

Intellectual property and SMEs ... What's the state of play?

Christopher T. Lohrey^{a,1}, Kelvin W. Willoughby^{b,*}

^a HHL Leipzig Graduate School of Management, Jahnallee 59, Leipzig, 04109, Germany

^b Stiftungsfonds Deutsche Bank Chair of Innovation Management and Entrepreneurship, HHL Leipzig Graduate School of Management, Jahnallee 59, Leipzig, 04109, Germany

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ABSTRACT

This paper investigates how small and medium-sized enterprises (SMEs) can leverage intellectual property (IP) use to enhance their innovation performance. The existing literature on IP use is typically focused on large established corporations, or discrete strategy issues related to specific topics such as patent management and lacks a comprehensive overview of IP strategy challenges for SMEs. Our study addresses this gap in the literature by conducting a systematic literature review addressing the dynamics, requirements and benefits to SMEs of the strategic accumulation, maintenance and exploitation of IP rights. Our findings indicate that SMEs may improve their innovation performance, their overall business performance and their competitive positioning by treating the management of IP as a basic business function alongside orthodox management functions such as finance, marketing, operations, and R&D. This paper makes three key contributions. First, it deepens our understanding of how the use of IP affects business functions within SMEs. Second, it advances the strategy literature by highlighting IP as an impactful if not yet widely appreciated strategic domain for managers of SMEs. Third, it connects the innovation and technology management literature, in the organizational context of SMEs, with the intellectual property literature.

1. Introduction

"Intellectual property is the oil of the 21st century." Echoing this well-known statement by Mark Getty, the Chairman of Getty Images [1], this paper investigates how small and medium-sized enterprises (SMEs) can leverage intellectual property (IP) to sustainably enhance their innovation activities and innovation-based economic performance. Intellectual property plays a critical role in safeguarding the returns derived from protected knowledge, thereby ensuring that innovation remains both profitable and incentivized [2,3]. Effectively managing the various IP protection mechanisms can generate strategic advantages that small and medium-sized enterprises (SMEs) cannot afford to overlook [4,5]. The potential benefits of robust IP management are diverse, ranging from enhanced venture capital acquisition [6] and improved liquidity [7] to the creation of additional passive income streams [8], increased company valuation [9], and higher rates of company survival [10]. In the wake of Teece's [11] pioneering work nearly four decades ago, IP use and management has gained traction in practice and the literature alike as shown by the growing numbers of publications in the field [12].

Prior research on the impact of intellectual property rights (IPR) on business has mainly focused on patents in large corporations, leaving out (a) other forms of formal IPRs such as copyrights, design rights, trademarks, trade secrets as well as informal approaches to knowledge protection [13] and (b) ignoring the specificities of SMEs that typically lack sufficient resources to train and assign employees to manage intellectual property. SMEs typically behave differently than larger corporations [5, 14] and insights from the analysis of larger corporations therefore typically have limited applicability for small ventures. Nevertheless, the number of studies addressing the beneficial impacts of IPRs on SMEs, taking in to account the distinctive characteristics of the business of SMEs, is growing. While Munari & Toschi [15] examine the impact on attracting VC financing from a specific type of VC, Barontini & Tagliatela [16] demonstrate the impact of patents on credit scores for banks. Other studies have investigated the impact of IPRs on SME reputation [17] or on the competitive actions of SMEs [18]. The selective, narrow or fragmented focus of most of these studies, however, leaves many questions about the broader impact of IPRs on SMEs unanswered; and it is currently difficult to derive robust strategy principles especially

* Corresponding author. Stiftungsfonds Deutsche Bank Chair of Innovation Management and Entrepreneurship, HHL Leipzig Graduate School of Management, Jahnallee 59, Leipzig, 04109, Germany.

E-mail addresses: christopher.lohrey@hhl.de (C.T. Lohrey), k.willoughby@hhl.de (K.W. Willoughby).

¹ First author.

relevant for practical application by managers of SMEs. This challenge is amplified by terminological and conceptual confusion in the literature about the relationship between the concepts of “entrepreneurial” ventures and “small and medium-sized” enterprises.

A comprehensive summary of the business functions impacted by the use of IP in SMEs may facilitate maximizing the benefits of IP to SMEs as well as optimizing the IP strategies of SMEs [19]. With this goal in mind, our research reported in this paper contributes to the literature by highlighting the relevance of IP management to the practical context of SMEs and by conducting a comprehensive overview of the salient academic literature and thereby laying the groundwork for further research on this significant yet underexplored topic. The current relevant academic literature tends to either address only a specific type of IP, such as patents or trademarks, or provides general insights about the effects of IPRs on larger corporations without consideration of the specific needs of smaller companies. To address this lacuna in the literature we conducted a systematic investigation and analysis of extant publications within the broad domain of the business of innovation and technology management, by addressing the following research question:

RQ: What is the role of intellectual property in the business of SMEs and what are the consequent managerial implications for the sustainable enhancement of SME economic performance?

To address this question holistically, we engaged in a systematic literature review of the broad domain of IPRs and SMEs following the methodological recommendations of Kraus et al. [20], comprising two steps, the systematic literature search and the analysis. While the systematic literature search was executed as described by Tranfield et al. [21], the 95 identified research papers were analyzed and synthesized using the Gioia et al. [22] method to guarantee a transparent, traceable, and rigorous analysis. Four distinct clusters of managerial interest related to SMEs impacted by intellectual property rights (IPRs) were identified through the inductive approach, following Gioia et al. [22]. Additionally, the specific dynamics underpinning each cluster were analyzed and systematically detailed. The resulting paper is structured into six sections, including this introduction. Section Two provides an overview of IPM and its specific considerations for SMEs, while the third section explains the methodology of the systematic review and describes the study sample. Section Four summarizes the facets of SMEs impacted by IPRs and provides practical insights for the management of SMEs—including the management of entrepreneurial ventures fitting within the general definition of an SME—in leveraging the benefits of IP for their business. The fifth and final section includes discussions of the theoretical and practical contributions of the research, the implications of our findings and the limitations of the research, as well as providing an outlook for future research.

2. The theory of intellectual property in SMEs

2.1. Intellectual property management

Thoroughly understanding and effectively managing intellectual property without trained and assigned specialists is a significant challenge for SMEs due to their limited resources [23,24]. Especially for emerging, innovation intensive companies, properly executed IP strategies are a way to gain and maintain a competitive advantage [25]. To enable a cost-efficient IP strategy and management, managers in SMEs must understand the different IPR options, their associated risks and benefits and find the appropriate balance between resource intensity and infringement protection [26]. Accordingly, the literature distinguishes between two main ways of protecting a company's intellectual assets: (1) informal protection methods and (2) formal IPRs [27].

Informal methods of protecting intangible assets (sometimes referred to casually as “informal IP”) include methods such as “secrecy” and “fast innovation cycles” or “first mover advantage.” Secrecy, or attempting to

keep information confidential, by withholding critical knowledge from employees, business partners or competitors, is a popular method for protecting the data and knowledge of firms and is generally labelled in the literature as a type of “informal” protection [1]. It is important to distinguish between, on one hand, confidential or quasi-confidential information that is protected *informally*, and, on the other hand, a “trade secret,” which is a particular category of *formal* IP attached to specific types of business-critical information that is maintained as a secret according to strict legally mandated procedures [28–30]. Unfortunately, many commentators confuse these two approaches to managing confidential information, thereby confounding their analysis. Nevertheless, despite the differences between informal secrecy and formal trade secret protection, it is frequently averred in the literature that both may hinder innovation by restricting information sharing [31]. Fast innovation cycles—the other main type of informal protection of intangible assets—ensure a rapid flow of new or improved products or product features, minimizing the time for competitors to replicate and thereby maintaining a first-mover advantage [32]. While informal protection mechanisms may be swift, simple, and cost-effective, they require continuous effort to maintain. More importantly, in contrast to various types of “formal” IP, including trade secrets, they typically may not enjoy the benefit of legal protection against infringement, and they are typically ineligible for defense in courts of law [33].

On the other hand, various types of “formal” intellectual property—such as patents, utility models, design rights, trade secrets and trademarks—are intangible assets to which legally recognized property rights are attached; and the respective rights (IPRs) belonging to the owners of those assets may be defended in courts of law and various administrative fora. In line with the approach of the World Intellectual Property Organization [34], and scholarly sources such as Willoughby [35] and Tekic & Willoughby [36], in this paper we adopt a definition of intellectual property as “*that class of intangible assets on which legal rights have been conferred by a sovereign state, granting the recipients the authority to exclude others from using, making, selling, distributing, importing, copying, or otherwise exploiting those assets without permission.*” ([36], p.131).

Among the formal categories of IP, patents and trademarks are among the most common. Patents require a time- and resource intensive application process [37] including a detailed description of the invention, and demonstration of its utility, novelty, and non-obviousness. Once a patent is granted by the relevant patent office, it clearly establishes the ownership of the intellectual property, provides grounds for legal defense against potential infringements [34], enables proper valuation [12,38] and thus allows for beneficial cooperation among different entities [9,39]. Trademark rights, which in many jurisdictions may be obtained at least temporarily without registration, nevertheless typically also require the recipient of those rights to engage in a formal registration procedure with the pertinent public authority (trademark office) involving: submission of a *bona fide* copy of the mark; specification of the product or service categories to which it is applied; and demonstration that the mark is distinctive and truly distinguishes the defined product or service in the pertinent market. Unlike a patent, that will normally expire in no more than twenty years, a properly managed trademark may in principle last indefinitely [34].

