it could thus be interesting for future studies to research the extent to which firms perform process and product innovation, in combination with knowledge management.

Because firm internationalization proved to have significant influence on innovation performance, it would be interesting for future research to investigate to what extent EM SMEs are internationally active, as the data in this database measured internationalization by means of export activity. Firms can also be internationally active through other means, and this could significantly change (positively or negatively) the influence of firm internationalization. In regard to internationalization, it would be helpful if future studies would examine the effects of barriers to internationalization, in order to examine if EM SMEs would experience greater positive influence of knowledge management on innovation if these barriers would be taken down. This could help government agencies to form a clearer image on which actions need to be taken in order to improve EM SME innovation. Lastly, the database that was used for this study did not allow for including many control variables, which future research could take into account. Other control variables could result in a higher explained variance on the innovation variable, but also help to interpret the influence of knowledge management, and thus more meaningful conclusions could be drawn. Recommended control variables to be included in future research are competition intensity (5.1.1), innovation cooperation (5.1.2) and agglomeration (5.1.3).

6 Conclusion

This study aimed to examine the influence of knowledge management on EM SME innovation by asking the following research question: *To what extent does knowledge management influence EM SME innovation?* The findings of this study prove that knowledge management only partly influences EM SME innovation in a positive way, namely through the dimension of knowledge embedding. The greater a firm's ability to embed knowledge into the organisation, the greater both process & product innovation performance. This is an interesting finding, as current literature on knowledge embedding in combination with EM SME innovation is very scarce.

Knowledge sourcing and knowledge acquisition proved not to have a positive significant influence on process & innovation, this was contrary to expectations beforehand. The previous chapter discussed possible explanations for the non-significant influence of these knowledge management practices on innovation. However, more research might be needed as current literature is contradictive whether knowledge sourcing and knowledge acquisition should positively or negatively influence innovation performance. Knowledge sourcing and knowledge acquisition proved to have the opposite effect as assumed beforehand, as they negatively influence product innovation.

A second research question was asked to examine the importance of EM SME internationalization on innovation performance, namely: *To what extent is the relationship between knowledge management and EM SME innovation moderated by firm internationalization?* Surprisingly, EM SME internationalization has a positive effect on the influence of knowledge acquisition on process and product innovation. This means that for international EM SMEs, knowledge acquisition has a significant positive influence on innovation performance, compared to domestic firms. This highlights the importance of firm internationalization in order to acquire the necessary knowledge for process & product innovation.

This study concludes that knowledge management has a positive influence on EM SME innovation, if only partially. The same was found to be true for EM SME internationalization.

This study contributes to the innovation literature by examining the effects of knowledge management on innovation, to the EM SME literature by examining drivers for EM SME innovation, and to the internationalization literature by examining the influence of EM SME internationalization on the relationship between knowledge management and innovation.

The main limitation of this study was that it only examined data from the South African manufacturing industry, and thus no conclusion could be drawn regarding other industries and sectors. This is a good subject for future research: to examine the effects of knowledge management on EM SME innovation in other industries and different countries. More research is also needed on drivers of EM SME innovation, to increase the understanding on how to enhance innovation performance in emerging markets, to help SMEs grow and thus increase prosperity in these emerging markets.

7 References

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8 Appendix

Appendix A: preliminary factor analysis

Sampling Size

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Small >=5 and <=19	246	24,6	24,6	24,6
	Medium >=20 and <=99	487	48,7	48,7	73,3
	Large >=100	267	26,7	26,7	100,0
	Total	1000	100,0	100,0	

Reliability Statistics

Cronbach's Alpha	N of Items
,758	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
G1. We have extensive contact with researchers at universities	16,93	26,374	,605	,684
G1. We have an active network of contacts with the scientific and research commu	16,42	24,114	,672	,656
G1. We read specialized journals and magazines to keep abreast of market and tec	15,56	29,168	,535	,712
G1. We regularly conduct a technological audit of our company	15,53	27,658	,651	,671
G1. We monitor the needs of our clients and customers	14,23	38,149	,170	,809

