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Original Paper

Accentuated User Entrepreneurship by Digital Technology: A Systematic Review and Research Agenda

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Abstract

There is a lack of research on the relationship between emphasizing digital technology and user entrepreneurship, a widely overlooked entrepreneurial approach. This study employs the first systematic literature review of user entrepreneurship to select and analyze 40 relevant articles from Web of Science and Scopus. Therefore, in order to advance research on user entrepreneurship and overcome its underestimated status, recognizing the empowering role of digital technology, this study, identifies sustainability as a distinctive characteristic of user entrepreneurship. The study underscores the uniqueness of user entrepreneurship, providing an opportunity for an in-depth understanding of user entrepreneurial behavior through the lens of digital technology. This research not only promotes the exploration of user entrepreneurship but also contributes valuable insights to the broader field of entrepreneurship studies, shedding light on the nuanced interplay between digital technology and the distinctive characteristics of user entrepreneurial endeavors. Finally, the theoretic frameworks are proposed through our analysis, offering valuable insights for future research in user entrepreneurship and digital transformation. The conclusions of this study provide objective theoretical value and practical guidance for research on the conceptualization of user entrepreneurship, and contributes to the direction of policy formulation.

Keywords

user entrepreneurship, digital technology, sustainable entrepreneurship, digital transformation, systematic review

1. Introduction

With the widespread adoption of Internet technology and the emergence of digital advancements, the processes of innovation and entrepreneurship have evolved from traditional forms. This transformation has reduced the uncertainty associated with entrepreneurial processes and outcomes, consequently lowering the barriers to entrepreneurship (Nambisan, 2017, pp. 1029-1055). Over the past few decades, the phenomenon of user entrepreneurship has been increasingly prevalent. In the United States alone, 11% of all companies and 46% of startups have been founded by users (Sonali, Smith & Reedy, 2012, pp. 1-30). A growing number of users are now taking center stage in entrepreneurship, autonomously engaging in business activities through digital technology and social media. Thriving in the digital environment, they have emerged as a crucial source of a new generation of entrepreneurs and startup

companies (Franke & Shah, 2003, pp. 157-178; Füller, Schroll & von Hippel, 2013, pp. 1197-1209). Digital technology has empowered user communities, enhancing their capacity to drive the commercialization of user entrepreneurship, further fostering both the ability and willingness of users to engage in entrepreneurial activities, promoting the sustainable occurrence of entrepreneurship (Claussen & Halbinger, 2021, p. 103943; Lin, Wang, Zhou et al., 2022, p. 121266; Schiavone, Rivieccio, Paolone et al., 2021, pp. 1158-1178). User entrepreneurship has played a significant role as a driving force for innovation in industries such as sports, scientific instruments, software, medical devices, and more. It facilitates the seamless integration of consumption with production and innovation with entrepreneurship, contributing to substantial economic and social development (Baldwin, Hienerth & von Hippel, 2006, pp. 1291-1313; Shah, n.d.).

User entrepreneurship was formally introduced by Shah and Tripsas in 2007, who conducted the first study on user entrepreneurship in the youth products industry, defining it as the commercialization of new products and/or services by individuals or groups. User entrepreneurship was characterized by its accidental and collectivity. Based on the characteristics of user innovation, user entrepreneurship is not profit-driven but rather innovation-driven entrepreneurship. The concept of user entrepreneurship stems from and evolves upon the foundation of user innovation. However, due to varying research perspectives and backgrounds, the concept of user entrepreneurship is gradually broadening, overlooking the crucial role of sustainable characteristic. Specifically, concerning the term “user”, various similar terms have emerged in academia, such as customer entrepreneurship. Some scholars argue that any entrepreneurial activity undertaken by individuals as users constitutes a form of user entrepreneurship phenomenon (Escobar, Schiavone, Khvatova et al., 2021, pp. 1-18). However, this perspective does not effectively apply to various research studies that focus on user entrepreneurship, neglecting the concept and intrinsic characteristics of user entrepreneurship.

