Knowledge management requirements for information systems in small ventures: A fuzzy-set qualitative comparative analysis (fsQCA)

Requisitos de la gestión del conocimiento para los sistemas de información de las pequeñas empresas: Un análisis comparativo cualitativo de conjuntos fuzzy (fsQCA)

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Abstract

Knowledge management and information systems have garnered increased attention for their potential to enhance venture performance. However, there is limited research on the specific competences of information systems based on knowledge management within the context of micro and small businesses. This study aims to fill this gap by examining small businesses in the entrepreneurship field to determine whether they recognize the importance of these competences. The research focuses on a sample of 70 small businesses operating in lower-middle-income economies and employs a fuzzy-set qualitative comparative analysis (fsQCA) methodology. The findings reveal that smaller businesses acknowledge the significance of information systems competences in facilitating their organizational development and that these ventures are increasingly exposed to the value of knowledge management in their day-to-day operations. This study contributes to the existing literature by shedding light on the role of smaller businesses in lower-middle-income economies.

Keywords: knowledge management; information systems; fuzzy-set qualitative comparative analysis; fsQCA; small businesses; lower-middle-income economies

JEL Classification: L26; M13; M15; O33

Resumen

La gestión del conocimiento y los sistemas de información han suscitado cada vez más atención por su potencial para mejorar el rendimiento de las empresas. Sin embargo, la investigación sobre las competencias específicas de los sistemas de información basados en la gestión del conocimiento en el contexto de las microempresas y las pequeñas empresas es escasa. Este estudio pretende colmar esta laguna examinando las pequeñas empresas en el ámbito del emprendimiento para determinar si reconocen la importancia de estas competencias. La investigación se centra en una muestra de 70 pequeñas empresas que operan en economías de renta media-baja y emplea una metodología de análisis cualitativo comparativo de conjuntos fuzzy (fsQCA). Los resultados revelan que las empresas más pequeñas reconocen la importancia de las competencias en sistemas de información para facilitar su desarrollo organizativo y que estas empresas están cada vez más expuestas al valor de la gestión del conocimiento en sus operaciones cotidianas. Este estudio contribuye a la literatura existente al arrojar luz sobre el papel de las empresas más pequeñas en las economías de renta media-baja.

Palabras clave: gestión del conocimiento; sistemas de información; análisis comparativo cualitativo de conjuntos fuzzy; fsQCA; pequeñas empresas; economías en desarrollo

Clasificación JEL: L26; M13; M15; O33

1. Introduction

In recent decades, scholars and practitioners have increasingly recognized the importance of organizational concerns, including knowledge management, which has played a central role in enabling the storage and transfer of information on a larger scale than previously imaginable, thanks to advancements in information systems (Argote et al., 2003). Consequently, investment in information systems has become essential as knowledge management activities expand (Abubakar et al., 2019; Levy et al., 2001). However, it is crucial to understand that technologies play a significant role only when they are responsive to the social context (Brown & Duguid, 1998).

Given the significance of knowledge management and its relevance to information systems, it is important to consider the resulting knowledge within various fields, including entrepreneurship (Alshanty & Emeagwali, 2019; Apulu & Latham, 2009; Cragg et al., 2011; Nonaka & Konno, 1998; Steininger, 2019; Wong, 2005). Discussions about knowledge scope should focus on its potential contribution rather than the quality of the knowledge itself. Academic discussions may involve combining different sources of knowledge or considering the level of abstraction and types of knowledge (Baskerville et al., 2015), while adhering to established scholarly standards.

The concept of knowledge within a business encompasses various perspectives and research approaches (Alshanty & Emeagwali, 2019). This enables small ventures to adapt more effectively to changes in the business environment and market trends. The rise of small businesses does not necessarily imply a simple disaggregation; it is more insightful to understand how these two aspects are intertwined (Brown & Duguid, 1998). In facilitating the flow of knowledge within organizations, technology should support not only the dissemination of knowledge but also the reciprocity necessary for shared practice. The strength of knowledge management in enhancing the application of information systems relates to how information systems provide support (Abubakar et al., 2019).

Despite the potential benefits, small businesses often hesitate to embrace knowledge management as part of their overall strategy. Knowledge management activities in small businesses tend to occur informally, as they lack dedicated information systems (Pillania, 2007). However, it is important to recognize that all businesses essentially operate as knowledge organizations, as knowledge is fundamental to their functioning (Abubakar et al., 2019).

Organizational knowledge, encompassing core competencies beyond mere knowledge acquisition, and technology that supports the development of practical expertise rather than just the dissemination of information, enable knowledge sharing within businesses instead of treating it as a marketable commodity. Failing to identify and connect with market needs through effective sensing actions and with the appropriate know-how can hinder the growth of small ventures (Alshanty & Emeagwali, 2019; Ruggles, 1998). Small businesses with strong market-sensing capabilities are better equipped to leverage knowledge, making knowledge management a crucial performance indicator for them (Abubakar et al., 2019; OECD, 2004). In other words, while knowledge management is widely practiced in large organizations, it is often overlooked by small ventures (Alshanty & Emeagwali, 2019; Apulu & Latham, 2009).

The existing literature on knowledge management lacks comprehensive research and insights specific to the context of small businesses. While studies have identified information systems competences that would benefit smaller ventures and enable them to leverage information systems effectively (Cragg et al., 2011; Eikebrokk & Olsen, 2007; Scupola, 2011), there is a notable gap in research in this area. These studies, rooted in resource-based theory, posit that the skills and abilities of a business are the information systems resources that are likely to contribute to creating and sustaining competitive advantage (Cragg et al., 2011).

However, this presents a paradox as smaller businesses are often assumed to have limited information systems expertise, including the knowledge and skill set required to handle information systems issues (Bradshaw et al., 2013; Chang et al., 2012). Consequently, existing studies do not provide precise insights into the performance of smaller ventures in terms of information systems. The identification of the specific expertise required and the means to acquire that knowledge pose significant challenges for small ventures (Apulu & Latham, 2009). Unfortunately, only a limited number of studies in the literature have focused on exploring the relationship between information systems competences and small businesses.

This research aims to fill the gap in the literature by investigating whether smaller ventures recognize the importance of information systems competences and whether they effectively utilize these competences through knowledge management. The study employs a comprehensive and integrative framework, specifically fuzzy-set qualitative comparative analysis (fsQCA), which combines qualitative and quantitative methods to identify necessary and/or sufficient conditions for the desired outcomes. The research focuses on answering the following research questions:

- RQ1: Do information systems play a significant role in smaller ventures?
- RQ2: If so, do smaller ventures widely benefit from adopting information systems?
- RQ3: Do smaller ventures in emerging economies, specifically lower-middle-income economies, embrace information systems based on knowledge management?

This investigation contributes to the existing literature in several ways. Firstly, it addresses the empirical and methodological gap by examining knowledge management and information systems competences critical for the growth and success of micro and small businesses, particularly in emerging economies where they play a vital role in economic prosperity. The study utilizes fsQCA to accurately analyse the variables, competences, and outcomes, while considering the underlying theory and contextual factors. Secondly, this study pioneers the examination of information systems competences in small ventures within the specific category of lower-middle-income economies, providing valuable evidence and paving the way for future research on knowledge management. Lastly, the use of fsQCA offers distinct advantages over traditional variance-based methods, making it suitable for studies with various sample sizes, from small to large.

The remaining sections of this study are structured as follows. The next section provides a comprehensive literature review, highlighting relevant research in the field and presenting the research framework based on proposed propositions. Subsequently, the research methodology is explained, including the variables considered and the application of fsQCA. The results are then presented and discussed in the subsequent section. Finally, the study concludes with a discussion of the findings, their academic implications, and suggestions for future research.

2. Literature review and proposition development

2.1. Operational Knowledge Management

Knowledge management is a concept that has been explored by academics in various ways, leading to different classifications and interpretations (Abubakar et al., 2019). However, a fundamental aspect of knowledge management is its ability to capture and preserve content for future use. While knowledge is often considered as something owned by individuals, a significant amount of knowledge is created and shared collectively (Brown & Duguid, 1998). Despite the extensive study of knowledge management, there is a tendency to focus on large organizations, overlooking its relevance to small ventures. As a result, our understanding of knowledge management in the context of small ventures remains limited, and the existing literature offers conflicting insights on the subject (Apulu & Latham, 2009; Cragg et al., 2011; Desouza & Awazu, 2006; Durst & Edvardsson, 2012; Júnior et al., 2020; Levy et al., 2001; Maldonado-Guzmán et al., 2016; Pillania, 2007; Steininger, 2019; Zieba et al., 2016).

