



# The allegory of tacit knowledge: a review & research agenda for entrepreneurship

Nils Wuytens<sup>1,2</sup> · Jelle Schepers<sup>1</sup> · Pieter Vandekerkhof<sup>1</sup> · Wim Voordeckers<sup>1</sup>

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## Abstract

Research on tacit knowledge in the entrepreneurship field has raised a significant amount of interest in recent years and has developed both quickly and unequally. On the one hand, there is consensus that tacit knowledge is highly valued in the context of entrepreneurship as it often holds unique insights, expertise, and problem-solving capabilities that can provide a competitive advantage to individuals and organizations. On the other hand, research on the intersection of entrepreneurship and tacit knowledge has evolved significantly and developed in different directions (e.g., in terms of research context, levels of analysis, proxies), resulting in fragmented and often ambiguous findings. Therefore, the goal of this study is to consolidate the state-of-the-art of scholarly research published in top-tier entrepreneurship journals. To this aim, we performed a systematic literature review by analysing a set of 25 papers in order to synthesize prior research, identify key gaps and contributions, and propose a framework to enhance our understanding of tacit knowledge in entrepreneurship. This review provides a valuable resource for scholars interested in the intersection of tacit knowledge and entrepreneurship. Our article underscores the need for further research by proposing a research agenda to bridge existing gaps, expand knowledge, and shape the future of this important field.

**Keywords** Tacit knowledge · Entrepreneurship · Systematic literature review · Research agenda

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Extended author information available on the last page of the article

## 1 Introduction

Tacit knowledge holds considerable value for any organization (Nonaka and Toyama 2003). Tacit knowledge is defined as knowledge that is implicit, personal and uncodified (Grant 1996; Kogut and Zander 1992). It is the opposite of explicit knowledge. Due to the particular properties of tacit knowledge, it is assumed to provide a competitive advantage to businesses and retain any sensitive intelligence inside the organization (Barney 1991; Castellani et al. 2019; Kogut and Zander 1992). Moreover, the tacit component of knowledge has proven beneficial for firm-level entrepreneurship (Smith et al. 2005; Zhao et al. 2011). A firm's tacit knowledge plays a prominent role in entrepreneurship literature, irrespective of the theoretical lens. Prior studies have focused on, for example, tacit knowledge of nascent entrepreneurs (Chrisman 1999; Davidsson and Honig 2003), family firms (Le Breton–Miller and Miller 2006), entrepreneurial top management teams of SMEs (Lubatkin et al. 2006), and science-based spin-offs (Knockaert et al. 2011). In essence, tacit knowledge is a critical resource for entrepreneurs, but its impact on entrepreneurship research has been under-researched. This is particularly surprising considering the well-developed nature of knowledge management in the field of management, from which entrepreneurship draws heavily.

Currently, within the entrepreneurship field, there is a growing body of research on tacit knowledge. However, we lack a focused understanding of how entrepreneurship field conceptualizes tacit knowledge, its antecedents, and outcomes within entrepreneurial contexts. In other words, there is no comprehensive review that specifically connects these aspects within the entrepreneurship domain. As a result, many measurements, and proxies to capture tacit knowledge have emerged (Ambrosini and Bowman 2001). This has led to an additional implication where the validity of tacit knowledge is compromised by the rise of different theoretical approaches within entrepreneurship research (Eisenhardt and Santos 2002), in which it is interpreted in different ways (Gourlay 2006; Tsoukas 1996). Moreover, tacit knowledge is employed across multiple levels of analysis within entrepreneurial contexts. However, the impact on theory development of the level of analysis is often ignored in entrepreneurship research (Zahra et al. 2020). Despite the scholarly attention devoted to tacit knowledge and its potential importance for understanding entrepreneurship, key questions remain regarding what tacit knowledge in entrepreneurship entails and how to study it.

While there have been review studies conducted on tacit knowledge in the past, no single one has specifically linked tacit knowledge and entrepreneurship to date. These previous reviews are directed at tacit knowledge in a specific domain (Venkitachalam and Busch 2012), while others analyze tacit knowledge in relation to a particular construct (Cavusgil et al. 2003; Leonard and Sensiper 1998) or study tacit knowledge from an exclusively individual (Gourlay 2006) or collective perspective (Li and Gao 2003). Other contributions investigate tacit knowledge practices spanning disciplines to propose their categorization of tacit knowledge (Castillo 2002; Hadjimichael and Tsoukas 2019). In the present review, we use a different approach: on the one hand, we adopt a systematic approach, an approach missing in prior review articles on the topic of tacit knowledge. On the other hand, we aim to contribute by explicitly focusing on tacit knowledge from an entrepreneurship angle. We believe this is a

necessary step to advance the field of entrepreneurship. Indeed, since entrepreneurship is concerned with the discovery and exploitation of profitable opportunities (e.g. Shane 2000) and since many years recognized as a distinguished field of study, it is not surprising that the role of tacit knowledge in entrepreneurship might also differ from tacit knowledge in (general) management literature. Therefore, the purpose of this systematic literature review is to take stock, outline areas of previous empirical research on tacit knowledge in entrepreneurship, identify trends & conflicting findings, highlight gaps, and develop a conceptual framework for research on tacit knowledge in entrepreneurship. We attempt to achieve this strong focus by limiting this review to the major journals within the entrepreneurship field. In this way, we fully recognize the dominant trends in the field. The latter is particularly relevant in light of the pivotal function of tacit knowledge in recent scholarly research.

This systematic literature review provides a comprehensive overview of the current state of tacit knowledge in entrepreneurship. It does so by synthesizing insights from prior empirical research published in top-tier entrepreneurship outlets. The aim is to highlight the contributions that have been made within an unifying conceptual framework, specifically tailored to entrepreneurship. The need for such a framework arises from the necessity to summarize the progress made in entrepreneurship research on tacit knowledge. Furthermore, it helps identify gaps in the existing entrepreneurship literature, thereby aiding in the development of a future research agenda. The results of our study also inform practitioners as recent studies (e.g. Kraus et al. 2024) have highlighted the importance of literature reviews in informing theory and practice. In this view, our study can serve as both a guiding light for academic research and a practical compass for real-world applications of tacit knowledge in entrepreneurship. For example, both policymakers and practitioners can rely on our conceptual framework to develop strategies related to tacit knowledge creation, - circulation and - accumulation. In sum, by synthesizing and summarizing the literature on tacit knowledge in entrepreneurship, our study provides a digestible sources of information, ensuring that academics, policy makers and practitioners can navigate the complex landscape of tacit knowledge in entrepreneurship.

In this paper, we start with explaining our methodological approach by clarifying every step in our systematic literature review. In this way, we ensure consistency and rigor in the evaluation of existing studies on tacit knowledge in entrepreneurship. Next, we present some descriptive results including the distribution of articles per journal, the annual distribution of articles, the most frequently applied research methods, the geographical scope of the research studies, the general practices in the operationalization of tacit knowledge, and an overview of the different levels of analyses examined across the studies. In what follows, we present an integrative view of tacit knowledge in entrepreneurship and introduce our conceptual framework. We conclude our study with a discussion and research agenda for tacit knowledge in entrepreneurship.

## 2 Methodology

Our earliest attempts to identify academic articles regarding tacit knowledge and entrepreneurship revealed an extensive yet highly dispersed literature in which articles spread across different disciplines and research domains. Also, when analyzing prior reviews on the topic of tacit knowledge, it became apparent that delineating the field of research is essential and a generally accepted practice. For instance, in his review, Gourlay (2006) examined the influence of empirical studies on conceptualizing individual-level tacit knowledge. Venkitachalam and Busch (2012) provide another example. Their review article reviewed specific subfields of the knowledge management literature to identify research gaps relating to tacit knowledge. Other scholars reviewed tacit knowledge in relation to firm innovation (Cavusgil et al. 2003; Leonard and Sensiper 1998). In fact, one review exclusively covers a specific model of knowledge creation and its subsequent role in the development of tacit knowledge in business organizations (Li and Gao 2003).

For this study, we aim to obtain this delineation by offering a confined look at the entrepreneurship literature that addresses tacit knowledge. Specifically, because the present study marks the first systematic review on tacit knowledge in entrepreneurship, we focus in this review on the leading entrepreneurship journals within the field. More specifically, we included eight journals identified by Landström and Harirchi (2018) and Teixeira (2011) as core-entrepreneurship journals<sup>1</sup>. By examining the leading journals in the field of entrepreneurship, we develop a comprehensive understanding of the dominant trends in the field.

The approach of using leading journals is an accepted and established practice in review processes, for instance, on trust in organizations (Fulmer and Gelfand 2012), entrepreneurship in family firms (Bettinelli et al. 2017), or progress in entrepreneurship research (Aldrich and Baker 1997).

