

Intellectual capital and sustainable start-up performance: a bibliometric analysis

Jumana Nalakam Paramba¹, Aidin Salamzadeh^{2*}, Samsudheen Karuthedath³, Md. Mizanur Rahman⁴

^{1,3} Department of Commerce and Management Studies, Farook College, India

² Faculty of Management, University of Tehran, Iran

⁴ BRAC Business School, BRAC University, Bangladesh

*Corresponding author E-mail: salamzadeh@ut.ac.ir

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Abstract

Intellectual capital (IC) and sustainable start-up performance (SP) are the two pillars required for the survival of ventures. Besides, the competitiveness of new ventures is ensured by the importance of intangible assets within the firm as well as strategies implemented by the start-up founders. This study aims to map the conceptual structure of research on intellectual capital and sustainable start-up performance conducted between 2002 and 2021 using bibliometric citation analysis. For that purpose, 292 papers from the Scopus database are scrutinized further to determine the publication activities of the concerned area. VOSviewer and Excel software were used to analyze the data. It is found that the publication activities of intellectual capital and SP are a relatively new concept that emerged in 2002 and is showing a favorable trend. The study discovered that most intellectual capital studies focus on sustainable start-up performance, innovative capabilities, and knowledge management practices.

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1. Introduction

Recent advancements in the sphere of entrepreneurship and new ventures necessitate the implementation of entrepreneurial strategies as well as knowledge resources. This knowledge can be acquired through developing quality human resources [1] and their degree of interaction with the external world [2]. For instance, business communities in Silicon Valley create top start-ups with trillions of valuations each year, and more unicorn start-ups emerge in such business environments [3, 4]. Even if this is the case, start-ups are particularly vulnerable to the risk of newness; then, the likelihood of failure for newly founded initiatives is higher than for established corporations [5]. As a result, the government, business incubators, and universities are tasked with improving the success of these ventures by providing financing, networking, and advisory services [6, 7].

Likewise, initial difficulties can be managed by incorporating the most appropriate resources for their activity [8]. As a result, the worth of intangible assets within the business becomes apparent, and intellectual capital is necessary to achieve greater value. As per many literature review analyses, intellectual capital consists of human, relational, and structural capital [9, 10, 11, 12, 13]. It is also essential for founders with educational qualifications, previous experience, and entrepreneurial backgrounds to create a start-up into a scalable business model [10]. Therefore, a person with these abilities can easily investigate business prospects, manage business circumstances, and assess project outcomes. In that case, accumulating intellectual capital emerges for the success of new companies [10].

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Intellectual capital has a significant role in knowledge creation, innovation, and competitive advantages [14]. Besides, intellectual capital is essential for satisfying the needs of specific organizations or offering benefits to such organizations. These advantages include making it easier to secure capital, increasing corporate image, and lowering transaction costs [15, 16]. However, appreciating intellectual capital's role in forecasting and driving performance and the importance of supporting innovative processes requires having a firm grasp of the connection between intellectual capital and the financing of start-ups [17]. Even if this is the case, start-ups are affected by many challenges at their initial stages, such as recruiting the right human resources, identifying business opportunities, selecting the best marketing strategies, etc. Then, studies concerning contributing factors of success and failure in new ventures provide insight into entrepreneurship research.

For various reasons, intellectual capital's importance in studying entrepreneurship or start-ups in the business sector has risen considerably in recent decades. First, intellectual capital provides businesses with a long-term competitive advantage, impacting new entrepreneurial ventures' feasibility and long-term viability. Second, strategic management research has demonstrated the importance of maximizing one's knowledge assets and their use [18]. Companies must have the proper dynamic capabilities to operate successfully in highly dynamic and competitive environments. As a result, studying the relationship between intellectual capital and entrepreneurship has become critical for new projects and a competitive component for established businesses seeking long-term success [18]. However, most of the earlier studies relating to intellectual capital and start-ups were empirical research [19, 20, 21, 22]. However, less attention has been given to evaluating and organizing literature for further understanding using e-bibliometric analysis.