While scholars have diversified these definitions to accommodate their respective research focuses, there remains a lack of conceptual research of user entrepreneurship (Bradonjic, Franke & Lüthje, 2019, pp. 1354-1361), particularly neglecting the impact of digital technology empowerment on user entrepreneurship. This paper reviews the existing literature on user entrepreneurship published in Web of Science and Scopus databases and provides suggestions for future research in this field. The research indicates that there are currently 40 articles directly using the similar concept of user entrepreneurship in their titles or abstracts, demonstrating that user entrepreneurship research is an underestimated and understudied area (Franke, Schirg & Reinsberger, 2016, pp. 1684-1689; Hamdi-Kidar & Vellera, 2018, pp. 465-473; Shah & Tripsas, 2007, pp. 123-140). Overall, our research focuses on two current research gaps. First, despite the increasing number of articles on user entrepreneurship, which we believe is due to the development of digital technology, there is currently no research attempting to validate this infer. Second, scholars are gradually extending their focus from the study of user innovation to the field of user entrepreneurship (Brem, Bilgram & Marchuk, 2019, pp. 348-360; Cuomo, Tortora, Festa et al., 2017, pp. 1109-1118; Hamdi-Kidar & Vellera, 2018, pp. 465-473), while the unique characteristic of user entrepreneurship have been underestimated, which we believe is one of the reasons for the scarcity of user entrepreneurship articles in the literature. In this context, the aim of this paper is to comprehensively review articles on user entrepreneurship, thereby exploring the relationship between user entrepreneurship and digital technology. While revealing the impact of digital technology on user entrepreneurship, this study also seeks to emphasize the uniqueness of the

three major characteristics of user entrepreneurship with digital technology. Specifically, our research is designed to address three research questions:

- What are the main trends and current status in user entrepreneurship research?
- What is the relationship between latest and most significant research themes and digital technology in user entrepreneurship?
- What potential research questions exist to provide directions for future research in user entrepreneurship?

In order to address the research questions, this paper investigates the relationship between user entrepreneurship and digital transformation, examining the two characteristics of user entrepreneurship, thus making the following research contributions: our research (1) bridge the current research gaps, (2) explores the underlying logic of digital technology empowering user entrepreneurship at the level of three major characteristics under theoretic frameworks, and (3) provides research propositions for future research directions in user entrepreneurship, sustainability development, and digital transformation studies. Although Escobar (Escobar, Schiavone, Khvatova et al., 2021, pp. 1-18) describe the current research on user innovation and user entrepreneurship and propose future research directions, their study does not specifically focus on the field of user entrepreneurship and fails to distinguish its relationship with consumer and customer entrepreneurship, we doubt whether user entrepreneurship can be equated with these two concepts, so will explore it in the following section. Based on this, our research goes beyond existing studies, consolidates different research streams, explained the other two characteristics of user entrepreneurship with the empowerment of digital technology, and establishes theoretic frameworks of the user entrepreneurship research for future research. In doing so, we aim to provide a more theoretical perspective on the study of user entrepreneurship research in this field.

2. Research Methodology

In order to achieve a more profound integration and understanding of the conceptual framework and characteristics of user entrepreneurship, our research process adheres to the methodology recommended by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page, Moher, Bossuyt et al., 2021). The PRISMA checklist provides us with a standardized systematic review process (see Supplementary Materials), ensuring that our analysis of the literature is sufficiently scientific and rigorous. Consequently, our study demonstrates the approximate process of identifying, screening, assessing, and incorporating literature (Figure 1).