Reliability Statistics

Cronbach's Alpha	N of Items
,692	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
G2. We are successful at acquiring the knowledge required to understand costumer	10,61	3,914	,444	,677
G2. We are successful at acquiring the knowledge required to identify market opp	10,77	3,078	,543	,551
G2. We are successful at acquiring the knowledge required comply with the requir	10,85	2,818	,551	,544

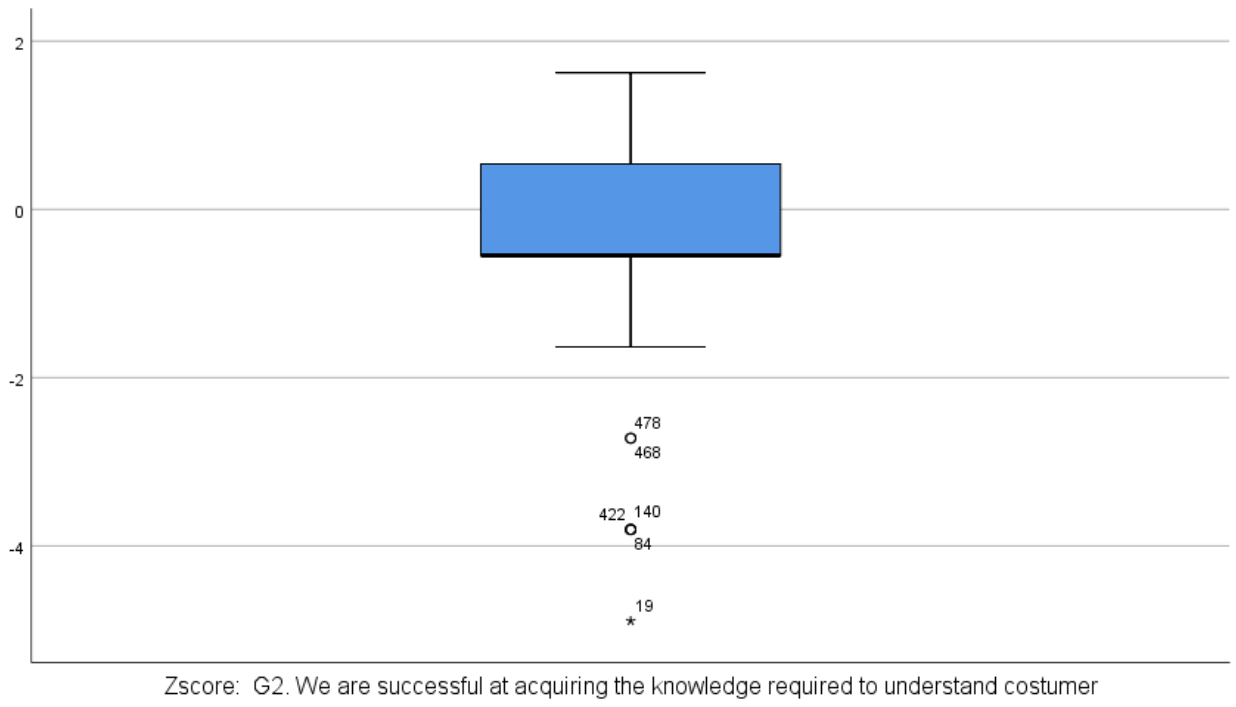
Reliability Statistics

Cronbach's Alpha	N of Items
,739	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
G3. Our employees have the skills to fuse or link newly aquiring knowledge withi	15,37	9,388	,523	,690
G3. We improve our knowledge management systems to better to use or exchange inf	15,35	8,698	,560	,666
G3. We have a department or coordinator that diffuses and disseminates knowledge	15,84	7,033	,553	,683
G3. Different deparments can work together easily in our firm	15,18	8,776	,530	,682