The bibliometric analysis gives us a new way of looking at academic publications. The bibliometric study uses many different methods, such as citation and co-citation studies, counting the number of publications, and bibliometric mapping. It shows us things about the growth of scientific knowledge, untapped potential, and unique points of view that were hidden before [23]. The bibliometric analysis says that citations show what work has been done in the scientific community in the past and the present [24]. Bibliometric analysis has also been used to track how research has changed over time in business, management, marketing, and entrepreneurship [25].

Thus, the main objective of this paper is to conduct a bibliometric analysis and identify a research gap in the studies of intellectual capital and sustainable start-up performance. To achieve the fundamental objective, the study addresses the following research questions: (i) What are the current publication trends in intellectual capital and sustainable start-up performance in terms of their journal, author, countries, and research domain, (ii) Which theoretical foundations have served as the basis for the development and expansion of the intellectual capital–start-up literature in the past?, (iii) What is the essential keyword used in intellectual capital studies?, (iv) What are the gaps and areas for further research?

To address such research questions, we conducted a quantitative bibliometric study of two hundred ninety-two (292) articles from the Scopus database from 2002 to 2021 taken for data analysis. To the best of our knowledge, there are no comprehensive quantitative bibliometric studies of the impact of intellectual capital on start-ups in the publications. The current study aims to close this knowledge gap and serve as a springboard for more research and development in the relevant field. Furthermore, the researchers believe that this study will act as a trigger for future research. The literature review conducted for this study used a quantitative bibliometric methodology, which allowed researchers to uncover the pre-existing scientific roots of the intellectual capital–start-up literature and identify current topic trends and new trajectories in the field. This research identified and investigated potential relevant future research avenues by completing a qualitative content analysis on a selection of the publications included in the study.

2. Theoretical background

The concept of intellectual capital has a broad scope for a knowledge-based economy. Firms occupied with efficient workers, infrastructure, and networking with the outside world generate knowledge management

practices [9]. It is the total of all the nonmonetary resources available in the organization [26]. These resources also reflect their qualities in innovation generation, adoption, degrees, and types [12]. Skills and knowledge possessed by human resources are the results of human capital investments. The entire task-related and non-task-related components are essential for creating organizational value [27]. Similarly, the success of start-ups depends on how they are effectively working in a group, their level of interaction, and their ability to coordinate their activities [28]. Then, they are looking to add a diverse workforce to the start-up firm, and thereby different cultural diversity can be acquired from these. Startup companies are newly formed businesses with great development potential. On the other hand, businesses face numerous hurdles in the early stages, including financial, technological, and managerial ones. Many of these businesses fail in their early stages as a result of the financial crisis. While highly-skilled companies can attract large investors, many entrepreneurs struggle to find venture capital and angel investors. In addition to that, there are now various business incubators and accelerators to help new companies, and it has been discovered that these organizations are required to manage the challenges they experience in their early phases [29]. Business incubators assist their tenants by offering physical support, mentoring, and networking opportunities both within and outside the start-up community. Similarly, incubator managers are developing dynamic leadership styles to deal with various social and cultural concerns [30]. According to the Resource-Based View Theory (RBVT), every founder must bring down essential and vital resources as well as varied strategies within the firm. As a result, the accumulation of intellectual capital, as well as varied marketing and financial strategies, helps new ventures survive [26]. Nowadays, colleges and educational institutions are also offering talent, infrastructure, and incubation space to develop new start-ups [31]. In a nutshell, all elements of the start-up ecosystem, such as start-up founders, incubators, financing agencies, educational institutions, and other stakeholders, work together to make start-ups successful. Thus, the first component of intellectual capital has wide application in the field of entrepreneurship research. Relational capital is another component that plays a significant role in enhancing entrepreneurial growth. It measures how they are connected with universities, educational institutions, funding agencies, and customer-supplier groups [32]. It may also take the form of internal and external ties [33]. Structural capital can be either in the form of explicit or implicit form, and all the resources, databases, infrastructure, and manuals are necessary for the smooth running of the enterprises [34]. In total, this intellectual capital is accumulated to create uniqueness in start-ups. Therefore, it is necessary to evaluate the studies conducted by start-up funders from a resource-based view and knowledge application.