A solid understanding of the diverse forms of IP protection methods—including an overview on the effects, advantages and disadvantages as well as the interplay between the diverse forms of IP rights—is crucial for efficiently and economically managing the protection of intellectual property [40] especially in resource-scarce firms [41]. Thus, the *management* of intellectual property is a critically important organizational capability alongside other managerial capabilities of enterprises. In this paper we accordingly define Intellectual Property Management as “*the set of activities within an organization—encompassing planning, decision-making, coordinating, controlling, implementing, and monitoring—focused on developing, maintaining, and protecting IP assets, as well as deriving value from those assets.*” ([42], p.239). The process of managing IP and their associated rights itself however is resource

intensive and thus impacts larger firms differently from SMEs [37].

2.2. IP considerations for SMEs

SMEs approach IPM differently from larger corporations, reflecting their unique organizational characteristics. While acknowledging that there are variations in the literature regarding the definition of the term “SME” (see, e.g., Ref. [43]), in this study we have adopted the standard definition promulgated by the European Commission [44], in which an SME is identified as a company with fewer than 250 employees and either a turnover below €50 million or total assets under €43 million.

The distinctive features of SMEs necessitate a tailored approach to managing IP. Although the positive impact of formal intellectual property rights (IPRs) on SME performance is recognized by scholars of technology management and innovation [35], the topic remains underexplored in the relevant literature (Agostini et al., 2016). Existing research highlights two critical insights: first, SMEs often favor informal protection mechanisms for their perceived cost-effectiveness, efficiency, and controllability [33]; and, second, barriers such as limited awareness of opportunities and processes for obtaining formal IP rights inhibits their adoption [45]. However, while these insights provide helpful clues, successfully addressing our primary research question regarding how SMEs may effectively manage IP to sustainably enhance their economic performance, requires more extensive and nuanced investigation, including a comprehensive analysis of business functions influenced by IPRs, emphasizing the specific benefits and strategic options available to SMEs. In the following section of this paper, we describe our systematic review of existing literature to address our core research question, focusing on the unique needs of SMEs and the specific IP-related benefits and strategic options available to SMEs.

3. Research methodology and data structure

In our research reported here we followed the transparent and reproducible procedure established by Tranfield et al. [21] and as further developed and refined for business literature reviews by Snyder [46], Kraus et al. [47] and Kraus et al. [20]. This approach requires three consecutive steps: (1) planning the review, (2) conducting the review, and (3) analyzing, synthesizing, and reporting the findings. The first step, involving identifying the need for the literature review, was conducted as outlined above in Sections One and Two. The current section describes the practical procedures we followed in conducting the review, while Section Four covers the analysis and reporting of our findings. This approach is in line with current scholarly research in this field such as the work of Pires and Ferreira [48].

The relevant keywords for the structured search relating to IP use in SMEs were identified by aggregating the terms used in the relevant literature. An initial search was conducted in Google Scholar using the terms “intellectual property” and “entrepreneur” or “SME.” The term “entrepreneur” was included to maximize the range of potential papers, given that much of the literature concerning SMEs treats entrepreneurial ventures as a sub-category of SMEs or employs the term “entrepreneurship” as a synonym for SME business. The five articles yielding the most citations, as well as the 5 most recent relevant articles, were selected and their keywords were combined in a list. The search was then augmented by a manual scan of the reference lists of those ten core articles, and their keywords were then added to the list. This list constituted the initial base for the search string employed in this paper. We found that authors use a variety of terms to describe intellectual property, employing terms such as “patents” or “trademarks,” in particular, as generic labels covering diverse forms of IP (including other categories of IP such as copyright, trade secrets and design rights); and that further ambiguity is introduced to the literature through the inconsistent use of various terms describing small and medium sized firms. To mitigate the issue of inconsistent nomenclature, the different keywords from the keyword-list were connected by the Boolean

operator “OR” to avoid excluding relevant sources. Our final search string was: (“intellectual property” OR “appropriation” OR “patent” OR “trademark”) AND (“entrepreneur” OR “sme” OR “start up” OR “enterprise” OR “small business”). Search terms were required to be present in the abstract, title, or keywords of research articles of peer-reviewed English-language academic articles.

In a second step, to reduce researcher bias and ensure comprehensiveness of the results, the keyword selection was presented to a sample of five academic experts in the field, but uninvolved in this study, to decide if the search string could be improved and to further adjust and augment the search terms. Various permutations of other possible search terms were then investigated and the results were compared. Lastly, as an additional test of robustness, each individual term was removed separately from the resulting search string, to check its significance for the results. All search term were found to be relevant. A summary of our systematic search process is shown in Fig. 1.

As suggested by Kraus et al. [47] and Kraus et al. [20] the search was conducted on multiple databases to ensure comprehensive results and increase the probability of capturing all relevant literature (see Fig. 2). The search was conducted in five different databases—namely, EBSCO Global Search, Emerald, ScienceDirect, Web of Science Core Collection, and SAGE—incorporating the suggestions of Gusenbauer & Haddaway [49]. The search was limited to peer reviewed articles in English appearing in academic journals where the keywords were found in either the title, the author supplied keywords or the abstract. The initial search was conducted on November 14, 2023, and updated on December 30, 2024. As the results were limited to the fixed search string, key features of a systematic literature review as required by Tranfield et al. [21] such as reproducibility and transparency were achieved. A total of 1463 papers were identified, with an initial count of 1457 and an additional six found through the update. After removing all doubles by comparing author, title, year and DOI-Number, 1290 papers remained. As suggested by Tranfield et al. [21], a quality check of the articles was performed using the criteria from the journal conversion ranking table as laid out by Kraus et al. [47]. After including only articles that satisfied the minimum quality standards, 809 papers remained. To select only papers directly relevant to the research question, the title and abstracts were read iteratively and analyzed according to four exclusion criteria (see Fig. 1). Most articles were rejected because they focused on social, legal, or policy-related factors, rather than on business topics operationally relevant to managers of SMEs. The set that passed successfully through our specified filters consisted of 95 papers that became the final sample for detailed analysis in our research.

As a final test of the robustness of our literature search, taking in to account the ambiguity or inconsistency in the IP terminology found in the work of some scholars, we conducted an additional search by substituting the terms “patent” and “trademark” in our Boolean search string with the terms “copyright” and “trade secret.” This search yielded 457 results. After removing all duplicate articles, and applying the identical literature quality filter criteria employed in original search, 153 articles remained. Of these articles, only 91 dealt specifically with SMEs. Applying the remaining inclusion/exclusion criteria, only 6 papers remained. Of those 6, four had already been incorporated in the previous search. Thus, two articles remained, one specifically targeting trade secrets and one specifically dealing with copyright. Both articles are in line with the findings of our paper and are included in the results and discussion section. Thus, this additional robustness test confirmed that the set of publications constituting our final data set addressed a broad scope of categories of intellectual property, including copyright and trade secrets, and not just patents and trademarks.

An inductive approach to the in-depth analysis of the final sample of articles was followed according to the procedure established by Gioia et al. [22]. Although this method has been used in other fields of management [50,51] our study is the first one to apply it specifically to the subject of intellectual property management in SMEs. To provide a comprehensive overview of descriptive statistics, meta data from all

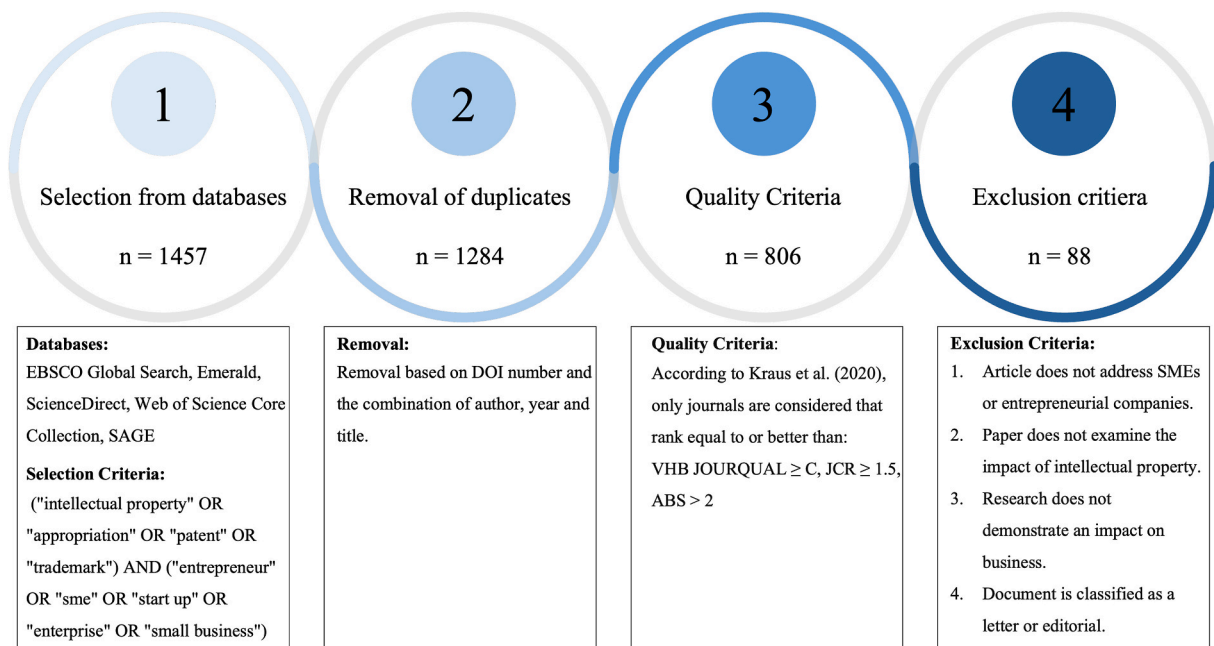


Fig. 1. Summary of the systematic literature review process.

