Review of Managerial Science
https://doi.org/10.1007/s11846-023-00638-9

ORIGINAL PAPER

# Digital innovation in entrepreneurial firms: a systematic literature review

**Alberto Michele Felicetti**[1] · **Vincenzo Corvello**[2] · **Salvatore Ammirato**[1]

Received: 18 June 2022 / Accepted: 27 February 2023


## Abstract

Entrepreneurial firms are central actors in the process of the generation and diffusion of digital innovation which, on the other hand, provides a wide range of opportunities for entrepreneurs. Although existing research has produced several contributions on both topics, the knowledge generated in the field appears fragmented and the findings are sometimes ambiguous. The reason for this fragmentation can be traced back to the lack of reference frameworks that clarify the most used concepts, thus providing a shared language. This study aims to consolidate the state-of-art of scholarly research published over the past 20 years at the intersection of the innovation and entrepreneurship fields of study. To this aim, we carried out a systematic literature review by analyzing a set of 185 papers in order to find what are the relevant topics in the investigated research domain. This activity was performed using MySLR software. Besides a descriptive picture of the scientific activity, a map of the literature published to date that simultaneously addresses the two themes, is provided. In particular, we characterized the six relevant topics in the investigated research domain: start-ups' collaboration networks, business-model innovation, digital platforms, digital ventures, the digital entrepreneur's profile, and digital-innovation ecosystems. Based on these results the article proposes three main research directions for future research: multi-level analysis of Digital Innovation in Entrepreneurial Ventures; interdisciplinary approaches; development of specific theories for igital Innovation. Overall, the value of research is to provide a framework for analyzing the phenomenon of innovation in and with entrepreneurial firms that can be used as a reference model for both entrepreneurship and innovation management researchers.

**Keywords** Digital innovation · Entrepreneurship · Digital transformation · Start-ups · Digital technology

✉ Alberto Michele Felicetti
alberto.felicetti@unical.it

[1] Department of Mechanical Energy and Management Engineering, University of Calabria, Rende, Italy

[2] Department of Engineering, University of Messina, Messina, Italy

Published online: 21 March 2023

**JEL Classification** L26 · Q55

## 1 Introduction

Companies today operate in an uncertain and dynamic context, within which digital technologies contribute to accelerating the pace of change (Ghezzi and Cavallo 2020) and can boost the generation of value and the exploitation of new business ideas (Spender et al. 2017). By leveraging new digital technologies, companies are transforming their business models (Kohli and Melville 2019). Not only do companies and public administrations adopt the available technologies, but they bend them to their own needs by generating new methods of use or, in many cases, helping to generate new digital tools. This phenomenon can be referred to as digital innovation and can be defined as the process of the adoption (Jeyaraj et al. 2006), generation, or recombination of new digital technologies (Lee and Berente 2012).

As observed by Autio et al. (2014), several disruptive digital innovations have been introduced over the years by entrepreneurial firms (e.g. electronic calculators, personal computers, and Internet search engines). Entrepreneurial firms have been defined as small and medium-sized enterprises (SMEs) that translate ideas and technologies into new products, services, processes, or business models (Brown et al. 2018). While for decades the scientific literature on innovation management has focused on innovations in large companies (e.g. Dougherty and Hardy 1996; Leifer et al. 2000; O'Connor and Rice 2001; Baumol 2004; O'Reilly and Tushman 2004; O'Connor 2008), more recently, a substantial amount of the literature in the field has begun to deal with entrepreneurial firms, both in terms of the fact that they produce digital innovation and that they are influenced by digital innovation in their operations (Alsaathy 2011; Bahl et al. 2021).The relationship between digital innovation and entrepreneurship is twofold. On the one hand, in recent years, digitalization has been opening up fascinating innovation opportunities for entrepreneurial firms (Secundo et al. 2020). In the digital technologies sector, where, often, the innovation processes do not require large investments and capital immobilization (Leliveld and Knorringa 2018), innovation has become accessible even to small entrepreneurial firms (Wymer and Regan 2005). On the other hand, many contributions in the literature suggest that entrepreneurial enterprises play a central role in generating digital innovation (Kraus et al. 2019a, b). Entrepreneurial firms strongly contribute to digital innovation as they play a key role in the exploration of new technological domains and market opportunities (Ferreira et al. 2019).

Digital innovation offers new opportunities for companies to increase the value created for their clients through novel products and services (Yoo et al. 2010; Åström et al. 2022), generating new business models (Richter et al. 2015) and enhancing their long-term success (Nylén and Holmström, 2015; Soluk and Kammerlander 2021). Entrepreneurial firms can use digital search to identify new opportunities for innovation and how this can impact their performance (Ardito and Capolupo 2023). Innovation can help entrepreneurial firms creating shared value, driving sustainable growth and achieving long-term success (Rubio-Andrés et al. 2022). However, entrepreneurs face challenges in identifying potential opportunities and

pursuing them effectively due to limitations in knowledge, resources, and networks. These barriers need to be addressed for entrepreneurship to drive digital innovation in firms (Khanin et al. 2022). The fields of entrepreneurship and digital innovation involve the combination of digital technologies with traditional entrepreneurship and innovation practices and results. Digital entrepreneurship can be considered as a sub-category of entrepreneurship, involving the digitization of some or all aspects of a traditional organization (Hull et al. 2007). The advent of new digital technologies has fundamentally modified the nature of the entrepreneurial process and its resulting outcomes, prompting significant questions at the intersection of digital technologies and entrepreneurship (Nambisan 2017). Scholars suggest that digital technologies break down traditional barriers and change the way entrepreneurship and innovation processes and outcomes occur, making current theories potentially outdated and leading to the need for investigation of these intersections as new phenomena (Berger et al. 2021). Actually, there is a growing divide between entrepreneurial companies that are able to effectively leverage on digital innovation and those that are not, and that this divide is largely driven by the skills and capabilities of the workforce (Shakina et al. 2021).

A considerable amount of literature on digital innovation and entrepreneurial firms exists. Several special issues of international journals have been published to stimulate the debate on the topic and several review papers have analyzed specific aspects of the phenomenon (e.g. Kraus et al. 2019a, b; Nambisan et al. 2019). While reviews of the literature exist on digital entrepreneurship (Kraus et al. 2018; Satalkina and Steiner 2020), digital transformation (Kraus et al. 2021), and digital innovation (Di Vaio et al. 2021), as well as with specific reference to SMEs (Ramdani et al. 2021), to the best of the authors' knowledge no review of the literature exists on digital innovation in entrepreneurial firms. Kraus et al. (2018) provided a qualitative literature review of "digital entrepreneurship" by analyzing 35 works. They identified the following six topics: digital business models; digital entrepreneurship process; platform strategies; digital ecosystems; entrepreneurship education; and social digital entrepreneurship. Satalkina and Steiner (2020) carried out an analysis of 52 papers with the aim of systematizing the determinants of digital entrepreneurship within three dimensions of the innovation system: the entrepreneur's profile; the entrepreneurial process; and its relevant ecosystem. A systematic literature review (SLR) on a sample of 39 high-quality papers on digital transformation was performed by Kraus et al. (2021) in which works were classified according three main clusters dealing with the societal, business, and technological impact of digital transformation. Di Vaio et al. (2021) investigated the role of digital innovation according to a knowledge-based perspective through a bibliometric analysis of 46 papers. Ramdani et al. (2021) provided a SLR on digital innovation in SMEs, analyzing 382 articles to provide a theoretical framework of digital innovation in SMEs based on three main components: digital innovation antecedents; digital innovation processes; and digital innovation performance.

The main contributions in past special issues and reviews are summarized in the Appendix. Although these works provide a useful summary of specific aspects related to the theme of this study, none of them address systematically the topic of entrepreneurial firms and digital innovation together. Because of the lack of such a synthesis,

obtaining an overview of this fragmented domain can be difficult. This is the first systematic review article to specifically address the two topics together, aiming to provide a comprehensive/integrated analysis exploring the topics, trends, methods/variables, and constructs used in prior studies integrating digital innovation, entrepreneurship, and new business ventures perspectives.

This study provides a state-of-art synthesis of scholarly research published over the past 20 years in the innovation and entrepreneurship field of study in order to provide a systematic mapping of the theoretical insights and knowledge gaps present in existing research. Furthermore, it suggests promising paths for future research on the intersection between digital innovation, entrepreneurship, and new business ventures. To achieve this goal, we used a combination of techniques. We performed bibliometric analyses aimed at understanding the main research trends (e.g. overall number of papers published, research methods used, and citations trend). The bibliometric part of the study includes a qualitative bibliometric analysis on the authors' co-citation networks using VosViewer, with the aim of identifying the main cluster of authors that have published in this field (Van Eck and Waltman 2014). The main analysis, however, is based on a text-mining approach, applying latent Dirichlet allocation (LDA) with the support of MySLR software (Ammirato et al. 2022a). This analysis allowed us to identify the main topics in the literature related to digital innovation in entrepreneurial firms.

The main result is the identification and discussion of six topics characterizing the investigated research domain. These topics are:

1. *Start-ups' collaboration networks*, comprising studies considering how an entrepreneurial firm relations impact digital innovation.
2. *Business-model innovation*, comprising studies on the relationship between digital innovation and business models in entrepreneurial firms.
3. *Digital platforms*, which have emerged as a particularly relevant type of digital technology in recent works.
4. *Digital ventures*, comprising papers focusing on the internal characteristics of the new firms.
5. *The digital entrepreneur's profile*, comprising, instead, papers focusing on the characteristics of the entrepreneur.
6. *Digital-innovation ecosystems*, comprising studies that adopt a broader perspective of the system of actors participating in digital innovation processes.

By analyzing the papers clustered into these topics, we provide an integrated view of this knowledge domain and identify research limitations and gaps. Based on this analysis, we provide an agenda for future research.

## 2 Methodology

We carried out a SLR (Kraus et al. 2022) to provide a complete and exhaustive overview of scientific research on synergies between digital innovation and entrepreneurial firms. The methodological approach we adopted consists of three main steps (papers' location and selection, paper analysis, and results presentation), following Denyer and Tranfield (2009). We implemented the research workflow described in Ammirato et al. (2022a).

### 2.1 Papers' location and selection

We selected Elsevier's Scopus as the scientific database in which to perform our search. Scopus is a comprehensive and relevant database in the managerial field of study (Kraus et al. 2022) and guarantees that a large proportion of articles published in top journals are included in the results (Bhimani et al. 2019). Several papers providing guidelines for systematic reviews of the literature suggest that Scopus is a suitable database for reviews of the literature (e.g. Donthu et al. 2021; Kraus et al. 2022) because it is one of the largest (Bhimani et al. 2019) and at the same time excludes some low-quality, non-peer reviewed documents (Schiederig et al. 2012). As shown in Table 1, we built two sets of keywords encompassing terms related to digital innovation and entrepreneurial firms, respectively.

The search string was structured so that the results contained papers with at least one term from each set in the title, abstract, and keywords; we found 401 works. In order to select relevant papers, we developed the inclusion and exclusion criteria reported in Table 2. These are divided into quality and fit-for-purpose criteria (Zahoor et al. 2020). Quality criteria are aimed at excluding documents that cannot guarantee a certain level of scientific rigor. In particular, following the approach used in several previous studies (Pittaway et al. 2004; Spender et al. 2017; Zahoor et al. 2020), we only considered papers published in peer-reviewed academic journals. Fit-for-purpose criteria are aimed at verifying whether the article content actually matches the purposes of our review. Basically, these criteria allowed us to verify that the title, abstract, or keywords of the selected papers did not include our search words by chance. We introduced the following criteria: the papers must be written in English and published In journals indexed in the subject areas "Business, Management and Accounting," "Economics, Econometrics and Finance," "Computer Sciences," "Social Sciences," "Decision Sciences," or

**Table 1** Sets of keywords used in the database research

| Field of study | Keywords |
|---|---|
| Digital innovation | "digital*" AND "innovat*" |
| Entrepreneurial firms | "entrepreneur*" AND ("firm" or "startup"or "start-up" or "young companies" or "new venture" or "newly-founded business" or "newly-founded companies" or "small and medium enterprise") |

**Table 2** Inclusion and exclusion criteria

| Description | Reason for inclusion | Reason for exclusion | Examples of excluded papers |
|---|---|---|---|
| *Fit-for-purpose criteria* | | | |
| Language | English | Not applicable | Not applicable[1] |
| | "Business, Management and Accounting", "Economics, Econometrics and Finance", "Computer Sciences", "Social Sciences", "Decision Sciences" and "Engineering" | Not applicable | Not applicable1 |
| Conceptual boundaries | Entrepreneurship understood as starting and managing a new business | Entrepreneurship as an individual ability (synonymous of initiative) | Keane and Chen (2019) |
| | Digital innovation as the process of adoption or development of new digital technologies | Analysis of specific technologies and their effects on the business rather than the adoption or development process | Makridakis (2017) |
| Search terms | Boolean logic with regard to Start-ups, large companies and collaboration | Search terms are present in the title, abstract or keywords but the paper does not fit in the conceptual boundaries of this study | Carayannis and Von Zedtwitz (2005) |
| *Quality criteria* | | | |
| Database | Scopus | Not applicable | Not applicable[1] |
| Type of documents | Empirical and theoretical articles published in peer reviewed journals | Books, book chapters conference proceedings | Not applicable[1] |

[1]The search methods ensure that articles that do not meet the criteria do not appear in the results

"Engineering." We analyzed the title and abstract of each work and assessed their content in relation to the definition we gave for the search terms (i.e. entrepreneurship and digital innovation, or their synonyms) to verify that they matched with the scope of our study (Christofi et al. 2021). After applying the quality and fit-for-purpose criteria, a total of 185 papers matching our inclusion criteria were found. We have not imposed a date limit from which to select items. Indeed, we were interested in the trajectories of the argument from its origin (Donthu et al. 2021). By choosing articles published in peer reviewed journals and discarding articles presented at conferences, as well as working papers and professional publications, we wanted to privilege the accuracy and scientific quality of the contents analysed. This means that potentially relevant contributions, for example published in books, may have been omitted. On the other hand we did not impose limits based on quality ratings, such as those attributed by the Australian Business Deans Council [ABDC] Journal Quality List [JQL] or by the Chartered Association of Business Schools [CABS] Academic Journal Guide [AJG]) to include a larger sample of items (Kraus et al. 2022). The search process, described in Fig. 1, was carried out at the end of December 2021.