Appendix B: Outlier test



Appendix C: Final Factor analysis

Reliability Statistics

Cronbach's Alpha	N of Items
,756	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
G1. We have extensive contact with researchers at universities	16,96	26,080	,605	,681
G1. We have an active network of contacts with the scientific and research commu	16,44	23,842	,672	,651
G1. We read specialized journals and magazines to keep abreast of market and tec	15,58	28,949	,532	,709
G1. We regularly conduct a technological audit of our company	15,56	27,437	,648	,668
G1. We monitor the needs of our clients and customers	14,25	38,009	,161	,808

Reliability Statistics

Cronbach's Alpha	N of Items
,808	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
G1. We have extensive contact with researchers at universities	11,51	21,720	,656	,744
G1. We have an active network of contacts with the scientific and research commu	11,00	19,374	,743	,697
G1. We read specialized journals and magazines to keep abreast of market and tec	10,14	25,576	,504	,812
G1. We regularly conduct a technological audit of our company	10,11	24,326	,609	,768

Reliability Statistics

Cronbach's Alpha	N of Items
,691	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
G2. We are successful at acquiring the knowledge required to understand costumer	10,61	3,908	,443	,676
G2. We are successful at acquiring the knowledge required to identify market opp	10,77	3,078	,542	,551
G2. We are successful at acquiring the knowledge required comply with the requir	10,85	2,817	,549	,543

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,737	,746	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
G3. Our employees have the skills to fusr or link newly aquiring knowledge withi	15,38	9,348	,519	,295	,688
G3. We improve our knowledge management systems to better to use or exchange inf	15,36	8,656	,557	,328	,664
G3. We have a department or coordinator that diffuses and disseminates knowledge	15,85	6,977	,551	,316	,680
G3. Different deparments can work together easily in our firm	15,19	8,715	,528	,287	,679

Appendix D: Final Factor analysis

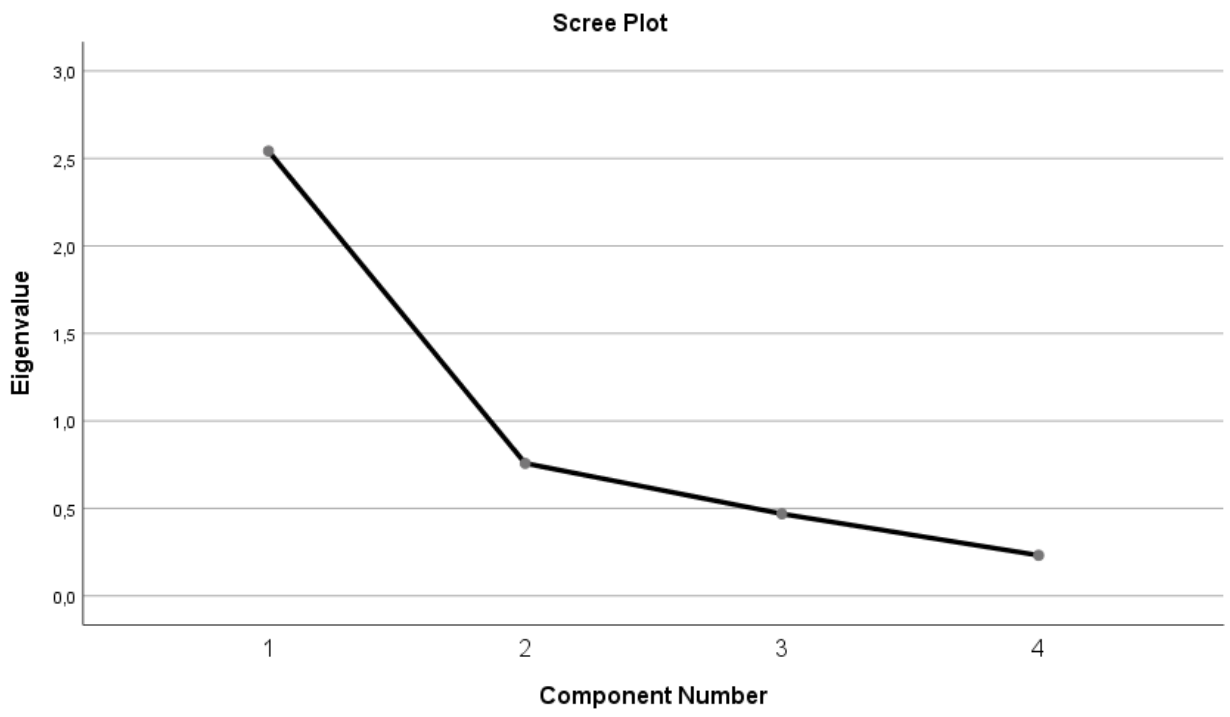
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,706
Bartlett's Test of Sphericity	Approx. Chi-Square	746,057
	df	6
	Sig.	,000