Sample overview			
Firm Size		Industry	
Size	# of References	Sector	# of References
SMEs	43	Manufacturing	21
Entrepreneurial companies	12	High Technology	19
Micro Firms	3	Software	18
Small Firms	15	Biotechnology	9
Medium Firms	5	Service Firms	8
Large Firms	4	Pharmaceuticals	5
Geographical Distribution		Type of IP employed	
Region/State	# of References	Type of IP	# of References
Europe	26	Patent	51
United States of America	20	Informal protection	19
China	12	Trademark	11
South America	1	Licence	5
Asia	3	Copyright	4
Africa	2	Other	11
Australia	1	IPRs in general	10

Note: The total number of references shown in the tables differs from the number of papers, as some papers refer to multiple domains while others do not specify any particular domain.

Fig. 2. Characteristics of the sample.

papers were collected, including publication year, journal quality, research type, theoretical lens, and type of IP addressed. The specific impact of IP use on managerial functions within SMEs was extracted inductively from each paper. This process was repeated iteratively for consistency across all papers in the sample. Finally, we generated a short summary of each article, emphasizing the most relevant theses for our research. Finally, all articles were analyzed using MaxQDA software to identify relevant aspects of IP related business. The coding process followed the guidelines suggested by Corbin & Strauss [52]: open coding, axial coding, and theoretical coding. The resulting first order concepts were clustered according to their subject and aggregated into second order themes as suggested by Gioia et al. [22]. To mitigate potential

researcher bias and ensure inter-coder reliability, three external researchers (uninvolved in this study) were assigned the task of attributing the first order concept codes to the predetermined list of second order themes. Initially, an average consensus of 82 % was achieved. Each divergent attribution then was discussed and resolved individually. Lastly, to visualize a holistic and comprehensive representation of the underlying relationships, MaxQDA's code-matrix-browsing tool was employed. The final data structure, providing the identified codes, concepts, and themes, is represented in Fig. 4.

Five literature reviews that were included in the sample were reviewed separately, following the same procedure that was followed for the other articles. The identical quality criteria for inclusion that were

applied to the other papers—namely, that the reviews ought to be published in peer reviewed journals of equivalent or better quality than mentioned in Fig. 1—were also applied to this set of literature reviews, leading to the exclusion of one paper. Of the remaining four reviews, three papers had to be excluded as they did not comply with other inclusion-exclusion criteria. Two articles did not use the individual company as unit of analysis, and one focused on dynamic capabilities without considering the impact of IPM on business. Therefore, only the literature review paper by Cao et al. [53] was finally included. However, the paper by Holgersson & Aaboén [54] was added to this review paper due to the direct relevance of its content. Interestingly, both reviews focused specifically on trademarks or patents respectively, rather than IP in general, thus highlighting the current lack of a comprehensive overview on this subject that we noted above.

4. Results

4.1. Descriptive results

The publication dates of the 95 articles range from 1992 to 2024 but are skewed towards recent years, with more than 50 % of the publications dating 2016 and later (see Fig. 3), indicating an increasing academic interest in the topic. Nine of the papers are categorized as conceptual, dedicated to theory building, with 6 of them dating before 2016. In contrast, the sample provides 20 empirical qualitative and 66 empirical quantitative papers, revealing IPM in SMEs is identified as a growing field of practical importance.

The dataset covers a total of 18 different countries, with Europe (26 references), the United States (20 references) and China (12 references) being the most frequently represented. In terms of industry relevance, 29 papers explicitly acknowledge the importance of industry or sector in the use of IP by SMEs. Within these, manufacturing (21 references) and high-tech industries (19 references) are most prominently featured.

While industry context and geographic or jurisdictional context are recognized in the literature as significant factors affecting IP management in SMEs—our analysis summarized in the body of this paper, taking into account the broad range of contexts from which the pertinent studies have emerged, suggests that future research focused explicitly on these themes would generate valuable fresh insights for management and policy concerned with IP and SMEs (see Table 1).

The leading journals are listed in Table 2, with the three most prominently represented journals—namely, *Research Policy*, *Technological Forecasting and Social Change* and *Technovation*—representing 31.6 % of the sample. In their own literature reviews both Holgersson & Aaboén [54] and Cao et al. [56] also identified the three aforementioned journals as the most important contributors to intellectual property

management, thus corroborating the view that the set of articles on our study is a representative sample (see Table 3).

Interestingly, the 10 leading entrepreneurship journals, as identified by Nikou et al. [59]—which, while not exclusively concerned with SMEs, are nevertheless also leading outlets for SME research—represent in combination only 11.6 % of our sample. This supports the hypothesis that while the importance of IP for smaller companies has been highlighted in a number of articles (e.g., Ref. [11,35,43]), within the broader management literature IP use still tends to be viewed as belonging primarily to the domain of innovation and technology management, and not so relevant to the management of SMEs, as such, even though a significant, if not the majority, of contemporary enterprises engaged in technological innovation may also be SMEs. Of the total of 50 distinct journals in our sample, a full 37 contributed only one article each. While, on one hand, this dispersion of the literature reveals the diversity of business topics affected by IP and that managing IP has entered many fields of academic discussion, on the other hand it also suggests that a coherent, comprehensive and explicit overview of the impact of utilizing IP on the business of SMEs is still lacking.

When our sample of 95 publications is viewed from the vantage point of management theory, two perspectives or frameworks are predominant, namely, the resource-based view of the firm [60] and signaling theory [61].

When the sample is viewed from the vantage point of specific themes, two themes in particular are prominent. The first, mentioned in 19 papers, is that the single largest impact of IP on business is the sustainable increase in sales associated with a firm's investment in patents [62–64]. The second, mentioned in 17 articles, is the impact of IP on the attraction of venture capital (VC) financing [6,15,65]. Both areas are important for SME growth [43], especially for SMEs engaged in entrepreneurial technology business, which makes the low attention devoted to IPM in the SME literature even more surprising. With regards to the form of “intellectual property” discussed in our sample, two broad categories may be distinguished: (1) informal protection measures for IP-like intangible assets, consisting of practices such as secrecy [66] or generating profits through market lead time by exploring learning curve advantages of unpublished technology [67]; and (2) formal IP encompassing, for example, patents, trademarks, copyright, trade secrets and design rights. Patents as a stand-alone type of IP are discussed in 55 articles, while informal means of knowledge protection are discussed in 19 articles and trademarks in only eleven. The strong emphasis placed on patents underlines the importance of IP for SMEs but raises questions as to why the management of a broad array of IP assets, including both patents and other types of IP, for business optimization by practitioners has not attracted more attention by researchers.

Details of the managerial aspects of SMEs affected by IPRs, and how

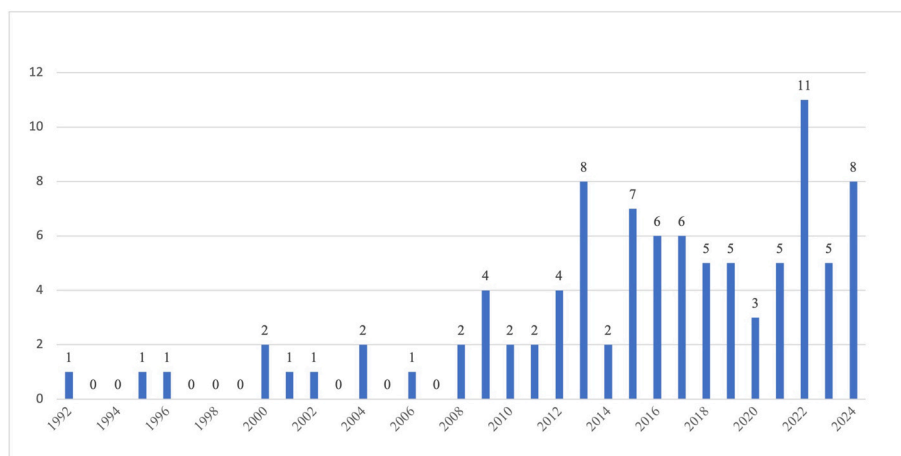


Fig. 3. Time distribution of sample publications.