### 2.1 Search & selection process

For our systematic literature review, we selected the *Scopus* and *Web of Science* databases. By combining these two databases we avoid potentially biased outcomes due to the scope covered by one single database (e.g. Kraus et al. 2022; Sauer and Seuring 2023). Furthermore, these database are two of the most complete databases for academic research, and they include a large number of influential and pronounced journals (e.g. Z. Cao and Shi 2021; Sauer and Seuring 2023; Shah et al. 2024). Consistent with Calabrò et al. (2019), the search and selection process was conducted in four consecutive steps (see Table 1). As a first step, we searched the online bibliographic databases of *Scopus* and *Web of Science* for academic articles containing the term “tacit knowledge” in the title, abstract, or keywords. We also included commonly-used synonyms, including know-how (Hau and Evangelista 2007; Howells 1996;

<sup>1</sup>Entrepreneurship & Regional Development (ERD), Entrepreneurship Theory & Practice (ETP), Family Business Review (FBR), International Small Business Journal (ISBJ), Journal of Business Venturing (JBV), Journal of Small Business Management (JSBM), Small Business Economics (SBE) and Strategic Entrepreneurship Journal (SEJ).

**Table 1** Systematic literature review procedure

Filter	Description	Scopus	Web of Science	Total
Step 1	Articles with selected keywords	67	55	<b>122</b>
Step 2	Merging the results and removing duplicate results			77
Step 3	After reading titles and abstracts, eliminating the non-relevant articles			45
Step 4	After reading the full articles and eliminating the non-relevant articles			25
			<b>Total sample</b>	<b>25</b>

Itami and Roehl 1987), implicit knowledge (Grant 1996; Reber 1989; Spender 1996), uncodifiable (Grant 1996; Hu 1995; Kogut and Zander 1992), procedural knowledge (Grant 1996; Sternberg et al. 2000) and subjective knowledge. In addition, we integrated “tacit\*” in the logical search term to include all derivatives of the term tacit knowledge. The search was limited to peer-reviewed journal articles in English and confined to our selection of eight journals. The online search was developed with no lower boundary for the time frame. The upper limit was set in January 2022. The initial online search yielded 122 journal articles.

As a second step, duplicate articles were eliminated from this initial collection. This resulted in a preliminary selection of 77 journal articles. As a third step, to verify if essential relevance criteria were met, all titles and abstracts were read, and studies that were purely conceptual ( $n=9$ ) and/or fully out of our scope ( $n=23$ ) were excluded. This involved eliminating articles not focused on tacit knowledge. For instance, the term “tacit” is employed in several scientific fields, including economics (competition), which often refers to the concept of “tacit collusion” (see eliminated articles by Anand and Giraud-Carrier (2020), Bertomeu et al. (2021), and Piccolo and Reisinger (2011). Conceptual articles were excluded in line with prior work on tacit knowledge (Gourlay 2006). This choice is grounded in the challenges posed by the nature of tacit knowledge itself as there remains a lack of consensus on what constitutes evidence of tacit knowledge. Therefore, by prioritizing empirical research this systematic literature review can directly address how tacit knowledge manifests in real-world entrepreneurial contexts. Empirical research provides tangible evidence and data-driven insights that can validate or challenge existing conceptual frameworks. This approach ensures the review remains grounded in empirical evidence, contributing to a clearer understanding of tacit knowledge and its implications for the entrepreneurship field. In total, 45 studies were eligible to proceed to the next step. As a fourth and final step, the remaining studies were comprehensively assessed taking into account the full papers. At this stage, we did consider all forms and approaches in terms of quantitative and qualitative research on tacit knowledge. After reading the full papers, we further eliminated non-relevant articles ( $n=20$ ) as tacit knowledge was not directly investigated. With this, we endeavored to obtain an inclusive and complete picture of the concept (Denyer and Tranfield 2009; Pawson 2006) and

compensated for unintentional value judgments and uncontrolled validity threats (Salipante et al. 1982). This search and selection process resulted in a final selection of 25 articles.

## 2.2 Content analysis

To analyze the content of the articles, we were guided by methodology propositions by Denyer et al. (2008), Denyer and Tranfield (2009), and Tranfield et al. (2003). This methodology has been used in several relevant and recent reviews, including Bettinelli et al. (2017), Thorpe et al. (2005), and Van Lancker et al. (2022).

First, we organized articles according to their respective research approach (van Burg and Romme 2014). This approach resulted in a segmentation with either a quantitative or qualitative approach. Second, all articles were subjected to an in-depth analysis of the article's literature study and its methodological section, thereby assessing the theoretical and methodological foundations. During the in-depth analysis, we focused on identifying each article's theoretical origin of tacit knowledge and also assessed the research methodology, sampling frame, and measures applied, depending on the research method. Third, we identified the contextual factors within the articles to categorize tacit knowledge research based on the level of analysis (i.e., organizational structure or size in combination with the sampling frame) and the knowledge contribution (i.e., transfer, accumulation, acquisition, etc.). Fourth, to better understand the scientific evidence of tacit knowledge, it was necessary to unearth the interventions leading to tacit knowledge, the outcome patterns of tacit knowledge, and the possible mechanisms that affect this relationship. Therefore, for each article under review, we reported the research contingencies related to tacit knowledge (i.e., antecedents, mechanisms, and consequences).

## 3 Descriptive results

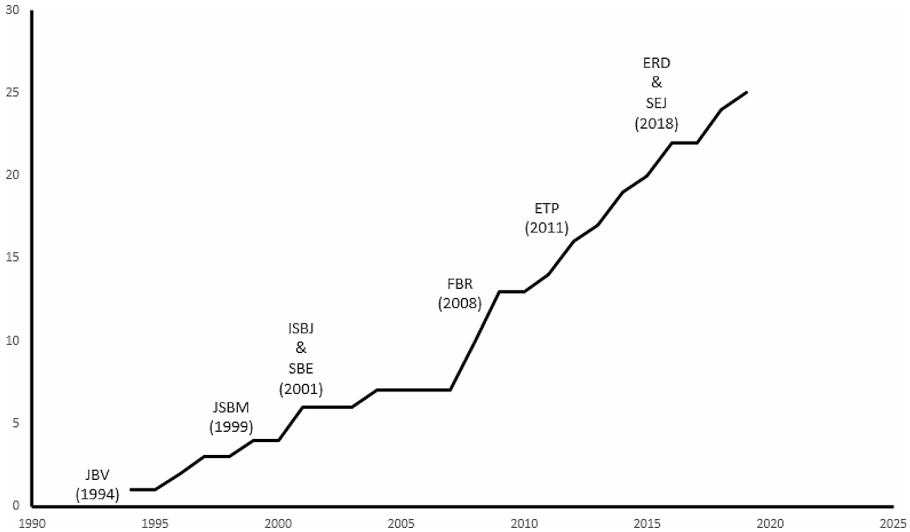
The following sections offer figures concerning several descriptive elements of the sample articles. This includes the distribution of articles per journal, the annual distribution of articles, the most frequently applied research methods, the geographical scope of the research studies, the general practices in the operationalization of tacit knowledge, and an overview of the different levels of analyses examined across the studies.

### 3.1 Distribution per journal

The distribution of articles by journal shows that the subject matter is not addressed to the same extent in each journal (see Table 2). In fact, JSBM, SBE, ISBJ and JBV together represent 76% of the articles examined. Still, tacit knowledge is scrutinized in every top-tier entrepreneurship journal, as identified by Landström and Harirchi (2018) and Teixeira (2011).

**Table 2** Articles per journal

Journal	Number
Journal of Small Business Management (JSBM)	6
Small Business Economics (SBE)	5
International Small Business Journal (ISBJ)	4
Journal of Business Venturing (JBV)	4
Entrepreneurship: Theory and Practice (ETP)	2
Family Business Review (FBR)	2
Strategic Entrepreneurship Journal (SEJ)	1
Entrepreneurship and Regional Development (ERD)	1



**Fig. 1** Cumulative growth over time

### 3.2 Cumulative growth over time

The entrepreneurship domain has started to accept publications about tacit knowledge since 1994. JBV was the first top-tier entrepreneurship journal to publish in this domain. Since then, the topic slightly found its way in the entrepreneurship field with a steady cumulative growth. Other top-tier entrepreneurship outlets like JSBM (first tacit knowledge publication in 1999), ISBJ and SBE (both first tacit knowledge publication in 2001) started to accept publications on tacit knowledge. Since 2008 this cumulative growth appears to increase even more, with FBR (first tacit knowledge publication in 2008) and ETP (first tacit knowledge publication in 2011) also starting to accept tacit knowledge publications. More than 20 years after JBV’s first publication on tacit knowledge, ERD and SEJ (both first tacit knowledge publication in 2018) also embraced the topic of tacit knowledge, resulting in a total of 25 published articles in top-tier entrepreneurship journals. Figure 1 shows the cumulative growth of tacit knowledge publications in the entrepreneurship domain over the years while also showing when each of the 8 top-tier entrepreneurship journals first published about this topic. The steady progression together with the gradual acceptance of each

of the 8 top-tier entrepreneurship journals, shows that the role and importance of tacit knowledge is taking a prominent and growing position in the entrepreneurship research field.