3. Research method

The systematic literature review may take different forms, such as Meta-analysis, theory-based, hybrid-based, and bibliometric analysis [13, 35, 41, 62]. The present study is based on bibliometric analysis, which is a quantitative tool for measuring a large number of databases [3, 36]. For this purpose, we seek to collect information on intellectual capital in entrepreneurship research by examining publication trends in terms of authors, articles, institutions, and countries. The scope of intellectual capital has wide application in today's competitive world, especially in the field of innovation in entrepreneurship. To collect data for the study, data were retrieved in January 2022 from the Scopus database, and data for the period of 2002 to 2021 were used for further analysis.

First, a comprehensive search in Scopus was conducted using keywords derived from a rigorous examination of publications in the disciplines of intellectual capital and start-up success. Although the Web of Science (WoS) has long been the most popular venue for authors to acquire scientific evaluations, Scopus is catching up [37]. The fact that Scopus has so many databases is one of the reasons for its popularity [38]. While that would be sufficient motivation to employ Scopus, we believe the field's evident immaturity is the primary reason. Because this field is still expanding, we decided to broaden our search for literature in this area. Scopus indexes most of the journals in WoS and many more, but many of the WoS indexes are not indexed in Scopus [39]. Search terms include ("Intellectual capital" and "Performance", and "Startup") for measuring titles, abstracts, and keywords. Notable, we excluded the papers that were not relevant to sustainable business performance. Again, the search

is limited to the English language and research articles published in finance, management, and social science disciplines.

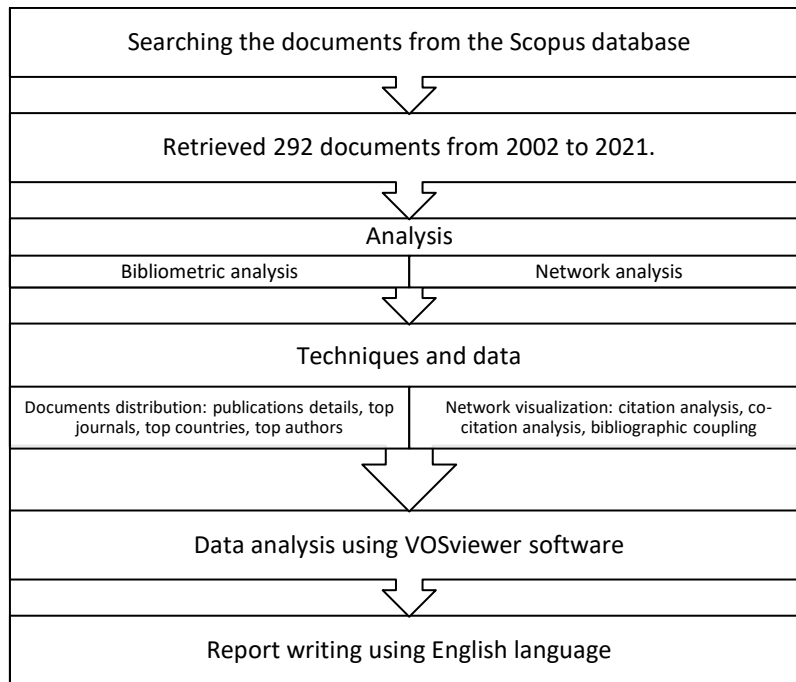


Figure 1. Publication search and report writing strategy (Source: authors’ elaboration)

Then, the final paper for conducting bibliometric analysis consists of 292 articles. The overall methodology is shown in the following Figure 1. Data analysis is done through VOSviewer software [40]. It helps to construct and view bibliometric networks, such as networks of journals, researchers, or publications that are based on citations, bibliographic coupling, co-citation, or co-authorship links [41]. Other types of bibliometric networks include co-citation networks and co-authorship networks. VOSviewer also offers text mining tools that may be used to create and view networks of terms that appear together in a body of scientific literature. These networks can be created and seen by using text-mining features. Besides, citation analysis, co-citation analysis, bibliometric coupling, co-occurrence, etc., are used to understand publication activities of intellectual capital and sustainable start-up performance from 2002 to 2021.