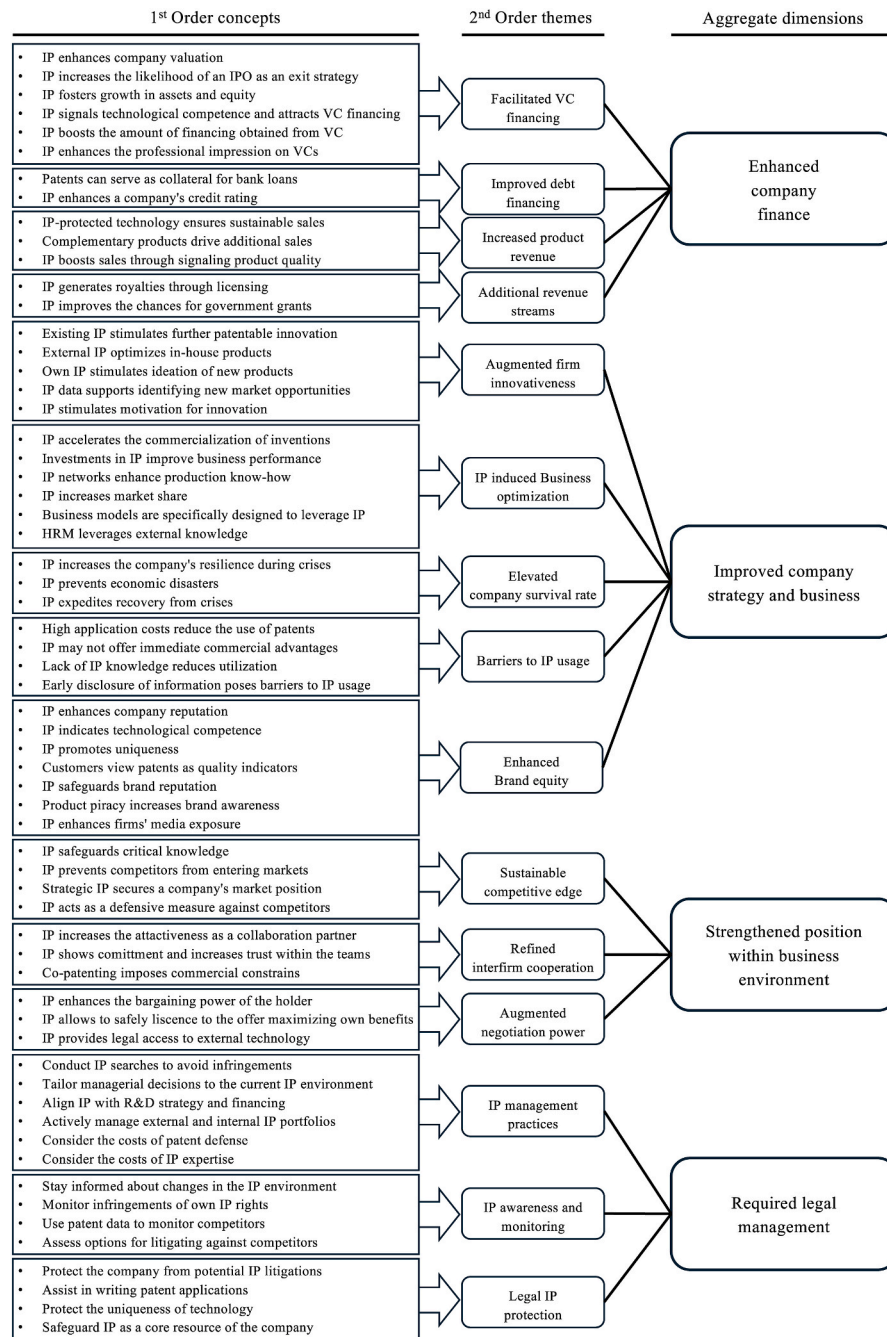


Fig. 4. Data structure derived from first-order concepts, second-order themes, and aggregate dimensions.

Table 1

Previous literature reviews of IP management.

Author (Year)	Systematic Review	Quality filter applied	Sample Size	Databases used as sources	Observation
Bazan [55]	Y	X	39	Web of Science; EBSCO	Low sample size, no quality criteria applied
Cao et al. [56]	Y	Y	71	Web of Science, EBSCO	Quality filter: Social Science Citation Index (SSCI) journals
[54]	Y	X	108	Web of Science	No quality filter, no exclusion criteria
Sanz-Prieto et al. [57]	X	X	X	X	Narrative review as basis for qualitative study
Yi & Fengyan [58]	X	X	X	X	Narrative review, Geographical provinces as units of analysis
Our study	Y	Y	95	EBSCO Global Search, Emerald, ScienceDirect, Web of Science Core Collection, SAGE	Research articles from peer reviewed academic journals: VHB JOURQUAL $\geq$ C, JCR $\geq$ 1.5, ABS $>$ 2, four described exclusion criteria, process according to Tranfield

Table 2
Journals most represented in the sample.

Journal	No. of articles	H-Index	Journal Impact Factor
Research Policy	17	289	7.5
Technological Forecasting and Social Change	7	179	12.9
Technovation	6	159	11.1
Journal of Business Venturing	5	224	7.7
Journal of Business Research	3	265	10.5
Small Business Economics	3	167	6.5
Management Decision	3	126	4.1
World Patent Information	3	37	2.2
Journal of Engineering and Technology Management	3	75	3.7
Management Science	2	153	4.6

Table 3
Barriers to use IPRs for SMEs.

Source	Barrier to use IP	SME specific implication
de Rassenfosse [8]	High application cost for patents	SMEs often operate with limited and inconsistent cash flows, making it difficult to allocate resources for specialized IP consultants, application fees, and the internal opportunity costs associated with diverting personnel from core operations.
European Patent Office [91]	No immediate commercial return for IP investment	Given their constrained financial horizons, SMEs struggle to absorb the high upfront costs of IP protection, especially in the absence of short-term revenue streams linked to these investments.
Hall et al. [45]	Lack of IP application process and management know-how	The absence of in-house intellectual property expertise within most SMEs hampers their ability to navigate complex IP procedures, thereby discouraging engagement with formal protection mechanisms.
Henkel [92]	Early disclosure of core information required	Disclosing proprietary knowledge as part of the IP application process poses a strategic risk for SMEs, as it may compromise their competitive advantage and expose them to imitation.
W. Hu et al. [93]	Cost of patent defense	SMEs are generally unable to afford the substantial legal and administrative costs associated with defending their IP rights, particularly in disputes with larger, better-resourced entities.

practitioners may leverage IP strategically for their ventures, will be discussed in Section 4.3 following.

4.2. Overview of results

In accordance with the analytical technique described in Section Three, we generated an integrated, organization-based framework of business functions within SMEs impacted by intellectual property (Fig. 4). The first order concepts—which were deduced through a systematic iterative process, ensuring their homogeneity, validity and reliability throughout the literature sample—represent the direct impact of intellectual property on the business of SMEs. By grouping these first-order concepts thematically, second-order themes emerged, describing the consequences of the use by enterprises of IP and IP rights. Further combining these themes led to the identification of four aggregated dimensions, which define the managerial areas of enterprises affected by

the us IP: (1) enhanced company finances, (2) improved company strategy and business, (3) strengthened position within business environment, and (4) required legal management. The literature was then used to model how IP impacts the four business functions. The sequence of the four aggregated dimensions in Fig. 3 is arbitrary.

We labelled the first aggregated business dimension as “Enhanced Company Finances” (EFC), describing how formal intellectual property improves the finances and financing of SMEs. This dimension includes two major sub-dimensions: (1) sales (organically generated money) and (2) external financing. The first addresses how companies increase their sales through either selling complementary products or adding new revenue streams from out-licensing. The latter describes how formal IP may ease company financing either through attracting VC investment or using the IP as collateral for debt.

The second aggregated dimension, “Improved Company Strategy and Business” (ICSB), encompasses decision-making and the impact formal IP has on internal company processes. Despite several barriers to the use formal IP, doing so supports company innovativeness and options for business process optimization. Moreover, it helps optimizing internal business processes and enhance brand equity. Lastly, but most importantly, obtaining and exploiting formal IP increases the survival rate of SMEs [10,68] in an environment where most of companies fail [69].

The third aggregated dimension, “Strengthened Position within Business Environment,” illustrates how formal IP enhances a company’s external standing by (1) providing a competitive edge, (2) fostering trust in interfirm cooperation, and (3) increasing the company’s bargaining power. The last aggregated dimension, “Required legal management,” encompasses all tasks essential for effectively the generation, possession, exploitation and management of IP and IP rights. Unlike other aggregated dimensions, this one focuses on the active tasks necessary to ensure the management of IP functions properly, rather than the impact of IP on the company. This includes adopting sound legal IP practices for safe navigation, maintaining awareness and monitoring competitors and the broader environment to prevent unauthorized use of IP, and ensuring adequate legal protection.

Each of the four aggregated dimensions identified during our systematic analysis of the pertinent literature incorporates consideration of IP factors that are relevant to both academic theory and practical application within SMEs.

4.3. Enhanced company finance

This section focuses on providing an overview on the impact of IP management on various financial aspects of SMEs and explores the resulting implications for practitioners. Generally, the impact of IPM on the finances of SMEs can be subdivided in two categories: (1) increasing company revenue, and (2) facilitating access to external funding.