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,542	63,557	63,557	2,542	63,557	63,557
2	,757	18,931	82,488			
3	,469	11,716	94,204			
4	,232	5,796	100,000			

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component 1
G1. We have extensive contact with researchers at universities	,821
G1. We have an active network of contacts with the scientific and research commu	,878
G1. We read specialized journals and magazines to keep abreast of market and tec	,697
G1. We regularly conduct a technological audit of our company	,783

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix E: Final Factor analysis

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,654
Bartlett's Test of Sphericity	Approx. Chi-Square	249,358
	df	3
	Sig.	,000

Communalities

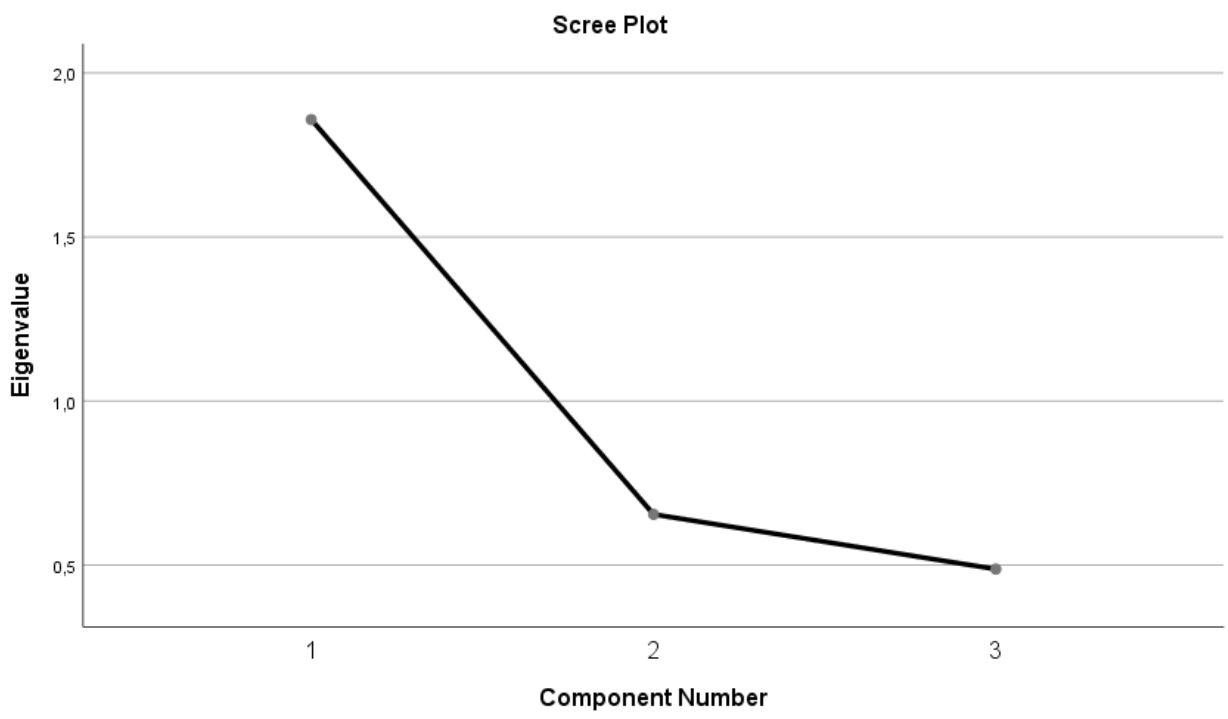
	Initial	Extraction
G2. We are successful at acquiring the knowledge required to understand costumer	1,000	,534
G2. We are successful at acquiring the knowledge required to identify market opp	1,000	,657
G2. We are successful at acquiring the knowledge required comply with the requir	1,000	,667