In small ventures, knowledge management practices are often informal and lack deliberate intention, making it challenging to identify and analyse (Desouza & Awazu, 2006; Zieba et al., 2016). Some argue that these ventures may not engage in knowledge management at all. However, small businesses play a crucial role, especially in emerging economies, where they contribute significantly to employment and business creation. To effectively utilize knowledge, it needs to be connected to problem-solving, decision-making, and protection. The application of knowledge can transform its nature and lead to desirable outcomes. This requires recording, disseminating, and applying knowledge, which are vital actions for small businesses, as they serve as a foundation for economic prosperity (Abubakar et al., 2019; Desouza & Awazu, 2006). In this context, knowledge management involves not only protecting intellectual property in established knowledge organizations but also fostering a more complex form of organizational capital.

Previous research (Apulu & Latham, 2009; Chang et al., 2012; Cragg et al., 2011; Desouza & Awazu, 2006; Wong, 2005) has highlighted the importance of knowledge management for organizational performance and effective information systems. However, most management research has focused on large businesses rather than small ventures (Zieba et al., 2016). Knowledge management plays a crucial role in entrepreneurship research and practice, particularly in fostering innovation competencies and enhancing the quality of work for knowledge workers, including those in information systems (Alshanty & Emeagwali, 2019; Cragg et al., 2011; Júnior et al., 2020; Supyuenyong et al., 2007).

Despite their potential, small ventures in emerging economies often fall short of expectations. Knowledge management is seen as an essential element in these ventures, requiring deliberate steps to develop, manage, and share knowledge to achieve improved performance (Alshanty & Emeagwali, 2019). Information systems are key enablers for knowledge management, as they facilitate the quick search for, access to, and retrieval of information, as well as support collaboration and communication within organizational relationships (Apulu & Latham, 2009; K. C. Lee et al., 2005; Wong, 2005). Technological approaches to knowledge management are often based on information processing assumptions (Bradshaw et al., 2013; Carlile, 2004; Cragg et al., 2011).

However, limited attention has been given to understanding the benefits of knowledge management for small ventures, mainly due to the lack of formal strategies and policies in place. As a result, small ventures rely on

informal and ad-hoc methods of sharing and utilizing knowledge, including information systems, often focusing on short-term gains. Storing knowledge poses a significant challenge for small ventures, and information systems should be leveraged as a means to store knowledge effectively (Apulu & Latham, 2009; Desouza & Awazu, 2006).

The success of knowledge management in small ventures depends on the recognition and understanding of the concept by business owner-managers. One of the major challenges associated with knowledge management in small firms is the limited awareness and familiarity of owner-managers with the fundamentals and potential benefits of knowledge management. The ease or complexity of knowledge progression is influenced by the social context within the organization, and its effective implementation relies on the buy-in and engagement of owner-managers (Brown & Duguid, 1998; Desouza & Awazu, 2006; Supyuenyong et al., 2007).

In small businesses, the adoption of knowledge management relies on various factors such as the channels and types of knowledge, the availability of resources, and the motivation of individuals to practice knowledge management (Júnior et al., 2020; Wong, 2005). Simply investing in infrastructure and technology without inspiring individuals to engage in knowledge management will not yield desired results. Some small ventures are more innovative than others, constantly seeking new approaches to enhance their performance, and information systems can serve as tools to support and manifest their ideas and creativity (Cragg et al., 2011).

To advance knowledge in this area, academics should focus more on the requirements and challenges faced by small businesses rather than adopting a purely theoretical perspective (Durst & Edvardsson, 2012; Supyuenyong et al., 2007; Zieba et al., 2016). Understanding how small ventures from different geographical regions tackle knowledge management challenges can provide valuable insights. Many small firms tend to rely on informal assessments and lack a systematic method or set of standards to evaluate information systems investments or fully utilize their day-to-day business tools for knowledge management, such as maintaining a customer database (Apulu & Latham, 2009; Cragg et al., 2011; Dyerson et al., 2016). Moreover, the development of visionary and knowledge management-driven information systems is often neglected or poorly conceptualized (Apulu & Latham, 2009; Caldeira & Ward, 2002).

Knowledge management is still a relatively new concept for many micro and small businesses, especially in emerging economies where there may be limited knowledge and experience with information systems (Apulu & Latham, 2009; Zieba et al., 2016). The overwhelming amount of technology and advice available in the field of information systems can confuse the owners and managers of small businesses, leading to a lack of direction and practical guidance (Bradshaw et al., 2013; Caldeira & Ward, 2002; Cragg et al., 2011; OECD, 2004; Ruggles, 1998; Supyuenyong et al., 2007). Addressing this challenge requires raising awareness and developing a comprehensive knowledge management framework that considers the specific needs and context of small ventures (Apulu & Latham, 2009). For a detailed overview of the literature on this topic, please refer to Table A1 in the appendices.

There is a scarcity of research in the existing literature on information systems in small ventures, primarily due to factors such as weak negotiating power, limited capital, and low management skills (Caldeira & Ward, 2002). The lack of knowledge and expertise in information systems has implications for decision-making, skills development, and practical implementation in small ventures (Cragg et al., 2011; OECD, 2004). However, because small ventures are less complex compared to large organizations, they tend to have a broader perspective on organizational issues, including information systems (Caldeira & Ward, 2002). It is important for leaders to convey the importance of knowledge management to employees and foster a culture of knowledge sharing and creation (Apulu & Latham, 2009; Garrido-Moreno et al., 2014; OECD, 2004). Continuous improvement of knowledge workers' competencies is essential for their positive impact on a venture, as their value can decline if their skills and knowledge remain stagnant (Wong, 2005).

Knowledge management has the potential to advance the field of information systems and contribute to various academic disciplines. It provides new insights into the phenomenon, identifies gaps in understanding knowledge management, and guides future research (Argote et al., 2003). However, there are prevalent gaps in knowledge management research, including the scarcity of job titles, limited exploration of organizational issues specific to knowledge management in small ventures, particularly in emerging economies (Pillania, 2007), and the need to consider the scope and applicability of knowledge, as well as its accessibility and support for various activities within companies (Baskerville et al., 2015). Addressing these gaps requires a comprehensive understanding of the challenges faced by small businesses in creating and managing knowledge, considering their unique requirements, alternatives, and design solutions.

Small ventures, being the drivers of many economies worldwide, often underestimate the value of their knowledge and the challenges of making that knowledge valuable elsewhere (Apulu & Latham, 2009; Brown & Duguid, 1998; Desouza & Awazu, 2006). Therefore, it is crucial for academics to recognize and emphasize the significance of knowledge in small business research, as small firms can greatly benefit from the field of knowledge management (Durst & Edvardsson, 2012). However, the impact of information systems on entrepreneurship research in this area is still relatively rare and scattered across different disciplines

(Steininger, 2019). Thus, information systems can be seen as enablers of entrepreneurial operations, which have not been extensively explored in the existing research, leading to a gap in understanding knowledge management in small businesses. The researcher proposes addressing this gap and further exploring the relationship between information systems and knowledge management in small ventures.

Indeed, the scarcity of research on information systems in small businesses can be attributed to factors such as weak negotiating power, scarce capital, and low management skills (Caldeira & Ward, 2002). These limitations hinder small ventures from acquiring the necessary knowledge and expertise in information systems, leading to challenges in decision-making, skills development, and the practical application of information systems (Cragg et al., 2011; OECD, 2004).

However, despite these limitations, small ventures, being less complex than large organizations, often have a comprehensive perspective on various organizational issues, including information systems (Caldeira & Ward, 2002). This suggests that while they may lack extensive resources, small firms can still benefit from a holistic understanding of the role of information systems in their operations.

Leaders play a crucial role in conveying the significance of knowledge management to employees, fostering a culture of knowledge sharing and creation within the organization (Apulu & Latham, 2009; Garrido-Moreno et al., 2014; OECD, 2004). Continuous improvement of knowledge workers' competences is essential to ensure their positive impact on the firm, as the value of knowledge workers, like any other tangible asset, can decline if not consistently improved (Wong, 2005).

Knowledge management is a productive field across academic disciplines, including information systems, as it provides new evidence, identifies gaps, and guides future research in understanding and managing knowledge (Argote et al., 2003). Given the scarcity of research on knowledge management in small businesses, particularly in emerging economies, an interdisciplinary approach is necessary to bridge the gaps and address various organizational issues related to knowledge management (Pillania, 2007). This includes understanding the scope of knowledge, its applicability, accessibility, and the activities it supports within small ventures (Baskerville et al., 2015).

To advance knowledge management in small businesses, research should focus on tackling their unique challenges and generating original knowledge. This involves understanding the specific requirements of small ventures, exploring alternative approaches, and formulating design solutions to enhance their knowledge management practices. Such research can contribute to the development of effective strategies for small firms to leverage knowledge management for their growth and success.