### 3.3 Research methods

Six articles (24%) adopted a qualitative research method, in which interviews were the standard approach to collect data. Most quantitative studies use regression analyses, such as a structural equation modeling technique (e.g. Cegarra-Navarro and Wensley 2009). One quantitative contribution adopts the event study method (Park and Kim 1997), and yet another employs a cluster analysis (Hilmersson 2014).

### 3.4 Geographical scope

It is apparent that the largest majority of the articles gathered their data in the U.S. (36%). Other leading countries that were represented in the articles were Italy (16%), the UK (12%), Spain (8%), and Germany (8%). Research on tacit knowledge is widely prevalent across the globe. This is evident from the various research studies conducted in Australia, Belgium, France and Russia.

### 3.5 Operationalizations of tacit knowledge

Various studies adopted different practices in operationalizing tacit knowledge. The grand majority of articles (52%) relied on indirect measures or proxies to operationalize tacit knowledge. The proxies can be broadly classified into three categories; these are (1) social capital, (2) human capital, (3) R&D. For social capital, strategic partnerships (Deeds and Hill 1996; Park and Kim 1997), outsider assistance (Chrisman 1999; Chrisman and McMullan 2004), and type of network/cluster (Islankina & Turner, 2018; Perrigot et al. 2013) are used. The human capital proxies that measure tacit knowledge capture various experiences, educational, or exposures directly linked to the individual or the organization (Bonaccorsi et al. 2014; Cooper et al. 1994; Erzurumlu et al. 2019; Ghio et al. 2016; West and Noel 2009). The R&D proxies related to tacit knowledge can be reduced investments in intangible capital or R&D-related variables (Antonelli and Scellato 2015; Hashai & Zander).

While the previous section highlighted the proxies employed in investigating tacit knowledge, the subsequent sections address the more direct measurements used in researching tacit knowledge. 16% of all articles devised a new measure to operationalize tacit knowledge (Ambrosini and Bowman 2008; Dohse and Walter 2012; Royer et al. 2008; Smith et al. 2009). In comparison, two articles or 8% of the reviewed articles relied upon existing measures to operationalize tacit knowledge (Cegarra-Navarro and Wensley 2009; Perez-Luno, Saporito & Gopalakrishnan, 2016). For example, Perez-Luno, Saporito & Gopalakrishnan, (2016) utilize the well-known measures developed by Kogut and Zander, which bolstered the investigation into the transferability of knowledge and innovation (Kogut and Zander 1993; Zander and Kogut 1995). Interestingly, one article (4%) combined an existing and a newly developed measure to investigate tacit knowledge empirically (Hilmersson 2014). 20% of



all reviewed articles employed a qualitative research methodology mostly relying on interview analyses concerning tacit knowledge (Dada et al., 2012; Jones and Craven 2001; Knockaert et al. 2011; Mazzola et al. 2008).

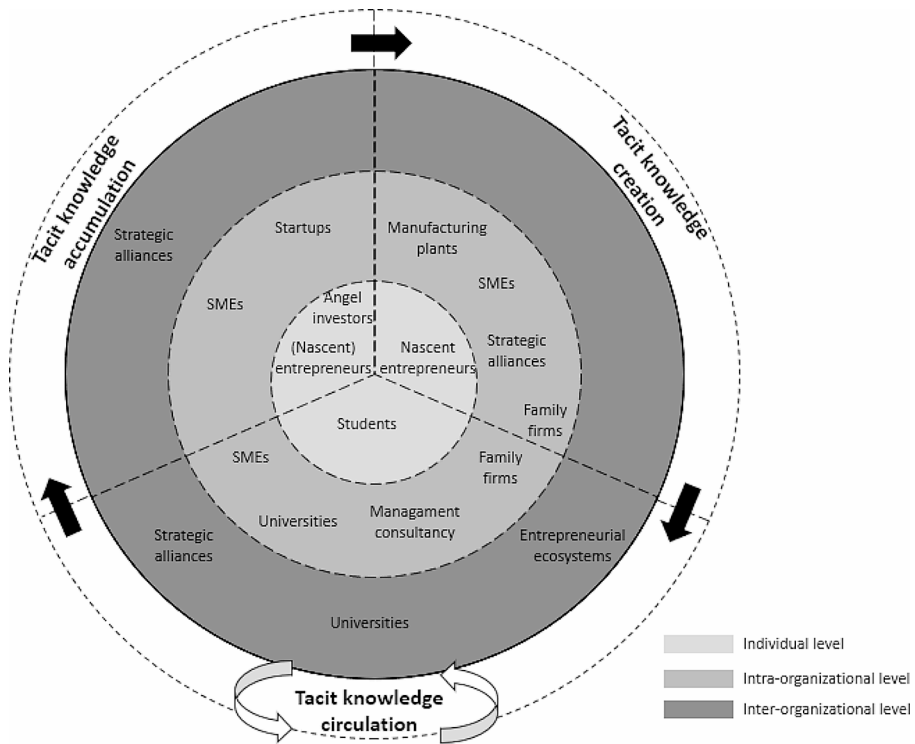
### 3.6 Levels of analysis

Studies emphasizing individual tacit knowledge represent 28% of our sample. Articles focusing on inter-organizational tacit knowledge constitute another 28% of the entire sample. Remarkably, most of these inter-organizational level articles are situated in the context of strategic alliances (Antonelli and Scellato 2015; Cegarra-Navarro and Wensley 2009; Dada, Watson, Kirby 2012; Islankina and Thurner 2018; Perrigot, Lopez-Fernandez, Eroglu, 2013; West and Noel 2009) or entrepreneurial ecosystems (Zeller 2001). Moreover, the investigations are very diverse in the sense that various industries are the subject of research, for example, biotech industry (Antonelli and Scellato 2015; Zeller 2001), the semiconductor industry (West and Noel 2009) or various industries (e.g. Dada, Watson, Kirby 2012).

Finally, the literature on intra-organizational tacit knowledge is well-developed and extensive. The majority of the articles in this review cover this topic, namely 44%, and are situated in different settings, such as manufacturing plants, family firms, strategic alliances, acquisitions and mergers, MNCs, universities, etc. The variety of research settings adds to the literature's diversity and development regarding intra-organizational tacit knowledge.

## 4 An integrative view on tacit knowledge in entrepreneurship

The fragmentation and sophistication of the research addressing tacit knowledge within entrepreneurship literature have made it challenging to compose a single overarching framework. Nonetheless, by framing the work in terms of different overarching themes in this systematic literature review, we present an overview of this fragmentary domain. The different overarching themes were created by synthesizing each article with each setting, level of analysis, and knowledge contribution. First, variations in the research setting were established by examining the context in which the research sample occurred, for instance, firms in emerging markets, CEOs, R&D activities, or SMEs. Second, differences in levels of analysis were determined by looking at whether they involved interactions between individuals (i.e., individual level), between companies (i.e., inter-organizational level), or between different units or departments of one company (i.e., intra-organizational level). Finally, the knowledge contributions were identified by scrutinizing the overarching knowledge theme of each article. This has resulted in the following three overarching themes: tacit knowledge accumulation, tacit knowledge creation, tacit knowledge circulation (see Fig. 2). Although some themes are closely related, they still have subtle distinctions. For this reason, in what follows, we preceded each theme with a definition of the overarching themes before synthesizing the review articles. This allowed us to expose the state around tacit knowledge of each article with clarity in its specific context (setting) and according to the level of analysis addressed.



**Fig. 2** Conceptual framework on tacit knowledge in entrepreneurship

#### 4.1 Tacit knowledge creation

The dynamic configuration of information (i.e., combining and exchanging) to generate new knowledge is the process of knowledge creation (Nahapiet and Ghoshal 1998; Nonaka 1994; Smith et al. 2005). The newly created knowledge is usually intangible and may be manifested in new products, patents, publications, or any other tangible manner (McFadyen et al. 2009). In many cases, knowledge creation requires a dynamic process between various actors within and beyond the organization (Nonaka and Takeuchi 1995; Spender 1996). Tacit knowledge creation can be viewed as the manifestation of organizational learning. In other words, it is the result or the product of tacit knowledge acquisition or accumulation. We collected six articles that examined knowledge creation.

*Individual level.* Two articles probed the importance of *outsider assistance* for (nascent) entrepreneurs (Chrisman 1999; Chrisman and McMullan 2004). On the one hand, outsider assistance leads to an increase in tacit knowledge within the nascent entrepreneur, leading to a higher likelihood of *starting* a new venture (Chrisman 1999). On the other hand, entrepreneurial ventures created with outside assistance have a greater chance of long-term *survival* (Chrisman and McMullan 2004).