The financial impact mentioned in the largest number of papers in the sample is the sustainable increase in revenue from products incorporating protected technology. Three general explanations for this impact are provided: a) Acs & Sanders [70], B. H. Hall et al. [71] and Huang et al. [72] provide evidence that such an increase may be attributed to the use of protected technology and thus a unique position on the market; b) Agostini et al. [7] suggest that formal IP such as patents, signals elevated product quality and thus encourage customers to buy; and, c) Gans et al. [73], Conceição et al. [74] and Wen et al. [75] argue that sales of complementary products increase revenue as they are unable to be sold by competitors. Identified drivers of this impact include the restriction of choice for customers, thus the increased buying intention for the IP holder’s company in combination with several optional revenue streams.

Insights about the sales factor are augmented by de Rassenfosse [8], Eppinger & Vladova [76] and Belingheri & Leone [77], highlighting that formal IP can be licensed out to other companies and thus create royalties as an additional, passive income stream, independent of the operations of the IPR holding firm.

The IPR sales option may also enable or increase the probability of a company being eligible for support from various government innovation support programs or receiving government subsidies [23,78], an important source of additional and secure income for SMEs Garcia-Martinez et al. (2023).

Another important issue for SMEs is the acquisition of external financial resources, especially at the early stage [79], and the subsequent positive contribution that early accumulation of such resources has on overcoming potential future financial constraints of the firm [80]. In accordance with the tenets of signaling theory, IPM impacts the attitude of VCs as well as banks in favor of the new ventures. Building on this insight, and drawing upon legal concepts such as the “inevitable disclosure doctrine,” Castellaneta et al. [81] provide empirical evidence that stronger trade secret protection can significantly enhance venture capital investment in early-stage firms, particularly when intangible assets are central to its value creation. Equity financing is the second most represented topic within the sample, highlighting its importance as well for SMEs and the impact IPM can have on their business. The literature addressing VC financing identifies six phases of the process. (1) Formal IP attracts VC financing, as the information asymmetry with regards to the technology and thus the risk for the VC is reduced and, additionally, estimated sales prices for the patents or licensing business increase potential profits [6,65,82]. (2) Formal protection of intellectual assets (e.g., through patents), in particular, enhances the professional impression and signals competence of the venture towards the VC, thus leading to improved access to VC funding. While patents are seen as a signal of technological competence, trademarks are perceived as a signal of commercial confidence and expertise [83]. (3) As for SMEs, the value of their intangible IP assets can constitute a significant portion of the company value. This leads to a higher calculated valuation and thus facilitates VC financing [84,85]. (4) Improved company value in turn boosts the amount of funding sourced from VCs [15,86]. (5) At a later stage in the venture’s lifecycle the additional revenue streams induced by the sales of complementary products or from royalties increase the return on equity and the return on assets, making IPR holding companies attractive to VCs in the long run [37,87]. (6) Lastly, with regards to an exit strategy, Ceccagnoli et al. [62] and Walsh [88] suggest that the likelihood of a successful Initial Public Offering (IPO) increases if the company holds formal IPRs. Here again, VCs profit from higher-than-normal returns and thus favor financing companies with attractive IP portfolios.

With regards to debt financing, banks are mostly concerned with the risks they accrue when issuing loans to SMEs. Thus, reducing information asymmetry and providing formal IP as a calculable collateral [89, 90] improves a venture’s credit rating [16] and thus facilitates debt financing for formal IP holding companies.

In summary, IPM impacts the finances of SMEs in four ways: (1) it increases sales by suggesting quality and uniqueness to customers; (2) it allows for additional revenue streams from complementary products and royalties; (3) it enhances VC financing by reducing the information asymmetry while increasing company value; and (4) it facilitates debt financing as patents or trademarks may be used as collateral with banks.

4.4. Improved company strategy and business

This section summarizes the contributions of our sample of publications to understanding the impact of utilizing IP on the strategic and managerial facets of SMEs and adumbrates the implications of these contributions for the companies. The diversity of this cluster of second-order themes reflects the challenge of mapping precisely the impact of IPM within complex settings such as strategy formation, operations, and organizational management of a business, especially in a dynamic and volatile environment. The cluster is composed of five sub-themes: (1) barriers to IP usage, (2) augmented firm innovativeness, (3) IP induced business optimization, (4) increased brand equity, and (5) elevated company survival rate.

The most prominent barrier to the effective exploitation of IP by practitioners is the disclosure—accidental or otherwise—of relevant information early in the patent application process. This could potentially lead to a competitor using the technology intended for patenting before any protection has been granted [91]. The literature also highlights that an additional prominent cause of companies’ failure to use IP is the lack of application process know-how [45,92]. As SMEs typically do not have dedicated and specifically trained professionals with IP know-how, or sufficient resource slack to easily address IP-related challenges internally [24], outsourcing IP-related functions provides an option to overcome this internal shortfall of capabilities. However, the cost of patent agents is usually an additional burden for resource scarce SMEs [45] reducing their much-needed short-term liquidity [37]. This aligns with the arguments of de Rassenfosse [8] who states that high process costs and long application times are the major reasons for firms not using formal IP.

Additionally, the commercial value and monetary returns of formal IP only occur in the long run and thus do not provide immediate liquidity and commercial benefits, which is an important argument against the engagement in IP management for liquidity-scarce SMEs [91]. Lastly, in contrast to larger corporations, SMEs often lack both the financial capacity and the legal infrastructure required to sustain prolonged IPR litigation, which may lead to a general reluctance to pursue formal IPR protection from the outset. [93]. These results align with evidence from the European Union Intellectual Property Office [94], which found that 54 % of SMEs refrain from registering formal intellectual property rights (IPRs), citing comparable barriers such as high costs, limited perceived benefits, and insufficient knowledge.

Interestingly, the literature included in our sample contains almost no mention of a strategy that many SMEs employ to defend or enforce their rights in the face of “unfair” or aggressive competition from larger and well-resourced competitors, namely, the use of specialized professional “litigating funding” companies [95]. Such companies are typically rich in specialized IP capabilities and have sufficient capital to engage in sophisticated litigation and legal transactions on behalf of SMEs. Discussion in the management literature of such IP management options for SMEs is muted, however, possibly due to the portrayal in the legal literature of such companies with dismissive or derogatory labels such as “NPEs” (non practicing entities) or “patent trolls” [96,97].

A second major theme is that firms actively incorporating IPM into their overall strategy and practice tend to exhibit relatively high levels of innovativeness compared to their competitors [98]. This strategic advantage is attributable to three main factors: (a) as the practical benefits of possessing IP become more apparent, the motivation of SME managers to make their firms more innovative increases accordingly [99,100]; (b) IP data can be used to identify technology trends or market opportunities, thereby further increasing a firms innovation capability [75,101]; and, (c) these new possibilities stimulate ideation for innovation for further patentable products [102,103] or the optimization of in-house products potentially supported by external IPRs [45].

Timely amortization of R&D investments hinges on the efficient commercialization of the newly developed products. Heikkilä & Peltoniemi [17] empirically correlate IP utilization to an accelerated commercialization of inventions, attributing this acceleration to access by the firm to external manufacturing facilities, sales networks, and marketing capabilities through collaboration with established firms, with confidence that the core knowhow of their own venture remains protected. Langseth et al. [104] refer to the same argument but discuss the improved ability of IPR holders to more quickly expand internationally.

In addition to their role in facilitating enlargement of the customer base of firms, IPRs are associated with improvements to both SME business performance in general [105–107] and business performance of SMEs directed towards environmental and social sustainability [37]. This improvement may be attributed to several factors, including enhanced production know-how [19,108,109] and increased market

share for the firms' products and services [87,106,110].

This becomes increasingly important when the company's main asset is the patent or trademark [15] and thus the strategy or even the business model itself is built to leverage the formal IPRs [82]. Informal protection measures, however, have significant human resource implications, as targeted talent acquisition and employee retention is an essential appropriability and protection mechanism for SMEs [24].

While the above-mentioned aspects of managing IP concern internal improvements to the firm, IPRs also affects external elements such as brand equity. Customers view formal IP, especially patents, as an indicator of product quality [8,23,108], thereby enhancing new customer acquisition and increasing existing customer loyalty [111,112]. More specifically, Nemlioglu & Mallick [107] attribute this to a signal of technological competence, while Olander et al. [24] highlight the uniqueness of the products. Another explanation, offered by Nathan & Rosso [113], suggests that IPRs induce increases in a firm's media exposure as a cause of augmented brand equity. As brand equity increases, the possibility of IPR infringement through product piracy rises. Interestingly, De Castro et al. [114] find that within certain limits, product piracy further increases brand awareness and even improves sales of the original products. Here, IPRs allow the holder a large variety of options to respond to competition, either legitimate or from trademark counterfeiters, while safeguarding [115] and enhancing its own brand reputation [17] and thus protecting the investments in marketing [62]. The theme of the signaling effect of formal IPRs and the resulting positive effect on a firm's reputation, is highlighted by 14 papers from our dataset.

In an environment where most companies fail, IPRs help to significantly reduce the default rate of SMEs [68,116] in three ways: (1) formal IPRs increase the company's resiliency and thus makes the firm less affected by crises [10]; (2) IPRs prevent economic disasters by lowering the probability of a firm going out of business [16]; and, lastly, (3) IPRs benefit firms in recovering during a post-crisis scenario [107].