Human beings distinguish themselves from other living forms by creating increasingly advanced technologies. However, small businesses often underestimate the value of the knowledge they possess, which could be valuable to others. The knowledge that remains confined within companies is often difficult to share or utilize outside the organization (Apulu & Latham, 2009; Brown & Duguid, 1998; Desouza & Awazu, 2006). Recognizing that small ventures are drivers of many economies worldwide, it is essential for academics to thoroughly explore and acknowledge the significance of knowledge in small business research, as these ventures can greatly benefit from the field of knowledge management (Durst & Edvardsson, 2012). However, the consideration of the main impacts of information systems on entrepreneurship research in this area is still limited and dispersed across different disciplines (Steininger, 2019). As a result, the role of information systems in enabling entrepreneurial operations, which has received little attention in existing research, further highlights the existing gap in knowledge management in small businesses. In light of these observations, the researcher makes the following proposition:

Proposition 1: *There is a positive relationship between information systems competences and their recognition in smaller businesses*.

2.2. Information Systems Strategy

More systematic attention has recently been paid to knowledge management in the context of small businesses, albeit not to a satisfactory extent. In today's economy, knowledge serves as the foundation for growth and development. With the increasing process of globalization, knowledge management has expanded its scope, encompassing areas such as management consulting and technological innovation within firms. However, when comparing knowledge to information, it is not surprising to find that knowledge is often viewed as a stock rather than a flow, which tends to dominate organizational thinking about knowledge (Fahey & Prusak, 1998).

In this context, the revolution in information systems is defined as the utilization of information technology that can be readily adapted by businesses, groups of businesses, or individuals in a specific location to facilitate entrepreneurial operations (Steininger, 2019; Wong, 2005). Information systems, as a technology, can support knowledge management by simplifying the generation, storage, sharing, and utilization of

knowledge (Desouza & Awazu, 2006), and aid in understanding information systems phenomena (Caldeira & Ward, 2002; Liu et al., 2017). The support provided by information systems can enhance the exchange and incorporation of information, stimulate creativity and learning within the company, and ultimately improve organizational performance. By integrating disparate knowledge, information systems remove communication barriers within the firm, facilitating knowledge creation, utilization, growth, and transfer (Abubakar et al., 2019).

However, in many companies, knowledge management is perceived as a separate entity to be managed rather than an inherent part of the organizational processes that contribute to its development and nurturing (Fahey & Prusak, 1998). Thus far, numerous small businesses have failed to connect knowledge with its practical applications, lacking the ability to assess the rationale and validity of changes. Many of these ventures have not developed a comprehensive understanding of knowledge-driven ventures and their significance (Apulu & Latham, 2009). Knowledge management plays a critical role when small ventures implement strategic initiatives, as it enables them to consider the impact of technology-based knowledge management as a complementary resource (Cragg et al., 2011; Garrido-Moreno et al., 2014). The more effort a small venture devotes to managing its knowledge, the more advanced its intellectual property becomes. Therefore, knowledge management should form an integral part of the overall activities of small businesses (Apulu & Latham, 2009; Maldonado-Guzmán et al., 2016; OECD, 2004; Zieba et al., 2016).

Furthermore, practitioners in the field strongly agree that the knowledge needs associated with information systems change rapidly. Organizations that prioritize business focus demand a greater emphasis on information systems knowledge (D. M. S. Lee et al., 1995). Therefore, it is crucial to delve into the knowledge and roles that small ventures play in adopting knowledge management. With the decreasing costs of information systems and their increasing prevalence, small businesses have started to recognize and utilize their potential (Levy et al., 2001), although this trend is more prominent in industrialized economies compared to emerging economies. However, it is important to note that information systems not only react to business strategy but also influence its direction. The concept of knowledge management can serve as a suitable framework for combining the valuable works of entrepreneurship and information systems, as each field contributes a significant understanding of the different aspects of knowledge management (Teece, 1998).

The success of knowledge-based ventures, including small businesses, hinges on effective knowledge management. Therefore, it is valuable for ventures to adopt a process-based view of knowledge management (Wong, 2005). Further research is needed to understand how micro and small businesses manage their knowledge (Júnior et al., 2020; Zieba et al., 2016). Building a solid foundation is crucial for the successful implementation of technology, and addressing the humanistic aspects of fostering knowledge management is a key step in establishing this foundation (Desouza & Awazu, 2006). It is also necessary to comprehend the unique characteristics of small businesses before exploring knowledge management activities within them. Many small ventures are founded and owned by entrepreneurs who are the strategic initiators, resulting in greater flexibility and a less well-defined separation of responsibilities (Alshanty & Emeagwali, 2019; Desouza & Awazu, 2006).

Small businesses exhibit flexibility, operate with less bureaucracy, employ informal strategies, and have simplified decision-making processes due to the frequent overlap of personal and business interests, in contrast to larger businesses. In addition to these entrepreneurial behaviours, the information systems used by small ventures are also distinct and valuable (Alshanty & Emeagwali, 2019; Desouza & Awazu, 2006). Therefore, the knowledge gained from market sensing becomes a resource that small ventures can utilize to foster continuous innovation. As with global companies, small businesses require relevant up-to-date knowledge to remain competitive (Apulu & Latham, 2009). In other words, small ventures compete based on their expertise and develop strategies to leverage information more effectively than traditional resources. It is therefore essential for small businesses to be proactive and successful in leveraging knowledge (Caldeira & Ward, 2002; Desouza & Awazu, 2006).

Academics should engage in a more focused discussion on knowledge management within the context of small ventures, given the scarcity of studies addressing this topic. Many ventures tend to overlook the importance of knowledge management, even though it plays a crucial role in executing tactical initiatives. It is imperative for small ventures to prioritize and integrate knowledge management into their overall actions.

Furthermore, the implementation of information systems in small ventures often lacks a strategic approach and is fragmented. This lack of strategic planning is not surprising, considering the challenges faced by small ventures in adopting information systems (Abubakar et al., 2019; Caldeira & Ward, 2002; Levy et al., 2001; Steininger, 2019; Zieba et al., 2016). There is a need to develop and refine knowledge management approaches that are tailored to the unique characteristics of small ventures within the realm of information systems.

Based on the above, the researcher makes the following proposition:

Proposition 2: *Smaller businesses can intuitively benefit from the adoption of information systems competences, which in turn facilitates the success of firm innovation.*

2.3. Knowledge management practices in smaller businesses

Acquiring knowledge empowers ventures to recognize the value of information, which in turn translates into envisioned innovation and the exploitation of market opportunities. Organizations that fail to achieve this integration are more likely to struggle with target-to-market alignment (Brown & Duguid, 1998). Conversely, ventures that successfully leverage knowledge naturally develop competences in operations, achieve higher levels of innovation success, enhance customer services, and demonstrate the ability to anticipate emerging trends and patterns in the marketplace (Desouza & Awazu, 2006).

The proposed framework thoroughly examines the impact of knowledge management practices on information systems competences. Strategic thinking in the realm of business and information systems influences a venture's ability to recognize and assess the need for information systems, offering opportunities to enhance business strategy and effectively manage information systems activities. This includes selecting the appropriate information systems investments, defining roles, responsibilities, and policies, and aligning information systems spending with business priorities (Cragg et al., 2011). For instance, applying knowledge in practice facilitates the immediate institutionalization of insights and the improvement of work practices (Desouza & Awazu, 2006).

Defining information systems strategies pertains to the data and applications tied to architectures, technological foundations, and critical information systems resources. Exploitation refers to the processes of effectively implementing information and applications, thereby maximizing returns on investment. Designing solutions that seamlessly interact with other systems and processes requires the ability to transform requirements into operational information systems assets. Supply involves the creation and maintenance of technological assets and applications through efficient supply chain management of both internal and external information systems resources (Cragg et al., 2011).

The adoption of information systems can be facilitated by utilizing this framework to understand which processes are most likely to be successful in examining competences across various micro and small businesses. In this context, knowledge management is a systematic strategy for enhancing a firm's knowledge economy (Abubakar et al., 2019; OECD, 2004; Ruggles, 1998). Key information systems activities, such as understanding business needs and integrating networks, have an impact on knowledge requirements within information systems (D. M. S. Lee et al., 1995; Pillania, 2007).