*Intra-organizational level.* We collected four articles concerning intra-firm tacit knowledge creation. One study explored the evolution of vertical boundaries of

**Table 3** Studies investigating tacit knowledge creation ( $n=6$ )

Setting	Research focus	Findings	Author(s)
family firms	collective learning	<ul style="list-style-type: none"> <li>Formalizing and institutionalizing innovation translates tacit knowledge into codified knowledge, which in turn mobilizes collective learning.</li> </ul>	Jones and Craven (2001)
manufacturing plants	creating and exploiting knowledge	<ul style="list-style-type: none"> <li>Large firms can better command the systematic generation and exploitation of codified technological change with solid scientific content.</li> <li>Small firms create new knowledge mainly based on learning processes and tacit competence capitalization. External tacit knowledge is a significant input into their knowledge-generation processes. Their exploitation strategies rely upon secrecy and time lags based upon the solid tacit component of their knowledge base.</li> </ul>	Antonelli and Scellato (2015)
nascent entrepreneurs	outsider assistance and starting	<ul style="list-style-type: none"> <li>Approximately 60–78% of nascent entrepreneurs who seek outside assistance start businesses, depending on whether a start-up is measured by boundary, resources, or exchange.</li> <li>The findings also indicate that even with assistance, the propensity of nascent entrepreneurs to start a business varies significantly across regions, with the East and West experiencing higher rates of start-ups among nascent entrepreneurs than in other regions.</li> </ul>	Chrisman (1999)
	outsider assistance and survival	<ul style="list-style-type: none"> <li>Entrepreneurial ventures started with the assistance of the SBDC are more likely to survive for at least four years than ventures in the general population.</li> <li>There is a positive relationship between the time entrepreneurs spend preparing to start a venture under the guidance of the SBDC and survival.</li> </ul>	Chrisman and McMullan (2004)
SMEs	entrepreneurial vs. market orientation	<ul style="list-style-type: none"> <li>A SMEs entrepreneurial orientation is positively related to the SME's creation and use of tacit knowledge.</li> <li>A SMEs market orientation is negatively related to an SME's tacit knowledge.</li> </ul>	Pérez-Luño et al. (2016)
strategic alliances	outsourcing of R&D	<ul style="list-style-type: none"> <li>New high-technology firms tend to compress vertical boundaries at different rates.</li> <li>Outsourcing of R&amp;D proceeds at the slowest pace, and outsourcing of marketing and sales proceeds at the fastest pace.</li> <li>The timing of these changes (i.e., the firms' early development stage) suggests that resource scarcity and liquidity constraints are compelling incentives to outsource activities whenever possible.</li> </ul>	Hashai and Zander (2018)

Israel-based new high-technology ventures (Hashai and Zander 2018). New high-technology firms tend to compress vertical boundaries at different rates (Hashai and Zander 2018). *Outsourcing of R&D* proceeds at the slowest pace and outsourcing of marketing and sales proceeds at the fastest pace since creating new knowledge relies on tacit knowledge. Further, the timing of these changes (i.e., the firms' early development stage) suggests that resource scarcity and liquidity constraints are compelling incentives to outsource activities whenever possible (Hashai and Zander 2018). Moreover, the founder's technical background is an additional constraint on the contraction of vertical boundaries, specifically those of R&D activities (Hashai and Zander 2018). Another study examined tacit knowledge creation in the manu-

**Table 4** Studies investigating tacit knowledge circulation ( $n=11$ )

Setting	Research focus	Findings	Author(s)
entrepreneurial ecosystems	spillover effect of cluster initiatives	<ul style="list-style-type: none"> <li>An analysis of biotech firms' input-output relations shows that spatial proximity is not a decisive factor for "hard" and traded interdependencies. However, spatial proximity facilitates "soft" untraded interdependencies and tacit knowledge. The relevance of these factors depends on the firm's business focus, growth strategy, market conditions, and maturity.</li> </ul>	Zeller (2001)
	internationalization process in Russian entrepreneurial clusters	<ul style="list-style-type: none"> <li>The dominant type of knowledge of the cluster industry explains internationalization activities.</li> <li>Industries with more explicit R&amp;D-oriented knowledge are more internationally active, while clusters with tacit and local knowledge remain closed.</li> </ul>	Islankina and Thurner (2018)
management consultancy	causal mapping	<ul style="list-style-type: none"> <li>It is possible to surface valuable processes and behaviors by employing the causal mapping approach.</li> <li>It is also possible that surfacing these tacit sources of success ensures the sustainability of the business whenever someone at the top of the organization leaves.</li> </ul>	Ambrosini and Bowman (2008)
students	entrepreneurial role models	<ul style="list-style-type: none"> <li>Tacit knowledge at the individual level (i.e., the existence of entrepreneurial role models and the expectation that support by strong ties in terms of know-how and know-who is available) has a significantly positive impact on entrepreneurial intentions.</li> <li>Tacit knowledge at the regional level (i.e., living in a region characterized by a high start-up intensity in knowledge-based industries and a high growth rate of R&amp;D investment) makes it more likely that a given individual will opt for an entrepreneurial career.</li> </ul>	Dohse and Walter (2012)
universities	the spillover from universities' tacit knowledge and innovative start-ups	<ul style="list-style-type: none"> <li>Knowledge generated by universities located in a geographical area strongly impacts the creation of innovative start-ups.</li> <li>The exploitation of university knowledge by prospective entrepreneurs to create innovative start-ups requires geographical proximity pointing to the fact that university knowledge spillovers are highly localized.</li> </ul>	Ghio et al. (2016)
	the spillover from universities' tacit knowledge and knowledge-intensive firms	<ul style="list-style-type: none"> <li>The knowledge produced by low-quality universities turns out to have a negligible impact on the creation of new knowledge-intensive firms, independent of the type of knowledge (either codified or tacit) and the locations of these universities.</li> <li>Both codified and tacit knowledge produced by high-quality universities has positive and significant impacts on creating new knowledge-intensive firms in the provinces where these universities are located. Conversely, tacit knowledge embodied in university graduates and knowledge codified in publications does not cross the province's boundaries.</li> </ul>	Bonaccorsi et al. (2014)
	composition of TMTs in science-based entrepreneurial firms	<ul style="list-style-type: none"> <li>Tacit knowledge transfer is improved as the founding team's proportion of original researchers in science-based entrepreneurial firms increases.</li> <li>Combining technical and commercial tacit knowledge leads to improved performance of science-based entrepreneurial firms.</li> </ul>	Knockaert et al. (2011)

**Table 4** (continued)

Setting	Research focus	Findings	Author(s)
SMEs	congenital learning	<ul style="list-style-type: none"> <li>• An open organizational context is a mediator for transferring knowledge between the founders and other organizational members.</li> <li>• Tacit knowledge needs to be converted into social knowledge to influence business performance.</li> </ul>	Cegarra-Navarro and Wensley (2009)
strategic alliances	JV valuations' attributes and capital gains	<ul style="list-style-type: none"> <li>• The valuation effect of JVs is multifaceted; the market valuation of JVs depends on the relationship between partners, the nature of partners' contributions, the extent of partners' control over JVs, and the corporate governance in parent firms.</li> <li>• Shareholders react more favorably to the JVs formed between competitors, reflecting their perception of market power enhancement from collusion in such ventures, particularly for the larger partners.</li> <li>• Our findings also show that partner size is a critical variable affecting wealth gains at the announcement of JVs. Shareholders tend to perceive JVs as risky operations, particularly for smaller partners. The role of smaller partners and their degree of control in JVs says much about the market valuation of JVs. It is challenging to protect the smaller partners' firm-specific know-how from being appropriated by the other partners.</li> </ul>	Park and Kim (1997)
family firms	strategic planning process	<ul style="list-style-type: none"> <li>• Strategic planning may play a critical role in building and/or reinforcing next-generation knowledge and skills, particularly industry and business knowledge, functional capabilities, and decision-making ability. Furthermore, social and business networks developed inside and outside the company, together with credibility and legitimacy—dimensions that help family businesses better survive across generations.</li> <li>• The next-generation benefits are enhanced in these conditions: first, the adoption of a formal and broad strategic planning process, not only limited to developing financial forecasts. Second is the existence of either a business or an ownership purpose behind realizing the strategic plan—finally, the next generation's actual involvement in the process, not simply as an observer.</li> </ul>	Maz-zola et al. (2008)
	nepotism in family firm succession	<ul style="list-style-type: none"> <li>• When family business-specific experiential knowledge is highly relevant, family members are the preferred choice for succession in family businesses. If no appropriate internal successor is available, there is a need to transform an outsider into an insider-substitute or, in other words, to select a quasi-family member, such as a long-term employee, as a successor.</li> <li>• When the relevance of family business-specific experiential knowledge is low, and the relevance of industry-specific general/technical knowledge is also low, there is a lower preference for internal successors.</li> </ul>	Royer et al. (2008)

facturing industry as a function of firm size (Antonelli and Scellato 2015). In this industry, large firms are more capable of *creating and exploiting knowledge* through codified technological change with strong scientific content (Antonelli and Scellato 2015). In contrast, smaller firms create new knowledge primarily through learning