### 2.2 Paper analysis

This phase was devoted to the examination of papers to highlight relationships and common points among them. We cleaned our sample by removing stopwords and other terms (e.g. scholars' affiliation, copyright statements, and nationalities) that could be misleading with respect to our objectives.

We analyzed the resulting sample of papers in two different steps due to the different outcomes we expected. First, we performed a qualitative bibliometric analysis by exploring the authors' co-citation networks (Van Eck and Waltman 2014). This part of the analysis was achieved using VosViewer software (Van Eck and Waltman 2017). This analysis was aimed at identifying the main clusters of authors working on the topic of digital innovation in entrepreneurial firms in order to analyze commonalities in these clusters, such as the common background of the authors or common theoretical approaches to the topic (Rossetto et al. 2018). While the assignment of the papers' authors to clusters was obtained using VosViewer (and, thus, through quantitative methods), the interpretation of the meaning of the clusters is qualitative and based on our analysis of the titles, abstract, and keywords of the papers for each cluster,

Second, we analyzed the sample of papers in order to identify the main topics in the literature related to digital innovation in entrepreneurial firms. This is the main part of our study and was implemented through a text-mining approach, based on LDA using MySLR software (Ammirato et al. 2022a). The LDA technique gives as output $k$ sets of relevant keywords (where each set represent

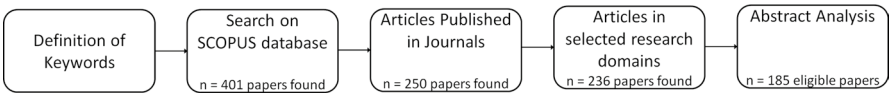


**Fig. 1** Papers location and selection process

a topic) and the document-term matrix, i.e. a matrix describing to what extent each paper is devoted to a specific topic (namely, topic proportion). Following Blei (2012), we selected the value of $k$, i.e. the number of topics to be extracted, by evaluating multiple LDA results with $k$ ranging from 2 to 20, as reported in Fig. 2. We chose the value of $k$ and the LDA algorithm that guarantee a sufficiently high value for topic coherence (Chen and Liu 2014) and, at the same time, a simple interpretation of the results for a human reader. The most meaningful set of topics was reached with $k = 6$, with a u_mass coherence value of $-1.70$ (Röder et al. 2015) for the Gensim LDA algorithm.

To perform this activity, we used MySLR software (Ammirato et al. 2022a), a semi-automated tool supporting researchers in performing SLRs.

The LDA procedure gave, as output, a group of keywords associated to each topic (as reported in Fig. 3) and a document-term matrix, i.e. a matrix that measures, for each sampled paper, to what extent it is related to each topic (namely the topic proportion). Following the suggestions provided in Grimaldi et al. (2017) and Ammirato et al. (2020b), to deduce meaningful descriptions for each topic, we implemented a human-based review of a restricted, representative, and relevant subset $Q$ of 60 relevant and representative papers. We considered the output of the document-term matrix to identify relevant papers for each topic. The six topics detected through the LDA procedure are presented in Sect. 4. In particular, the description is developed on the basis of the papers' main concepts proposed or a reformulation of the studies they cited.

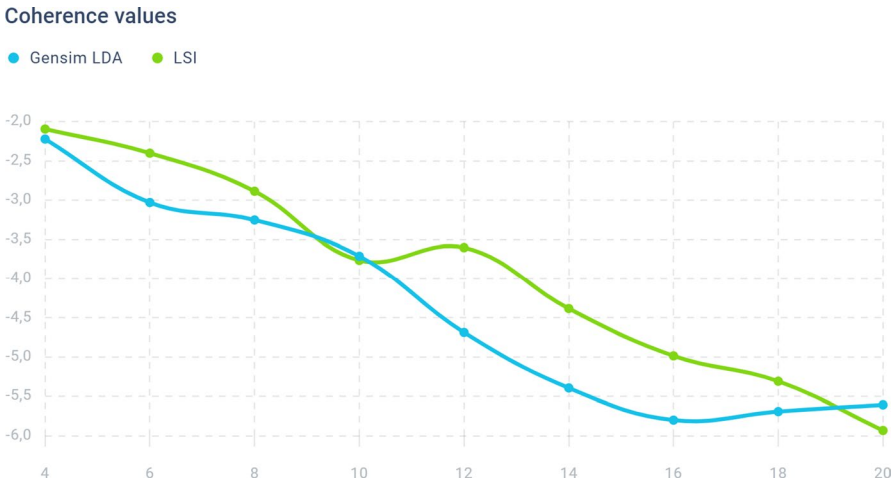


**Fig. 2** Coherence scores

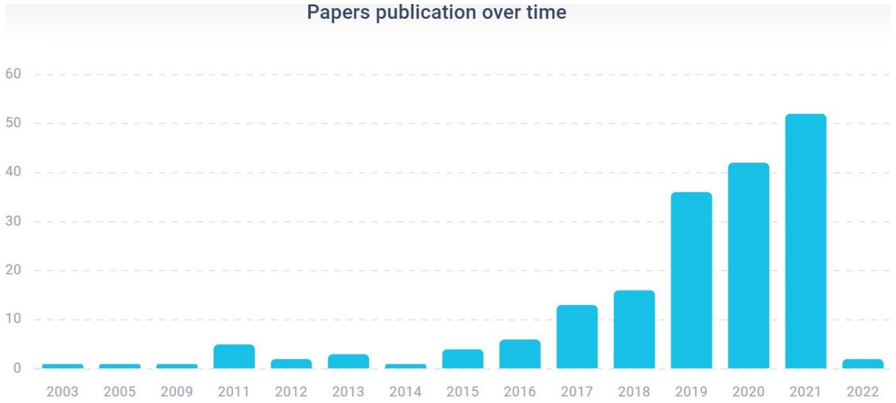


**Fig. 3** Published articles by year

## 3 Results

### 3.1 Bibliometric analysis

The issue of digital innovation in entrepreneurial firms has become increasingly important over time. Figure 4 shows a growing interest around this theme, starting from 2011. This is a period in which the interest of academia in digital transformation started to grow, as also suggested by previous studies (e.g. Kraus et al. 2021). The growth of papers on the topic of innovation in entrepreneurial firms, however,

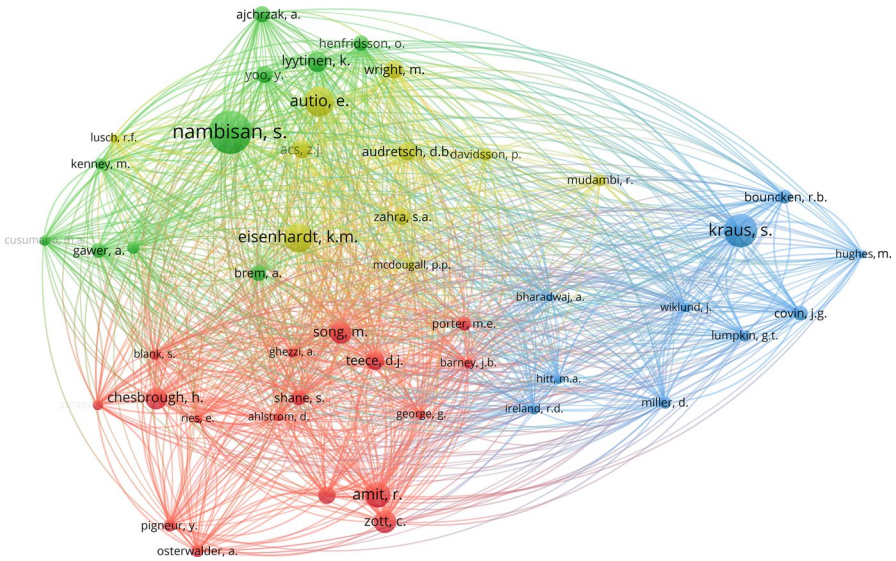


**Fig. 4** Published articles by year

has been more accentuated since 2017, with a trend that suggests the domain is exiting its emergent stage (Snyder 2019). About 70% of the papers have been published starting from 2019 and over 50% have been published in the last two years.

We found that the 185 papers in our dataset were published in 121 journals. This demonstrates the high interdisciplinary nature of the issues related to digital innovation and entrepreneurial firms. As presented in Table 3, four journals published six papers or more: *Journal of Business Research*, with the higher number of published papers (9); *Technological Forecasting and Social Change* (8); *Sustainability (Switzerland)* (7); and *Emerald Emerging Markets Case Studies* (6). A total of 23 journals published more than one paper.

The authors' co-citation network (Fig. 5) evidences the presence of four main clusters. Cluster 1 (green) includes authors such as Nambisan (99 local citations), Lyytinen (51), Gawer (34), and Cusumano (25). Cluster 2 (yellow) include authors such as Autio (69), Eisenhardt (68), Audretsch (43), Acs (42), and Davidsson (29). Cluster 3 (blue) includes Kraus (77), Covin (34), and Bouncken (33). Cluster 4 (red) includes Amit (59), Zott (52), Chesbrough (51), Teece (45), Osterwalder (30), Pigneur (29), Blank (24), and Ries (21).

**Table 3** Journals with at least 2 articles published in the selected domain

| Sources | Articles |
|---|---|
| Journal of Business Research | 9 |
| Technological Forecasting and Social Change | 8 |
| Sustainability (Switzerland) | 7 |
| Emerald Emerging Markets Case Studies | 6 |
| Business Horizons | 3 |
| International Journal of Entrepreneurial Behavior & Research | 3 |
| Journal of Business Strategy | 3 |
| Journal of Information Technology Teaching Cases | 3 |
| Journal of Small Business And Enterprise Development | 3 |
| Long Range Planning | 3 |
| Strategic Entrepreneurship Journal | 3 |
| Technology Analysis and Strategic Management | 3 |
| Technovation | 3 |
| California Management Review | 2 |
| Computers in Human Behavior | 2 |
| Education and Training | 2 |
| International Journal of Advanced Science And Technology | 2 |
| International Journal of Innovation And Technology Management | 2 |
| International Journal of Innovation Management | 2 |
| International Journal of Innovation Science | 2 |
| International Journal of Technology Management | 2 |
| Journal of Entrepreneurship in Emerging Economies | 2 |
| Review of Managerial Science | 2 |

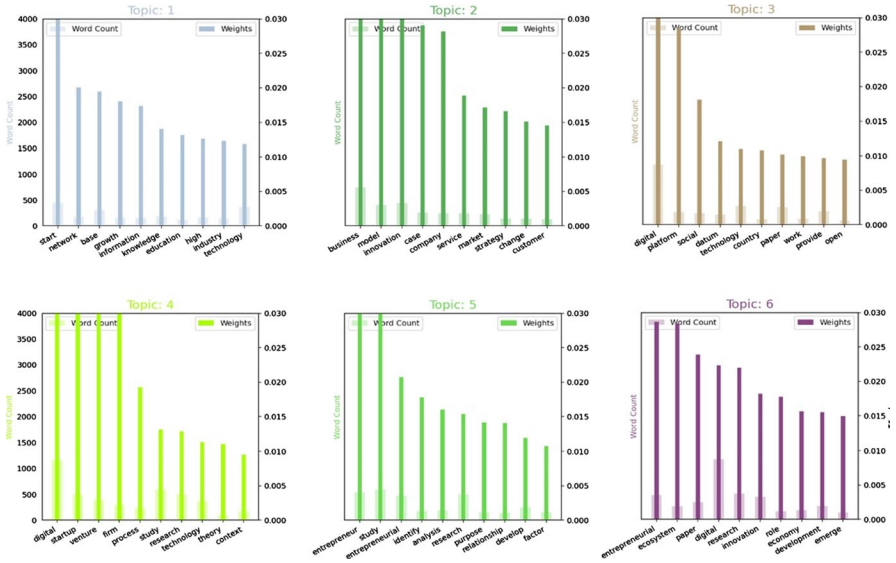


**Fig. 5** Word Count

The co-citation network clearly shows the presence of four clusters to which it is possible to associate four theoretical pillars in the area of research analyzed. Specifically, we are able to identify the following theoretical areas of reference that form the basis of the research field of digital innovation in entrepreneurial firms. Cluster 1 (green) deals with the digital technology perspective of entrepreneurship, with authors mainly adopting a digital-technology perspective to analyze the phenomenon at hand. Cluster 2 (yellow) includes studies at the intersection between digital technologies and entrepreneurship. Cluster 3 (blue) mainly adopts an entrepreneurship perspective. Cluster 4 (red) includes researchers involved in innovation-management studies, whose main topics of interest seem to be start-ups and business-model innovation.