Based on these considerations, the researcher makes the following proposition:

Proposition 3: *Smaller businesses demonstrate information systems competences that are influenced by knowledge management practices.*

Figure 1. Research Framework
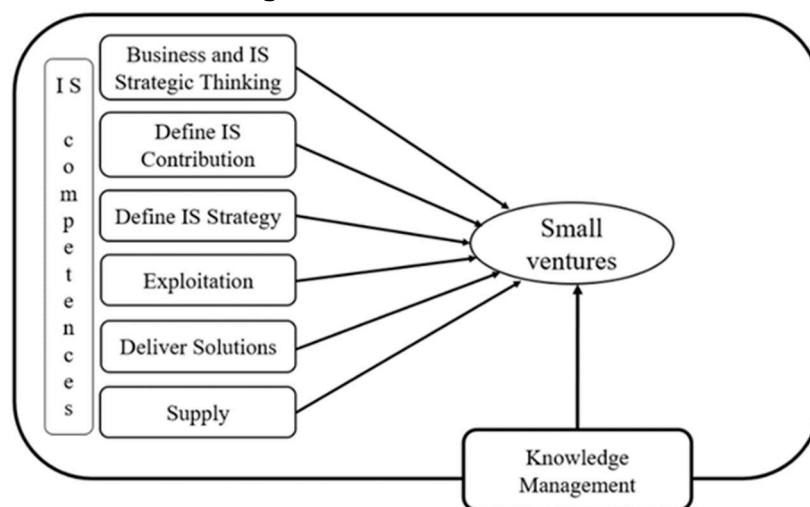
Source: Own elaboration

3. Research methodology

3.1. Sample and data

Although the literature generally refers to small and medium-sized enterprises (SMEs), the researcher in the present study prefers to focus on smaller ventures, specifically micro and small businesses. It is advisable to divide the SMEs category into small ventures, including micro businesses (Zieba et al., 2016). A major issue facing information systems researchers is the various definitions of SMEs size (Parker et al., 2015) and the potential exclusion based on the minimum number of employees (Eikebrokk & Olsen, 2007). SMEs size is one dimension that can differentiate heterogeneous SMEs (Parker et al., 2015). Therefore, the knowledge management needs of a firm with, for example, ten employees are significantly different from those of a large company. In this regard, micro and small businesses find themselves needing to respond to changes in a new global business environment (Bermeo Pazmiño & Saavedra García, 2018). Despite this, many of these ventures still rely on primitive technological systems, which mainly affect their competitiveness.

Micro and small businesses deserve much more attention, considering that their categorization varies notably depending on the geographical location of the firm. For instance, in Latin America, micro ventures in Nicaragua have 1-5 employees, while small ventures have 6-30 employees. In South-East Asia, micro ventures in Indonesia have 1-4 employees, while small ventures have 5-19 employees (KEMENKOPUKM, 2022; MIFIC, 2022). Given their importance and clear participation in the countries' economies, it is essential to strengthen this sector (Bermeo Pazmiño & Saavedra García, 2018; Supyuenyong et al., 2007). Additionally, small ventures operate within industry and government-level contexts, which can influence their perception and use of information systems (Parker et al., 2015). Small businesses are fundamental pillars of large industries, as they spend time and effort exploring new and better ways of producing products and services, contributing significantly to the industrial development of countries (Jha & Sahoo, 2021; Philbin et al., 2022). Thus, an information system, as a logical structure, requires components such as planning. The planning of information systems involves defining the strategy and systems plan based on the needs of the company, as the majority of small ventures continuously seek to update their processes through technological development (Beltramino et al., 2023; Bermeo Pazmiño & Saavedra García, 2018; Molina-Sánchez et al., 2022). Small businesses can understand the critical factors affecting the selection of information systems (Chang et al., 2012; Silva-Giraldo et al., 2023).

Given the limited research on knowledge management in micro and small businesses (Zieba et al., 2016), the aim of this study was to draw upon existing studies dedicated to SMEs as a whole. The rationale behind this approach is that the phenomena explained in relation to micro and small ventures are based on the literature encompassing the broader group of SMEs. However, due to the lack of research specifically focused on knowledge management in information systems within small ventures, it is essential to examine this specific business type and contribute to the literature in this area.

The researcher empirically tested the knowledge management requirements in information systems competences in the contexts of Nicaragua and Indonesia, aiming to determine whether smaller ventures in these geographical locations and categories of emerging economies (i.e., lower-middle-income economies) apply knowledge management appropriately. Primary data collection was conducted through a survey administered from July to November 2022. The survey was translated from English into Spanish and Indonesian languages, following a back-translation method (Brislin, 1970). The unit of analysis in this study was represented by the owner-managers or deputies, as they play a central role in the development of the firms and bear the corresponding duties and responsibilities.

The final sample consisted of 70 small businesses, resulting in a response rate of 87.5% out of the initial 80 small ventures contacted for participation in the study. These small businesses were initially contacted and expressed their agreement to participate. Subsequently, the survey information was shared with the participants via email, and paper and pencil surveys were also distributed in person in the respective countries. The survey instrument is shown in Table A2 in the appendices.

3.2. Variables

To measure the independent variable of information systems competences, a set of competences adapted from Cragg et al. (2011) was used. These competences encompass business and information systems strategic thinking, defining information systems contribution, defining information systems strategy, exploitation, delivery solutions, and supply, with a total of 22 items. This set of competences recognises the various ways in which owner-managers can utilize information systems to support their companies, such as identifying business opportunities, defining business cases, engaging with relevant stakeholders, managing change, project management, and handling supplier relationships. Examining these competences allows us to identify which information systems competences have the greatest impact on small ventures, as micro and small businesses actively strive to address any specific weaknesses, including information systems knowledge, and

recognize the relationship between information systems competences and information systems success (Cragg et al., 2011).

In addition, the researcher followed the recommendations of previous studies that encourage scholars to consider differences between countries, as knowledge management in information systems can vary across different contexts (Durst & Edvardsson, 2012; Júnior et al., 2020; Zieba et al., 2016).

To measure knowledge management, the most updated measures obtained from an academic literature review were utilized. These measures were adapted from Bozbura (2004, 2007), the OECD (2004), and Bontis et al. (2000), focusing on employee training, policies and strategies, creation and acquisition of knowledge, and organizational culture, with a total of 18 items.

Small business performance was assessed based on three items adapted from Narkhede et al. (2014), which examined profitability performance level, sales turnover, and return on investment. These items were used to measure the dependent variable.

Given the need for small businesses to remain competitive in today's volatile market, where strong competition exists, they must actively leverage information channels to continuously improve.

A 7-point Likert scale was employed to assess each variable, which was then transformed into fsQCA. Specifically, following suggestions for the widespread use of the 7-point Likert scale, this study used thresholds of 6, 4, and 2. Once these thresholds were established, all unique values were assigned to the crossover point and transformed into odds ratios. Taking the natural logarithm of these odds ratios resulted in the preferred fuzzy membership measure ranging from 0 to 1 (Longest & Vaisey, 2008; Ordanini et al., 2014; Pappas et al., 2016; Ragin, 2008). Using these thresholds provided a more precise representation of the sample (Pappas & Woodside, 2021). The constructs and measures used in this study are shown in Table A2 in the appendix.

3.3. Fuzzy-set Qualitative Comparative Analysis – fsQCA

This study employs fsQCA, a methodology that has gained increased interest in the fields of innovation and entrepreneurship (Chen & Tian, 2022; Kraus et al., 2018), as well as in various social science disciplines (Liu et al., 2017). The use of fsQCA in this study was motivated by several reasons.

Firstly, fsQCA is well-suited for examining complex causality and multiple interactions, drawing upon set theory and fuzzy algebra (Fiss, 2011; Ragin, 2008). It is particularly useful for capturing the complexities inherent in organizational phenomena, as it explores how lower-level features combine to produce higher-level constructs, as is the case with knowledge management and information systems.

Secondly, as an asymmetric data analysis technique, fsQCA offers the benefits of both qualitative and quantitative analysis methods. It integrates the logical and empirical strengths of quantitative approaches, which can handle large sample sizes and provide abundant relative information, with the richness of qualitative approaches, which yield detailed and context-specific information (Ragin, 2006, 2008).

Thirdly, fsQCA is outcome-oriented, focusing on identifying specific conditions necessary for achieving desired outcomes (Du & Kim, 2021; Misangyi et al., 2017). In this regard, fsQCA is particularly suitable for examining whether information systems competences are necessary or sufficient for small businesses, and whether small ventures exhibit information systems competences based on knowledge management.

Overall, the use of fsQCA in this study enables a comprehensive and nuanced examination of the relationships and conditions surrounding information systems competences and their role in small businesses.

3.4. Calibration

Before conducting the fsQCA analysis, it is necessary to calibrate each variable by transforming them into set membership values, ranging from 0 for full non-membership to 1 for full membership, with a crossover point indicating maximum ambiguity (Kraus et al., 2018; Ragin, 2008; Schneider & Wagemann, 2012). This study employs a calibration method based on the sample maximum, mean, and minimum values (Fiss, 2011; Misangyi et al., 2017).

As fsQCA is derived from fuzzy sets, it captures conditions that are either sufficient or necessary to explain an outcome, as well as conditions that, while insufficient on their own, are necessary components of solutions (Fiss, 2011). Given that the sample distribution deviated from the scale anchors, the study established conceptual anchors based on the existing sample distribution (Fiss, 2011; Misangyi et al., 2017). Three anchor points were set: 'fully in', 'fully out', and the crossover point. For example, calibration involved assigning a

value of 60% to the 'fully in' set, 20% to the 'fully out' set, and setting the crossover point at 40%. Additionally, a small constant of 0.001 was added, following established practices (Fiss, 2011; Ragin, 2008).