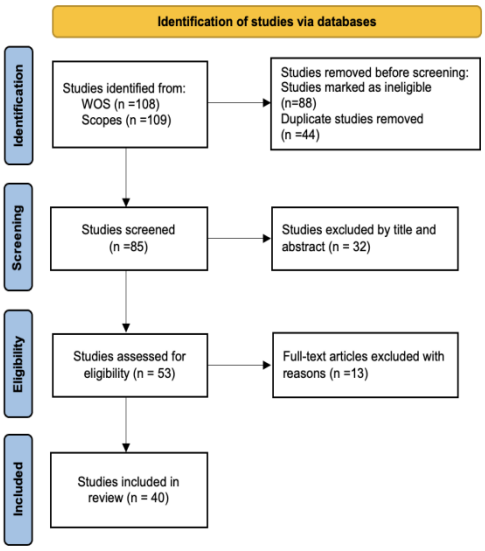

Figure 1. The PRISMA Procedure of Search and Select Research Articles

In the first phase, concerning the database selection, we opted for Web of Science (WoS) and Scopus to conduct a systematic literature review. The rationale behind choosing these two databases lies in ensuring a comprehensive coverage of influential academic articles within the realm of social sciences (Vieira & Gomes, 2009, pp. 587-600). As for the search keywords, to broaden the search scope and concurrently explore the relationships between user entrepreneurship concepts and other related terms, we drew inspiration from Escobar's study (Escobar, Schiavone, Khvatova et al., 2021, pp. 1-18) and defined our search content as user entrepreneurship, customer entrepreneurship, and client entrepreneurship—the definitions of which have been previously mentioned. Specifically, during advanced searches, we employed different specific Boolean search strategies for various databases, including in WoS: TS= ("User* entreprene*" OR "Customer* entreprene*" OR "Consumer* entreprene*"). And in Scopus: TITLE-ABS-KEY ((user* PRE/0 entrepren*)) OR (TITLE-ABS-KEY (customer* PRE/0 entrepren*)) OR (TITLE-ABS-KEY (consumer* PRE/0 entrepren*)).

After the initial search as of November 1, 2023, we obtained a total of 217 articles from both the WoS and Scopus databases. To precisely identify relevant articles before entering the screening phase, we applied inclusion criteria to exclude articles that did not meet specific conditions. These criteria encompassed the publication date range from January 1, 2007, to October 31, 2023, as the first literature on user entrepreneurship was published in 2007. Article types included peer-reviewed articles and early articles, ensuring a focus on the domains of "business", "economics", and "society". Additionally, articles were required to be written in English. Following the refinement of the inclusion criteria, we excluded 88 irrelevant articles and removed duplicates present in both databases, facilitating integration and further review of the articles. Through this process, 44 duplicate articles were eliminated, resulting in a final set of 85 articles for the next stage of analysis.

In the second stage, we identified articles eligible for inclusion through a series of exclusion criteria. Prior to conducting a comprehensive reading to determine eligibility, we performed an initial screening based on titles and abstracts, excluding 32 articles that did not meet the specified criteria. Subsequently, we meticulously formulated exclusion criteria and conducted full-text readings to ascertain the final set of articles eligible for literature analysis. Our eligibility criteria involved excluding articles that did not

directly focus on the topic of user entrepreneurship, those whose subjects did not align with our defined scope, and those incapable of addressing the research questions posed in this study. At this stage, we excluded 8 articles. Finally, to ensure the inclusion of high-quality articles, we excluded journals not covered by the Thomson Reuters Social Science Citation Index (SSCI) or those with a CiteScore Percentile below 75% (Q1), resulting in the exclusion of 5 articles. Ultimately, a total of 40 articles were included in our research analysis.

These 40 articles were downloaded in full-text and carefully examined. In the subsequent section, we will initially extract and present detailed information about these publications, including publication information, definition of terms, journal, authors, and research methods, to provide a comprehensive overview. Subsequently, to address the first and second research questions posed in this paper, we conducted a co-occurrence trend analysis of the thematic terms in these articles. This analysis aimed to identify the developmental trends in research themes related to user entrepreneurship literature and analyze the outcomes. Finally, we sought to extend the analytical findings by investigating how, based on highlighting the two prominent characteristics of user entrepreneurship, digital technology promotes the development of user entrepreneurship. This involved establishing theoretic frameworks and proposing propositions for future research, thus addressing the final research question.