**Table 5** Studies investigating tacit knowledge accumulation ( $n=8$ )

Setting	Research focus	Findings	Author(s)
angel investors	investor know-how	<ul style="list-style-type: none"> <li>• In the early-development stage, the direct effect of investor know-how increases the entrepreneur's share, while the indirect effect from that know-how, due to its interaction with the investment size, decreases the entrepreneur's share.</li> <li>• In the subsequent growth stage, the direct effect of investor know-how decreases the entrepreneur's share, while the indirect effect increases the entrepreneur's share.</li> </ul>	Erzurumlu et al. (2019)
entrepreneurs	tacit opportunities	<ul style="list-style-type: none"> <li>• Tacit opportunities are more often discovered through prior experience than through systematic search.</li> </ul>	Smith et al. (2009)
nascent entrepreneurs	resource profile of nascent entrepreneurs	<ul style="list-style-type: none"> <li>• Management know-how has a weak direct effect on the performance of a new venture.</li> <li>• The experience and contacts developed in a similar business may lessen the liability of the newness of the venture, leading to less "trial and error" as the venture gets started.</li> </ul>	Cooper et al. (1994)
SMEs	experiential knowledge	<ul style="list-style-type: none"> <li>• Tacit organizational knowledge dedicated to the internationalization process is multidimensional.</li> <li>• It depends on four types of knowledge: internationalization knowledge, institutional knowledge, business network knowledge, and social network knowledge.</li> </ul>	Hilmersson (2014)
start-ups	knowledge resources on new venture performance	<ul style="list-style-type: none"> <li>• Procedural knowledge in the form of business experience leads to an increase in firm performance.</li> <li>• Procedural knowledge in the form of networking increases firm performance as networking instills a constant stream of new information into the firm.</li> </ul>	West and Noel (2009)
strategic alliances	complementary assets	<ul style="list-style-type: none"> <li>• The accumulation of tacit knowledge through alliances can benefit an organization in product development, but the number of alliances can also provide negative returns.</li> </ul>	Deeds and Hill (1996)
	franchisee entrepreneurship	<ul style="list-style-type: none"> <li>• A theoretical model for maximizing entrepreneurial behaviors amongst franchisees.</li> <li>• Franchisee networks positively influence franchisees' stock of relational and informational capital.</li> <li>• Franchisees' stock of relational and informational capital positively influences franchisee entrepreneurial behaviors.</li> </ul>	Dada et al. (2012)

**Table 5** (continued)

Setting	Research focus	Findings	Author(s)
	franchise internationalization	<ul style="list-style-type: none"> <li>• As opposed to the service industry, the retail industry promotes network internationalization to a significant extent for all three samples.</li> <li>• Retail franchisors perceive less risk than franchisors in the service industry with respect to their international operations as they are not required to focus entirely on intangible inputs, which are typically difficult to control and transfer. On the contrary, retail franchisors primarily deal with tangible goods, which require nothing or much less in the way of know-how transferred to franchisees because the value added is already embodied in the products sold.</li> </ul>	Perrigot et al. (2013)

processes and the capitalization of tacit knowledge (Antonelli and Scellato 2015). Here, external tacit knowledge is an essential input into the process. On the other hand, another study examined tacit knowledge creation in innovative SMEs (Pérez-Luño et al. 2016). They concluded that innovative SMEs tend to create more tacit knowledge when they have an *entrepreneurial versus market orientation* (Pérez-Luño et al. 2016). Moreover, operating in hostile environments also enhances the creation of tacit knowledge (Pérez-Luño et al. 2016). The final article on intra-firm tacit knowledge creation stands out as it examines the process of tacit knowledge creation between a small family firm operating in the manufacturing industry and a business school (Jones and Craven 2001). In this case study research, the authors found that formalizing and institutionalizing innovation leads to translating tacit knowledge into codified knowledge, which in turn mobilizes *collective learning* (Jones and Craven 2001).

## 4.2 Tacit knowledge circulation

Knowledge circulation is easier within than between firms (Kogut and Zander 1992; Singh 2005). This is explained through the social community within a firm, in which new knowledge creation occurs (Nonaka 1994). This newly created knowledge, or tacit knowledge, is embedded within the social structures of the firms, making it less perceptible to outside leakage (Bierly and Chakrabarti 1996; Droege and Hoobler 2003). Still, tacit knowledge can be circulated in many ways, in many contexts and between different agents or organizations (e.g. Castellani et al. 2019; Feser 2023). Therefore, we conceptualize tacit knowledge circulation in a broad way including topics like knowledge sharing, -diffusion, -hiding, -loss, -retention, -spillover, and -transfer. We collected eleven articles that examined tacit knowledge circulation.

*Individual level.* One article uses an individual-level perspective as it performed an exploration of the embeddedness of students and the effect on their knowledge and entrepreneurial intentions (Dohse and Walter 2012). This study found that German university students ascertain individual-level tacit knowledge from *entrepreneurial role models* and support by strong ties in know-how and know-who (Dohse and Walter 2012). Additionally, they argue that regional tacit knowledge is spilled

over from living in a region characterized by a high start-up intensity in knowledge-based industries and a high growth rate of R&D investment (Dohse and Walter 2012). When both knowledge contexts are present, this will significantly positively impact the students' entrepreneurial intentions.

*Intra-organizational level.* We found five articles that examined organizational tacit knowledge circulation using an intra-organizational lens. One study developed a *causal mapping* methodology to diffuse tacit knowledge within an organization to prevent any loss of valuable tacit knowledge (Ambrosini and Bowman 2001). This causal mapping methodology existed in participants who uncovered their personal tacit knowledge by reflecting on their behavior and know-how. The authors concluded that such a process of uncovering tacit knowledge in individuals improved the organization-wide diffusion of crucial knowledge (Ambrosini and Bowman 2001). One study examined founder knowledge's effect on business performance by analyzing *congenital learning* and tacit knowledge transfer within Spanish SMEs (Cegarra-Navarro and Wensley 2009). Congenital learning refers to transforming founder knowledge into knowledge available to the company and its members. The study finds that an open organizational context facilitates transferring tacit knowledge between the founders and organizational members (Cegarra-Navarro and Wensley 2009). It also concludes that tacit knowledge should be transformed into social knowledge to influence business performance (Cegarra-Navarro and Wensley 2009). Knockaert et al. (2011) used a team-perspective and examined *the composition of TMTs in science-based entrepreneurial firms* to explore how tacit knowledge is transferred and managed to improve firm performance. They found that the transfer of tacit knowledge within science-based entrepreneurial firms enhanced when the proportion of founding teams that were original researchers increased (Knockaert et al. 2011). They also concluded that performance increases with technical and commercial tacit knowledge (Knockaert et al. 2011). We found two articles dealing with knowledge retention. Both articles were framed within the setting of family firms (i.e., intra-organizational). The first article examined how the *strategic planning process* serves as a knowledge retention mechanism through inter-generational succession in family firms (Mazzola et al. 2008). The strategic planning process has a vital function both in building or consolidating the knowledge and skills of the next generation and in developing the social and business networks in and outside the company, along with the credibility and legitimacy dimensions that help family businesses survive better across generations (Mazzola et al. 2008). The second article investigated how *nepotism in family firm succession* serves as a knowledge retention mechanism (Royer et al. 2008). This article found that nepotism is only appropriate in certain industries requiring specific tacit knowledge (Royer et al. 2008). The authors also suggest that if an internal successor is unavailable, a quasi-family member, such as a long-tenured employee, should be chosen (Royer et al. 2008).

*Inter-organizational level.* We found five articles that examined organizational tacit knowledge circulation using an inter-organizational lens. The following two articles investigated the spillover of tacit knowledge from Italian universities. Ghio et al. (2016) concluded that *the spillover from universities' tacit knowledge* increases the creation of *innovative start-ups* (i.e., young, small, and innovative firms). In comparison, Bonaccorsi et al. (2014) found that the tacit knowledge spillover from



high-quality universities, tacit knowledge embedded within its graduates, increases the creation of *knowledge-intensive firms* (i.e., R&D laboratories, high-tech firms, law and accounting firms, and management, engineering, and computer consultancy companies) in the vicinity of the university. Both studies underline the importance of proximity in relation to university knowledge spillover (Bonaccorsi et al. 2014; Ghio et al. 2016).

Zeller (2001) investigated the knowledge *spillover effect of cluster initiatives* in the biotechnology industry in three German regions (Zeller 2001). The results indicate that explicit knowledge (i.e., hard and traded interdependencies) do not require spatial proximity. However, the spillover of soft untraded interdependencies and tacit knowledge is facilitated through spatial proximity (Zeller 2001). These aspects vary on the firm's business focus, growth strategy, market conditions, and maturity (Zeller 2001). A different article studies *JV valuations' attributes and capital gains* (Park and Kim 1997). The finding gathered here is that the valuation of JVs depends on several factors, including the relationship between the partners, tacit knowledge contributions, the degree of control the partners have over the JVs, and corporate governance in the parent companies (Park and Kim 1997). Interestingly, when JVs are formed between competitors, shareholders tend to react more favorably. Also, partner size is perceived as a significant variable in determining wealth gains at the announcement of JVs, for instance, shareholders tend to dislike JVs from the perspective of the smaller partner (Park and Kim 1997). Islankina and Thurner (2018) focused on knowledge transfer across entrepreneurial ecosystems. More specifically, their work examined the *internationalization process in Russian entrepreneurial clusters* (Islankina and Thurner 2018). They concluded that specific funding mechanisms and the presence of distinct types of knowledge drive the internationalization process of entrepreneurial clusters in Russia. In terms of funding mechanisms, this study argues that publicly funded clusters focus more on internationalization to consider new technologies for commercial success, while privately funded clusters immediately emphasize competitive advantage and the development of commercial applications (Islankina and Thurner 2018). With respect to types of knowledge, this study finds that clusters relying primarily on explicit knowledge (i.e., explicit R&D-oriented knowledge) tend to be more internationally active (Islankina and Thurner 2018). At the same time, clusters depending on local and tacit knowledge remain closed (Islankina and Thurner 2018).