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1,858	61,927	61,927	1,858	61,927	61,927
2	,655	21,817	83,744			
3	,488	16,256	100,000			

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component 1
G2. We are successful at acquiring the knowledge required to understand costumer	,731
G2. We are successful at acquiring the knowledge required to identify market opp	,810
G2. We are successful at acquiring the knowledge required comply with the requir	,817

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix F: Final Factor analysis

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,742
Bartlett's Test of Sphericity	Approx. Chi-Square	413,346
	df	6
	Sig.	,000

Communalities

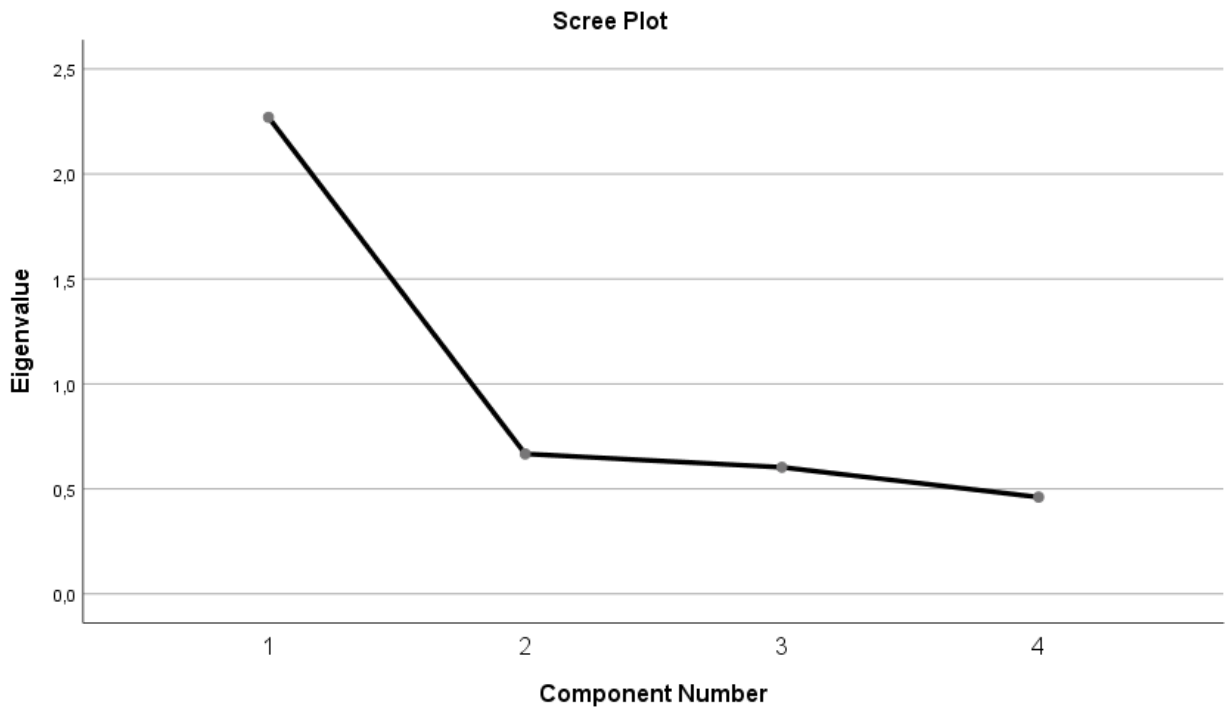
	Initial	Extraction
G3. Our employees have the skills to fusr or link newly aquiring knowledge withi	1,000	,553
G3. We improve our knowledge management systems to better to use or exchange inf	1,000	,592
G3. We have a department or coordinator that diffuses and disseminates knowledge	1,000	,578
G3. Different deparments can work together easily in our firm	1,000	,547