3. Findings of Systematical Review

3.1 Descriptive Analysis

As shown in Figure 2, the number of articles varies across different time periods, with the minimum being 4 articles before 2013 and in the years 2014-2015, and the maximum being 11 articles in the years 2022-2023. The citations per article were highest before 2013, with a maximum of 593 citations and a minimum of 24 citations in the years 2022-2023. Analyzing the citations per year, the highest citations occurred in 2020-2021, with different articles accumulating a total of 385 citations during these two years, while the lowest citations was observed in 2014-2015, with a total of 78 citations. From this, it is evident that, in terms of the number of citations per article, literature before 2013 is the most authoritative, with citations far exceeding other years. Despite the small number of articles in that time period (4), they hold significant value. Examining the citations per year alongside the number of publications, there is a general correlation between the two. The field's development was relatively subdued before 2015, and with the passage of time, both the citations and the number of publications in user entrepreneurship have been steadily increasing. This suggests that the field is currently in a developmental stage and holds substantial research value.

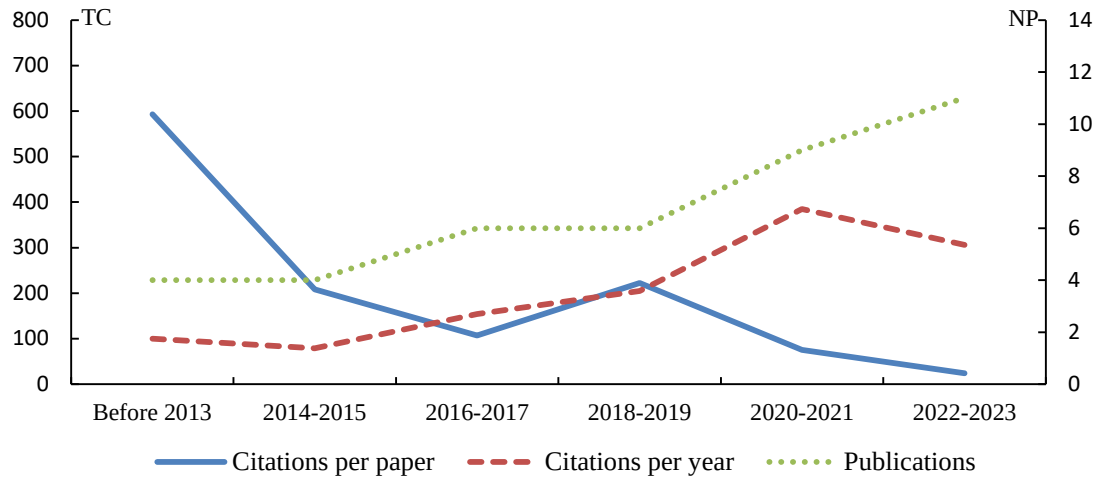

Figure 2. Descriptive Analysis of Selected Articles

Note. TC=times cited; NP=number of publications.

Table 1 presents various scholars' explications of concepts related to user entrepreneurship. In the field of user entrepreneurship, the definitions provided by Agarwal and Shah have gained substantial consensus, with many articles drawing upon this definition (Baglieri & Lorenzoni, 2014, pp. 52-74; Cuomo, Tortora, Festa et al., 2017, pp. 1109-1118; Del Bosco, Chierici & Mazzucchelli, 2020, pp. 681-701; Möller & Herm, 2021, p. 3580), offering significant conceptual assistance for subsequent research on user entrepreneurship. The content in the table also briefly introduces the most representative definitions of customer entrepreneurship and user entrepreneurship. It can be observed that the definitions of consumer entrepreneurship and user entrepreneurship are very similar, and they can be regarded as synonymous. However, customer entrepreneurship is completely different from user entrepreneurship. Although the entrepreneurial subjects are both consumers, their entrepreneurial purposes and processes exhibit significant differences. Therefore, this paper contends that only customer entrepreneurship is equivalent to user entrepreneurship, while customer entrepreneurship needs to be distinguished from user entrepreneurship.