4. Results

4.1. Descriptive statistics and analysis strategy

In this study, the reliability and validity of the conditions were assessed. Composite reliabilities were calculated, and all conditions showed values greater than 0.70, indicating sufficient internal consistency. Additionally, the Cronbach's alpha coefficient, which was derived, demonstrated appropriate indices as all conditions exceeded the threshold of 0.80.

To establish validity, the average variance extracted (AVE) was examined, and it was found that the AVE exceeded 0.50 for all conditions. This indicates satisfactory convergent validity. Furthermore, the AVE values for individual conditions were also greater than 0.50 points, further supporting the validity of the conditions. The results of these assessments are presented in Table 1.

Table 1. Descriptive statistics

Variable	M	SD	Reliabilities	Cronbach a	AVE	BISST	DISC	DISS	EXPL	DESOL	SPLY	KM	SVEN
Business IS strategic thinking	4.63	0.92	0.69	0.82	0.51	**0.71**							
Define IS contribution	4.34	0.88	0.84	0.83	0.59	.58**	**0.77**						
Define IS strategy	4.19	1.03	0.94	0.91	0.85	.60**	.38**	**0.92**					
Exploitation	4.45	0.93	0.87	0.81	0.69	.58**	.62**	.61**	**0.84**				
Deliver solution	4.70	1.19	0.96	0.94	0.86	.60**	.67**	.61**	.84**	**0.93**			
Supply	4.51	1.06	0.90	0.84	0.77	.60**	.67**	.66**	.84**	.87**	**0.88**		
Knowledge management	4.46	0.73	0.95	0.95	0.59	.61**	.51**	.66**	.71**	.71**	.77**	**0.77**	
Small ventures	4.42	1.09	0.91	0.86	0.77	.05	.42**	.24*	.33**	.36**	.37**	.43**	**0.88**

Note: Diagonal elements (in bold) are the square root of the average variance extracted (AVE). **significant at 0.01; *significant at 0.05

Harman's single factor test was conducted to analyse multicollinearity concerns and assess the presence of latent common method bias. The test indicated that 45.93% of the variance could be explained by a single factor, suggesting that common method bias is not a significant issue in this study. Additionally, the variance inflation factor (VIF) for each condition was calculated, and all values were less than 6, indicating that multicollinearity is not a concern.

Overall, these tests provide evidence that the conditions used in this study are reliable and valid (Pappas et al., 2016; Park et al., 2017).

Table 2. Characteristics of the survey sample

Characteristic	Frequency	Percent	Characteristic	Frequency	Percent
Firm age (years)			**Industry sector**		
< 5	37	52.90	Commerce	23	32.90
6 – 10	16	22.90	Processing manufacturing (food, craft, textile)	14	20
11 – 15	7	10	Services	8	11.43
16 – 20	3	4.30	Education	5	7.14
21 – 30	7	10	Processing industry (metal, wood, leather)	4	5.71
Number of employees			Health, social services (communal, personal)	4	5.71
< 5	41	58.60	Building and construction	3	4.30
6 – 10	12	17.10	Financial establishment and insurance	2	2.90
11 – 30	17	24.30	Tourism, hospitality (hotel, restaurant)	2	2.90
Gender (owner-manager)			Real estate trade	1	1.40
Male	29	41.43	Electronic	1	1.40
Female	41	58.57	Chemical industry	1	1.40
Type of firm			Agriculture	1	1.40
Family business	52	74.29	Livestock	1	1.40
Non-family business	18	25.71			
Country					
Indonesia	40	57.14			
Nicaragua	30	42.86			

Note: Processed primary data, 2022

Table 2 presents the characteristics of the small ventures included in the sample. The sample consists of a combination of micro and small businesses, all of which have fewer than 30 employees.

To assess the set-theoretic relationships and determine the necessity of causal conditions for outcomes, the researcher conducted necessary condition analysis (NCA) tests before performing the configurational analysis of fsQCA. NCA focuses on identifying single determinants and their combinations that are necessary but not automatically sufficient for the outcomes (Dul, 2016; Ragin, 2008). This analysis allows for understanding the range of necessity without pre-calibration, providing more precise results than fsQCA alone (Dul, 2016; Richter et al., 2020; Vis & Dul, 2018).

Table 3 presents the results of the NCA test, using two procedures for calculating the necessary effect size: ceiling envelopment (CE) and ceiling regression (CR). The accuracy in this context represents the proportion of cases that fall on or below the ceiling line relative to the total number of cases. The necessity effect size (d) is calculated by dividing the empty space (ceiling zone) by the entire area that can contain observations (scope). A variable or construct is considered a necessary condition if its effect size (d) is equal to or greater than 0.1 (Dul, 2016).

By employing the NCA method, the researcher can not only determine whether specific competences act as necessary conditions for the outcome but also identify the bottleneck level of the necessary condition. The bottleneck level refers to the specific threshold that the condition needs to reach in order to have a certain outcome level. By applying NCA, the researcher can assess if a particular condition is a necessary condition by examining its effect size (d), which should be greater than 0.1. Additionally, the significance of the outcome can be evaluated through a permutation test using Monte Carlo simulations.

Permutation resamples are created by assigning observed values of X (condition) and Y (outcome) to each other, generating every possible combination or permutation. This process allows for assessing the significance of the relationship between the condition and outcome (Dul, 2016; Dul et al., 2020).

Table 3. NCA results

Fuzzy-set condition[a]	Small Ventures (outcome)					
	Method	Accuracy	Ceiling zone	Scope	Effect size[b] (d)	P-value[c]
Business and IS strategic thinking	CE	100%	5.582	30.00	0.186*	0.102
	CR	98.60%	3.115	30.00	0.104*	0.508
Define IS contribution	CE	100%	4.165	22.50	0.185*	0.275
	CR	97.10%	2.486	22.50	0.110*	0.467
Define IS strategy	CE	100%	8.221	36.00	0.228*	0.010
	CR	95.70%	5.876	36.00	0.163*	0.044
Exploitation	CE	100%	5.250	24.00	0.219*	0.187
	CR	95.70%	3.909	24.00	0.163*	0.273
Deliver solution	CE	100%	8.410	33.00	0.255*	0.013
	CR	97.10%	6.958	33.00	0.211*	0.012
Supply	CE	100%	7.891	30.00	0.263*	0.104
	CR	97.10%	5.204	30.00	0.173*	0.315
Knowledge management	CE	100%	9.118	29.34	0.311*	0.003
	CR	94.30%	7.279	29.34	0.248*	0.010

Note: NCA procedures are taken directly from Dul (2016)

a Membership scores are used instead of values in raw variables

b The extent to which a condition is necessary is expressed with the effect size d (general benchmark: 0≤d<0.1 small effects, 0.1≤d<0.3 medium effects, 0.3<d<0.5 large effects, and d>0.5 very large effect)

c NCA analysis with the permutation test (resampling =10,000)

* d≥0.1

According to the NCA analysis, the upper bound function is determined using ceiling regression (CR) when both the condition (X) and outcome (Y) variables are continuous or discrete variables with a level of 5 or above. For binary or discrete conditions below a level of 5, the ceiling envelopment analysis (CE) is employed to create the function. In this study, the conditions involved were binary or discrete conditions below a level of 5.

Table 4 presents the bottleneck level of each condition based on the NCA method. The bottleneck level indicates the minimum threshold of each condition required to achieve a specific outcome level. For instance, if the aim is to reach a 70% level of small business information systems, the study suggests that the following bottleneck levels need to be attained: 55.0% for business information systems strategy thinking, 53.3% for defining the level of information systems contribution, 55.5% for defining information systems strategy, 56.2% for exploitation, 59.1% for delivering solutions, 73.4% for supply, and 60.1% for knowledge management. These levels represent the minimum requirement for each condition to contribute to achieving the desired outcome.

Table 4. Bottleneck levels of NCA

	SVEN	BISST	DISC	DISS	EXPL	DESOL	SPLY	KM
1	0	NN	NN	NN	NN	NN	NN	NN
2	10	NN	NN	NN	NN	NN	NN	NN
3	20	NN	NN	NN	NN	NN	NN	NN
4	30	NN	NN	NN	NN	NN	NN	NN
5	40	NN	NN	NN	NN	NN	NN	29.4
6	50	NN	NN	NN	NN	NN	NN	29.4
7	60	NN	NN	NN	6.2	NN	NN	29.4
8	70	55.0	53.3	55.5	56.2	59.1	73.4	60.1
9	80	55.0	53.3	55.5	56.2	72.7	73.4	63.6
10	90	55.0	53.3	77.8	68.8	81.8	73.4	65.8
11	100	55.0	53.3	77.8	68.8	81.8	73.4	65.8

Note: a CE method. NN = unnecessary

4.2. Configuration analysis

In this study, fsQCA 3.0 software was used to analyze the standardized data, aiming to capture conditions that are sufficient or necessary to explain the outcome, as well as those that are insufficient on their own but contribute as necessary parts of the overall solutions. Following previous recommendations, the analysis of sufficiency was guided by a minimum case occurrence benchmark of ≥1 (De Crescenzo et al., 2020; Schneider & Wagemann, 2012), and a raw consistency benchmark of ≥0.8 (Du & Kim, 2021; Fiss, 2011) was applied. Additionally, a relational decrease in inconsistency (PRI) was employed to filter out distant rows that are both reliable and relevant to the outcome (Greckhamer et al., 2018).