In summary, the utilization and management of IP impacts the strategy and business of SMEs on five ways. First, it presents knowledge-protection barriers that need to be overcome by potential competitors. Second, IP augments the innovativeness of the firm by supporting the ideation of new products or enhancing existing products, through either internally owned or externally sourced IP. Third, major business optimizations are supported by IP, especially if the IP represents the main asset of the company where the business model is built to leverage this IP. Enhancements include an accelerated domestic and international commercialization of the products and thus an increase in market share, an enhancement in production know-how and the attraction of talent to appropriate and protect firm know how. Fourth, formal IP enhances brand equity as customers perceive this as quality signal of increased technological competency, thus increasing company reputation. Finally, IP significantly reduces the default rate of SMEs by increasing the firm's resiliency during crises and accelerating the post-crisis recovery.

4.5. Strengthened position within business environment

Following our examination of the largely internal impacts of IP on the firm, we will now summarize our findings on the impact of IP on the company within its business environment. This section comprises three complementary themes, describing how the management of IP (1) provides a sustainable competitive edge, (2) impacts interfirm cooperation and (3) augments the negotiating power of the IP holding firm.

Gaining a competitive edge through the strategic employment of formal IPRs is a frequently discussed topic within our literature sample and is considered from a variety of vantage points. Gans et al. [73] and de Rassenfosse [8] stress that the main reason SMEs use patents is to obtain protection from imitation, thus preventing competitors from entering the market; while Olander et al. [24] adds that by using IPRs, SMEs are less preoccupied by protecting their latest product but rather strive to protect the underlying critical knowledge. In this way,

companies can block new firms from entering the market, or at least increase the cost of competitor's product development, thus making the market entry less attractive [63]. More generally, IPRs are used by firms strategically to inhibit competition developing within their market, or to prevent themselves being out-patented and thereby losing their freedom-to-operate and appropriate the returns of their own inventions, especially within the digital space [117,118]. Heikkilä & Peltoniemi [17] and Z. Zhang et al. [37] additionally describe IPRs as defensive measures and weapons against competitors with the main goal of securing and improving a firm's competitive market position [76,119]. In contrast with this view, Larsson et al. [120] argue that an open innovation policy of sharing non-core IP, especially in a digital ecosystem, may enhance social and cognitive capital, thereby allowing knowledge-providing companies to actively adapt to changing competitive landscapes while shaping their business environment to their own benefit; while Brem et al. [121] discuss the need to align open innovation with the SME's IP strategy for optimized performance. The emerging body of scholarly research on open innovation, or co-creation, and intellectual property suggests a productive line of future research in the field of IPM and SMEs [36,122].

On one hand, when cooperating with other companies, formal IP signals technological and commercial capabilities and thus makes the firm a more attractive partner leading to an improved selection of cooperation possibilities for the firm [123]. Moreover, IPRs are found to increase trust between interorganizational teams, as team members do not have to fear the misuse or exploitation of their knowledge [124]. Additionally, Delerue [125] points out that joint patenting increases the expectation of continuity and thus the commitment towards the project and thus fosters cooperation between teams and firms. On the other hand, co-ownership of a patent might strengthen the perception of commercial uncertainty of among the cooperating SMEs and thus might impose some commercial constraints such as reduced VC investments [23].

The third theme related to improving the IPR holding firms' position in the business environment is its increased negotiation power. Strong formal IPRs provide the knowledge creator with a strong bargaining position and thus increases the potential share of revenue extracted from their invention [70,82]. Haefliger et al. [18] suggest that this is related to the commercialization of the new products being dependent on the tolerance of the exertion of its rights by the IP owner. A suggested quantification of this advantage is provided by Hiller et al. [126]. Additionally, holding formal IP allows companies to outsource parts of their business safely to another company and thus, for example, license the manufacturing of their products to a firm that enables the IP holding firm to maximize its benefits [17], as described in Section 4.4. Lastly, the legal in-licensing by a firm of externally generated technology and knowhow supports improvements of its own product features, innovativeness or quality as well as related production processes, which in turn strengthen the negotiation position of the company [77].

In summary, the intelligent use of IP ameliorates the position of an SME within its business environment by providing a sustainable competitive advantage by hindering competitors entering their market while protecting the core know-how of the company and thus reducing the freedom to operate of rivals. Possessing and actively managing IPRs also allows improved interfirm cooperation by increasing the attractiveness for potential partners by signaling technological and market competence, increasing trust within the project teams that their shared knowledge will not be misused, and signaling commitment for a long-term cooperative engagement. In general, the negotiation power of the knowledge creator is improved as holding a scarce resource increases its bargaining power. Moreover, it allows selection of other firms that might employ the IP, thereby maximizing its own benefits. Lastly, IP also allows legal internalization of know-how to optimize a firm's own products and processes.

4.6. Required legal management

In contrast to the three aggregated dimensions just summarized, this cluster of themes consolidates the tasks that a firm must actively carry out to benefit properly from their IPRs. The section addresses three themes: (1) the IP management practices within the SME, (2) the monitoring of the IPR landscape and (3) the requirement for professional advice to legally establish and protect the IPRs.

The simplest IP management practice is to create awareness of the IPR environment through regular and systematic searches within IP databases to (a) help avoid infringing external IP and thus reduce the threat of litigation, and (b) detect infringement of a firm's own IP by competitors [45,127]. This practice should be augmented by managerial decisions to ensure that the IP strategy should be aligned with the current IPR environment [19]. This includes alignment between the IP strategy, the R&D strategy and the required financing [8,76]. This comprehensive and dynamic understanding of IPM thus requires actively managing external (licensing-in) as well as internal (licensing-out) IPR portfolios [128,129]. Such active management, however, requires acquiring and maintaining IPR expertise within the firm, and consideration of the costs associated with such practices [92]. This becomes especially important when considering the cost of patent litigation in court [45,93,114]. Moreover, as Appleyard [130] emphasizes, effective IPM strategies for SMEs must extend beyond patents to include design rights and copyright—forms of IP that are becoming increasingly relevant in innovation-driven environments yet are often overlooked in traditional IP portfolios.

The awareness and the continuous monitoring of the IP landscape allow ventures to stay informed about relevant changes in the environment [131]. This enables the IP holding SME to track developments by competitors and identify technology and market trends to better inform strategic planning and action [45]. This also facilitates detection of infringements of a company's own IPRs, especially when conducting R&D and manufacturing abroad [18,132]. This in turn provides the option to litigate against the rival company when appropriate [17,93].

Lastly, professional legal support can assist in writing patent applications [127] thereby not only increasing the chances of a patent being successfully granted [45], but also increasing the patent strength and thus the chances of victory in patent litigations [93]. Interestingly, no paper in our sample dealt with trademarks or design rights with regards to application support. This suggests that either the application process is intuitive enough to require little support, or that general knowledge about IP focuses predominantly on patents, overlooking other forms of IP. Our review of the literature suggests the latter of the two explanations as dispositive. A well-drafted patent enhances the protection of the uniqueness of a product or technology, making imitation more difficult [17,82,86]. This reduces the risk of IP litigation for SMEs and reinforces the uniqueness of their know-how [91]. Winning potential litigation claims, however, helps safeguard IPRs from imitation, maintaining them as core resources for the SME [73,133].

In summary, this section highlighted the importance of IP-specific management practices including systematic searches to minimize the risk of infringement of IP by either the firm itself or competitors. Information about the IP landscape may then contribute to the IPR strategy that needs to be aligned with R&D and finance strategies, while accounting for the cost of legal IP expertise and IPR defense in court. Constant awareness of changes in the IPR environment also allows tracking infringements of one's own IP while monitoring competitors, identifying market and technology trends, and keeping open the option for IP litigation. Professional legal advice also facilitates the writing and processing, or prosecution, of strong patent applications. This in turn may protect the uniqueness of a company's products while minimizing the risk of litigation. Together, these capabilities and practices help SMEs to safeguard their IPR as a core resource.

5. Discussion

5.1. Contributions

This paper adopts a practitioner-oriented perspective, synthesizing and integrating the literature on IP in SMEs, aiming to provide scholars, policymakers, entrepreneurs and SME managers with a comprehensive understanding of how to leverage existing IPRs for company benefit or why investing in new IP might be advantageous for their ventures. It reviews existing literature following a systematic and transparent approach as suggested by Tranfield et al. [21], and analyzing and synthesizing the results as suggested by Gioia et al. [22]. In this regard, our research reported here contributes to the discussion by identifying three ways in which SMEs may leverage IP to their advantage.

First, this paper advances the IP and innovation management literature by systematically synthesizing existing research on IP use in the context of SMEs. It provides researchers with a structured platform to identify suitable publication outlets and foundational articles tailored to the SME domain. The study also introduces an integrative framework that consolidates four key pillars of IPR use in SMEs, emphasizing their interconnections and relevance for future research. In doing so, it reveals critical gaps in the literature and proposes a research agenda aimed at strengthening the theoretical foundations and practical relevance of IP in innovation strategies.

Second, the paper extends the entrepreneurship literature by bridging it with the innovation and technology management literature. Through a comprehensive analysis of the benefits and requirements of IPR use, it deepens the understanding of how IPRs affect entrepreneurial ventures across business functions. This cross-disciplinary perspective fosters the integration of IP management practices into entrepreneurial decision-making and highlights their role in shaping firm strategy, resource allocation, and competitive positioning. Furthermore, the study draws attention to the *underrepresentation of IPM topics in general entrepreneurship and SME-focused journals*, thereby contributing to a more inclusive and nuanced understanding of IP-related challenges in entrepreneurial contexts.