### 4.3 Tacit knowledge accumulation

An organization learns by building experience across domains (Levinthal and March 1993; West and Iansiti 2003) through learning from organizational relationships (Huber 1991; Penrose 1959; Spender and Grant 1996; Yli-Renko et al. 2001), which serve as bridging mechanisms for knowledge acquisition (Lane and Lubatkin 1998; Yin and Bao 2006). These experiences lead to the accumulation of internal and external knowledge (Lai 2013), and having a culture conducive to the accumulation of knowledge can lead to a significant competitive advantage for the organization (Mostafiz et al. 2019).

*Individual level.* We collected three articles that investigated knowledge accumulation between individuals. The following articles underline the variations in addressing individual-level tacit knowledge in the entrepreneurship literature. One article investigates the distribution of new venture ownership shares and found that the entrepreneur's ownership share is affected by the investment size and the *investor's know-how* (Erzurumlu et al. 2019). With this study, the accumulation of tacit knowledge possessed by angel investors is considered in the distribution of ownership share of new ventures across two investment stages (i.e., development stage and growth stage) (Erzurumlu et al. 2019). A second article found that *tacit opportunities* appeared to be discovered more likely by entrepreneurs with prior experience, while systematic search proved more beneficial in discovering codified opportunities (Smith et al. 2009). A third article examines the *resource profile of nascent entrepreneurs* in relation to various performance outcomes (Cooper et al. 1994). The article posits that human and financial capital predict new venture performance. More specifically, an entrepreneur's general human capital is related to marginal survival and growth. In contrast, industry-specific human capital is a strong predictor of future success, management know-how has a weak direct effect on the performance of a new venture, and finally, the level of venture capitalization positively affects marginal survival and growth (Cooper et al. 1994).

*Intra-organizational level.* Two articles studied knowledge accumulation in organizations across various settings, ranging from SMEs to start-ups. One study uncovered a learning dynamic behind SMEs' internationalization, emphasizing *experiential knowledge* (Hilmersson 2014). This study posits that tacit organizational knowledge focused on the internationalization process is multi-dimensional and is accumulated through various knowledge domains, including internationalization, institutional, business network, and social network knowledge (Hilmersson 2014). Similarly, West and Noel (2009) examines the role of *knowledge resources on new venture performance* and finds that tacit knowledge in the form of business experience and networking increases firm performance.

*Inter-organizational level.* Three articles studied knowledge accumulation between organizations. The present articles share similarities as opposed to the previous articles concerning individual-level tacit knowledge accumulation. Six studies had one additional aspect in common: they were all undertaken within strategic alliances. First, Deeds and Hill (1996) analyzed the impact of entering into strategic alliances on the product development process. They found that disembarking into strategic alliances between entrepreneurial biotechnology firms to secure *complimentary assets* leads to an increase in the rate of new product development. Although the results indicate that tacit knowledge can be accumulated through alliances, the authors also find that maintaining these alliances is difficult and time-consuming, potentially leading to decreasing and even negative returns (Deeds and Hill 1996). The second article studied the impact on the internationalization in franchises from the perspective of the franchisor's tacit knowledge and the coexistence of franchised outlets and company-owned outlets within the same network (Perrigot et al. 2013). The results indicated that the retail industry network promotes network internationalization instead of the service industry network. Perrigot et al. (2013, p. 570) theorize "that retail franchisors perceive less risk than franchisors in the service industry

with respect to their international operations because they are not required to focus entirely on intangible inputs, which are typically difficult to control and transfer. On the contrary, retail franchisors primarily deal with tangible goods, which require nothing or much less in the way of know-how transferred to franchisees, because the value added is already embodied in the products sold.” A third article regarding franchise chains sheds light on the dynamics of *franchisee entrepreneurship* operating within the standardized framework of the franchise system (Dada et al., 2012). A theoretical model for maximizing entrepreneurial behavior among franchisees was developed by employing a phenomenological multiple-case study design, identifying the accumulation of tacit knowledge as a determinant of information capital that influences a franchisee’s entrepreneurial behavior (Dada et al., 2012).

## 5 Discussion: a research agenda for tacit knowledge in entrepreneurship

The previous section reviewed the existing entrepreneurship research at the interface of tacit knowledge in an attempt to provide a structured overview of the state of the field’s leading entrepreneurship outlets. The following section offers our assessment and recommendations for future research in tacit knowledge.

There is considerable potential for future research that contributes to the entrepreneurship literature on tacit knowledge. As this review shows that not all themes have received the same degree of examination in the tacit knowledge debate, we have chosen to concentrate on specific themes. Moreover, as our overview clarifies, several themes have received rather extensive attention and already represent a diverse scholarly landscape. In fact, entrepreneurship scholars in the leading journals have focused mainly on tacit knowledge accumulation, -creation, and -circulation. Nonetheless, the presented conceptual framework (see Fig. 2) shows that within these domains a high level of granularity exists in terms of research context or in the level of analysis.

As a result of conducting this review of prior studies, we have identified six main research gaps in existing research. First, we observe a limited use of qualitative techniques in terms of the applied methodologies. Second, we note the lack of quantitative operationalization of tacit knowledge. Third, we argue that the entrepreneurial ecosystem represents an underdeveloped research setting in our sample. Fourth, we discuss future research possibilities related to the tacit knowledge of principal decision makers. Fifth, we elaborate on the role and importance of knowledge loss. Finally, we enrich the conversation on entrepreneurial learning for scaling by integrating tacit knowledge in this debate. The following sections describe in more detail each of the research gaps we have identified throughout this review study.

### 5.1 Shifting attention to qualitative research

Over the past two decades, qualitative research has gained traction in entrepreneurship (Hlady-Rispal and Jouison-Laffitte 2014; Van Burg et al. 2020). Qualitative inquiry remains vital in advancing theoretical understanding and comprehending

emerging and distinctive characteristics associated with research domains. However, recent scholarly contributions have argued for more plurality with regard to qualitative methods for examining challenges in entrepreneurship (Hlady-Rispal et al. 2021; Van Burg et al. 2020). In fact, it is this same debate that we see reflected in this literature review. On the one hand, qualitative methods are underrepresented when studying tacit knowledge in entrepreneurship, as only 20% of our sample adopts a qualitative approach (see 3.3.3). On the other hand, methodological diversification within the qualitative methods is limited, as most studies rely on interview analyses (Dada, Watson, Kirby 2012; Mazzola, Marchisio & Astrachan, 2008; Zeller 2001; Knockaert et al. 2011) or observations (Jones and Craven 2001). Therefore, we see sensemaking analysis as a valuable alternative qualitative approach as it is ideal for studying complex and cognitive processes in entrepreneurs, such as tacit knowledge (Hlady-Rispal et al. 2021; Weick 1995). Indeed, sensemaking analysis is well suited to capture temporal processes and therefore examine actors, organizations, and environments in transformation (Hlady-Rispal et al. 2021). This kind of analysis allows working with a multitude of data, such as interview, observational, secondary, and archival data. Another inspiration can be found in the emerging ‘entrepreneurship as design’ perspective, which emphasizes the need for ethnographies of specific entrepreneurial artifacts (see Berglund et al. 2020). This method rests on the augmenting effects of design principles and artifacts on the interactions between individual cognition and social interactions. Examples of concrete cases of entrepreneurial artifacts include business models, prototypes, landing pages, pitches, etc. (Berglund and Glaser 2022). In sum, tacit knowledge is ideally suited for a qualitative research approach as it is defined as subjective and unexplored knowledge forged through an individual’s experiences, insights, and individual learnings (Acs et al. 2013; Grant 1996). We firmly believe that qualitative studies can help demystify tacit knowledge in entrepreneurship.