We created an inter-topic distance map for our dataset. As presented in Fig. 6, this map represents a visualization of the topics in a two-dimensional space. The area of these topic circles is proportional to the number of words that belong to each topic across the dictionary. The circles are plotted using a multidimensional scaling algorithm based on the words they comprise, so topics that are closer together have more words in common. While topics 1 (start-ups' collaboration networks), 2 (business-model innovation), 4 (digital ventures), and 6 (digital-innovation ecosystems) are close to each other, topics 3 and 5 seem to be quite distant. Topic 3 (digital platforms) includes articles focusing on a specific technology, while topic 5 (the digital entrepreneur's profile) focuses on the individual rather than the organizational level of analysis. The six topics and the differences among them will be discussed in detail in Sect. 3.2.

Focusing on the 60 papers that have been classified as most relevant and representative, reported in Table 4, we observe that one-third of the studies (20) applied

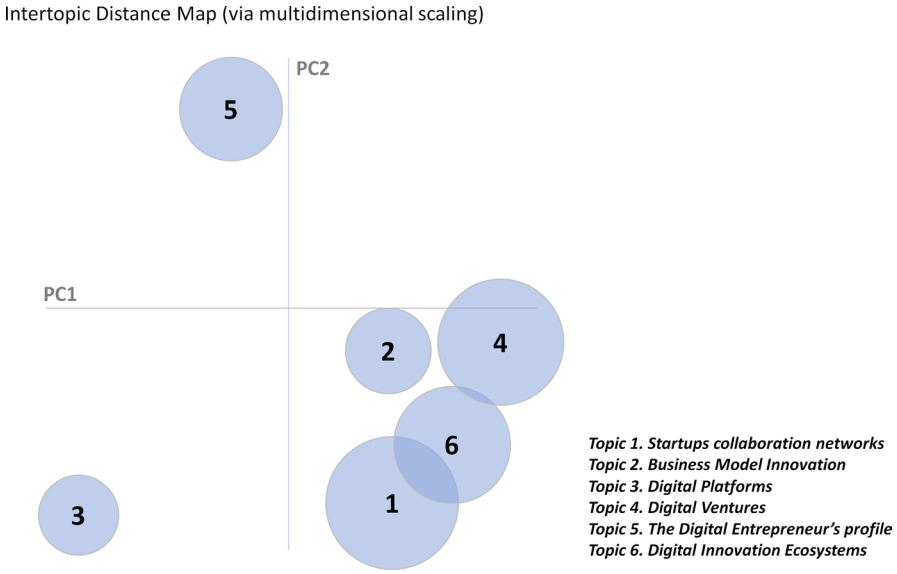


**Fig. 6** Intertopic Distance Map

a qualitative methodology (mainly multiple case studies). There were slightly fewer studies based on quantitative methods (15). There is a large number of articles presenting conceptual models (14) without any empirical analysis. Nine papers are reviews of the literature, of which six are systematic reviews. Only three papers present studies based on mixed methods.

As shown in Table 4, the articles analyzed consider a varied set of topics in several different contexts, including different countries, industries, and types of organization (e.g. large companies or SMEs and mature businesses rather than start-ups or spin-off companies).

Finally, the analysis of the most representative and relevant papers made possible the identification of the main research lines, the contexts of applications, the main theoretical references, and the most widely used methodologies. A summary of the results is presented in Table 5.

### 3.2 Presentation of the main topics

In this section we will discuss the six main topics on which the literature has focused, identified through the LDA approach.

#### 3.2.1 Topic 1. Start-ups' collaboration networks

The creation and maintenance of more or less stable relationships with external partners is decisive for the success of digital start-ups (Teece 2010). SMEs and start-up companies in the digital sector face a lack of resources for innovation. Smallness,

**Table 4** List of 60 most relevant and representative papers

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Ammirato, S., Sofo, F., Felicetti, A. M., Helander, N., & Aramo-Immonen, H | 2019 | A new typology to characterize Italian digital entrepreneurs | International Journal of Entrepreneurial Behavior & Research | Individual-opportunity nexus; entrepreneurial profile | Italian Digital new ventures | Digital entrepreneur's profile | Quantitative analysis |
| Autio, E., Kenney, M., Mustar, P., Siegel, D., & Wright, M | 2014 | Entrepreneurial innovation: The importance of context | Research Policy | National Innovation Systems | Digital entrepreneurial firms | Digital Innovation Ecosystem | Conceptual Model |
| Autio, E., Nambisan, S., Thomas, L. D., & Wright, M | 2018 | Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems | Strategic Entrepreneurship Journal | Entrepreneurial Ecosystems | REGIONAL BUSINESS INCUBATORS | Digital Innovation Ecosystems | Conceptual Model |
| Bala, H., & Feng, X | 2019 | Success of small and medium enterprises in Myanmar: Role of technological, organizational, and environmental factors | Journal of Global Information Technology Management | Technology organization-environment framework | SMEs in Myanmar | Digital Ventures; digital entrepreneur's profile | Quantitative analysis |
| Benoit, S., Baker, T. L., Bolton, R. N., Gruber, T., & Kandampully, J | 2017 | A triadic framework for collaborative consumption (CC): Motives, activities and resources & capabilities of actors | Journal of Business Research | Collaborative consumption | Digital platform operators | Digital Platforms | Conceptual model |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Bogers, M | 2011 | The open innovation paradox: knowledge sharing and protection in R&D collaborations | European Journal of Innovation Management | Transaction cost economics; resource-based view of the firm | R&D Collaboration | Startups collaboration networks | Multiple case study |
| Bonfanti A., Del Giudice M., Papa A | 2018 | Italian Craft Firms Between Digital Manufacturing, Open Innovation, and Servitization | Journal of the Knowledge Economy | Open innovation and Servitization | Digitalization in entrepreurial firms | Digital ventures | Multiple Case Study |
| Boudreau, K., & Lakhani, K | 2009 | How to manage outside innovation: Competitive markets or collaborative communities? | MIT Sloan Management Review | Collaborative consumption; Open innovation | Digital platform operators | Digital Platforms | Conceptual model |
| Bunduchi, R., Crișan-Mitra, C., Salanță, I. I., & Crișan, E. L | 2021 | Digital product innovation approaches in entrepreneurial firms–the role of entrepreneurs' cognitive frames | Technological Forecasting and Social Change | Entrepreneurial Cognitive Frames; perpetual incompleteness of digital products | Small digital entrepreneurial firms | The Digital Entrepreneur's profile; Digital Ventures | Multiple case study |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Carayannis, E. G., & Von Zedtwitz, M | 2005 | Architecting gloCal (global–local), real-virtual incubator networks (G-RVINs) as catalysts and accelerators of entrepreneurship in transitioning and developing economies: lessons learned and best practices from current development and business incubation practices | Technovation | Entrepreneurial Ecosystems | REGIONAL BUSINESS INCUBATORS | Digital Innovation Ecosystems | Conceptual model |
| Cavallo, A., Ghezzi, A., Dell'Era, C., & Pellizzoni, E | 2019 | Fostering digital entrepreneurship from startup to scaleup: The role of venture capital funds and angel groups | Technological Forecasting and Social Change | Organization growth lifecycle; venture financing | Italian Digital new ventures | Startups collaboration networks | Regression analysis |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Chalmers, D., Matthews, R., & Hyslop, A | 2021 | Blockchain as an external enabler of new venture ideas: Digital entrepreneurs and the disintermediation of the global music industry | Journal of Business Research | External enabler theory | Digital entrepreneurial firms in the music industry | The digital entrepreneur's profile | Multiple case study |
| Chesbrough, H | 2010 | Business model innovation: opportunities and barriers | Long Range Planning | Open Innovation; Business Model Innovation | Digital spin-offs | Business Model Innovation | Case study; Conceptual Model |
| Corvello, V., Steiber, A., & Alänge, S | 2023 | Antecedents, processes and outcomes of collaboration between corporates and start-ups | Review of Managerial Science | Collaboration Models; Organization growth lifecycle | Swedish startups | Startups collaboration networks | Multiple Case Study |
| Cosenz, F., & Bivona, E | 2021 | Fostering growth patterns of SMEs through business model innovation. A tailored dynamic business modelling approach | Journal of Business Research | System Dynamics; Business Model Canvas | E-commerce SME | Business Model Innovation | Case study |
| Day G.S., Schoemaker P.J.H | 2016 | Adapting to fast-changing markets and technologies | California Management Review | Dynamic capabilities | Digitalization in entrepreurial firms | Digital Ventures | Case Study |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Dong J.Q | 2019 | Moving a mountain with a teaspoon: Toward a theory of digital entrepreneurship in the regulatory environment | Technological Forecasting and Social Change | Dynamic Capabilities | Digital entrepreneurial firms | Digital ventures | Case study |
| Du, W., Pan, S. L., Zhou, N., & Ouyang, T | 2018 | From a marketplace of electronics to a digital entrepreneurial ecosystem (DEE): The emergence of a meta-organization in Zhongguancun, China | Information Systems Journal | Digital entrepreneurship and ecosystem | Digital entrepreneurial firms | Digital Innovation Ecosystem | Case study |
| Elia, G., Margherita, A., & Passiante, G | 2020 | Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process | Technological Forecasting and Social Change | Digital entrepreneurship and ecosystem | Digital entrepreneurial firms | Digital Innovation Ecosystem | Conceptual model |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Elia, G., Margherita, A., Ciavolino, E., & Moustaghfir, K | 2021 | Digital Society Incubator: Combining Exponential Technology and Human Potential to Build Resilient Entrepreneurial Ecosystems | Administrative Science | Entrepreneurial Ecosystems | Digital Incubators | Digital Innovation Ecosystem | Systematic literature review |
| Ferreira J.J.M., Fernandes C.I., Ferreira F.A.F | 2019 | To be or not to be digital, that is the question: Firm innovation and performance | Journal of Business Research | Antecedents of Digital Transformation | Portugueses digital firms | Digital Ventures; Business Model Innovation | Multivariate quantitative analysis |
| Gagliardi D | 2013 | Next generation entrepreneur: Innovation strategy through Web 2.0 technologies in SMEs | Technology Analysis & Strategic Management | Digital entrepreneurship | Digital entrepreneurial firms | Digital ventures | Quantitative analysis |
| Gawer, A., & Cusumano, M. A | 2014 | Industry platforms and ecosystem innovation | Journal of product innovation management | Network Effects and Multisided Markets | digital platform operators | Digital Platforms | Multiple Case Study |
| Ghezzi, A., & Cavallo, A | 2020 | Agile business model innovation in digital entrepreneurship: Lean startup approaches | Journal of Business Research | Business Model Innovation; Lean Startup; Agile development | Digital Startups | Business Model Innovation | Multiple Case Study |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Granstrand, O., & Holgersson, M | 2020 | Innovation ecosystems: A conceptual review and a new definition | Technovation | Digital entrepreneurship and ecosystem | Digital entrepreneurial firms | Digital Innovation Ecosystem | literature review; multiple Case study |
| Gupta, G.; Bose, I | 2018 | Strategic learning for digital market pioneering: Examining the transformation of Wishberry's crowdfunding model | Technological Forecasting and Social Change | Strategic Learning; digital capabilities | Digital Businesses | Digital Ventures; digital entrepreneur'sprofile | quantitative analysis |
| Haaker, T., Ly, P. T. M., Nguyen-Thanh, N., & Nguyen, H. T. H | 2021 | Business model innovation through the application of the Internet-of-Things: A comparative analysis | Journal of Business Research | Business Model Innovation | IoT Startups | Business Model Innovation | Multiple Case Study |
| Hagiu, A. and Wright, J | 2015 | Multi-sided platforms | International Journal of Industrial Organization | Network effects | Digital multi-sided platforms | Digital Platforms; Business Model Innovation | Mathematical Model |
| Hair, N., Wetsch, L.R., Hull, C.E., Perotti, V. and Hung, Y.-T.C | 2012 | Market orientation in digital entrepreneurship: advantages and challenges in a web 2.0 networked world | International Journal of Innovation and Technology Management | Market orientation | Digital Businesses | Digital ventures | Quantitative analysis |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Hartmann, P.M., Zaki, M., Feldmann, N. and Neely, A | 2016 | Capturing value from big data—a taxonomy of data-driven business models used by start-up firms | International Journal of Operations and Production Management | Business Model | Big Data Digital Startups | Business Model Innovation | Two step cluster analysis |
| Hsieh, Y. J., & Wu, Y. J | 2019 | Entrepreneurship through the platform strategy in the digital era: Insights and research opportunities | Computers in Human Behavior | Open Innovation and Entrepreneurship | digital platform operators | Digital Platforms | Conceptual Model |
| Hull, C. E. K., Hung, Y. T. C., Hair, N., Perotti, V., & DeMartino, R | 2007 | Making advantage of digital opportunities: a typology of digital entrepreneurship | International Journal of Networking and Virtual Organisations | Entrepreneurship typology | Digital entrepreneurial firms | Digital Ventures; Business Model Innovation | Conceptual Model |
| Kamberidou, I | 2020 | Distinguished" women entrepreneurs in the digital economy and the multitasking whirlpool | Journal of Innovation and Entrepreneurship | Gender attitudes | Female digital entrepreneurs | Digital entrepreneur's profile | Literature Review |
| Kapoor, K., Bigdeli, A. Z., Dwivedi, Y. K., Schroeder, A., Beltagui, A., & Baines, T | 2021 | A socio-technical view of platform ecosystems: Systematic review and research agenda | Journal of Business Research | Socio-Technical view | Digital platform operators | Digital Platforms | Systematic literature review |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Kraus S, Palmer C, Kailer N, Kallinger FL, Spitzer J | 2018 | Digital entrepreneurship: a research agenda on new business models for the twenty-first century | International Journal of Entrepreneurial Behavior & Research | Digital entrepreneurship | Digital entrepreneurial firms | Business Model Innovation | Systematic literature review |
| Kuester, S., Konya-Baumbach, E. and Schuhmacher, M.C | 2018 | Get the show on the road: go-to-market strategies for e-innovations of start-ups | Journal of Business Research | Signaling theory | Digital Startups | Business Model Innovation | systematic literature review |
| Larios-Hernández G.J | 2017 | Blockchain entrepreneurship opportunity in the practices of the unbanked | Business Horizon | Traditional unisystemic views for financial inclusion | FINANCIAL BLOCKCHAIN firms | Digital Platforms; Business Model Innovation | Fuzzy-set Qualitative Comparative Analysis |
| Lin, Y. K., & Maruping, L. M | 2022 | Open source collaboration in digital entrepreneurship | Organization Science | Collaboration Models; Organization growth lifecycle | Digital Startups | Startups collaboration networks | Quantitative analysis |
| Mancha, R. and Shankaranarayanan, G | 2021 | Making a digital innovator: antecedents of innovativeness with digital technologies | Information Technology & People | Entrepreneurial digital competencies; entrepreneurial orientation | Digital entrepreneurial firms | Digital entrepreneur's profile | PLS-SEM |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Matricano, D., Castaldi, L., Sorrentino, M., & Candelo, E | 2021 | The behavior of managers handling digital business transformations: theoretical issues and preliminary evidence from firms in the manufacturing industry | International Journal of Entrepreneurial Behavior & Research | Knowledge-Based View | Digital Businesses | Digital Ventures; digital entrepreneur's profile | Multiple Case Study |
| McAdam, M., Crowley, C., & Harrison, R. T | 2020 | Digital girl: Cyberfeminism and the emancipatory potential of digital entrepreneurship in emerging economies | Small Business Economics | Entrepreneurship as emancipation | Digital entrepreneurial firms | Digital entrepreneur's profile | Multiple Case Study |
| Nambisan, S., Siegel, D., & Kenney, M | 2018 | On open innovation, platforms, and entrepreneurship | Strategic Entrepreneurship Journal | Open Innovation | Digital platform operators | Digital Platforms | Conceptual Model |
| Ngoasong, M.Z | 2018 | Digital entrepreneurship in a resource-scarce context: A focus on entrepreneurial digital competencies | Journal of Small Business and Enterprise Development | Entrepreneurial digital competencies | Digital entrepreneurial firms | Digital entrepreneur's profile | Multiple Case Study |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Nwankpa, J. K., & Datta, P | 2017 | Balancing exploration and exploitation of IT resources: the influence of Digital Business Intensity on perceived organizational performance | European Journal of Information Systems | Resource based view; dynamic capability | Digital Businesses | Digital ventures | Quantitative analysis |
| Piaskowska, D., Tippmann, E., & Monaghan, S | 2021 | Scale-up modes: Profiling activity configurations in scaling strategies | Long Range Planning | Scale-up models | Digital Businesses | Digital Ventures; digital entrepreneur's profile | Quantitative analysis |
| Pinkow, F., & Iversen, J | 2020 | Strategic objectives of corporate venture capital as a tool for open innovation | Journal of Open Innovation: Technology, Market, and Complexity | Open Innovation; Ambidexterity | Corporate Venture Capitalists | Digital Innovation Ecosystem | Literature Review |
| Quinton, S., Canhoto, A., Molinillo, S., Pera, R., & Budhathoki, T | 2018 | Conceptualising a digital orientation: antecedents of supporting SME performance in the digital economy | Journal of Strategic Marketing | Digital orientation theory | Digital Businesses | Digital Ventures; digital entrepreneur's profile | Conceptual Model |
| Rachinger, M., Rauter, R., Müller, C., Vorraber, W. and Schirgi, E | 2019 | Digitalization and its influence on business model innovation | Journal of Manufacturing Technology Management | Dynamic Capabilities; Business Model Innovation | Digitalization in entrepreurial firms | Business Model Innovation | Multiple Case Study |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Richter, C., Kraus, S., Brem, A., Durst, S., & Giselbrecht, C | 2017 | Digital entrepreneurship: Innovative business models for the sharing economy | Creativity and innovation management | Sharing Economy; Business Model Innovation | German speaking entrerpreneurial firms in the sharing economy sector | Business Model Innovation; Digital Platforms | Multiple Case Study |
| Romero, D., & Molina, A | 2011 | Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era | Production Planning & Control | Collaborative Networks | Digital entrepreneurial firms | Digital Innovation Ecosystem | Multiple Case Study |
| Sambamurthy V., Bharadwaj A., Grover V | 2004 | Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms | MIS Quarterly | Dynamic Capabilities; Business Model Innovation | IT Firms | Business Model Innovation | Conceptual Model |
| Satalkina L., Steiner G | 2020 | Digital entrepreneurship and its role in innovation systems: A systematic literature review as a basis for future research avenues for sustainable transitions | Sustainability | Digital entrepreneurship | Digital entrepreneurial firms | Digital Innovation Ecosystem | Systematic literature review |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Soetanto, D. and van Geenhuizen, M | 2015 | Getting the right balance: university networks' influence on spin-offs' attraction of funding for innovation | Technovation | Social Capital Theory | spin-offs from technical universities | Digital Innovation Ecosystem; Start-ups collaboration networks | Regression Analysis |
| Solberg, E., Traavik, L.E. and Wong, | 2020 | Digital mindsets: recognizing and leveraging individual beliefs for digital transformation | California Management Review | entrepreneurial mindset | Digital Businesses | digital entrepreneur's profile | Conceptual Model |
| Spender, J.-C., Corvello, V., Grimaldi, M. and Rippa, P | 2017 | Startups and open innovation: a review of the literature | European Journal of Innovation Management | Open Innovation; Organization growth lifecycle | Startups | Startups collaboration networks; Digital Innovation Ecosystem; | Systematic literature review |
| Steiber, A., Alange, S., & Corvello, V | 2021 | Evaluating Corporate-Startup Co-Creation: A Critical Review Of The Literature | International Journal of Innovation Management | Collaboration Models; Organization growth lifecycle | Startups | Startups collaboration networks; Digital Innovation Ecosystem; | Literature Review |
| Sussan, F. and Acs, Z | 2017 | The digital entrepreneurial ecosystem | Small Business Economics | Digital Ecosystem | Digital entrepreneurial firms | Digital Innovation Ecosystem | Conceptual Model |
| Teece, D.J | 2010 | Business models, business strategy and innovation | Long Range Planning | Business Model | Digital Businesses | Business Model Innovation | Conceptual Model |