Lastly, the paper offers practical guidance for policymakers, public authorities, and SME managers. The integrative framework identifies and explores the business functions most affected by IP management—such as finance, strategy, legal support, and market positioning—and discusses the implications of IPR use within each. For policymakers, the findings inform strategies to improve innovation policies and IP systems by reducing administrative barriers and increasing the affordability and accessibility of formalized IPRs for SMEs. For managers, the framework supports evidence-based decision-making by helping assess (a) whether IPR investment is beneficial, (b) how to unlock further value from existing IPRs, and (c) what internal capabilities are required to sustain these benefits. Overall, the study may be used to enhance the capacity of SMEs to align innovation and IP strategies with internal and external conditions, ultimately strengthening firm performance and competitiveness.

5.2. Limitations

Despite our adherence to the transparent and systematic literature review procedure according to Tranfield et al. [21], and the rigorous and peer reviewed analysis and synthesis of the findings as promulgated by Gioia et al. [22], we acknowledge some limitations of this paper. First, related to the method employed in this study, neither the absolute nor the relative strength of the observed effects of IP on SMEs have been quantified here; and, thus, we cannot specify precisely the relative merits to SMEs of different IP management practices.

The second limitation relates to the definition of an SME. While in Section Two we provide a clear definition of “SME” that we employed in our analysis, there is heterogeneity in the broader literature about the meaning of the term “SME” and, in particular, there is ambiguity in the

literature regarding the relationship between, and differences between, an entrepreneurial venture and an SME. To minimize the risk of this ambiguity producing potentially irrelevant results, we meticulously applied the four selection criteria described in Section Three to eliminate publications from our sample that were neither concerned with SMEs nor provided a clear definition (see Fig. 1). In this way we were able to overcome the problem of the definitional heterogeneity of the literature by ensuring that all the effects we identified in our sample were reported in multiple papers, regardless of variations in their stated definitions. We were thus able to generate robust results.

Third, the analysis does not distinguish findings across geographic regions or industries, despite both being recognized as significant contextual factors for SMEs in our dataset. Given that SMEs often require tailored strategies depending on their regulatory and industry environments, constructing subsamples to reflect these dimensions and deriving corresponding IPR strategies was beyond the scope of this paper. This limitation, however, offers multiple opportunities for future research.

Lastly, we cannot be absolutely certain that all relevant articles were captured by our research. To mitigate this risk, we were diligent in following the rigorous search procedures described in the methodology section, including the careful investigation of a broad range of different search terms, strengthened by sophisticated use of Boolean logic, to maximize the range of possible wordings captured in the sample. Our search terms were then also enlarged through a review by multiple academic peers to reduce any potential researcher biased limitations. Multiple permutations of additional or different keywords from additional papers also delivered no improvement in our results. We are therefore confident that our sample of publications is a robust representation of the academic state of the art in the field. Additionally, every term included in the search string was tested independently for its impact on the results, without affecting our conclusions. Finally, the set of 95 papers included in the sample for our Systematic Literature Review was completed and verified as of the end of December 2024, and thus omits any new papers that may have been published since the cut-off date of our research.

5.3. Future research

Our systematic literature review provides a foundation for further research on various topics within the management literature and identifies several specific opportunities. First, a quantitative study on the impact of IPRs on each business function described in this paper may support entrepreneurs and managers of SMEs by allowing them to make data driven decisions for their company regarding the use of available IP, or investing in generating new IP, and to allocate resources wisely based on current needs. This would also enable academics to concentrate their research on the most impactful outcomes for SMEs and the areas where IP has the greatest influence. It may thereby also help redress the current imbalance in the distribution of IP research within the broader management literature.

Second, a qualitative study could identify the specific contextual variables impacting IPM specifically tailored towards SMEs. This study would be first of its kind seeking to identify and consolidate the possible factors that would moderate the impact of IP on the business functions as stated in this paper and thus allow practitioners to assess and define the IP environment with which they are confronted across several dimensions, thus refining and improving their decision-making capability. For academics, this study would allow to better define the research environment of their future studies.

Thirdly, a confirmatory study could combine the two previous suggestions and analyze quantitatively the impact of IPRs across different business functions in SMEs within specific context dimensions. The originality would lie in quantifying the circumstantial and contingent factors determining the impact of IPRs on specific business functions within SMEs. This would not only allow practitioners to make data driven decisions about their options with management of IP, and thus

improve the success of their ventures, but also provide academics with new insights on the context specific implications of IPRs.

Fourthly, as highlighted in our discussion above of the limitations of our study, future research should investigate how the general conclusions we have drawn from our analysis need to be calibrated and enhanced to incorporate significant differences between the IPM challenges and practices of SMEs operating in different industry contexts (e.g., biotechnology, energy or software) and different geographic contexts (e.g., United States, Europe, China, SE Asia, Latin America, Africa, etc.) Valuable insights may also be gained from conducting additional research on IP management-related variations between SMEs in different intra-national contexts (e.g., metropolitan vs. non-metropolitan locations), different organizational contexts (e.g., family-owned SMEs vs. non-family-owned SMEs), different age groups (e.g., startups vs. established SMEs), or different SME size categories (e.g., micro, small and medium size firms).

Fifthly, given that the resource constraints that typify many SMEs (especially the smaller ones) in their overall business tend to constrain their ability to actively invest in generating, managing and appropriating value from their IP rights—in comparison with larger better-resourced corporations—future research should also examine empirically the strategies that SMEs pursue to mitigate or overcome these constraints.

6. Conclusions

This paper provides a consolidated overview of existing academic research addressing the impact of utilizing and managing IP on different aspects of the business of small and medium sized enterprises (SMEs) by systematically screening and synthesizing the fragmented literature. While drawing upon the extant academic literature, the study nevertheless adopted a practitioner-oriented view, thereby identifying and analyzing the four areas of business affected by IP, namely, venture finances, strategy and business, strengthened position within the business environment, and the required legal IP support, specifically for SMEs. This paper demonstrates that managing IP is a topic that is relevant not only to technological innovation or technology management, but which may be integrated into various academic discussions across the broader domain of management and business, with special relevance for SMEs, including that class of SMEs typically discussed under the rubric of “entrepreneurship.” Our systematic analysis of the existing literature enhances our understanding of the topic of IP utilization for both academics and managers concerned with how SMEs may manage IP to support innovation strategies that not only promote sustainability and social responsibility but also enable improved business performance. Furthermore, it contributes to bridging the gap between the two streams of literature—innovation and technology management literature and entrepreneurship literature with regards to IP management.

Practitioners can utilize this study to qualitatively evaluate whether investing in new IP assets would be advantageous for their company or whether existing IPRs are being fully utilized to their potential. Practitioners may also draw upon the research reported here to identify which business areas are likely to be affected and determine how effectively leveraging these IPRs could enhance their venture’s performance.

CRedit authorship contribution statement

Christopher T. Lohrey: Writing – original draft, Visualization, Investigation, Conceptualization. **Kelvin W. Willoughby:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Ethics approval