The fsQCA analysis proceeded as follows:

First, using set measures, a truth table with 2k rows was constructed, where k represents the number of causal conditions, including both independent and dependent variables. Each row in the truth table corresponds to a specific combination of variables, covering all possible combinations.

Second, the truth table underwent a filtering process, removing rows based on their classification as sufficient, necessary, or insufficient solutions. The minimum case occurrence benchmark of ≥1 ensured that a condition had to be present in at least one case to be considered sufficient. Similarly, the raw consistency benchmark of ≥0.8 ensured a high level of consistency in the relationship between conditions and the outcome. Rows that did not meet these criteria were excluded from further analysis.

Third, a relational decrease in inconsistency (PRI) technique was applied to filter out distant rows, prioritizing those that were reliable and directly related to the outcome. This step aimed to refine the analysis and focus on the most meaningful combinations of conditions.

Finally, the remaining rows in the truth table underwent a Boolean algebra reduction, utilizing an algorithm derived from counterfactual analysis of causal conditions. This process logically reduced the truth table, identifying the most effective and simplified combinations of conditions. It differentiated between core and peripheral causes of the variables, where core conditions were present in both parsimonious and intermediate solutions, while peripheral conditions were eliminated from the parsimonious solution but remained in the intermediate solution (Fiss, 2011).

By following these steps and utilizing the fsQCA 3.0 software, the study sought to identify the sufficient and necessary conditions and their combinations that explain the outcome variable. The analysis considered the relationships between conditions and the outcome, filtering out irrelevant combinations, and focusing on the most relevant and effective ones.

This study examines the recognition of information systems conditions as necessary or sufficient by small ventures in lower-middle-income economies, focusing on the role of knowledge management. A sample of 70 small ventures was analyzed. Table 5 presents the fsQCA results for the total sample.

The results reveal a single solution term, indicating the degree of interpretation of conditions for recognition and the benefits derived from knowledge management. The results support the study's propositions, as the overall coverage and consistency represent 100% of all cases. Perfect consistency indicates that all cases described by this conjunction are indeed members of small ventures, providing a strong basis for theory extension (Schneider & Wagemann, 2012).

New frontier technologies are emerging among small ventures, emphasizing the need for improved knowledge management to effectively utilize valuable information and enhance business operations (de Bem Machado et al., 2022; Upadhyay & Kundu, 2019). Information systems have become crucial for small businesses, signaling a new era for these organizations (Silva-Giraldo et al., 2023).

Furthermore, the fsQCA results confirm the necessity of conditions, as indicated by the consistency values exceeding 0.9. In Table 5, ● represents a core condition, implying its inclusion in both the concise and intermediate solutions. The symbol ○ signifies an association with the outcome but with auxiliary strength compared to other conditions. This highlights the importance of information systems competences and their channels in small ventures worldwide, emphasizing their role in knowledge management and innovation performance. Effective knowledge management and information systems directly contribute to enhancing venture knowledge, customer interaction, innovation, profitability, operational processes, and decision-making (de Bem Machado et al., 2022; Idrees et al., 2023).

Various studies support the association between small business success and the use of information and communication technologies (ICTs) (Molina-Sánchez et al., 2022). Thus, information systems competences play a predictive role in the success of small businesses, facilitated by the utilization of diverse technologies (Eikebrokk & Olsen, 2007). It is essential for small ventures to develop the necessary capabilities to effectively use, adapt, and modify technology to thrive in the current business landscape (Molina-Sánchez et al., 2022).

Table 5. Configuration analysis

Condition	Small Ventures (outcome)
	Configuration
Business and IS strategic thinking	○
Define IS contribution	●
Define IS strategy	●
Exploitation	●
Deliver solution	●
Supply	●
Knowledge management	●
Raw coverage	1.000
Unique coverage	1.000
Consistency	1.000
Overall solution coverage	1.000
Overall solution consistency	1.000

Note: Configuration represents a solution term of
[BISST*DISC*DISS*EXPL*DESOL*SPLY*KM]; and ●=core condition;
○=conditional causal condition.

The findings suggest that for small ventures to achieve technological development and efficiency in complex environments, they need to adopt innovative attitudes and carefully assess their needs in their respective environments. External expertise, such as knowledge in information systems implementation, plays a crucial role in the success of small businesses (Apulu & Latham, 2009). Therefore, it is important for them to have well-defined and established know-how to manage their knowledge as a valuable asset (Jha & Sahoo, 2021; Upadhyay & Kundu, 2019).

Know-how technology serves as an integral enabler in accelerating knowledge management activities and enhancing the user experience in small businesses (Beltramino et al., 2023). By leveraging technology tools, small ventures can not only perform knowledge management activities but also enhance their business operations. Furthermore, innovation within firms can be fostered by increasing the knowledge and experience of entrepreneurs (Van Auken et al., 2021).

To develop the necessary competences, small ventures should establish business policies that promote the use of information systems and work towards changing their mindset (Eikebrokk & Olsen, 2007; Scupola, 2011). Knowledge management is recognized as an essential resource for competitiveness and innovative thinking in the digital era, and information systems utilities have become crucial for maintaining competitiveness (Chang et al., 2012). Therefore, small businesses are actively seeking new ways to acquire information and knowledge, and effectively utilize them in their internal processes (Beltramino et al., 2023).

The study challenges the assumption that information systems do not directly influence the competitiveness of small ventures (Bermeo Pazmiño & Saavedra García, 2018) and highlights the scarcity of appropriate information systems skills and abilities in solving problems and implementing new systems (Bradshaw et al.,

2013). When small businesses introduce new information systems, they often face challenges integrating operational procedures and intended introductions due to a lack of skills and experience (Chang et al., 2012). Additionally, small ventures exhibit varying capabilities to derive value from information systems investments, with some lacking the ability to adopt technology and innovate effectively (Dyerson et al., 2016; Rajapakse, 2020).

However, the researcher acknowledges that many studies still treat the adoption of information systems by small ventures as a single activity, overlooking the multi-stage process and the varying importance of factors at each stage (Eikebrokk & Olsen, 2007; Salim et al., 2015). The study contributes to the theory by examining the context of lower-middle income economies, where research on this subject is scarce. It provides evidence that small ventures recognize the importance of information systems competences in remaining competitive in the knowledge economy, where new business structures and management concepts are required (Ferreira et al., 2020). Knowledge management has become increasingly important for small businesses, both directly and indirectly, as knowledge is considered a lifeline for growth and survival in the age of globalization and a rapidly changing technological landscape (Idrees et al., 2023; Ode & Ayavoo, 2020). Small ventures with well-developed technological capabilities are more likely to be innovative and successful (Molina-Sánchez et al., 2022; Philbin et al., 2022).

4.3. Robustness check

To test the robustness of the findings, the study conducted two robustness tests: calibration change and consistency change. The calibration anchor, which determines the membership scores, was adjusted to 95%, 50%, and 5% instead of the original calibration values. Additionally, the consistency level was adjusted from 0.8 to 0.81 (Huang et al., 2023; Zheng et al., 2022). These changes were made to assess the impact of different calibration and consistency levels on the results.

The results of the robustness tests, shown in Table 6, indicate that the overall solution coverage and solution consistency did not undergo significant changes compared to the solution term generated by fsQCA. This suggests that the research findings are relatively robust and not heavily influenced by changes in calibration and consistency levels.

By conducting these robustness tests, the study addresses concerns regarding the stability and reliability of the findings. The fact that the results remain consistent even with variations in calibration and consistency parameters enhances the confidence in the research conclusions (Schneider & Wagemann, 2010).

Table 6. Calibration and adjusted consistency thresholds

Condition	Small Ventures (outcome)
	Configuration
Business and IS strategic thinking	○
Define IS contribution	●
Define IS strategy	●
Exploitation	●
Deliver solution	●
Supply	●
Knowledge management	●
Raw coverage	0.998
Unique coverage	0.998
Consistency	0.999
Overall solution coverage	0.998
Overall solution consistency	0.999

Note: Configuration represents a solution term of
[BISST*DISC*DISS*EXPL*DESOL*SPLY*KM]; and ●=core condition;
○=conditional causal condition.

5. Conclusions and discussion

This paper examines the role of fsQCA in analysing information systems competences and knowledge management in small businesses within lower-middle-income economies. It aims to identify the critical factors and testable propositions related to knowledge management and information systems competences. Knowledge management is a well-established discipline in both academia and the business world (Donate & Sánchez de Pablo, 2015; Durst & Edvardsson, 2012).