Table 1. Definition of Terms Related to User Entrepreneurship

Terms	Definition	Representative literature
User entrepreneurship	The commercialization of new products and/or services by an individual or group of individuals.	Shah & Tripsas
	The commercialization of entirely new or improved products and services, innovated to meet personal needs, and sold to others.	Agarwal & Shah
Consumer Entrepreneurship	Community members create new products or solutions based on inspiration or stimulation in the community and establish companies at the request of community members.	Biraghi et al.
Customer entrepreneurship	Users of products or services become intermediary companies by earning promotion fees between their manufacturers and consumers.	Miao et al. Park, Kim, et al.

Table 2 demonstrates the journals of selected articles that have been covered in SSCI, only journals with more than 2 publications are shown in the table. In summary, we analyzed a total of 34 articles from the selected articles of journals that are covered by SSCI, constituting 85% of the total number of articles. And 100% of the articles are above 75% (Q1) of the CiteScore Percentile in their respective research fields. Journals such as *Journal of Business Research* and *Research policy* emerged as the most prolific publishers in the field of user entrepreneurship, followed by journals like the *Strategic Entrepreneurship Journal* and *Technological Forecasting and Social Change*. Despite the relatively low number of articles published in these journals, their citation rates are noteworthy, underscoring the ongoing potential and widespread interest in the research domain of user entrepreneurship phenomena.

Table 2. Overview of the Journal Sources by Selected Articles

No.	List of the journals	Total no. of citations	No. of articles
1	Strategic Entrepreneurship Journal	400	2
2	Research Policy	276	3
3	Technological Forecasting and Social Change	78	2
4	Journal of Business Research	58	3
5	Journal of Business & Industrial Marketing	3	2

Table 3 presents an authorship analysis of publications in the field of user entrepreneurship, focusing on authors who have contributed two or more articles among the selected literature. We have compiled the total number of citations for these authors across their selected articles. The results indicate that Shah, recognized as a pioneer in the field of user entrepreneurship, holds the top position in terms of citations and ranks second in the number of publications. The temporal span of Shah's contributions reflects ongoing engagement in user entrepreneurship research. Following closely are Tripsas and Chandra, both accumulating over 100 citations. Although Schiavone's citations is comparatively lower than the aforementioned three, the frequency of articles and the temporal scope suggest significant recent attention to the field of user entrepreneurship, highlighting substantial research potential.

Table 3. Overview of the Authors Sources by Selected Articles

No.	List of the Author	Total no. of citations	No. of articles	Time span
1	Sonali K. Shah	561	3	2007-2020
2	Mary Tripsas	400	2	2007-2020
3	Yanto Chandra	113	2	2010-2012
4	Francesco Schiavone	36	5	2020-2023
5	Hyunkyu Park	27	2	2016-2021
6	Saurabh Srivastava	3	2	2022-2023

Table 4 elucidates the research methods and topics employed in the selected empirical articles. Out of the selected articles, 37 are empirical studies, while the remaining 3 are conceptual studies., including two narrative review (Agarwal & Shah, 2014, pp. 1109-1133; Li, Zhang, Liu et al., 2022, pp. 597-608) and a bibliometric study (Escobar, Schiavone, Khvatova et al., 2021, pp. 1-18). Hence, our study represents the first systematic review dedicated to user entrepreneurship. Table 3 reveals that in the field of user entrepreneurship research, qualitative methodologies constitute the majority, accounting for 62.1%, while quantitative approaches comprise 35.1%. Qualitative methods primarily include interviews and case studies, while quantitative research is predominantly based on survey studies. Regarding research topics, the commercialization process of user entrepreneurship and its performance are the primary focus of scholarly investigations. Understanding the motivations behind user commercialization, i.e., entrepreneurial intent, constitutes a major aspect of research on the commercialization process of user entrepreneurship. In summary, 64.8% of studies address the commercialization process, representing the majority of research content.