**Table 4** (continued)

| Authors | Year | Title | Source | Theory | Context | Content | Methodology |
|---|---|---|---|---|---|---|---|
| Troise, C., Matricano, D., Candelo, E. and Sorrentino, M | 2021 | Entrepreneurship and fintech development: comparing reward and equity crowdfunding | Measuring Business Excellence | | | Digital Platforms | |
| Zhu, Z., & Lin, S. F | 2019 | Understanding entrepreneurial perceptions in the pursuit of emerging e-business opportunities: The dimensions and drivers | Computers in Human Behavior | Subjectivist theory of entrepreneurship | Digital Businesses | Digital entrepreneur's profile | Two-stage least square |

**Table 5** Main Findings

| Topic | Main research lines | Main contexts of application | Main theoretical foundations | Main methodological approaches |
|---|---|---|---|---|
| Startups collaboration networks | Reasons for engaging in collaborative-based innovation initiatives with other digital startups<br>Structural aspects of collaboration<br>Open innovation projects between digital startups and large companies | Digital Startups<br>Academic Spinoffs of technical universities | Transaction cost economics;<br>Resource-based view<br>Social Capital Theory<br>Open Innovation;<br>Organization growth lifecycle<br>Collaborative Networks; | Multiple Case Studies;<br>Literature Reviews<br>Regression Analysis |
| Business Model Innovation | Performance drivers of business model innovation for digital entrepreneurial firms<br>Novel approaches to business model design as tools to support innovation for digital enterprises | Digital spin-offs<br>Digital businesses<br>Digital companies in specific sectors (e.g. e-commerce, IoT, Big Data, Financial blockchain, sharing economy,…)<br>Digital companies in specific regions (e.g. Italy, Portugal, German speaking countries,…) | Business Model Innovation/ Business Model Canvas<br>System Dynamics<br>Dynamic Capabilities<br>Lean Startup/Agile Development<br>Signaling theory<br>Unisystemic views for financial inclusion | Conceptual Models<br>Case studies/multiple case studies<br>Systematic Literature Reviews |
| Digital Platforms | Modeling frameworks for digital platforms<br>Digital platforms supporting innovation processes | Digital platform operators<br>Digital platform users<br>Digital platform in specific sectors (e.g. fintech, crowdsourcing, blockchain, and non-fungible tokens) | Collaborative consumption/ sharing economy<br>Open innovation<br>Network Effects and Multisided Markets<br>Socio-Technical view<br>Unisystemic views for financial inclusion<br>Business Model Innovation | Conceptual Models<br>Multiple Case Studies |

**Table 5** (continued)

| Topic | Main research lines | Main contexts of application | Main theoretical foundations | Main methodological approaches |
|---|---|---|---|---|
| Digital Ventures | Antecedents contributing to the birth of innovation-oriented digital entrepreneurial firms<br>Strategies for digital entrepreneurial firms' success<br>Critical success factors for digital enterprises | Regional Digital Ventures (e.g. Italy, Myanmar,…)<br>Digital entrepreneurial firms in specific industries (e.g. music, tourism)<br>Digital entrepreneurial firms/ digital businesses | Dynamic Capabilities<br>Resource-based view;<br>Knowledge-based view<br>Antecedents of Digital Transformation<br>Market orientation<br>Strategic Learning<br>Intellectual Capital Theory | Quantitative Analysis (Regression Analysis—SEM)<br>Case Studies/Multiple Case Studies |
| The Digital Entrepreneur's profile | Reasons for starting digital entrepreneurial firms<br>Factors characterizing successful digital entrepreneurs<br>entrepreneurial behaviour and the motivation to start digital ventures<br>the traits of the innovator in the digital environment<br>Gender studies in digital innovation entrepreneurship | Regional Digital Ventures (e.g. Italy, Myanmar,…)<br>Female digital entrereneurs<br>Digital entrepreneurial firms in specific industries (e.g. music, tourism)<br>Digital entrepreneurial firms | Individual-opportunity nexus;<br>entrepreneurial mindset/entrepreneurial profile/Entrepreneurial Cognitive Frames/ entrepreneurial orientation;<br>subjectivist theory of entrepreneurship<br>digital capabilities/entrepreneurialdigital competencies/ digital orientation theory<br>Knowledge-Based View<br>Gender attitudes/Entrepreneurship as emancipation | Quantitative Analysis (Regression Analysis—SEM)<br>Multiple Case Studies |

**Table 5** (continued)

| Topic | Main research lines | Main contexts of application | Main theoretical foundations | Main methodological approaches |
|---|---|---|---|---|
| Digital Innovation Ecosystems | Contextual aspects of digital innovation ecosystems<br>Performances of digital innovation ecosystems<br>Impact of innovation ecosystems on digital entrepreneurial firms performances<br>Collaboration between digital new ventures and other stakeholders | Regional business incubators<br>Regional Innovation Systems<br>Corporate Venture Capitalists<br>Spin-offs from technical universities | Social Capital Theory<br>Digital entrepreneurship and ecosystems<br>Collaborative Networks<br>Open Innovation | Conceptual Models<br>Systematic Literature Reviews |

the structural lack of tangible and intangible resources, and the lack of financial and human resources often limit their ability to develop and market new product and services (Spender et al. 2017). Being involved in collaboration processes is therefore a necessity for start-ups that want to overcome the above-described weaknesses and bring innovative products and/or services to the market (Bogers 2011).

In the innovation literature, collaboration networks are considered as functional in deploying innovative products and services since they help start-ups to acquire resources or to introduce new products into the market (Soetanto and van Geenhuizen 2015). Bunduchi et al. (2021) found that "collaborating with others" represents a valuable solution for digital-entrepreneurial firms that are aiming to acquire development and commercialization capabilities. In particular, they evidenced that collaboration is seen as critical to offer digital entrepreneurs the opportunity to access international markets, which would otherwise be difficult (or impossible) to enter.

Some works have addressed the structural aspects of collaboration, i.e. actors and roles involved in collaborative processes. Soetanto and van Geenhuizen (2015) analyzed the impact of the characteristics of the network (e.g. dimension and density) on the ability of new firms to attract funding. Regarding the actors involved in digital-innovation networks, the analysis of the literature led to the identification of certain categories of actors. Lin and Maruping (2022) analyzed the relationship between the level of engagement in open-source collaboration and the value of digital start-ups. They analyzed a pool of 17,552 digital start-ups to prove how this effect is contingent on the stage of venture maturity (conception, commercialization, or growth) and the mode of engagement (inbound or outbound).

Some research has been devoted to investigating the collaboration between digital start-ups and large companies. Steiber et al. (2021) proposed a framework for evaluating collaboration, based on three main dimension, namely the purpose of the collaboration, time, and the stakeholder perspective. Goncalves et al. (2020) deepened how organizational culture influences company agility and how it enables or hinders digital innovation in start-ups and large firms. They found that the most innovative start-ups were those based on a clan or adhocracy culture, open-minded towards working with external partners, including large firms. Corvello et al. (2023) analyzed the antecedents, processes, and outcomes of collaboration between large corporates and innovative start-ups, including digital ones. They proposed a set of factors that could guide start-ups in evaluating the opportunity for collaboration with large corporates. Relevant factors to take into consideration when start-ups engage in collaboration with large partners are the maturity of the start-up and its technology, the presence of intermediaries, as well as the objectives of the start-up and of the large corporation.