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,270	56,746	56,746	2,270	56,746	56,746
2	,666	16,662	73,408			
3	,603	15,070	88,479			
4	,461	11,521	100,000			

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component 1
G3. Our employees have the skills to fusr or link newly aquiring knowledge withi	,744
G3. We improve our knowledge management systems to better to use or exchange inf	,769
G3. We have a department or coordinator that diffuses and disseminates knowledge	,761
G3. Different deparments can work together easily in our firm	,739

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix G: Assumptions: Linearity

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Knowledge_Sourcing	-,333	,617	,292	1	,589	,717	,214	2,402
	Knowledge_Acquisition	1,156	2,385	,235	1	,628	3,178	,030	340,875
	Knowledge_Embedding	,377	1,788	,045	1	,833	1,458	,044	48,468
	Knowledge_Sourcing by LN_Knowledge_Sourcing	,112	,283	,157	1	,692	1,118	,643	1,946
	Knowledge_Acquisition by LN_Knowledge_Acquisition	-,407	,901	,205	1	,651	,665	,114	3,889
	Knowledge_Embedding by LN_Knowledge_Embedding	-,040	,696	,003	1	,954	,961	,245	3,760
	Constant	-4,232	4,613	,842	1	,359	,015		

a. Variable(s) entered on step 1: Knowledge_Sourcing, Knowledge_Acquisition, Knowledge_Embedding, Knowledge_Sourcing * LN_Knowledge_Sourcing , Knowledge_Acquisition * LN_Knowledge_Acquisition , Knowledge_Embedding * LN_Knowledge_Embedding .

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Knowledge_Sourcing	,940	,737	1,625	1	,202	2,560	,603	10,857
	Knowledge_Acquisition	-2,051	2,129	,928	1	,335	,129	,002	8,350
	Knowledge_Embedding	-,602	1,730	,121	1	,728	,548	,018	16,260
	Knowledge_Sourcing by LN_Knowledge_Sourcing	-,417	,334	1,561	1	,212	,659	,342	1,268
	Knowledge_Acquisition by LN_Knowledge_Acquisition	,781	,812	,924	1	,336	2,183	,444	10,725
	Knowledge_Embedding by LN_Knowledge_Embedding	,338	,676	,249	1	,618	1,402	,373	5,272
	Constant	1,534	3,744	,168	1	,682	4,635		

a. Variable(s) entered on step 1: Knowledge_Sourcing, Knowledge_Acquisition, Knowledge_Embedding, Knowledge_Sourcing * LN_Knowledge_Sourcing , Knowledge_Acquisition * LN_Knowledge_Acquisition , Knowledge_Embedding * LN_Knowledge_Embedding .

Appendix H: Assumptions: Multicollinearity

Coefficients[a]

Model		Collinearity Statistics Tolerance	VIF
1	InternationalFirm	,996	1,005
	Knowledge_Sourcing	,838	1,193
	Knowledge_Acquisition	,672	1,487
	Knowledge_Embedding	,585	1,708

a. Dependent Variable: Product_Innovation

Coefficients[a]

Model		Collinearity Statistics Tolerance	VIF
1	InternationalFirm	,995	1,005
	Knowledge_Sourcing	,839	1,192
	Knowledge_Acquisition	,671	1,490
	Knowledge_Embedding	,585	1,711

a. Dependent Variable: Process_Innovation

Appendix I: Logistic Regression: Main Effects

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	207,228	99	,000
	Block	207,228	99	,000
	Model	224,560	102	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	278,962[a]	,384	,579