## 5.2 A plurality of quantitative operationalizations of tacit knowledge

Across domains, tacit knowledge has been operationalized to quantify the construct at both the organizational and individual levels. Prominent organizational measurements for tacit knowledge are the ones created by Bruce Kogut and Udo Zander. In the 90s, their efforts strengthened the investigation into the transferability of knowledge and innovation (Kogut and Zander 1993; Zander and Kogut 1995). These measurements, which offer insights into an organization’s knowledge and the tacitness and transferability thereof, have been used for nearly 30 years in various (knowledge) management studies. Surprisingly, in our systematic literature review in top-tier entrepreneurship outlets, only one study relies on this well-known measures developed by Kogut and Zander (Perez-Luno, Saporito & Gopalakrishnan, 2016). Despite the interest and widespread use of the measurements in various (knowledge) management studies, its scientific use in the entrepreneurship domain tends to be relatively limited. The current measurements have a confined character, as they emphasize manufacturing processes and end-products, which is inconsistent with, for example, service sector organizations. Therefore, we call for adapting the current organizational measurement for tacit knowledge to become more easily applicable across

domains. More specifically, we believe that an adaptation directed to the context of entrepreneurship could facilitate the cross-fertilization between entrepreneurship and knowledge management domains. Furthermore, the entrepreneurship domain has disregarded the operationalization of individual-level tacit knowledge, especially in comparison with other fields. Across disciplines, myriad attempts have been made to quantify tacit knowledge at the individual level. These domains include accountancy (Bol et al. 2018), management (Armstrong and Mahmud 2008), academia (Insch et al. 2008), and law enforcement (Taylor et al. 2013, 2017). Yet they remain limited to domains other than entrepreneurship, despite numerous calls to operationalize individual-level tacit knowledge in entrepreneurship (Andrews and Smits 2018; Baum et al. 2011; Sternberg 2004; Vecchio 2003). It is the individual who represents the primary source of knowledge within an organization (Grant 1996; Nelson and Winter 1982; Nonaka 1994), and without measurement, it is impossible to determine whether tacit knowledge is actually being accumulated, stored, or transferred. It remains surprising that no measurement for individual-level tacit knowledge has been developed to date, mainly since there exist methodologies upon which one can rely, such as the methodologies proposed by Ambrosini and Bowman (2001), Insch et al. (2008) and Wagner and Sternberg (1985). For example, situational judgment test (SJT) to quantify the tacit knowledge of (nascent) entrepreneurs. This SJT-approach is widely-known in psychological literature for quantifying tacit knowledge. SJTs employ work-related scenarios, followed by a range of potential reactions. In so doing, the context in which tacit knowledge exists is taken into account. This process results in a measurement instrument for an individual's tacit knowledge. Such a lack of measurements to unravel entrepreneurial tacit knowledge opens future research areas for entrepreneurship scholars. A noticeable exception in entrepreneurship literature can be found in Wuytens et al.'s (2022) study, in which they use this SJT-approach to create a measurement instrument for an individual's Tacit Entrepreneurial Knowledge (TEK).

### 5.3 Tacit knowledge exchanges in entrepreneurial ecosystems

The current review demonstrates that tacit knowledge results from exchanges among organizational actors. Nevertheless, only two studies have explored tacit knowledge specifically in the context of entrepreneurial ecosystems (Islankina and Thurner 2018; Zeller 2001). Fernandes & Ferreira (2022) have also already identified this omission. These authors reviewed the state-of-the-art in terms of entrepreneurial ecosystems and highlighted the exchange and development of knowledge in ventures engaged in entrepreneurial ecosystems as an important topic for future research. Another recent review of entrepreneurial ecosystems also highlighted the importance of knowledge within such ecosystems by highlighting the significance of knowledge spillover research in entrepreneurial ecosystems (Wurth et al. 2022). Although these recent reviews do not elaborate on this research direction, these reviews are complementary to the present review. As such, we can support their proposition, adding that research on tacit knowledge in entrepreneurial ecosystems is especially necessary, as we have identified the following extensions.

First, research on tacit knowledge in conventional entrepreneurial ecosystems, such as incubators, accelerators, and universities, remains very limited. In this line, a recent study by Bouncken and Kraus (2022) argues that there is still sparse evidence on how entrepreneurial ecosystems develop and operate and in which ways they influence performance. We believe future research can build on our conceptual framework to unravel how tacit knowledge is created, circulated and accumulated within these ecosystems in order to advance the research field of entrepreneurial ecosystems (e.g. Berman et al. 2022). Second, in line with Wurth et al.'s (2022) suggestions for future research, we also believe an expanded focus on the individual within the ecosystem and the exchanges between them are essential. We suggest zooming in on the mentoring programs such entrepreneurial ecosystems typically include (Nabi et al. 2021; Ozgen and Baron 2007; St-Jean and Tremblay 2011). Research has established that mentoring is an ideal conduit of tacit knowledge between individuals (Lave and Wenger 1991). Nevertheless, this phenomenon is under-researched, and little is known about the mentorship process in general (Kuratko et al. 2021). For example, prior research has unearthed which factors are relevant for the diffusion of tacit knowledge between employees (Haldin-Herrgard 2000; Joia and Lemos 2010), in supply chain networks (Todo et al. 2016), in R&D networks (Jiafu et al. 2018; Liu et al. 2021), and more recently in SMEs (Bracci et al. 2022). However, our understanding is lacking concerning the exchanges of tacit knowledge in ecosystem mentoring programs. Third, tacit knowledge is also conducive to other types of ecosystems, in which entrepreneurs aggregate into various unconstrained and more cohesive associations (Roundy 2017), such as voluntary associations (Davis et al. 2006). Also, the exchange of tacit knowledge between circular start-ups and established companies can significantly boost the motivation of participants in entrepreneurial ecosystems (Audretsch and Fiedler 2024; Theodoraki et al. 2023) to adopt circular economy principles and apply circular knowledge. Still, the question how entrepreneurial ecosystems can transition to circularity remains unsolved (Audretsch and Fiedler 2024; Konietzko et al. 2020). Therefore, applying our tacit knowledge creation, -circulation and -accumulation lens might be a potentially fruitful avenue for future researchers to investigate how tacit knowledge can be a catalyst for introducing, enacting and entrenching circular knowledge and circular economy values in entrepreneurial ecosystems (Audretsch and Fiedler 2024).

#### 5.4 The principal decision-maker's tacit knowledge

Contemporary entrepreneurship research has firmly established the influence of principal decision-makers on entrepreneurial ventures, such as founding entrepreneurs' human capital in high-tech new ventures (Colombo and Grilli 2005; Marvel et al. 2020), CEO characteristics in high-growth firms (HGFs) (Nguyen et al. 2018; Willard et al. 1992), and the founder's knowledge in relation to the performance of SMEs (Cegarra-Navarro and Wensley 2009). These research lines are no surprise, considering that a firm's competitive advantage emerges through an individual's idiosyncratic experiences and insights (Reed and Defillippi 1990; Spender and Grant 1996). This link to the individual especially holds in the context of entrepreneurship, where individuals are guided by their experience and prior knowledge to respond appropriately

to opportunities (Shane 2000) and leverage resources consistent with their objectives using their entrepreneurial judgments (Foss and Klein 2012). In contrast to other organizational disciplines, entrepreneurship places a strong emphasis on the individual operating independently or within organizations (Carlsson et al. 2013; Shane 2012).

However, this emphasis on the individual is not reflected within research on tacit knowledge in entrepreneurship. Despite the surge in studies emphasizing the influence of principal decision-maker's demographics, traits, management styles, and social networks on a diversity of firm outcomes (Bamford et al. 2006; Barker and Mueller 2002; Brunzel and Ebsen 2023; Cao et al. 2015; Danso et al. 2021; Ou et al. 2018; Zhang and Wang 2020; Zhang et al. 2017). This trend is not represented in our literature review, as studies emphasizing tacit knowledge among individuals represent the minority in our sample (28%). Even more, within these 28% there are only a few studies explicitly focusing on (nascent) entrepreneurs as principal decision makers (Chrisman and McMullan 2004; Chrisman 1999; Cooper et al. 1994; Dohse and Walter 2012). However, this limited insight offers promising perspectives for future research.

## 5.5 The role and importance of the loss of tacit knowledge

Within the identified domain of tacit knowledge circulation, the *loss* of tacit knowledge can be seen as a separate substream. Indeed, previous literature on tacit knowledge agrees that it is often difficult to control and transfer, making a loss of tacit knowledge sometimes inevitable. Although we believe the loss of tacit knowledge is a very relevant topic in entrepreneurship, for example in the case of inventor turnover (e.g. Khanna 2022; Tzabbar et al. 2022), none of the identified articles in this review explicitly focusses on the loss of tacit knowledge in an entrepreneurial context. This is surprising, and we believe this opens several interesting future research avenues for entrepreneurship scholars. For example, Venkitachalam & Busch's (2012) review of tacit knowledge offers a solution for the loss of tacit knowledge by establishing practice communities, which is in line with propositions made by Lave and Wenger (1991). The social nature of knowledge exchange is illustrated by Lave & Wenger's (1991) communities of practice in which participation gradually increases from a peripheral role to a higher degree of engagement and complexity. This progressive integration encourages the transmission of tacit knowledge while supporting the learning process. Unfortunately, the authors do not elaborate on how the execution of these communities of practice across domains should be developed to retain such vital knowledge within the organization. Also, Venkitachalam and Busch (2012) failed to discuss additional ways practice communities may contribute to the loss of tacit knowledge and other related knowledge processes, such as creating or circulating tacit knowledge.