4. Results and discussion

4.1. Publication trend of intellectual capital and [sustainable] start-up performance

Figure 2 shows the trend in the publication of intellectual capital and sustainable start-up performance from 2002 to 2021.

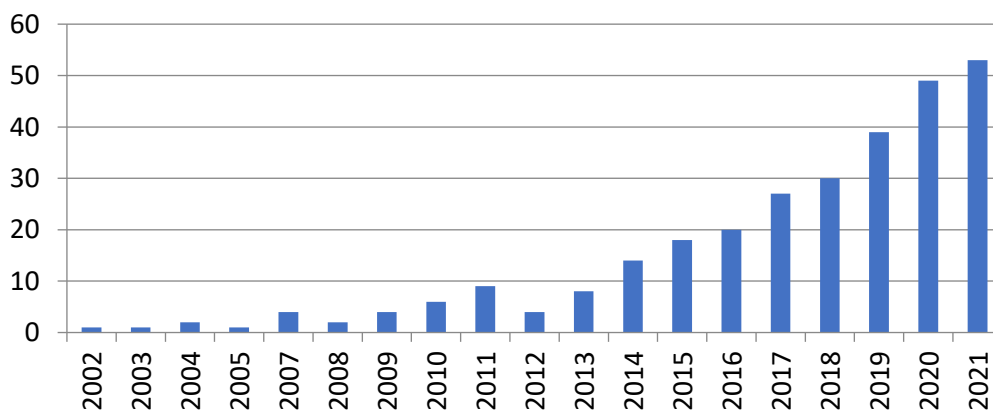


Figure 2. Publication trend of intellectual capital and [sustainable] start-up performance

The figure depicts that the use of intellectual capital to assess start-up effectiveness is relatively new, having begun in 2002. However, it has been steadily increasing in recent years. The most important years of this publication activities are 2021 (53 articles), followed by 2020 (49 articles), and 2019 (39 articles).

4.2. Top authors, institutions, and countries of intellectual capital and start-up performance

Table 1. Top authors, institutions, and countries of intellectual capital on entrepreneurship research

TC	Author	TP	TC	Organization	TP	TC	Country	TP
526	Kianto A.	7	307	McMaster University, Canada	2	700	UK	30
399	Bontis N.	6	103	Lappeenranta University of Technology	2	696	US	20
284	Sáenz J.	5	92	Lincoln University	2	641	Spain	23
255	Aramburu N.	3	63	Qingdao Agricultural University	3	599	Finland	10
241	Ritala P.	3	54	University of Canada	2	596	Canada	10
241	Vanhala M.	3	47	Vigo University	2	417	China	21
141	Xu J.	5	43	McMaster University	2	322	Australia	10
99	Wang Z.	2	42	University of Kent, UK	2	300	Jordan	6
96	Novasj. C.	2	38	Sichuan University, China	2	263	Portugal	11
95	Alves H.	2	32	Jiangsu University, China	2	242	Malaysia	35
92	Wang B.	2	29	University of Lincoln, United Kingdom	2	168	Ireland	6
90	Andreeva T.	3	29	University of Castilla-La Mancha, Spain	2	168	Russian Federation	13
90	Garanina T.	3	25	University of Castilla-La Mancha, Spain	2	158	Italy	18
73	Jordäor. V.D.	2	25	Kainan University, Taiwan	2	158	Taiwan	9

Table 1 displays the citation and productivity of intellectual capital publications by authors, institutions, and nations. According to the number of citations, the leading authors in the field of intellectual capital on entrepreneurship research are Kianto (526 citations) and Bontis (399 citations). In terms of the number of publications productivity, Kianto is the most productive author with seven publications. Likewise, McMaster University, Canada, is the top institution in the publication activity with 307 citations, followed by Lappeenranta University of technology with 103 citations. Qingdao agricultural university placed first rank with three publications in terms of productivity. In terms of publication activities of intellectual capital on [sustainable] start-up performance, Malaysia has a large number of publications (35 articles).