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Classification Table[a]

			Predicted		
			Process_Innovation		Percentage
	Observed		,00	1,00	Correct
Step 1	Process_Innovation	,00	336	20	94,4
		1,00	39	69	63,9
	Overall Percentage				87,3

a. The cut value is ,500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Knowledge_Sourcing	-,033	,117	,079	1	,779	,968	,769	1,217
	Knowledge_Acquisition	-,317	,242	1,719	1	,190	,728	,453	1,170
	Knowledge_Embedding	,397	,191	4,313	1	,038	1,487	1,023	2,162
	Foreign_Owned	-,004	,009	,229	1	,632	,996	,978	1,013
	Formal_Training(1)	1,707	,440	15,022	1	,000	,181	,077	,430
	Research_Development(1)	2,368	,411	33,166	1	,000	,094	,042	,210
	Firm_Age	,002	,014	,019	1	,892	1,002	,974	1,030
	Firm_Size			31,855	95	1,000			
	Firm_Size(2)	-,759	1,328	,327	1	,567	,468	,035	6,316
	Constant	1,428	1,596	,801	1	,371	4,171		

a. Variable(s) entered on step 1: Foreign_Owned, Formal_Training, Research_Development, Firm_Age, Firm_Size.

Appendix J: Logistic Regression: Moderated effects

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	8,695	3	,034
	Block	8,695	3	,034
	Model	233,255	105	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	270,267[a]	,395	,597

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Classification Table[a]

			Predicted		
			Process_Innovation		Percentage
	Observed		,00	1,00	Correct
Step 1	Process_Innovation	,00	335	21	94,1
		1,00	42	66	61,1
	Overall Percentage				86,4

a. The cut value is ,500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Knowledge_Sourcing	-,225	,234	,921	1	,337	,799	,505	1,264
	Knowledge_Acquisition	,346	,331	1,088	1	,297	1,413	,738	2,705
	Knowledge_Embedding	-,183	,314	,341	1	,559	,833	,450	1,539
	Foreign_Owned	-,003	,009	,086	1	,769	,997	,980	1,015
	Formal_Training(1)	1,927	,461	17,454	1	,000	,146	,059	,360
	Research_Development(1)	2,234	,417	28,720	1	,000	,107	,047	,242
	Firm_Age	-,001	,015	,009	1	,922	,999	,970	1,028
	Firm_Size			32,762	95	1,000			
	Firm_Size(1)	-21,307	13500,821	,000	1	,999	,000	,000	.
	Firm_Size(2)	-1,019	1,401	,529	1	,467	,361	,023	5,626
	International_Firm(1) by Knowledge_Sourcing	,271	,273	,989	1	,320	1,312	,768	2,240
	International_Firm(1) by Knowledge_Acquisition	,919	,358	6,576	1	,010	,399	,198	,805
	International_Firm(1) by Knowledge_Embedding	,872	,392	4,955	1	,026	2,392	1,110	5,155
	Constant	1,347	1,663	,656	1	,418	3,844		

a. Variable(s) entered on step 1: International_Firm * Knowledge_Sourcing , International_Firm * Knowledge_Acquisition , International_Firm * Knowledge_Embedding .

Appendix K: Logistic Regression: Main Effects

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	282,497	99	,000
	Block	282,497	99	,000
	Model	325,262	102	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	254,220[a]	,504	,707

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Classification Table[a]