#### 3.2.2 Topic 2. Business-model innovation

The increasing availability of social media technologies, the Internet of things (IoT), and big data analytics has had a huge impact on the deployment of new business models. The anything-as-a-service economy has represented a revolution in the business context over recent years (Rachinger et al. 2019). Within the digital revolution, rather than focusing on the new technology itself, it is important to emphasize

the ability to design and modify (i.e. to innovate) a company's business models in order to boost firms' competitiveness and sustainability (Hagiu and Wright 2015).

Business-model innovation has become a topic of paramount importance in several research fields of study, such as innovation, strategy, and entrepreneurship (Chesbrough 2010; Amit and Zott 2012). Business models in digital settings possess distinctive characteristics compared to traditional ones (Hull et al. 2007). Kuester et al. (2018) explored how digital entrepreneurs should design their go-to-market strategies in order to facilitate the adoption of e-innovations. Haggege et al. (2017) investigated the performance drivers of business-model innovation. They highlighted the interdependence of drivers, arguing that the specific combination of these drivers matters at different phases of an entrepreneurial firm's lifecycle.

Some authors have focused on the study of approaches to business-model design in terms of tools to support innovation processes for digital entrepreneurs (Ammirato et al. 2022b). Osterwalder et al. (2010) proposed the well-known business model canvas, widely used to design business models for digital start-ups. Hartmann et al. (2016) provided an exhaustive analysis of the business-modeling framework for digital services. According to Cosenz and Bivona (2021), designing and experimenting with dynamic business modeling in entrepreneurial firms allows entrepreneurs to explore and simulate alternative scenarios. This practice is extremely useful, especially in highly uncertain and dynamic contexts such as that of digital business (Del Giudice et al. 2016).

Digitalization is the backbone for innovating business models in many sectors. Several case-study applications have proved the value of business-modeling approaches in designing innovation for entrepreneurial firms. Ammirato et al. (2022b) proposed the case of a digital entrepreneurial firm offering web services for passenger-transportation companies. They showed how the system-dynamics approach allowed entrepreneurs to overcome the complexity of the business parameters within the design of the business model. Aloini et al. (2022) investigated the relationship between digital technologies and the business-model structure by means of a multiple case study of start-ups operating in the aerospace industry. Haaker et al. (2021) provided an analysis of business models for IoT entrepreneurial firms in Vietnam. Their analysis of the case studies led to the creation of a general IoT business model providing alternatives for each of the four business-model dimensions. Ghezzi and Cavallo (2020) carried out an exploratory multiple case study based on three digital start-ups to design a framework taking into account the relationship between business-model innovation, lean start-up, and agile development, within the context of strategic agility.

#### 3.2.3 Topic 3. Digital platforms

Digitalization has enabled the emergence of web- and mobile-based platforms supporting value creation and innovation in small enterprises' activities and entrepreneurial initiatives (Kapoor et al. 2021). Digital platforms, entrepreneurship, and innovation are tightly intertwined. During the last two decades, digital platforms have proliferated as an engine of innovation for partners to build complementary products and services. The success of digital platforms relies on the important role

of complementary innovators (Boudreau and Lakhani 2009). We have witnessed a growth in digital entrepreneurs supporting digital platforms such as Android, iOS, Facebook, and Twitter. The success of these platforms requires support from applications, and entrepreneurs in such settings play a critical role in making some platforms rather than others succeed (Srinivasan and Venkatraman 2018). According to Gawer and Cusumano (2014), a platform can be defined as a technology that an external innovator uses as a foundation to innovate and develop complementary products. Over the last few years, several platforms have emerged, becoming an inseparable part of our everyday life. Examples of successful digital-entrepreneurial firms include Airbnb, which disrupted the hotel business by launching a new sharing-economy-based platform for accommodation rental (Benoit 2017). Similarly, Uber changed the game in the taxi business by not owning any taxis (Cramer and Krueger 2016). Platforms enable matching among consumers and producers, facilitating the exchange of goods and services, and enabling value creation for all through the digital landscape in multi-sided markets (Parker et al. 2017). Hsieh and Wu (2019) identified three types of platforms, namely innovation, transaction, and integration platforms. The first type deals with platforms providing developers with an environment through which to develop complementary products and services (e.g. the Android ecosystem). The second type favors the meeting between supply and demand, typical of electronic-commerce platforms for products (e.g. Amazon) or services (e.g. Airbnb). Finally, integration platforms offer the capabilities both of transaction and innovation platforms.

A relevant area of scientific literature in the context of strategic entrepreneurship is focusing on how digital-born entrepreneurial firms develop and adapt their strategies and business models when their products and services must be coordinated within digital platforms. Srinivasan and Venkatraman (2018) argued that such types of entrepreneurship must, at least, recognize how entrepreneurs take into account the choice of platforms based on network effects, as well as how they preferentially connect to different platforms based on the dynamic characteristics of the interdependence networks between key actors. In doing so, they proposed moving from a framework of strategic entrepreneurship as autonomous actions towards coordinated actions within a network of influences.

Digital platforms can be traced back to different areas of application, such as passenger transportation, social networks, digital payments, and finance. A type of platform that has received much interest concerns the area of the so-called "sharing economy" (Richter et al. 2017). More recently, works on digital platforms and entrepreneurship have dealt with FinTech (e.g. Troise et al. 2021), crowdsourcing (Nambisan et al. 2018), blockchain (Chalmers et al. 2021), and non-fungible tokens (Chohan and Paschen 2023).

#### 3.2.4 Topic 4. Digital ventures

The role of digital start-ups in fostering innovation processes is widely recognized in the literature (Ghezzi and Cavallo 2020; Mingione and Abratt 2020; Scheuenstuhl et al. 2021).

Many studies on digital innovation and digital entrepreneurship have focused on the firm and organization level (Bharadwaj et al. 2013). Some of these works have investigated the antecedents that contribute to the birth of innovation-oriented digital entrepreneurial firms. Managerial strategies (Sprenger et al. 2017) and digital capabilities (Gupta and Bose 2018) have been recognized as the basis for starting an entrepreneurial path for a digital entrepreneurial firm. Other works have considered factors such as IT capability (Nwankpa and Datta 2017) and IT infrastructure maturity (Zhu and Lin 2019). According to Matricano et al. (2021), organizational culture plays a central role when dealing with digital businesses. Organizational culture represents a fundamental factor for digital companies (Solberg et al. 2020). Quinton et al. (2018) asserted that digital orientation in entrepreneurial firms is driven by a positive appraisal of the value created through digital technologies, given the perceived risks. At the same time, the presence of organizational capabilities, adaptability, and cross-functional integration between marketing and non-marketing functions positively impact the success of activities in the digital domain. Schallmo et al. (2017) analyzed preconditions for the development and implementation of a digital business model, combining them in a transformation roadmap.

These factors are highly relevant, especially in the context of digital innovative businesses, characterized by high dynamism and volatility, with opportunities that emerge and vanish rapidly (Autio et al. 2018).

The definition of appropriate strategies, according to the digital-economy paradigm, is fundamental for entrepreneurial firms' success. Digitalization represents an important enabling factor for strategy deployment both at organizational and employee levels (Le Dinh et al. 2018). Piaskowska et al. (2021) studied digital scale-up companies, discussing scaling strategies based on Penrose's theory of firm growth in the digitization context. Ghezzi et al. (2019) analyzed the adoption of lean start-up approaches by digital entrepreneurial firms launching innovative products/services.

Some works have investigated critical factors contributing to the success of digital entrepreneurial firms. Spiegel et al. (2016) highlighted the importance of social capital, the presence of a balanced and stable team, and organizational agility as crucial factors for company success. Ammirato et al. (2020) identified critical success factors affecting digital companies' ability to pursue entrepreneurial objectives. The ability to obtain funds, to set up an appropriate business plan, and to find reliable and willing partners were recognized among the most relevant factors. Other studies have investigated the organizational and business-process performance of digital entrepreneurial firms. Regarding organizational performance, the most widely used measures are competitiveness, customer satisfaction, profitability, and internationalization (Scuotto et al. 2017; Bala and Feng 2019).

#### 3.2.5 Topic 5. The digital entrepreneur's profile

The digital entrepreneur is a person pursuing new venture opportunities through the exploitation of digital media, the Internet, and other information and communication technologies (ICTs) (Hair et al. 2012). In some cases, the digital entrepreneur stands out for his/her skills as an innovator and vision capabilities; he/she is an individual

who takes the initiative and is predisposed to change, risk, and the acceptance of failure (Kamperidou 2020). The capability of entrepreneurial ventures to bring new products and services to the market by creating and seizing opportunities depends to a large extent on the work and capabilities of the entrepreneur (Cowling and Nadeem 2020). Higher commitment, individual creativity, and flexibility make entrepreneurial firms agile and ready to take up the challenges of innovation, especially in highly dynamic contexts (Sahut and Peris-Ortiz 2014).

A wide range of studies has been devoted to the identification and analysis of aspects characterizing the figure of the digital entrepreneur. Some of these studies have focused on the reasons why entrepreneurs decide to undertake an entrepreneurial initiative in the digital field (Lasso et al. 2019). The analysis of papers retrieved in this domain allows the identification of two fundamental reasons, namely "necessity-based" or "opportunity-driven." In the first case, we refer to individuals pushed into digital entrepreneurship due to negative external forces (e.g. suffering a layoff, economic problems, or difficulty in finding a job) (Block and Koellinger 2009; Kautonen and Palmroos 2010; Fairlie 2013), while in the second case, we refer to entrepreneurs who have the possibility of seizing an opportunity to achieve economic benefits, self-realization, a better position, or personal satisfaction (Hull et al. 2007; Fossen and Sorgner 2021; Modgil et al. 2022). Other works have investigated factors characterizing successful digital entrepreneurs. Such elements deal with the entrepreneur's attitude (e.g. mindset and leadership), the possession of technical and managerial skills, educational paths, personal ties, and professional connections (Scholin et al. 2016; Vey et al. 2017). The chances of success for digital entrepreneurs have been linked to contextual aspects (Dy et al. 2017). Ngoasong (2018) analyzed a theoretical relationship in which context is an antecedent of an entrepreneur's digital competencies (entrepreneurial and technological skills), influencing the willingness to be engaged in a digital venture and his/her post-entry strategic decisions.

Hassan et al. (2020) studied entrepreneurial behavior and the motivation to start digital ventures. The engagement of digital entrepreneurs is classified into four dimensions: social digital entrepreneurship; business entrepreneurship; knowledge entrepreneurship; and institutional entrepreneurship. Ammirato et al. (2019) identified three main clusters among digital entrepreneurs: emerging young; business-focused; and experienced. These clusters vary with the entrepreneurs' background and competence base, motivation, and satisfaction factors. In particular, the second cluster is the one that is characterized by a strong orientation to technologies and innovation.

Some studies have investigated the entrepreneurial aspects relating to the traits of the innovator in the digital environment. The digital domain is rather new and markedly different compared to analog or traditional ones, demanding a different set of traits and skills (Fichman et al. 2014). Mancha and Iyer (2017) identified some characteristics of the digital entrepreneur/innovator, including attitude toward digital, strong online identity, capacity to leverage social networks, innovativeness with technology, ability to experiment, and managerial skills. Later, Mancha and Shankaranarayanan (2021) delved into the antecedents that make an entrepreneur a digital innovator. They found that the possession of digital skills and self-efficacy distinguish a digital innovator while, surprisingly, digital literacy and entrepreneurial

orientation do not relate to the individual's digital innovativeness. Ngoasong (2018) pointed out that entrepreneurs who are able to deploy entrepreneurial digital competencies are more likely to develop innovative digital businesses.

Some papers have addressed gender questions in digital entrepreneurship. Despite the Utopian view held concerning opportunities deriving from the Internet, gender inequalities, already demonstrated in traditional markets, also persist in the domain of digital entrepreneurship (Duffy and Pruchniewska 2017; Dy et al. 2017). McAdam et al. (2020) deepened the emancipatory possibilities offered by digital entrepreneurship for women constrained by social and cultural practices, such as the male guardianship of female relatives and legally enforced gender segregation. They examined women's engagement in digital entrepreneurship in emerging economies with restrictive social and cultural practices. Kamperidou (2020) confirmed that women entrepreneurs continue to face the multitasking whirlpool, work–life conflict, and discrimination also in digital businesses. In conclusion, the study argued that innovation is the first criterion for successful female digital entrepreneurship.

#### 3.2.6 Topic 6. Digital-innovation ecosystems

This topic concerns the study of the contextual aspects influencing the choices, behavior, and performance of innovative entrepreneurial firms operating within the digital domain. Autio et al. (2013) distinguished two types of entrepreneurial-innovation behaviors in web-based companies: "entry behaviors" (i.e. the situational context leading individuals to initiate an entrepreneurial pursuit); and "post-entry behaviors" (i.e. how the context affects entrepreneurs' goal-setting). These behaviors lead respectively to two types of effects through which context may influence digital entrepreneurs, namely selection effects and strategic choice effects. Another classification provided by Autio et al. (2014) identifies categories of factors that influence the context (industry and technology, organizations, society, and institution and policy). These contextual factors can create favorable conditions, constituting a breeding environment for the birth and development of digital-innovation ecosystems (Romero and Molina 2011). Sussan and Acs (2017, p. 58) defined digital an entrepreneurial ecosystem as "a self-organizing, scalable and sustainable system composed of heterogeneous digital entities and their interrelations focusing on interactions among entities to increase system utility, gain benefits, and promote information sharing, inner and inter cooperation and system innovation." Du et al. (2018, p. 2) referred to digital entrepreneurial ecosystems as "the combination of social, political, economic and cultural elements within a region that supports the development and growth of innovative start-ups pursuing new venture opportunities presented by digital technologies." According to Granstrand and Holgersson (2020), digital-innovation ecosystems can be defined as purposeful collaborative arrangements within the digital industry, through which firms combine their efforts into innovative, coherent, and collective customer-facing solutions. In this context, digital-innovation ecosystems help entrepreneurs to generate and deploy new ideas, select and allocate resources, exploit market opportunities, and create legitimacy for innovations (Kraus et al. 2018).