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Consent

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

#	Document Designator	Type of IP studied	IPM impact on business
1	Abreu & Grinevich [134]	Patents + Licensing	Patents garner higher sales figures.
2	Acs & Sanders [70]	Patents	Optimal IPR protection balances revenue between knowledge creators and entrepreneurs.
3	Agostini et al. [7]	Patents	Applying patents across multiple jurisdictions positively affects sales.
4	Barontini & Tagliatala [16]	Patents	Patents improve SME crisis resilience by enhancing credit ratings.
5	Barros [135]	Patents	In weak IP regimes, management techniques can replace patenting.
6	Belingheri & Leone [77]	Patents + Licensing	Licensing is an underexploited means of external knowledge acquisition.
7	Block et al. [84]	Patent + Trademark	Patents and trademarks elevate startup valuations for VC funding.
8	Block et al. [111]	Trademark	Trademarks are filed for protection, marketing, and exchange reasons by SMEs.
9	Block et al. [101]	Patent + Trademark	Efficient green innovation through patents and trademarks
10	Blümel et al. [19]	Patents + Trade Secrets + Confidentiality	IP Management strategy aligns with business goals.
11	Borg [115]	Intellectual Property	Knowledge management is crucial for firm value.
12	Brem et al. [121]	Patents; Trade Secrets; Trademarks; Copyrights	Open Innovation boosts SME performance when aligned with effective IPRs.
13	Bureth et al. [82]	Patents	The business model dictates patent importance.
14	Cao et al. [53]	Trademark	Trademarks assist SME financing and market positioning.
15	Ceccagnoli et al. [62]	Patents; Copyright; Trademark	Strong IP Management enhances sales and brand reputation.
16	Chen et al. [119]	Patents	Preemptive power shapes patent litigation strategies.
17	Cheratian et al. [136]	Intellectual Property	Intellectual property investment correlates with tech access, not sales growth in Iranian MSMEs.
18	Cockburn & Macgarvie [63]	Patents	Patent ownership ups VC funding probability and facilitates public exits.
19	Conceição et al. [74]	Patents + Licensing	Licensing of IP, particularly patents, generates revenue.
20	Cui et al. [80]	Patents	Holding patents reduces financing constraints in SMEs.
21	De Castro et al. [114]	Intellectual Resources	Legal and pirated product markets differ, with piracy sometimes boosting legal sales.
22	De Rassenfosse [8]	Patents	SMEs utilize patents for funding and operational freedom.
23	De Zubielqui et al. [109]	Intellectual Property	Both formal and informal IP protection enhance firm innovation.
24	Dehghani et al. [118]	Patents	Patents play a role in competitive positioning for VC attraction.
25	Delerue & Lejeune [137]	Secrecy	Cultural factors influence the use of secrecy over laws.
26	Delerue [125]	Patents	High interaction and transparency in R&D partnerships favor joint patenting.
27	Dushnitsky & Shaver [138]	Intellectual Property	Corporate-entrepreneur collaborations can fail due to required IP disclosures.
28	Eppinger & Vladova [76]	Patents + Trademarks	SMEs often lack IP Management expertise, viewing patents as legal, not business, assets.
29	European Patent Office [91]	Patents + Licensing	Patents secure competitive position despite high costs and early data exposure.
30	Exadaktylos et al. [110]	Patents	Patents have a significant impact on market share increases, especially for smaller firms.
31	Fan et al. [105]	Intellectual Property	Intellectual property increases total factors productivity and fosters innovation.
32	Fassin [139]	Intellectual Property	Describes ethical issues with regards to intellectual property in entrepreneurial firms.
33	Fisch [129]	Patents + White paper	Patents have no impact on the amount of VC funding in ICOs
34	Gans et al. [73]	Patents + Licensing	Strong IPRs lead firms to license out innovations for cooperative commercialization.
35	Gans et al. [140]	Patents + Licensing	Formal IP rights reduce market uncertainty and increase licensing likelihood.
36	Giarratana [116]	Patents	Patents safeguard competitive advantage, aiding survival.
37	Greenberg [65]	Patents	Software sector VC investment is boosted by patent applications.
38	Haefliger et al. [18]	Intellectual Property	Cross-industry asset use requires IP infringement caution.
39	Hall et al. [71]	Patents + Secrecy	Patenting correlates with increased sales performance.
40	Hall et al. [45]	Patents	IP Management is crucial but underutilized in SME strategies.
41	Heikkilä & Peltoniemi [17]	Design Rights	Design rights protect against imitation and aid in legal battles.
42	Helmerts & Rogers [68]	Patents; Trademarks	Patenting increases asset growth rate compared to non-patenting firms.
43	Henkel [92]	Patents	Patent licensing is hindered by procedural uncertainties.
44	Hiller et al. [126]	Patents	Patents can yield royalties and diverse income streams.
45	Hoenig & Henkel [108]	Patents	Patents indirectly promote VC funding without signaling effects.
46	Hsu [127]	Patents	Knowledge management software fosters team innovation and competitiveness.
47	Huang et al. [72]	Patents	Patents escalate company revenue.
48		Patents; Licensing	Patent citations and alliances aid in out-licensing.

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#	Document Designator	Type of IP studied	IPM impact on business
49	Hu et al. [93]	Patents	Patent litigation strengthens patent robustness.
50	Hu et al. [98]	Patents	Patents increase revenue from innovation in SMEs.
51	Hynynen [141]	Trademark; Trade name; web site	Trademarks, trade names and web sites as proprietary marketing information are not widely spread and barely known.
52	Jee & Sohn [123]	Patents	Moderate patent overlap shows promise in R&D partnerships for tech firms.
53	Jiang et al. [64]	Patents	Returned educated individuals boost innovation and new product sales.
54	Jung et al. [10]	Patents	Patent-related R&D investment can aid survival during downturns.
55	Kay et al. [142]	Patents	Patenting fosters product commercialization.
56	Kou et al. [143]	Patents	Government subsidies and VC backing affect patent output and new product revenue.
57	Zhang et al. [6]	Patents	Patent backing influences VC funding amounts.
58	Langseth et al. [104]	Intellectual Property	IP Rights awareness protects against imitation, aids globalization.
59	Larsson et al. [120]	Intellectual Property	Sharing non-core IP enhances social and cognitive capital for entrepreneurs.
60	Leiponen & Byma [128]	Patents; Speed to market; Secrecy	Patents are preferred for R&D-intense SMEs collaborating with universities.
61	Li et al. [106]	Patents + Trade Secrets + Trademarks + copyrights	Trade secrets and trademarks outperform patents in enterprise performance.
62	Liu et al. [85]	Intellectual Property	Appropriate IP protection elevates SME value.
63	Lv et al. [23]	Patents	Co-patenting can reduce SME market value.
64	Matricano [144]	Patents	Female-led high-potential firms see sales boosts with patents.
65	Mina et al. [78]	Patents	Patent ownership can increase EU SME grant chances.
66	Miric et al. [117]	Patents + Trademarks + Copyright + Speed to market + Secrecy	Informal protection is the choice of smaller firms, formal for larger entities.
67	Morales et al. [112]	Patents + Trademarks + Copyright + Speed to market + Secrecy	Informal IPRs contribute to sustainable business success.
68	Munari & Toschi [15]	Patents	Core technology patents draw VC investment in startups.
69	Nathan & Rosso [113]	Patents; Trademark	Trademarks significantly impact new product sales.
70	Nemlioglu & Mallick [107]	Patents; Trademarks	Patents and trademarks buffer against economic crises.
71	Nilsen & Raknerud [99]	Patents	Patenting increases the R&D activity in SMEs.
72	Odei & Hamplová [145]	Utility Model	Utility models boost SME product numbers and sales.
73	Olaisen & Revang [124]	Formalized IPR	Formalized IPRs strengthen inter-organizational trust and innovation.
74	Olander et al. [24]	Patents + Trademarks + Copyright + Speed to market + Secrecy	HR management is a strategic tool for safeguarding secret knowledge.
75	Pickernell et al. [146]	Patents; Copyright; Trademark	Robust IP fosters export success.
76	Riquelme & Rickards [86]	Patents	Patents support SME VC funding, particularly in second selection stage.
77	Roland et al. [131]	Patents	Being first to patent doesn't ensure market success.
78	Roma et al. [147]	Patents	Crowdfunding success and professional investment likelihood increase with patents.
79	Schmiele [132]	Intellectual Property	Weak IPR protection increases infringement risks.
80	Shaik et al. [148]	Intellectual Property	SMEs investing in the protection of their intellectual property show sustainable growth.
81	Shuwaikh & Dubocage [149]	Patents	Backing by Corporate Venture Capital boosts patent performance.
82	Tagliatalata & Barontini [150]	Patents	Patent filing increases sales, actual patent use does not.
83	Thomä & Bizer [102]	Patents + Trademarks + Copyright + Speed to market + Secrecy	Selective IP protection correlates with innovation and revenue in small firms.
84	Ueda [133]	Patents	Valuable collateral leans entrepreneurs towards VC over loans.
85	Walsh [88]	Trademark	Trademark vigilance is crucial to prevent genericization.
86	Wen et al. [75]	Patents	Discusses IBM's IP strategy supporting the open source software (OSS) community stimulating new OSS product entries by start-up firms.
87	Yang et al. [89]	Patents	Optimal firm age and patent numbers aid in financing acquisition.
88	Yang et al. [90]	Patents	VC-backed patents serve as better loan collateral.
89	Yin et al. [151]	Patents	Awareness of patent trolls can spark R&D investment and increase patent value.
90	Zhang et al. [37]	Patents	Patents enhance SMEs' long-term economic performance and Return on Assets.
91	Zahra [87]	Patents	Patents influence sales growth, market share, and Return on Equity.
92	Zhao et al. [103]	Patents	Active patent management boosts high tech firm profits.
93	Zhaao et al. [152]	Intellectual Property	IP risk requires active internal and external management.
94	Zheng et al. [100]	Patents	IPR regulations significantly influence innovation by patent count.
95	Zhou et al. [83]	Patent + Trademark + Secrecy	Secrecy alone doesn't impact VC funding; combined patents and trademarks do.
A	Holgersson & Aaboen [54]	Trademarks	Lit Review: Research provides a to simplistic view on IPRs ignoring the diversity of IPR possibilities.

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Christopher T. Lohrey is a doctoral researcher at HHL Leipzig Graduate School of Management, specializing in innovation management with a focus on SMEs. He holds a Master's degree in Aerospace Engineering from the University of Applied Sciences in Bremen and an MBA from Mannheim Business School. His research and professional activities center on the intersection of technology management and SME organizational development, with an emphasis on fostering sustainable growth among German entrepreneurs. With a decade of experience as a consultant, Mr. Lohrey has developed extensive expertise in supporting SMEs to achieve long-term, sustainable growth.

Kelvin W. Willoughby is Professor and Chair Holder in the Stiftungsfonds Deutsche Bank Chair of Innovation Management and Entrepreneurship, at the HHL Leipzig Graduate School of Management. He is an expert on the management of intellectual property, technology-based entrepreneurship, and strategic planning for technology-based industry development. He holds doctorates in both strategic management and technology studies, and a Master's degree in intellectual property law. Professor Willoughby has extensive experience as a university professor, researcher and industry consultant in the United States, Europe, Asia, Australia and Russia; and has directed internationally prominent graduate programs in both business administration and the management of technological innovation. He is active as both an academic and as a trainer and advisor to industry and government.