			Predicted		
			Product_Innovation		Percentage
	Observed		,00	1,00	Correct
Step 1	Product_Innovation	,00	296	21	93,4
		1,00	33	114	77,6
	Overall Percentage				88,4

a. The cut value is ,500

Variables in the Equation

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Knowledge_Sourcing	-,562	,138	16,493	1	,000	,570	,435	,748
	Knowledge_Acquisition	-,865	,283	9,356	1	,002	,421	,242	,733
	Knowledge_Embedding	1,184	,243	23,821	1	,000	3,267	2,031	5,255
	Foreign_Owned	,003	,010	,120	1	,729	1,003	,985	1,022
	Formal_Training(1)	1,984	,495	16,047	1	,000	,137	,052	,363
	Research_Development(1)	3,622	,491	54,390	1	,000	,027	,010	,070
	Firm_Age	-,020	,016	1,679	1	,195	,980	,950	1,011
	Firm_Size			44,264	95	1,000			
	Firm_Size(1)	-1,704	2,013	,716	1	,397	,182	,004	9,410
	Firm_Size(2)	,433	1,317	,108	1	,743	1,541	,117	20,345
	Constant	3,402	1,695	4,028	1	,045	30,020		

a. Variable(s) entered on step 1: Foreign_Owned, Formal_Training, Research_Development, Firm_Age, Firm_Size.

Appendix L: Logistic Regression: Moderated effects

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	4,286	3	,232
	Block	4,286	3	,232
	Model	329,549	105	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	249,933[a]	,508	,713

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Classification Table[a]

			Predicted		
			Product_Innovation		Percentage
	Observed		,00	1,00	Correct
Step 1	Product_Innovation	,00	296	21	93,4
		1,00	32	115	78,2
	Overall Percentage				88,6

a. The cut value is ,500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Knowledge_Sourcing	-,672	,251	7,199	1	,007	,511	,312	,834
	Knowledge_Acquisition	-,293	,393	,556	1	,456	,746	,346	1,611
	Knowledge_Embedding	,656	,368	3,167	1	,075	1,926	,936	3,966
	Foreign_Owned	,004	,009	,157	1	,692	1,004	,986	1,022
	Formal_Training(1)	2,067	,504	16,810	1	,000	,127	,047	,340
	Research_Development(1)	3,532	,493	51,376	1	,000	,029	,011	,077
	Firm_Age	-,024	,016	2,175	1	,140	,976	,945	1,008
	Firm_Size			44,520	95	1,000			
	Firm_Size(1)	-2,019	2,199	,843	1	,359	,133	,002	9,885
	Firm_Size(2)	,165	1,397	,014	1	,906	1,179	,076	18,240
	International_Firm(1) by Knowledge_Sourcing	,157	,283	,306	1	,580	1,170	,671	2,039
	International_Firm(1) by Knowledge_Acquisition	,823	,430	3,660	1	,046	,439	,189	1,020
	International_Firm(1) by Knowledge_Embedding	,823	,467	3,107	1	,078	2,277	,912	5,683
	Constant	3,418	1,742	3,849	1	,050	30,505		

a. Variable(s) entered on step 1: International_Firm * Knowledge_Sourcing , International_Firm * Knowledge_Acquisition , International_Firm * Knowledge_Embedding .

Appendix M: Logistic Regression: Main effects excluding control variables

Process Innovation

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Knowledge_Sourcing	-,015	,077	,036	1	,850	,986	,848	1,146
	Knowledge_Acquisition	-,097	,161	,364	1	,546	,908	,663	1,243
	Knowledge_Embedding	,450	,130	11,990	1	,001	1,568	1,215	2,022
	Constant	-2,816	,805	12,250	1	,000	,060		

a. Variable(s) entered on step 1: Knowledge_Sourcing, Knowledge_Acquisition, Knowledge_Embedding.

Product Innovation

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Knowledge_Sourcing	-,196	,072	7,389	1	,007	,822	,713	,947
	Knowledge_Acquisition	-,186	,152	1,501	1	,221	,831	,617	1,118
	Knowledge_Embedding	,716	,129	30,720	1	,000	2,046	1,588	2,636
	Constant	-2,563	,748	11,725	1	,001	,077		

a. Variable(s) entered on step 1: Knowledge_Sourcing, Knowledge_Acquisition, Knowledge_Embedding.