Entrepreneurs value the potential of such digital ecosystems as an environment in which to try out ideas and contribute to digital solutions through a collaborative setting. According to Elia et al. (2020), digital technologies in innovation ecosystems can represent both the object of the venture creation and the context where the operational processes of firms are conducted. In the first case, the digital-innovation ecosystem leverages a network of entrepreneurial knowledge that helps to produce and deliver innovative digital artifacts or services. In the second case, the ecosystem uses digital technologies as a facilitating structure to aggregate a wide network of heterogeneous and geographically dispersed stakeholders in order to deliver innovative products and services. Hsieh and Wu (2019) emphasized the relationship between the way entrepreneurs relate to innovation and their participation in digital ecosystems.

Some works have analyzed the role of incubators in fostering the innovation processes of digital companies. Incubators favor digital-enabled collaboration and offer services such as training, mentoring, access to seed funding, and workspace, offering the opportunity to overcome the resource limitations of a single firm and accelerating the creation of digital offerings and digital start-ups (Elia et al. 2021). These authors proposed a model to identify the actors, values, flows, and processes that are required to support the construction of a resilient digital-entrepreneurial ecosystem.

Other works have examined the collaboration between digital new ventures and business angels and venture capitalists. Cavallo et al. (2019) examined the role of this kind of collaboration in explaining the growth of digital new ventures, with reference to two specific phases of digital start-ups' lifecycle: start-up; and scale-up. They found a positive relationship between venture capitalists' support and the growth of digital ventures, while no evidence emerged for business angels' contribution to digital ventures' growth, both in the start-up and scale-up phase. The role of venture capitalists as a "scout" or as a "coach" for new ventures was investigated by Granz et al. (2021). Venture capitalists are recognized as a powerful support for new ventures to engage in open-innovation practices, since they allow organizations to increase their internal exploitation capabilities and to foster external knowledge acquisition (Pinkow and Iversen 2020).

Some studies have explored how digital-innovation ecosystems arise; for example, Du et al. (2018) analyzed the case of the Zhongguancun digital ecosystem, often referred to as China's Silicon Valley. Based on the meta-organization literature, these authors found that Zhongguancun's ecosystem consists of three roles (institutional supporter, co-working space, and niche players) and two processes (the construction of a common infrastructure and the cultivation of an entrepreneurial culture). Sussan and Acs (2017) introduced a conceptual framework for digital entrepreneurial ecosystems, linking entrepreneurial ecosystems with their focus on agency and institutions, and digital ecosystems with their focus on digital infrastructure and users.

The inter-topic distance map shows an overlap between topic 1 (start-ups' collaboration networks) and topic 6 (digital-innovation ecosystems). In fact, the two topics refer to the relational aspects of digital entrepreneurial firms, both in collaborations aimed at specific objectives (e.g. innovation projects) and with regard to the impact of ecosystems and other stakeholders in the success of digital-innovation projects. Overall, these two aforementioned topics are close in terms of inter-topic distance

with topic 4 (digital ventures) and topic 2 (business-model innovation), since they represent characteristic aspects of digital entrepreneurial initiatives. On the other hand, topic 3 (digital platforms) and topic 5 (the digital entrepreneur's profile) seem to be logically distant from each other and from the other four topics.

## 4 Discussion

Advancement in digital technologies has led to unprecedented transformation in society and the main economic sectors. Many scholars have recognized the role of digital technologies as a fundamental driver of companies' development and competitiveness (Nambisan et al. 2017; Martínez-Caro et al. 2020). Digital innovation has expanded a wide range of opportunities for entrepreneurs, in terms both of the creation of new digital ventures (Kraus et al. 2019a, b; Nambisan et al. 2019) and as an enabler of transformation for existing businesses (Hanelt et al. 2021). The literature on digital innovation suggests that digital technologies support companies' flexibility (Svahn et al. 2017), lead to market disruption (Geissinger et al. 2020), and offer opportunities for the creation of new business models (Bouncken et al. 2021).

Our study highlights the structure of the literature on digital innovation in entrepreneurial firms and provides insights into the major research topics in this field. The results of the systematic review based on LDA showed that the literature has mainly focused on six main topics, which can be further developed in future research. The first topic, *start-ups' collaboration networks*, highlights the importance of horizontal collaborations for digital innovation and the structural aspects of such collaborations, as well as the open innovation projects between digital startups and large companies. The second topic, *business-model innovation*, examines the drivers of business model innovation for digital entrepreneurial firms and the novel approaches to business model design as a tool to support innovation. The third topic, *digital platforms*, looks at the modelling frameworks for digital platforms and the role of digital platforms in supporting innovation processes. The fourth topic, *digital ventures*, examines the antecedents that contribute to the birth of innovation-oriented digital entrepreneurial firms and the strategies for their success. The fifth topic, *the digital entrepreneur's profile,* looks at the reasons for starting digital entrepreneurial firms, the characteristics of successful digital entrepreneurs, and the impact of the innovation ecosystem on their performance. Finally, the sixth topic, *digital-innovation ecosystems*, focuses on the contextual aspects of digital innovation ecosystems, the performances of these ecosystems, and the impact on digital entrepreneurial firms.

The analysis of the trends, author clusters, and topics has allowed us to identify gaps in the literature and, as a consequence, directions for future research.

A first observation that arises quite clearly from the review and analysis is that digital innovation, with reference to entrepreneurial ventures, is a multi-level phenomenon. The literature passes from the individual level (entrepreneur) to the organizational level (entrepreneurial ventures and business models), to then consider organizational systems of increasing complexity, such as collaborations through digital platforms, networks, and ecosystems as a whole. While studies that focus on one

level of investigation are critical, many dynamics are likely to be better understood if multiple levels are analyzed at the same time. For this reason, we propose that future research includes studies with several units of analysis nested together.

Our analysis suggests a prevalence of studies in the field of entrepreneurship, while studies from the cultural field of innovation management are in the minority. Comparing the results from the text-mining analysis with the theoretical clusters identified in the co-citation analysis, differences and similarities emerge that are worth analyzing. The co-citation analysis identified four groups or clusters of authors that (apart from cluster 2) are associated with specific disciplinary areas, namely technology management, entrepreneurship, and innovation management. The six topics identified through the text-mining approach only partially overlap with the four clusters, but they also seem to represent a mono-disciplinary approach. For example, topics 4 and 5 include entrepreneurship studies (although they not completely overlap with cluster 3). Similarly, topic 3 investigates topics and uses models from the technology-management domain, while topics 1 and 2 often adopt an innovation-management approach. The phenomenon at hand is interdisciplinary, so the contribution of other areas of investigation, in addition to that of entrepreneurship, could be of great value. Thus, a second suggestion for future research is to adopt an interdisciplinary approach, valorizing in particular the field of innovation and technology management.

Furthermore, from the point of view of the theoretical approach, it is noted that the literature addresses the issue of digital innovation with continuity compared to the literature on technological innovation in general. The models used and the referenced theories are very similar to those used for other innovation domains in recent decades, although the phenomena studied are presented as radically different. This happens both for articles that can be placed in the disciplinary area of entrepreneurship and for those in the area of innovation or technology management. The observation can be extended both to articles that study the adoption of new technologies and to those that study their development. A third suggestion for the literature, therefore, is to develop specific theories, constructs, and models for the new context generated by digital transformation.

## 5 Conclusions

The topic of digital innovation has received great attention from research in recent years. The role of entrepreneurial firms in innovation processes, on the other hand, has been considered central since Schumpeter's contributions. In recent years, however, the intersection between the two fields of research seems to have become broader and deeper. The spectacular success of some digital start-ups in the last quarter of a century and the development of innovation ecosystems centered on new innovative companies have certainly contributed to this phenomenon.

The article provides a descriptive picture of the scientific activity, highlighting the main trends, the most active authors and countries, the journals that have published the most on the topic. This work has mapped the literature published to date

that simultaneously addresses the two themes, relating digital innovation to the role of entrepreneurial firms.

Above all, this paper highlights and analyzes the most frequently addressed thematic areas, namely: start-up'' collaboration networks, business-model innovation, digital platforms, digital ventures, digital entrepreneu''s profile, digital-innovation ecosystems.

These topics provide a roadmap for future research, as there are still gaps in the literature that can be addressed. For example, there is a need for more research that combines different topics to provide a more comprehensive understanding of the digital innovation process in entrepreneurial firms. Additionally, there is a need for more studies that focus on the regional and sectoral differences in the digital innovation process. Furthermore, there is a need for more studies that examine the role of innovation ecosystems in supporting the growth and success of digital entrepreneurial firms. In conclusion, this study provides valuable insights into the current state of the literature on digital innovation in entrepreneurial firms and identifies areas for future research.

The study demonstrates that the research domain is growing and research interest on the topic is lively. However, the results are fragmented. Three main directions have been proposed:

- *Multi-level Analysis* future research should provide a more comprehensive understanding of the phenomenon of digital innovation in entrepreneurial firms at a multiple level, the individual (entrepreneur), organizational (entrepreneurial ventures and business models), and ecosystem levels.
- *Interdisciplinary Approach* research should take into account contributions from other areas of investigation, in particular, the fields of innovation and technology management. By taking an interdisciplinary approach, the digital innovation process in entrepreneurial ventures can be analyzed from multiple perspectives, leading to a more comprehensive understanding of the phenomenon.
- *Development of Specific Theories for Digital Innovation* future research should aim to develop specific theories, constructs, and models for the new context generated by digital transformation. This will provide a more robust understanding of the digital innovation process in entrepreneurial ventures and help to fill the gap between the literature on technological innovation and digital innovation.

The proposed framework is a first step towards a systematization of knowledge on this topic. The relationships between digital innovation and entrepreneurship are numerous and complex. If on the one hand digital innovation is an opportunity for new businesses, on the other hand new entrepreneurial businesses represent a development engine for digital innovation. Not only are they able to contribute to the development of new technologies, but they are able to translate them into business models and test them on the market. Future research will have to analyze the ways in which technological innovation translates into business innovation.

Furthermore, the role of entrepreneurial companies cannot be analyzed in isolation from the ecosystems that have developed thanks to and around digital technologies. These digital innovation ecosystems are made up of a large variety of players (start-ups,

large companies, venture capitalists, intermediaries) linked by a dense network of relationships. The research will have to analyze the phenomenon at several levels a: individual, organizational and ecosystem.

Overall, the article provides a framework for analyzing the phenomenon of innovation in and with entrepreneurial firms that can provide a useful reference for both entrepreneurship and innovation management researchers. It contributes to the advancement of these two disciplines which increasingly interact to explain innovation-related phenomena.

### 5.1 Implications

The article provides a summary of the topics most frequently dealt with in the literature in the field of digital innovation and entrepreneurship. For this reason, it can be a useful guide for entrepreneurs engaged in digital start-ups. It may also be of interest, however, for those managers of large companies looking for partners in start-ups to accelerate the digitization of their business. Our article provides information to policy-makers interested in promoting open innovation in the digital environment.

For business practitioners, this study can provide a useful reference regarding the role of digital innovation and entrepreneurial traits in new venture initiatives. For scholars, the study can provide a holistic overview of the current research landscape in this field, evidencing research themes and gaps in the extant knowledge and envisaging some promising streams for future research.

### 5.2 Limitations

Some limitations must be acknowledged. The study considered only one database, namely Elsevier's Scopus. While many guideline papers include Scopus among the most suitable databases for SLRs, a small number of relevant documents may have been missed. Future studies could expand the search to other databases. Further, bibliometric techniques may introduce distortions because of their reliance on formal elements and because the qualitative assertions made as a result of the application of bibliometrics techniques can be quite subjective. Much of the work relies on human-based review and interpretation and is for this reason subject to bias. In other words, bibliometric analysis is quantitative in nature, so the relationship between quantitative and qualitative results can be unclear. For the current state of knowledge, this limit can only be overcome through an onerous effort to analyze the full papers, which can be the subject of future studies. Finally, the choice of articles as the only type of source considered (as well as from one specific database, even though it is one of the largest ones) limits the scope of the research and might have led to the omission of some valuable documents.