We believe that this requires a two-stage investigation process. First, more investigation should be conducted on the loss of knowledge in different entrepreneurial domains and across levels of analysis. One such example could be examining knowledge loss in founders of entrepreneurial ventures as an entrepreneurial founder is considered to guide his venture based on personal insights and experiences (Ham-

brick 2007). The tacit knowledge of the founder can be viewed as an asset to both the entrepreneur and the organization (Hambrick and Mason 1984). If the founder departs from the venture without preserving that tacit knowledge, it will affect the venture. Only then can there be a second research stage probing knowledge retention and retention strategies. It is known that knowledge retention mitigates the effects of knowledge loss due to employee turnover, retirees, or outsourcing (Levallet and Chan 2018; Lin et al. 2016), but prior research has indicated that it is a tedious concept often not well-executed (Levallet and Chan 2018). However, emerging research has shown that building a community of practice effectively retains tacit knowledge (Borzillo et al. 2011; Brown and Duguid 1991; Cervigon and Romero 2008; Chigada and Ngulube 2016). The inquiry into communities of practice is still in its infancy, especially in entrepreneurship and as a knowledge retention mechanism. We also see additional roles for communities of practice in entrepreneurial teams. A recent review by Gregori and Parastuty (2021) has revealed that entrepreneurial teams in startups significantly change over time, and that up to 40% of entrepreneurial teams experience at least one exit of a team member. Such entrepreneurial team member exits go hand in hand with the loss of (often very tacit) knowledge as they reduce the knowledge and resource base of the company. We encourage future researchers to scrutinize how communities of practice in entrepreneurship might affect the accumulation, creation and circulation of tacit knowledge within entrepreneurial teams.

It is important to recognize that while the loss of tacit knowledge can pose challenges when valuable insights become unavailable, it can also yield positive outcomes, particularly when outdated practices need to be abandoned in light of new markets and technologies. Schumpeter (1934), already hinted at the importance of knowledge loss with his concept of creative destruction. While thinking and acting entrepreneurially, entrepreneurs continually have to question themselves and look for new ways to remain innovative and competitive. In this regard, future research can build on our conceptual framework to contribute to timely discussions about the role of unlearning in entrepreneurship. For example, Klammer et al. (2023) delve into this phenomenon, examining how incumbents engage in learning and unlearning processes through collaboration with start-ups. Moreover, Hermans et al. (2012), building on Arthur's (1989) concept of "lock-in," illustrate how collective technological choices within an ecosystem can limit local ventures' exposure to alternative approaches and hinder the exploration of new opportunities. Bringing in tacit knowledge into these unlearning debates (for a review see Sharma and Lenka (2022) can yield interesting future research areas, not only on an individual level but also on an intra- and inter-organizational level.

## 5.6 Enriching the conversation on entrepreneurial learning for scaling

There is a great deal of consensus that an organization's ability to efficiently disseminate crucial knowledge to its new employees is considered a vital competitive advantage (Castellani et al. 2019; Kogut and Zander 1992; Spender and Grant 1996), especially in scaling ventures (Caloghirou et al. 2022; Penrose 1959; Shepherd and Patzelt 2022) and gazelles (Fulco et al. 2024). Yet, this review highlights that notwithstanding the widespread research interest in tacit knowledge across domains and



contexts, there is still limited knowledge about the role of tacit knowledge in scaling entrepreneurial ventures. Creating a well-defined research position in which tacit knowledge and all its overarching themes are explored, not merely the exchange of tacit knowledge (Shepherd and Patzelt 2022), can greatly contribute to the existing literature of entrepreneurial learning for scaling. Especially considering that entrepreneurial learning is the ongoing process of acquiring and applying knowledge to start and manage new ventures (Politis 2005). It is a critical component of scaling ventures, as it allows entrepreneurs to adapt to changing market conditions, develop new strategies, and overcome challenges.

Yet the existing research themes in the academic literature on entrepreneurial learning seem to focus on the early stages of the entrepreneurial journey in order to describe the process behind the concept. For instance, scholars have revealed how entrepreneurial experience can emphasize an exogenous learning process (Reuber and Fischer 1999; Westhead et al. 2005), or in contrast, be characterized by its path-dependency, event-based experiences, and its continuous learning process (Cope 2005; Reuber and Fischer 1999). Another example is Baron & Ensley's (2006) cognitive frameworks. They found that experienced entrepreneurs develop cognitive frameworks over time, aiding them in assessing business opportunities more effectively than their inexperienced counterparts. These cognitive frameworks, acquired through experience, are critical in recognizing entrepreneurial patterns (Baron and Ensley 2006). These cognitive frameworks are inextricably linked to the creation and accumulation of tacit knowledge as this practical experience often leads to knowledge that is implicit, personal and uncodified.

Another major line of research seems to focus on learning elements grafted to the end of the venture often addressing issues directly related to the outcome of the venture (i.e., failure or success) (Cope 2011; Minniti and Bygrave 2001; Politis and Gabrielsson 2009). It is in the scaling phase between the early stages and the exit stage in the entrepreneurial journey that there remains a gap in the literature.

In sum, despite the importance of entrepreneurial learning in scaling ventures, the existing research on this topic is still limited. Most of the existing research has focused on the early stages of the entrepreneurial journey, such as starting and managing new ventures. There is a need for more research on how entrepreneurial learning is used to scale ventures and which role tacit knowledge must play in this learning process. In this regard, our study's conceptual framework on tacit knowledge in entrepreneurship can be used to contribute to wider ongoing discussion within this journal that link to entrepreneurial learning. For example, ongoing debates on co-working spaces (e.g. Bouncken and Reuschl 2018), innovation intermediaries (e.g. Feser 2023) and digitalization in entrepreneurship (e.g. Calderon-Monge and Ribeiro-Soriano 2024; Kraus et al. 2019) can be enriched by integrating a tacit knowledge lens to enhance entrepreneurial learning in order to stimulate growth and scaling.

## 6 Conclusion

This systematic literature review was designed to address the challenges that stem from the expanding body of entrepreneurship research on tacit knowledge. The inherent nature of tacit knowledge, the proliferation of various theoretical perspectives, the application of different levels of analysis, and the absence of an conceptual framework for tacit knowledge in entrepreneurship have contributed to the confusion surrounding this concept over time. Following a systematic literature review approach, we addressed the challenges above and highlighted valuable research avenues for tacit knowledge in entrepreneurship research. In sum our study offers a thorough examination of the current landscape of tacit knowledge within the field of entrepreneurship. The study's main objective was to delineate the contributions made by prior research within a cohesive conceptual framework specifically designed for entrepreneurship. This framework serves the dual purpose of summarizing the advancements made in understanding tacit knowledge in the entrepreneurship field and pinpointing areas where further investigation is warranted. Additionally, our study sheds light on the practical implications of these findings, echoing recent research emphasizing the pivotal role of literature reviews in informing both theory and practice. Accordingly, our study serves as a valuable resource for both academic researchers and practitioners alike. For instance, policymakers and practitioners can leverage our conceptual framework to devise strategies pertaining to the accumulation, creation, and circulation of tacit knowledge. In essence, through synthesizing and distilling the literature on tacit knowledge within the entrepreneurship domain, our study provides an accessible source of information, facilitating navigation through the intricate terrain of tacit knowledge for academics, policymakers, and practitioners. In sum, with this systematic literature review serving as a guide, future researchers can begin to uncover specific research paths within entrepreneurship that have remained unexplored to date.

Although the study was conducted systematically, it is not without limitations. The main limitation of conducting this systematic literature review is our failure to consider many specialized and essential knowledge- and innovation-oriented journals. After all, we purposefully chose to concentrate on eight top entrepreneurship journals to obtain our sample of 25 studies. Therefore, our approach reveals a tendency in which the interest of prominent researchers in the field of entrepreneurship and tacit knowledge has been situated in recent years. The limited sample size of 25 articles, can also be seen as a potential limitation. Still, previous systematic literature reviews (e.g. Baltazar et al. 2023; Paul et al. 2023; Pütz and Werner 2024) have proven that a similar sample size can still be adequate if the search strategy is robust and captures the most relevant literature available. The limited number of analyzed articles therefore resulted in a focused but reduced validity of the findings. Only English articles were considered and we only included top-tier entrepreneurship journals. Eliminating this criterion would not only have led to the inclusion of more articles but also to a diminished level of verified knowledge, given that not all articles meet the same qualitative standard. Our findings and the proposed conceptual framework need to be interpreted in this vein.

**Data availability** Regarding the underlying data, the papers which form the sample underlying the present SLR are available from the databases stated in the manuscript.

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## Authors and Affiliations

Nils Wuytens<sup>1,2</sup>  · Jelle Schepers<sup>1</sup>  · Pieter Vandekerkhof<sup>1</sup>  ·  
Wim Voordeckers<sup>1</sup> 

✉ Jelle Schepers  
jelle.schepers@uhasselt.be

Nils Wuytens  
nils.wuytens@uhasselt.be

Pieter Vandekerkhof  
pieter.vandekerkhof@uhasselt.be

Wim Voordeckers  
wim.voordeckers@uhasselt.be

<sup>1</sup> Hasselt University, Agoralaan, Building D, Diepenbeek 3590, Belgium

<sup>2</sup> Flemish Institute for Technological Research (VITO N.V.), Boerentang 200, Mol 2400, Belgium