Figure 3 shows connected countries or regions of publication during the period from 2002 to 2012. Vos viewer identified 57 items, which are divided into ten clusters, and different colors are used to represent the countries.

In Figure 3, the most influential countries are Malaysia, Indonesia, Spain, China, and the US. The size represents the number of publications, and the connecting line shows the interconnection among different countries. From Table 1, it is clear that Malaysia is more connected with Indonesia and the UK. China is connected with Malaysia and Indonesia.

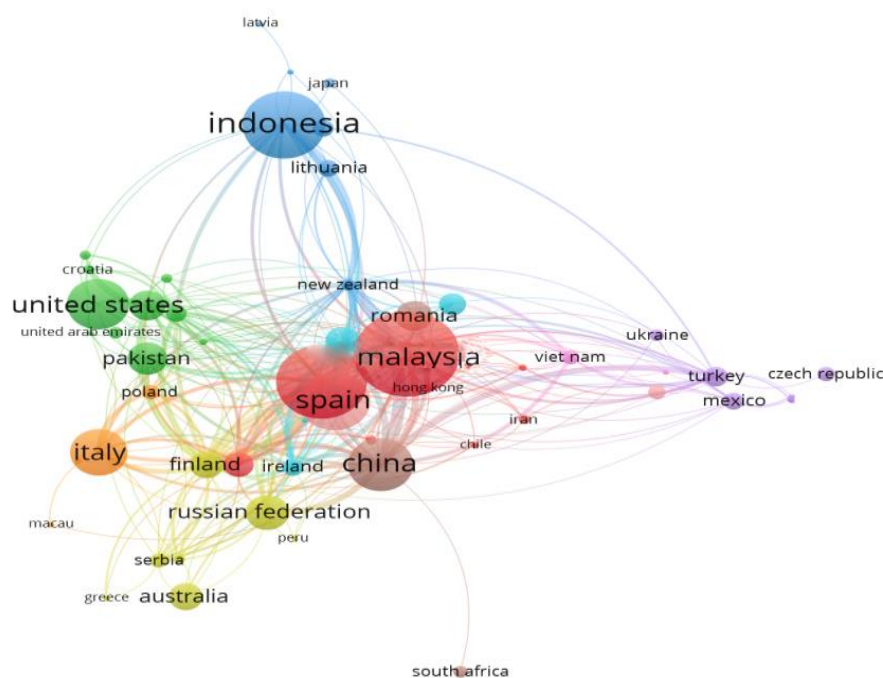


Figure 3. Top countries in intellectual capital publication

4.3. Top journals related to intellectual capital and [sustainable] start-up performance research

The top journals that publish intellectual capital and sustainable start-up performance in entrepreneurship research are presented in Table 2. Based on the number of citations, the Journal of Intellectual Capital placed the top position in the journal ranking with 1083 citations, followed by the Journal of Sustainability and Journal of Management Decision with 527 and 407 citations, respectively.

In terms of publications published, the Journal of Sustainability and Journal of Intellectual Capital had top publications published. i.e., 35 and 21, respectively. However, if we examine Table 2, the majority of the journals are indexed in the ABDC ranking list (The Australian Business Deans Council). From the analysis of Table 2, it is clear that the Journal of Human Resource Management is placed A* ranking in the ABDC list.