# Appendix

## Recent Special Issues on digital innovation and entrepreneurship

| Special issue | Journal | No of. Papers included | References | Main focus |
|---|---|---|---|---|
| Digital Innovation Management: Reinventing innovation management research in a digital world | MIS Quarterly | 6 | Nambisan et al. (2017) | New challenges for innovation management due to increasing digitalization in entrepreneurship |
| The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes | Research Policy | 11 | Nambisan et al. (2019) | Three main themes in the literature on digital innovation and entrepreneurship: affordance, openness and generativity |
| Digital innovation and Venturing | Review of Managerial Science | 7 | Kraus et al. (2019a, b) | Focus on crowdfunding, sharing economy and digital business models |
| The age of digital entrepreneurship | Small Business Economics | 5 | Sahut et al. (2019) | Digital value creation perspective |
| Digital or not—The future of entrepreneurship and innovation | Journal of Business Research | 11 | Berger et al. (2021) | Digital entrepreneurship and digital innovation |

## Recent Review Papers on digital innovation and entrepreneurship

| Review paper | Journal | No of. Papers analyzed | References | Main contribution |
|---|---|---|---|---|
| Digital entrepreneurship: a research agenda on new business models for the twenty-first century | International Journal of Entrepreneurial Behavior & Research | 35 | Kraus et al. (2018) | Six main topics in the literature on digital entrepreneurship: digital business models, digital entrepreneurship process, platform strategies, digital ecosystems, entrepreneurship education and social digital entrepreneurship |

| Review paper | Journal | No of. Papers analyzed | References | Main contribution |
|---|---|---|---|---|
| Digital entrepreneurship and its role in innovation systems: A systematic literature review as a basis for future research avenues for sustainable transitions | Sustainability | 52 | Satalkina and Steiner (2020) | Classification of findings in tthree dimensions of the innovation system: the entrepreneur's profile, the entrepreneurial process, and its relevant ecosystem |
| Digital Transformation: An Overview of the Current State of the Art of Research | SAGE Open | 39 | Kraus et al. (2021) | Classification of findings in three main clusters: societal, business and technological impact of digital transformation |
| The role of digital innovation in knowledge management systems: A systematic literature review | Journal of Business Research | 46 | Di Vaio et al. (2021) | A knowledge—based perspective on digital innovation |
| Digital innovation in SMEs: a systematic review, synthesis and research agenda | Information Technology for Development | 382 | Ramdani et al. (2021) | A theoretical framework of digital innovation in SMEs based on three main components: digital innovation antecedents, digital innovation processes and digital innovation performances |

**Funding** Open access funding provided by Università della Calabria within the CRUI-CARE Agreement.

**Data availability** My manuscript has no associate data.

## References


Aloini D, Latronico L, Pellegrini L (2022) The impact of digital technologies on business models. Insights from the space industry. Meas Bus Excell. 26(1):64–80

Alsaaty FM (2011) A model for building innovation capabilities in small entrepreneurial firms. Acad Entrep J 17(1):1

Amit R, Zott C (2012) Creating value through business model innovation. MIT Sloan Manag Rev 53(3):41–49

Ammirato S, Sofo F, Felicetti AM, Helander N, Aramo-Immonen H (2020) A new typology to characterize Italian digital entrepreneurs. Int J Entrep Behav Res 26(2):224–245

Ammirato S, Felicetti AM, Ròganо D, Linzalone R, Corvello V (2022a) Digitalizing the systematic literature review process: the MySLR platform, knowledge management research and practice 1–18

Ammirato S, Linzalone R, Felicetti AM (2022b) The value of system dynamics' diagrams for business model innovation. Manage Decis 60(4):1056–1075

Ardito L, Capolupo P (2023) Exploratory innovation in family-owned firms: the moderating role of digital search. IEEE Trans Eng Manag 1–11

Åström J, Reim W, Parida V (2022) Value creation and value capture for AI business model innovation: a three-phase process framework. RMS 16(7):2111–2133

Autio E, Dahlander L, Frederiksen L (2013) Information exposure, opportunity evaluation, and entrepreneurial action: an investigation of an online user community. Acad Manag J 56(5):1348–1371

Autio E, Kenney M, Mustar P, Siegel D, Wright M (2014) Entrepreneurial innovation: the importance of context. Res Policy 43(7):1097–1108

Autio E, Nambisan S, Thomas LD, Wright M (2018) Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. Strateg Entrep J 12(1):72–95

Bahl M, Lahiri S, Mukherjee D (2021) Managing internationalization and innovation tradeoffs in entrepreneurial firms: evidence from transition economies. J World Bus 56(1):101150

Bala H, Feng X (2019) Success of small and medium enterprises in Myanmar: role of technological, organizational, and environmental factors. J Glob Inf Technol Manag 22(2):100–119

Baumol WJ (2004) Entrepreneurial enterprises, large established firms and other components of the free-market growth machine. Small Bus Econ 23(1):9–21

Benoit S, Baker TL, Bolton RN, Gruber T, Kandampully J (2017) A triadic framework for collaborative consumption (CC): motives, activities and resources & capabilities of actors. J Bus Res 79:219–227

Berger ES, von Briel F, Davidsson P, Kuckertz A (2021) Digital or not–The future of entrepreneurship and innovation: Introduction to the special issue. J Bus Res 125:436–442

Bharadwaj A, El Sawy OA, Pavlou PA, Venkatraman NV (2013) Digital business strategy: toward a next generation of insights. MIS Q 37(2):471–482

Bhimani H, Mention AL, Barlatier PJ (2019) Social media and innovation: a systematic literature review and future research directions. Technol Forecast Soc Chang 144:251–269

Blei DM (2012) Introduction to probabilistic topic models. Commun ACM 55:77–84. https://doi.org/10.1145/2133806.2133826

Block J, Koellinger P (2009) I can't get no satisfaction – necessity entrepreneurship and procedural utility. Kyklos 62(2):191–209

Bogers M (2011) The open innovation paradox: knowledge sharing and protection in R&D collaborations. Eur J Innov Manag 14(1):93–117

Boudreau K, Lakhani K (2009) How to manage outside innovation: Competitive markets or collaborative communities? MIT Sloan Manag Rev 50(4):69–75

Bouncken RB, Kraus S, Roig-Tierno N (2021) Knowledge-and innovation-based business models for future growth: digitalized business models and portfolio considerations. RMS 15(1):1–14

Brown R, Mawson S, Rowe A, Mason C (2018) Working the crowd: improvisational entrepreneurship and equity crowdfunding in nascent entrepreneurial ventures. Int Small Bus J: Res Entrepreneurship 36(2):169–193. https://doi.org/10.1177/0266242617729743

Bunduchi R, Crișan-Mitra C, Salanță II, Crișan EL (2021) Digital product innovation approaches in entrepreneurial firms–the role of entrepreneurs' cognitive frames. Technol Forecast Soc Change 175:121343

Carayannis EG, Von Zedtwitz M (2005) Architecting gloCal (global–local), real-virtual incubator networks (G-RVINs) as catalysts and accelerators of entrepreneurship in transitioning and developing

economies: lessons learned and best practices from current development and business incubation practices. Technovation 25(2):95–110
Cavallo A, Ghezzi A, Del'Era C, Pellizzoni E (2019) Fostering digital entrepreneurship from startup to scaleup: the role of venture capital funds and angel groups. Technol Forecast Soc Change 145:24–35
Chalmers D, Matthews R, Hyslop A (2021) Blockchain as an external enabler of new venture ideas: digital entrepreneurs and the disintermediation of the global music industry. J Bus Res 125:577–591
Chen Z, Liu B (2014) Topic modeling using topics from many domains, lifelong learning and big data. In: international conference on machine learning. Proceedings of the 31st International Conference on Machine Learning, PMLR 32(2):703–711
Chesbrough H (2010) Business model innovation: opportunities and barriers. Long Range Plan 43(2/3):354–363
Chohan R, Paschen J (2023) What marketers need to know about non-fungible tokens (NFTs). Bus Horiz 66(1):43–50
Christofi M, Vrontis D, Cadogan JW (2021) Micro-foundational ambidexterity and multinational enterprises: a systematic review and a conceptual framework. Int Bus Rev 30(1):101625
Corvello V, Steiber A, Alänge S (2023) Antecedents, processes and outcomes of collaboration between corporates and start-ups. Rev Manag Sci. 17:129–154
Cosenz F, Bivona E (2021) Fostering growth patterns of SMEs through business model innovation. a tailored dynamic business modelling approach. J Bus Res 130:658–669
Cowling M, Nadeem SP (2020) Entrepreneurial firms: with whom do they compete, and where? Rev Ind Organ 57(3):559–577
Cramer J, Krueger AB (2016) Disruptive change in the taxi business: the case of Uber. Am Econ Rev 106(5):177–182
Del Giudice M, Caputo F, Evangelista F (2016) How are decision systems changing? The contribution of social media to the management of decisional liquefaction. J Decis Sys 25(3):1–13
Denyer D, Tranfield D (2009) Producing a systematic review. In: Buchanan D, Bryman A (eds) The SAGE handbook of organizational research methods. Sage, London, pp 671–689
Di Vaio A, Palladino R, Pezzi A, Kalisz DE (2021) The role of digital innovation in knowledge management systems: a systematic literature review. J Bus Res 123:220–231
Donthu N, Kumar S, Mukherjee D, Pandey N, Lim WM (2021) How to conduct a bibliometric analysis: An overview and guidelines. J Bus Res 133:285–296
Dougherty D, Hardy C (1996) sustained product innovation in large, mature organizations: overcoming innovation-to-organization problems. Acad Manag J 39(5):1120–1153
Du W, Pan SL, Zhou N, Ouyang T (2018) From a marketplace of electronics to a digital entrepreneurial ecosystem (DEE): the emergence of a meta-organization in Zhongguancun, China. Inf Syst J 28(6):1158–1175
Duffy BE, Pruchniewska U (2017) Gender and self-enterprise in the social media age: a digital double bind. Inf Commun Soc 20(6):843–859
Dy AM, Marlow S, Martin L (2017) A Web of opportunity or the same old story? Women digital entrepreneurs and intersectionality theory. Hum Relations 70(3):286–331
Elia G, Margherita A, Passiante G (2020) Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process. Technol Forecast Soc Change 150:119791
Elia G, Margherita A, Ciavolino E, Moustaghfir K (2021) Digital society incubator: combining exponential technology and human potential to build resilient entrepreneurial ecosystems. Adm Sci 11(3):96
Fairlie RW (2013) Entrepreneurship, economic conditions, and the great recession. J Econ Manag Strateg 22(2):207–231
Ferreira JJ, Fernandes CI, Kraus S (2019) Entrepreneurship research: mapping intellectual structures and research trends. RMS 13(1):181–205
Fichman RG, Dos Santos BL, Zheng Z (2014) Digital innovation as a fundamental and powerful concept in the information systems curriculum. MIS Q 38(2):329–353
Fossen FM, Sorgner A (2021) Digitalization of work and entry into entrepreneurship. J Bus Res 125:548–563
Gawer A, Cusumano MA (2014) Industry platforms and ecosystem innovation. J Prod Innov Manag 31(3):417–433

Geissinger A, Laurell C, Sandström C (2020) Digital Disruption beyond Uber and Airbnb—Tracking the long tail of the sharing economy. Technol Forecast Soc Chang 155:119323
Ghezzi A (2019) Digital startups and the adoption and implementation of Lean Startup approaches: effectuation, bricolage and opportunity creation in practice. Technol Forecast Soc Change 146:945–960
Ghezzi A, Cavallo A (2020) Agile business model innovation in digital entrepreneurship: lean startup approaches. J Bus Res 110:519–537
Goncalves D, Bergquist M, Bunk R, Alänge S (2020) Cultural aspects of organizational agility affecting digital innovation. J Entrep Manag Innov 16(4):13–46
Granstrand O, Holgersson M (2020) Innovation ecosystems: a conceptual review and a new definition. Technovation 90:102098
Granz C, Lutz E, Henn M (2021) Scout or coach? Value-added services as selection criteria in entrepreneurs' venture capitalist selection. Ventur Cap 23(1):5–40
Grimaldi M, Corvello V, De Mauro A, Scarmozzino E (2017) A systematic literature review on intangible assets and open innovation. Knowl Manage Res Pract 15(1):90–100
Gupta G, Bose I (2018) Strategic learning for digital market pioneering: examining the transformation of Wishberry's crowdfunding model. Technol Forecast Soc Change 146:865–876
Haaker T, Ly PTM, Nguyen-Thanh N, Nguyen HTH (2021) Business model innovation through the application of the Internet-of-Things: a comparative analysis. J Bus Res 126:126–136
Haggège M, Gauthier C, Rüling C-C (2017) Business model performance: five key drivers. J Bus Strateg 38(2):6–15
Hagiu A, Wright J (2015) Multi-sided platforms. Int J Ind Organ 43:162–174
Hair N, Wetsch LR, Hull CE, Perotti V, Hung Y-TC (2012) Market orientation in digital entrepreneurship: advantages and challenges in a web 2.0 networked world. Int J Innov Technol Manag 9(9):1250045
Hanelt A, Bohnsack R, Marz D, Antunes Marante C (2021) A systematic review of the literature on digital transformation: insights and implications for strategy and organizational change. J Manage Stud 58(5):1159–1197
Hartmann PM, Zaki M, Feldmann N, Neely A (2016) Capturing value from big data – a taxonomy of data-driven business models used by start-up firms. Int J Oper Prod Manag 36(10):1382–1406
Hassan H, Sade AB, Rahman MS (2020) Shaping entrepreneurial intention among youngsters in Malaysia. J Humanit Appl Soc Sci 2(3):235–251
Hsieh YJ, Wu YJ (2019) Entrepreneurship through the platform strategy in the digital era: insights and research opportunities. Comput Hum Behav 95:315–323
Hull CEK, Hung YTC, Hair N, Perotti V, DeMartino R (2007) Taking advantage of digital opportunities: a typology of digital entrepreneurship. Int J Netw Virtual Organ 4(3):290–303
Jeyaraj A, Rottman JW, Lacity MC (2006) A review of the predictors, linkages, and biases in IT innovation adoption research. J Inf Technol 21(1):1–23
Kamberidou I (2020) "Distinguished" women entrepreneurs in the digital economy and the multitasking whirlpool. J Innov Entrep 9(1):1–26
Kapoor K, Bigdeli AZ, Dwivedi YK, Schroeder A, Beltagui A, Baines T (2021) A socio-technical view of platform ecosystems: systematic review and research agenda. J Bus Res 128:94–108
Kautonen T, Palmroos J (2010) The impact of a necessity-based start-up on subsequent entrepreneurial satisfaction. Int Entrep Manag J 6(3):285–300
Keane M, Chen Y (2019) Entrepreneurial solutionism, characteristic cultural industries and the Chinese dream. Int J Cult Policy 25(6):743–755
Khanin D, Rosenfield R, Mahto RV, Singhal C (2022) Barriers to entrepreneurship: opportunity recognition vs. opportunity pursuit. Rev Manag Sci 16(4):1147–1167
Kohli R, Melville NP (2019) Digital innovation: a review and synthesis. Info Syst J 29:200–223. https://doi.org/10.1111/isj.12193
Kraus S, Palmer C, Kailer N, Kallinger FL, Spitzer J (2018) Digital entrepreneurship: a research agenda on new business models for the twenty-first century. Int J Entrep Behav Res. https://doi.org/10.1108/IJEBR-06-2018-0425
Kraus S, Palmer C, Kailer N, Kallinger FL, Spitzer J (2019a) Digital entrepreneurship: a research agenda on new business models for the twenty-first century. Int J Entrep Behav Res 25(2):353–375
Kraus S, Roig-Tierno N, Bouncken RB (2019b) Digital innovation and venturing: an introduction into the digitalization of entrepreneurship. RMS 13(3):519–528
Kraus S, Jones P, Kailer N, Weinmann A, Chaparro-Banegas N, Roig-Tierno N (2021) Digital transformation: an overview of the current state of the art of research. SAGE Open 11(3):21582440211047576