The main contribution of the study lies in its focus on the unique context of lower-middle-income economies and small businesses, where limited research has been conducted on the benefits of knowledge management. Furthermore, the topic itself spans multiple disciplines (Steininger, 2019). Additionally, the concept of information systems failure suffers from conceptual weaknesses and lacks clarity, which the study addresses by employing fsQCA to describe and deliver information systems phenomena. The use of fsQCA allows for a better understanding of asymmetric interactions and the essential and/or sufficient conditions necessary to comprehend social occurrences (Liu et al., 2017).

Researchers can justify their findings based not only on design science criteria but also on a wide range of other established scholarly criteria, depending on the momentum of knowledge. The findings of this study highlight the distinct impact of various information systems conditions derived from knowledge management on small ventures. Conditions such as DISC, DISS, EXPL, DESOL, and SPLY have a particularly pronounced influence. These results enhance decision-makers' understanding of decision-making mechanisms. The study significantly contributes to our comprehension of this important subject by shedding light on the role of fsQCA in identifying and revealing asymmetric links in explanations of information system phenomena and perceptual conditions.

Small businesses typically start as micro-enterprises and, with perseverance, overcome adversity and achieve success, eventually growing into small enterprises. Successful small businesses may further expand into medium-sized enterprises, broadening their scope and industry leadership. The significance of knowledge as a valuable resource for small ventures warrants extensive research. Information systems support can enhance work and business efficiency, and the focus of emerging research on the connection between knowledge management and the knowledge perspective of firms (Alshanty & Emeagwali, 2019) holds promise for improving overall performance, particularly for smaller ventures.

The literature lacks sufficient research and sound judgment on the mechanisms and enablers of the impact of information systems on business performance, particularly in the context of smaller firms. Regardless of the knowledge management architecture used, the practice of knowledge management in small businesses necessitates a fundamental understanding of knowledge operations (Abubakar et al., 2019; Maldonado-Guzmán et al., 2016). The primary objective of a company's knowledge management strategy is to become aware of its knowledge and restructure itself to effectively utilize the knowledge it possesses or can acquire (Donate & Sánchez de Pablo, 2015).

Business and management studies tend to focus more on larger organizations than on small firms, despite the unique benefits of information systems for the latter. Information systems enable small ventures to better exploit changes in the business and social environment, as well as market trends (Alshanty & Emeagwali, 2019). The findings of the study provide practical support for the concept of knowledge formation, suggesting that small business information systems derived from knowledge management have a significant influence on innovation. However, the new theoretical grounding for design needs further validation, which may be achieved through action research within an iterative and supportive process that generates context-specific knowledge.

Understanding information systems as enabling entrepreneurial operations is crucial, as they become a central part and a core competency of small businesses (Steininger, 2019). Empirically supported theories, practices, and methodologies specific to small ventures are essential for both practitioners and academics, considering the significant contribution of small businesses to economic prosperity and the social fabric of economies. Given the existing literature gap and the findings of the study, the researcher suggests that cultural and contextual forces may lower the impact of knowledge management in the context of small businesses. Collaboration is a critical aspect of knowledge management, and cultural factors play a role in shaping this collaboration (Apulu & Latham, 2009; Wong, 2005).

Micro and small businesses play a vital role in generating employment, fostering innovation, and driving social and economic growth in lower-middle-income economies. Therefore, it is imperative to increase the focus on entrepreneurial-based research, strategies, and techniques, as empirical studies within the information systems domain have been limited in this area. Information systems are a key enabler for implementing knowledge management. It is important to recognize that what differentiates knowledge from information is not just its explicit content but also the implicitly shared practices and know-how that facilitate its creation (Brown & Duguid, 1998). It is a misconception to equate knowledge and information and assume that complexities may be overcome solely through information systems. New knowledge is continuously developed within a company through various practical situations, and strategic benefits are realized when information systems are seen as part of the business strategy, incorporating both internal and external perspectives (Levy et al., 2001).

5.1. Academic and practical implications

By examining the important role of knowledge management requirements in information systems for small businesses, the findings of this study carry significant implications.

Firstly, this study contributes to the literature by being one of the first to comprehensively examine information systems competences using fsQCA in the context of lower-middle-income economies for small businesses. Previous research has primarily focused on the pivotal role of knowledge management in large organizations and more advanced economies. The findings suggest that small business owner-managers have the potential to significantly enhance their capability to actively employ fundamental innovation, thereby fostering competitive advantage. To achieve this, small business management should strive to expand their overall threshold of knowledge management. Consequently, small business owner-managers need to align their processes related to market sensing, learning, and entrepreneurial orientation (Alshanty & Emeagwali, 2019).

Secondly, based on the insights gained from the study, it is evident that information systems play a crucial role in every organization, including small ventures (Alshanty & Emeagwali, 2019). Small business owner-managers are advised to adopt an entrepreneurial mindset and foster market innovation. The findings of this study suggest that, in order to enhance their competitiveness, numerous small businesses should prioritize the implementation of knowledge management practices (Wong, 2005). Additionally, effective management leadership is essential in setting an example and promoting the desired performance in knowledge management within the organization.

Thirdly, it is important to note that small ventures, particularly in lower-middle-income economies, still exhibit reluctance in embracing knowledge management practices in their day-to-day operations, and they often fall short compared to small firms in developed economies (Apulu & Latham, 2009). Despite the changing global dynamics, the vast potential of the small business sector necessitates the adoption of innovative approaches. The global community of small ventures is increasingly influenced by the power of knowledge. However, despite the significant benefits associated with knowledge management, there are several challenges that need to be addressed, including knowledge identification, capture, storage, mapping, dissemination, and creation. Therefore, information systems should be utilized as a means to effectively store knowledge within small businesses. These challenges arise in the process of evaluating and transferring knowledge (Brown & Duguid, 1998). It is worth noting that less successful firms in information systems adoption often lack sufficient knowledge and understanding of information systems. The evidence suggests that management perspective, attitudes towards information systems adoption and use, and the development of internal competencies are crucial factors in determining successful adoption.

Fourthly, it is crucial for owner-managers of small businesses to participate in training programs that educate them on the advantages of information systems adoption. Many small business owner-managers are hesitant to invest in employee training due to concerns that employees may leave following the completion of such training. Additionally, some believe that the cost of implementing knowledge management is too high and that resources would be better utilized for other purposes that yield greater effectiveness and profitability. However, it is important to recognize that attending training programs can provide valuable insights and enhance understanding of information systems adoption.

Fifthly, the findings of the study highlight that information systems competences alone are insufficient to improve small businesses. Instead, they are derived from effective knowledge management. This study contributes to our understanding of the relationship between knowledge management and the potential for improvement of small businesses. Effective knowledge management has been identified in the literature as a means to enhance a firm's innovation capacity (Donate & Sánchez de Pablo, 2015). Therefore, further research should focus on exploring what can be provided to small businesses, rather than solely focusing on what should be offered or given.

Sixthly, this study demonstrates that small businesses recognize the importance of information systems competences. This suggests that small business owner-managers may adopt innovations if they have sufficient knowledge of management practices. However, owner-managers with a low level of knowledge management should consider implementing countervailing practices to overcome their limitations.

Seventhly, it is crucial for theoretical studies on knowledge management to acknowledge the significant role played by small businesses, particularly in the context of emerging economies. While much of the existing literature focuses on SMEs as a whole, there is a need for research that specifically targets smaller businesses. Surprisingly, there is limited research activity in this field, considering the distinction between small and micro categories of SMEs. Therefore, further attention should be given to exploring the unique characteristics and challenges faced by smaller companies (Mehra et al., 2014; Steininger, 2019; Zieba et al., 2016).

Finally, the results of this study contribute to the theoretical research on small businesses, particularly from a methodological perspective. By examining the relationship between knowledge management and information systems competences using the fsQCA technique, this study expands the scope of research in this area and enhances our understanding of the dynamics and capabilities of small businesses.

5.2. Limitations

This study is not without limitations, and identifying these limitations can provide valuable insights for future research.

First, although this study contributes to our understanding of knowledge management and information systems competences for small businesses, there is a lack of theoretical work that can help us better comprehend the dynamics of these different competences. Further development of concepts, definitions, and measurements should be pursued through critical literature reviews and grounded in theory derived from in-depth case research.

Second, the data used in this study relied on a purposive sample, and caution should be exercised in interpreting the statistically supported relationships. Future research could benefit from conducting longitudinal studies to explore how information systems competences in small businesses evolve over time, considering the dynamic nature of these competences.

Third, there are likely other organizational-level constructs that could influence knowledge management in the context of entrepreneurship. Future research should expand the framework proposed in this study by incorporating other plausible explanations and factors related to knowledge management.