Table 2. Top journals on intellectual capital and [sustainable] start-up performance in entrepreneurship research

Authors	TC	TP	ABDC
Journal of Intellectual Capital	1083	21	B
Sustainability (Switzerland)	527	35	...
Management Decision	407	3	A
Journal of Business Research	305	3	C
Corporate Governance: An International Review	247	2	A
Technological Forecasting and Social Change	182	4	A
Borsa Istanbul Review	97	2
Journal of Knowledge Management	66	2	C
Human Resource Management	61	2	A*
Entrepreneurship and Sustainability Issues	59	3
Asian Social Science	57	7	C
Economic Research-Ekonomska istraživanja	54	5
International Journal of Islamic and Middle Eastern Finance and Management	54	2	B
Intangible Capital	46	4

4.4. Top articles related to intellectual capital and [sustainable] start-up performance research

Top cited articles on intellectual capital and [sustainable] start-up performance are presented in Table 3. Sharabata et al. [42] is the most cited article with the highest number of citations (289 citations), followed by Kianto [43] with 227 citations. Sharabati et al. [42] conducted a study to identify the relationship between intellectual capital and business performance in the Jordan Pharma Sector. 132 managers registered in the Jordan Pharmaceutical Association have participated in the survey. Correlation and path analysis reveal that intellectual capital components such as human capital, relational capital, and structural play significant role in business performance. A business organization equipped with innovation capabilities, creativity, and a cordial relationship with suppliers- customers are essential determinants of business performance.

Likewise, Kianto et al. [43] focused on identifying the connection between knowledge-based human resource management practices and intellectual capital for innovation creation. For that purpose, 180 Spanish companies participated in the survey, and structural equation modeling reveals that human capital plays a significant role in enhancing innovation. Further scrutiny of intellectual capital studies reveals that most of the studies are connected with the influence of intellectual capital on knowledge management [44], competitive advantages [45], and corporate social responsibility [46]. Thus, it is inferred that the concept of intellectual capital has a broad scope in entrepreneurship research.

Table 3. Top articles on intellectual capital and [sustainable] start-up performance in entrepreneurship research

Author	Articles	TC
Sharabati (2010)	Intellectual capital and business performance in the pharmaceutical sector of Jordan	289
Kianto (2017)	Knowledge-based human resource management practices, intellectual capital, and innovation	227
Clarke (2011)	Intellectual capital and firm performance in Australia	225
Kianto (2014)	The interaction of intellectual capital assets and knowledge management practices in organizational value creation	151
Yoshikawa (2009)	Convergence of corporate governance: Critical review and future directions	126
Nicholson (2004)	A framework for diagnosing board effectiveness	121
Reed (2012)	How open innovation affects the drivers of competitive advantage: Trading the benefits of IP creation and ownership for free invention	100
Ozkan(2017)	Intellectual capital and financial performance: A study of the Turkish Banking Sector	93
Hussinki (2017)	Intellectual capital, knowledge management practices and firm performance	90
Mouritsen (2005)	Dealing with the knowledge economy: intellectual capital versus balanced scorecard	89
Andreeva (2016)	Do all elements of intellectual capital matter for organizational performance? Evidence from the Russian context	81
Chu (2011)	Charting intellectual capital performance of the gateway to China	81
Sardo (2018)	On the relationship between intellectual capital and financial performance: A panel data analysis on SME hotels	77

4.5. Intellectual capital and [sustainable] start-up performance through co-occurrence analysis

Figure 4 explains the top keywords used in intellectual capital and [sustainable] start-up performance studies done from 2002 to 2021. Among the various keywords used, intellectual capital is the most widely used keyword with 181 occurrences. The other three most frequently used keywords are human capital (50 occurrences), financial performance (37 occurrences), and innovation (24 occurrences). Thus, it is inferred that the influence of intellectual capital on [sustainable] start-up performance can be evaluated by considering human capital, relational capital, and structural capital. Likewise, performances are identified by using innovation, sustainability, and financial performance. As per the knowledge-based theory, intellectual capital consists of