Kraus S, Breier M, Lim WM, Dabić M, Kumar S, Kanbach D, Mukherjee D, Corvello V, Piñeiro-Chouse J, Liguori EW, Marqués DP, Schiavone F, Ferraris A, Fernandes C, Ferreira JJ (2022) Literature reviews as independent studies: guidelines for academic practice. Rev Manag Sci 16:2577–2595. https://doi.org/10.1007/s11846-022-00588-8

Kuester S, Konya-Baumbach E, Schuhmacher MC (2018) Get the show on the road: go-to-market strategies for e-innovations of start-ups. J Bus Res 83:65–81

Lasso S, Mainardes E, Motoki F (2019) Why do entrepreneurs open tech startups? A comparative study between Brazilian and foreign enterprises. Int Entrep Manag J 15(1):233–255

Le Dinh T, Vu MC, Ayayi A (2018) Towards a living lab for promoting the digital entrepreneurship process. Int J Entrep 22(1):1–17

Lee J, Berente N (2012) Digital innovation and the division of innovative labor: digital controls in the automotive industry. Organ Sci 23(5):1428–1447

Leifer R, McDermott CM, O'connor GC, Peters LS, Rice MP, Veryzer RW (2000) Radical innovation: how mature companies can outsmart upstarts. Harvard Business Press, Brighton

Leliveld A, Knorringa P (2018) Frugal innovation and development research. Eur J Dev Res 30(1):1–16

Lin YK, Maruping LM (2022) Open source collaboration in digital entrepreneurship. Organ Sci 33(1):212–230

Makridakis S (2017) The forthcoming Artificial Intelligence (AI) revolution: its impact on society and firms. Futures 90:46–60

Mancha R, Iyer B (2017) Harnessing innovation. Ivey Bus J (2):1–9

Mancha R, Shankaranarayanan G (2021) Making a digital innovator: antecedents of innovativeness with digital technologies. Inf Technol People 34(1):318–335

Martínez-Caro E, Cegarra-Navarro JG, Alfonso-Ruiz FJ (2020) Digital technologies and firm performance: the role of digital organisational culture. Technol Forecast Soc Chang 154:119962

Matricano D, Castaldi L, Sorrentino M, Candelo E (2022) The behavior of managers handling digital business transformations: theoretical issues and preliminary evidence from firms in the manufacturing industry. Int J Entrep Behav Res 28(5):1292–1309

McAdam M, Crowley C, Harrison RT (2020) Digital girl: Cyberfeminism and the emancipatory potential of digital entrepreneurship in emerging economies. Small Bus Econ 55(2):349–362

Mingione M, Abratt R (2020) Building a corporate brand in the digital age: imperatives for transforming born-digital startups into successful corporate brands. J Mark Manag 36(11–12):981–1008

Modgil S, Dwivedi YK, Rana NP, Gupta S, Kamble S (2022) Has Covid-19 accelerated opportunities for digital entrepreneurship? An Indian perspective. Technol Forecast Soc Chang 175:121415

Nambisan S (2017) Digital entrepreneurship: toward a digital technology perspective of entrepreneurship. Entrep Theory Pract 41(6):1029–1055

Nambisan S, Lyytinen K, Majchrzak A, Song M (2017) Digital Innovation Management: reinventing innovation management research in a digital world. MIS Q 41(1):223

Nambisan S, Siegel D, Kenney M (2018) On open innovation, platforms, and entrepreneurship. Strateg Entrep J 12(3):354–368

Nambisan S, Wright M, Feldman M (2019) The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. Res Policy 48(8):103773

Ngoasong MZ (2018) Digital entrepreneurship in a resource-scarce context: a focus on entrepreneurial digital competencies. J Small Bus Enterp Dev 25(3):483–500

Nwankpa JK, Datta P (2017) Balancing exploration and exploitation of IT resources: the influence of Digital Business Intensity on perceived organizational performance. Eur J Inf Syst 26(5):469–488

Nylén D, Holmström J (2015) Digital innovation strategy: a framework for diagnosing and improving digital product and service innovation. Bus Horiz 58(1):57–67

O'Connor G (2008) Major innovation as a dynamic capability: a systems approach. J Prod Innov Manag 25(2):313–330

O'connor GC, Rice MP (2001) Opportunity recognition and breakthrough innovation in large established firms. Calif Manage Rev 43(2):95–116

O'Reilly C, Tushman M (2004) The ambidextrous organization. Harv Bus Rev 82(4):74–82

Osterwalder A, Pigneur Y, Clark T (2010) Business model generation. A handbook for visionaries, game changers, and challengers. Wiley, Hoboken

Parker G, Van Alstyne M, Jiang X (2017) Platform ecosystems: How developers invert the firm. MIS Q Manag Inf Syst 41(1):255–266

Piaskowska D, Tippmann E, Monaghan S (2021) Scale-up modes: Profiling activity configurations in scaling strategies. Long Range Plan 54:102101
Pinkow F, Iversen J (2020) Strategic objectives of corporate venture capital as a tool for open innovation. J Open Innov Technol Market Complex 6(4):157
Pittaway L, Robertson M, Munir K, Denyer D, Neely A (2004) Networking and innovation: a systematic review of the evidence. Int J Manag Rev 5–6(3–4):137–168
Quinton S, Canhoto A, Molinillo S, Pera R, Budhathoki T (2018) Conceptualising a digital orientation: antecedents of supporting SME performance in the digital economy. J Strateg Mark 26(5):427–439
Rachinger M, Rauter R, Müller C, Vorraber W, Schirgi E (2019) Digitalization and its influence on business model innovation. J Manuf Technol Manag 30(8):1143–1160
Ramdani B, Raja S, Kayumova M (2022) Digital innovation in SMEs: a systematic review, synthesis and research agenda. Inf Technol Dev 28(1):56–80
Richter C, Kraus S, Syrjä P (2015) The shareconomy as a precursor for digital entrepreneurship business models. Int J Entrep Small Bus 25(1):18–35
Richter C, Kraus S, Brem A, Durst S, Giselbrecht C (2017) Digital entrepreneurship: innovative business models for the sharing economy. Creat Innov Manag 26(3):300–310
Röder, M., Both, A., & Hinneburg, A. (2015, February). Exploring the space of topic coherence measures. In Proceedings of the eighth ACM international conference on Web search and data mining (pp. 399–408).
Romero D, Molina A (2011) Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era. Prod Plan Control 22(5–6):447–472
Rossetto DE, Bernardes RC, Borini FM, Gattaz CC (2018) Structure and evolution of innovation research in the last 60 years: review and future trends in the field of business through the citations and co-citations analysis. Scientometrics 115(3):1329–1363
Rubio-Andrés M, del Mar Ramos-González M, Sastre-Castillo MÁ (2022) Driving innovation management to create shared value and sustainable growth. RMS 16(7):2181–2211
Sahut JM, Iandoli L, Teulon F (2021) The age of digital entrepreneurship. Small Bus Econ 56:1159–1169
Sahut JM, Peris-Ortiz M (2014) Small business, innovation, and entrepreneurship. Small Bus Econ 42(4):663–668
Satalkina L, Steiner G (2020) Digital entrepreneurship and its role in innovation systems: a systematic literature review as a basis for future research avenues for sustainable transitions. Sustainability 12(7):2764
Schallmo D, Williams CA, Boardman L (2017) Digital transformation of business models—best practice, enablers, and roadmap. Int J Innov Manag 21:1740014
Scheuenstuhl F, Bican PM, Brem A (2021) How can the lean startup approach improve the innovation process of established companies? An experimental approach. Int J Innov Manag 25(03):2150029
Schiederig T, Tietze F, Herstatt C (2012) Green innovation in technology and innovation management. R&D Manage 42:180–192. https://doi.org/10.1111/j.1467-9310.2011.00672.x
Scholin T, Broome P, Ohlsson H (2016) Self-employment: the significance of families for professional intentions and choice of company type. Int J Entrep Behav Res 22(3):329–345
Scuotto V, Del Giudice M, Obi Omeihe K (2017) SMEs and mass collaborative knowledge management: toward understanding the role of social media networks. Inf Syst Manag 34(3):280–290
Secundo G, Rippa P, Cerchione R (2020) Digital academic entrepreneurship: a structured literature review and avenue for a research agenda. Technol Forecast Soc Change 157:120118
Shakina E, Parshakov P, Alsufiev A (2021) Rethinking the corporate digital divide: the complementarity of technologies and the demand for digital skills. Technol Forecast Soc Change 162:120405
Snyder H (2019) Literature review as a research methodology: an overview and guidelines. J Bus Res 104:333–339
Soetanto D, van Geenhuizen M (2015) Getting the right balance: university networks' influence on spin-offs' attraction of funding for innovation. Technovation 36–37:26–38
Solberg E, Traavik LE, Wong SI (2020) Digital mindsets: recognizing and leveraging individual beliefs for digital transformation. Calif Manage Rev 62(4):105–124
Soluk J, Kammerlander N (2021) Digital transformation in family-owned Mittelstand firms: a dynamic capabilities perspective. Eur J Inf Syst 30(6):676–711
Spender J-C, Corvello V, Grimaldi M, Rippa P (2017) Startups and open innovation: a review of the literature. Eur J Innov Manag 20(1):4–30

Spiegel O, Abbassi P, Zylka MP, Schlagwein D, Fischbach K, Schoder D (2016) Business model development, founders' social capital and the success of early stage internet start-ups: a mixed-method study. Inf Syst J 26(5):421–449

Sprenger M, Mettler T, Winter R (2017) A viability theory for digital businesses: exploring the evolutionary changes of revenue mechanisms to support managerial decisions. Inf Syst Front 19(4):899–922

Srinivasan A, Venkatraman N (2018) Entrepreneurship in digital platforms: a network-centric view. Strateg Entrep J 12(1):54–71

Steiber A, Alange S, Corvello V (2021) Evaluating corporate-startup co-creation: a critical review of the literature. Int J Innov Manag 25(07):2150073

Sussan F, Acs Z (2017) The digital entrepreneurial ecosystem. Small Bus Econ 49(1):55–73. https://doi.org/10.1007/s11187-017-9867-5

Svahn F, Mathiassen L, Lindgren R (2017) embracing digital innovation in incumbent firms: how Volvo cars managed competing concerns. MIS Q 41(1):239–253

Teece DJ (2010) Business models, business strategy and innovation. Long Range Plan 43(2–3):172–194

Troise C, Matricano D, Candelo E, Sorrentino M (2021) Entrepreneurship and fintech development: comparing reward and equity crowdfunding. Meas Bus Excell 26(1):52–63

Van Eck NJ, Waltman L (2014) Visualizing bibliometric networks. In: Ding Y, Rousseau R, Wolfram D (eds) Measuring scholarly impact: methods and practice. Springer, Cham, pp 285–320

Van Eck NJ, Waltman L (2017) Citation-based clustering of publications using CitNetExplorer and VOSviewer. Scientometrics 111:1053–1070

Vey K, Fandel-Meyer T, Zipp J, Schneider C (2017) Learning & development in times of digital transformation: facilitating a culture of change and innovation. Int J Adv Corp Learn 10(1):22–32

Wymer SA, Regan EA (2005) Factors influencing e-commerce adoption and use by small and medium businesses. Electron Markets 15(4):438–453

Yoo Y, Henfridsson O, Lyytinen K (2010) Research commentary—the new organizing logic of digital innovation: an agenda for information systems research. Inf Syst Res 21(4):724–735

Zahoor N, Al-Tabbaa O, Khan Z, Wood G (2020) Collaboration and Internationalization of SMEs: insights and recommendations from a systematic review. Int J Manag Rev 22:427–456. https://doi.org/10.1111/ijmr.12238

Zhu Z, Lin SF (2019) Understanding entrepreneurial perceptions in the pursuit of emerging e-business opportunities: the dimensions and drivers. Comput Hum Behav 95:252–261