Lastly, the low response rate of the survey could be a potential limitation. To validate the study's findings and ensure a larger and more diverse sample, future research could include a broader range of business sectors and explore small firms in other countries, including different categories of economies such as upper-middle-income and low-income economies. Additionally, to better understand the strength of the impact of each competence in terms of functioning, alternative methods could be employed in future research. Another limitation of using fsQCA is that the sets of competences considered can vary depending on the calibration technique used. Therefore, future research should re-test the proposed research framework using different anchors to further clarify and generalize the findings of this study.

5.3. Concluding remarks

The study's empirical evidence highlighting the association between knowledge management and information systems in the context of micro and small businesses provides valuable practical insights. It is recommended to further develop and expand this line of research to continue fostering the development and growth of micro and small businesses in highly competitive global environments. This study represents an initial contribution to the growing stream of research in which a robust quantitative approach yields significant results. Academics can consider this paper as an informative resource for understanding the current state of the art and as a justification for future analyses across different geographical areas and countries, aiming to identify unique knowledge and insights relevant to the topic.

Acknowledgements

Appendix A

Table A1. Overview of literature related to the topic

Author(s)	Year	Country	Research (Aim/Objectives)	Theoretical (Perspective/Framework)	Method (Empirical/Theoretical)	Main Findings
Calderia & Ward	2002	Portugal	Aimed at the identification of factors enabling or inhibiting the successful adoption and use of information systems in SMEs, as well as understanding how these factors interrelate in determining relative success in the adoption and use of information systems	Strategic change framework used to structure 19 factors cluster in four dimensions to ensure evidence in connection with their nature and effects	Case study research in five stages (literature of empirical studies into information systems, semi-structured interviews, mapping of factors from the exploratory fieldwork, set of 12 enterprises case study selection, and use of content analysis technique to examine each data of the cases)	Identification of factors related to information systems adoption in SMEs. Attributes associated between one or two factors may influence how other factors are addressed, but do not explain why attributes exist in some firms in an effective combination while factors do not in other firms
Desouza & Awazu	2006	U. S. A	Discussing five key peculiarities that differentiate KM practices at SMEs versus larger firms	Peculiarities in SMEs (socialization, common knowledge, knowledge loss, exploitation of external sources of knowledge, and people centered) KM practices	Based on commonalities SMEs (business started by one or two individuals, operation of businesses for no more than 5 years, under 100 employees, revenues less than US 400,000 per year, traditional organizational setup, and embrace in information communication technology), semi-structured interviews with 25 firms, and supplemented with observation in the site at least four times	SMEs do not manage knowledge in comparable tendencies as larger firms. SMEs have understandable resources constraints
Supyuenyong et al.	2007	Thailand	Aimed to answer how do particular features of SMEs affect their KM processes	Case study building a two-dimensional framework consisting of KM processes and SMEs features	SMEs comprising the Enterprise Resources Planning (ERP) implementation services providers. Data collected through semi-structured interviews in 2 local firms	KM practices do reside in SMEs, the level of KM in SME s is dissimilar from larger firms thus KM cannot be directly translated to SMEs due to peculiarities
Apulo & Latham	2009	Nigeria	Discuss about dissimilarities benefits associated with the adoption of KM in SMEs in connection with their operational strategy	Literature review on KM, and the analysis of a case study	Data gathered through primary and secondary sources. For the case study data comes from primary sources collected using semi-structured interviews via telephone, secondary sources collected from	KM is still a novel concept There are countless issues to be considered, which are not known KM adoption is facilitated by certain factors. Any technological

Table A1. (continued)

Author(s)	Year	Country	Research (Aim/Objectives)	Theoretical (Perspective/Framework)	Method (Empirical/Theoretical)	Main Findings
Cragg et al.	2011	Multicultural (New Zealand, Portugal, U.K.)	Improve our understanding of internal information systems expertise. That is, what information systems competences are relevant to SMEs	Use of resource-based theory and empirical investigations to evolve a new framework of information systems competences (business and information systems strategic thinking, define information systems contribution, define information systems strategy, exploitation, deliver solutions, and supply) for SMEs	Identification of five typologies of information systems resources. Creation of the framework steps and sources. Empirical data comes from 22 SMEs from three dissimilar studies (data collected via semi-structured interviews with CEO, managers, information systems people, key information systems users, and entrepreneurs), three similar research projects in three countries were managed separately, combined, and examined	Provide a new framework that include a comprehensive set of information systems competences relevant to SMEs, where managers can identify countless novel ways to provide support for information systems
Zieba et al.	2016	Poland	How small ventures manage their KM	Literature review on KM derived from empirical investigations involving owner-managers of small ventures offering knowledge-intensive business services (KIBS), as well as use of multiple-case study	Interviews to 12 small ventures lasted between 20~50 minutes, ventures with less than 30 employees on board, analysis conducted in five stages (introduction of the 'emergent' term to signify knowledge, open coding, crossed out, similar category clustered, and all transcripts were allocated worked out each category)	KM activities is considered an emergent approach in small ventures, there may be the need to better delineate KM approach that fit smallest ventures, no formal KM plan exist even if some ventures already introduce various KM practices
Junior et al.	2020	Brazil	Aimed to highlight degrees of diffusion and intensity use of KM systems among SMEs and apply a taxonomy that synthesizes the strategies use of KM systems by the	Literature review on KM systems used by SMEs and empirical investigation	Empirical investigation conducted through on-line surveys involved 49 SMEs	Brazilian SMEs have a KM approach that value clear knowledge, but there is need for countless dissemination for practices and tools to support KM as well as a more dynamic theory, empirical studies in emerging economies have not been addressed

Table A2. Survey instrument

1. Firm Age (years): From 1 to 5 ; 6 to 10 ; 11 to 15 ; 16 to 20 ; 21 to 30 ; over 31
2. Firm Size (employees): From 1 to 5 ; 6 to 10 ; 11 to 30 ; 31 to 49 ; 50 to 100 ; 101 to 200 ; 201 to 250 ; over 251
3. Gender of the respondent: Male ; Female
4. Are there at least one or two family members employed in the firm?: Yes ; No
5. Industry Sector[a]
Please select one scales related to each indicative that best describe your firm scale[b]
6. Business and information systems strategy thinking
  a) Information systems innovation
  b) Business case and investment criteria
  c) Including information systems in business strategy
  d) Information governance
7. Define information systems contribution
  a) Information systems alignment
  b) Business process management
  c) Define information systems requirements
  d) Accessing information systems knowledge
8. Define the information systems strategy
  a) Software sourcing strategies
  b) Information systems acquisition processes
  c) Technology infrastructure requirements
9. Exploitation
  a) Benefits management
  b) Managing change
  c) Project management
  d) Inter-organizational collaboration
10. Deliver solutions
  a) Applications development
  b) Implementation and integration
  c) Apply and use technology
  d) Business continuity and security
11. Supply
  a) Manage information systems supplier relationships
  b) Information asset management and maintenance
  c) Staff development
12. Knowledge Management
Employee training
  a) Formal training given to employees in work-related subjects
  b) Formal training given to employees in personal skills (non-work-related subjects)
  c) Encouraging workers to continue their education (reimbursing tuition fees)
  d) Formal mentoring practices (including apprenticeships)
Policies and Strategies
  a) Quick and easy access to information
  b) Existence of a bureaucratic system
  c) IS contains all knowledge, including strategic definition
  d) Satisfactory technology and research and development investments
  e) Frequency of accessing to and updating of the database
Creation and Acquisition
  a) Using knowledge obtained from its supply chain and competitors
  b) Using knowledge obtained from public institutions (e.g., ministry of SMEs)
  c) Taking professional support from outside to obtain knowledge about the firm's environment
  d) Using the internet to obtain external knowledge
  e) Hiring consultants to work with the internal workforce (learning while working together)
Organizational culture
  a) Experienced workers or managers transfer their knowledge to new or less experienced workers
  b) Has a value system or culture promoting knowledge sharing
  c) Teamwork is encouraged
  d) Has an encouraging environment to develop and implement ideas and express opinions
13. Enterprise performance
  a) Profitability performance level
  b) Sales turnover
  c) Return on investment

(a) Agriculture ; Fishing ; Mining and excavation ; Processing industry (metal, wood, leather) ; Livestock ; Chemical industry ; Electricity and Water, Gas and Storage ; Financial establishment and insurance ; Forestry ; Central and municipal government ; Automotive industry (machinery, equipment, etc.) ; Real estate trade ; Recycling industry ; Information technology ; Electronic ; Health, social services (communal, personal) ; Education ; Transportation and communication ; Commerce Processing manufacturing (food, craft, textile) ; Services ; Tourism, hospitality (hotels, restaurants) ; Building and construction ; Other

(b) 1 Very strongly disagree; 2 Strongly Disagree; 3 Disagree; 4 Neutral; 5 Agree; 6 Strongly agree; 7 Very strongly agree

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