5. Discussions

The first finding showed that intellectual capital is the organization's intangible asset, and these components are the tools for developing innovative capabilities, managing information, and gaining competitive advantages [57, 58, 59, 60, 61]. Second, it has been discovered that intellectual capital publication activities and sustainable start-up performance are new notions that have emerged since 2002. A thorough examination of 292 papers indicated that intellectual capital studies were on the rise during this period, with a substantial number of publications in 2021. Third, Kianto is the top author in the intellectual capital publication process in terms of the number of authors, and the United Kingdom has a large number of publication activities. Finally, studies of intellectual capital reveal favorable developments in both number and quality. Most papers have received top rankings in the ABDC ranking list (The Australian Business Deans Council). Similarly, the Journal of Intellectual Capital is the most-cited journal in the field of intellectual capital research.

The study has several ramifications. To begin, management scholars interested in studying the relationship between intellectual capital and start-ups have primarily focused on aspects related to the individual components of intellectual capital and their effects on the performance and survival of new ventures. This finding is consistent across the majority of the studies that were analyzed. To address this issue, researchers have concentrated their efforts on theoretical improvements made within the same community (intellectual capital), with only minimal contributions from other communities or management theories, such as those associated with start-ups. In addition, as shown by the findings of our historical study of publishing patterns, this approach to conducting research has remained mostly unchanged over time.

Based on these conditions, it is possible to provide proposals for new lines of inquiry for studies on intellectual capital start-ups [62, 63, 64]. On the one hand, research should become more open to the ideas and suggestions of many communities of academics. For example, individuals who study start-ups or general managers should have a more incredible voice in the discussion. The contamination of complementary study fields can bring about new viewpoints and interpretations of the issues at hand, potentially improving both intellectual capital–start-up studies and intellectual capital studies in general [65, 66]. On the other hand, the data from the current literature confirms that research in the field of start-up study should take a holistic approach to intellectual capital, highlighting the existence of interactions and synergies among the various components of intellectual capital.

6. Theoretical and practical contributions

This research significantly adds to the extant body of literature in a number of ways. This study first investigates intellectual capital's theoretical foundations and critical topics using a bibliometric network-based co-citation and co-occurrence analysis of 292 publications published in the intellectual capital and [sustainable] start-up performance domain. The primary objective of this study is to provide academics with a more in-depth understanding of the topic at hand by expanding their knowledge of the topic's organizational framework and theoretical underpinning. In this particular instance, the bibliometric method was selected to record a sizeable amount of intellectual capital research carried out by various institutions from the Scopus database. Second, our results pinpoint the substantial contributions made by the major works on this subject and the available infrastructure already in place [67]. This article attempts to address the ever-increasing significance of this subject by utilizing an extensive bibliographic investigation of intellectual capital and [sustainable] start-up performance papers. Consequently, we were in a position to put them in contact with individuals who had an interest in this sector as a prospective area of study soon.

7. Conclusions

The main objective of this paper is to conduct a bibliometric analysis and identify a research gap in the studies of intellectual capital and [sustainable] start-up performance. To achieve the objective, we carried out a quantitative bibliometric analysis based on 292 papers drawn from the Scopus database between 2002 and 2021 [62]. To the best of our knowledge, no comprehensive quantitative bibliometric studies have been published on

intellectual capital's effect on start-ups. This effort aims to fill this knowledge gap and lay a basis for further research and development in the subject area so that it can continue to expand. In addition, the researchers believe that the findings of this study will serve as a foundation for further investigation in the future. This allowed them to discover the pre-existing scientific foundations of the current issue trends and unique trajectories in the field of intellectual capital–start-up performance.

8. Limitations and directions for future research

The study used bibliometric data, and various exclusion criteria were used to explore the publications' relevance. All Scopus articles written in English and social science subjects were used, which may not benefit scholars from other disciplines. Besides, intellectual capital is not the only element influencing sustainable start-up performance. Along with intellectual capital, several other factors influencing sustainable start-up performance, such as knowledge management, innovation, and competition, remain unsolved.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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