Table 4. Overview of the Empirical Research by Selected Articles

Methodologies	Research contents	%	Exemplary studies
Qualitative approach	Commercialization Process (N=17)	45.9	Jung & Pawlowski; Hung; Kalisz et al.; Schiavone et al.
	Performance (N=6)	16.2	Miao et al.; Möller & Herm; Srivastava et al.; Arshad et al.
Quantitative approach	Commercialization process (N=7)	18.9	Block et al.; Haefliger et al.; Shah & Tripsas; Yun & Park;
	Performance (N=6)	16.2	Abrell & Durstewitz; Hopp et al.; Näslund et al.; Oo et al.;
Mix approach	Commercialization process (N=1)	2.7	Cuomo et al.

3.2 Major Research Trend and Topic

To provide a clear understanding of research status of user entrepreneurship, this paper will conduct a detailed analysis of the research trends in user entrepreneurship. The significance of a systematic literature review lies in its ability to fully depict the entirety of literature and research trends in the studied field (Giuggioli & Pellegrini, 2023, pp. 816-837; Paul, Alhassan, Binsaif et al., 2023, p. 113507). In this section, we employed VOSviewer bibliometric software version 1.16.19 for co-occurrence analysis of key terms. VOSviewer stands out as one of the most widely used tools in academia (Pan, Yan, Cui et al., 2018, pp. 481-493). We choose VOSviewer for our term co-occurrence analysis is because it's powerful function which includes user-friendly interface, automatic clustering functionality, and accessibility being completely free of charge. As a software tool for constructing and visualizing bibliometric networks, leveraging its inherent capabilities for co-occurrence analysis of key terms and other forms of bibliometric analysis. As a software tool for constructing and visualizing bibliometric networks, leveraging its inherent capabilities for co-occurrence analysis of key terms and other forms of bibliometric analysis (van Eck & Waltman, 2010, pp. 523-538), we were able to conduct a high correlation term frequency analysis for abstracts and titles. In other words, utilizing this software for term frequency analysis ensures that the selected words are correlated, thereby filtering out irrelevant terms that do not align with the main themes of the articles.

Due to the limited number of articles selected for analysis and to conduct a detailed trend analysis of a research topic that reflects changes over time, exporting terms co-occurrence map directly through VOSviewer may lead to inaccurate clustering analysis of terms. Therefore, instead of directly displaying co-occurrence analysis graphs, we chose to import articles from different years into the software separately to obtain processed raw data and then manually draw a research trend analysis

graph. Specifically, before the step of map generation, we exported the processed terms, selected them by year, and conducted further analysis and processing in Microsoft Excel. In the following content, we processed the results of the term frequency analysis, filtering out all terms that appeared at least consecutively for two years and occurred at least twice during this period. Terms highly associated, such as "user entrepreneurship" and "user innovation", were excluded. Throughout the entire process, the corresponding author of this study is responsible for performing data processing, while the first author is responsible for verifying the resulting data. After integrating terms that meet the above conditions, the analysis revealed that terms such as "digital", "concept", "knowledge", among others, exhibited high-frequency occurrences continuously, with some displaying distinct peaks during different time intervals. It is worth noting that in order to study the relationship between user entrepreneurship and digital technology, we have expanded the clustering range of terms that have similar meanings to digital, so that they are not limited to only those terms that must include "digit-". This is because according to the definition of digital technology: any technology that integrates information, computation, and communication (Bharadwaj, El Sawy, University of Southern California, et al., 2013, pp. 471-482), encompassing foundational technologies such as mobile and big data, as well as advanced technologies like 3D printing and artificial intelligence (Gong & Ribiere, 2021, p. 102217). Specifically, based on our findings in the title and abstract, the digital clustering in the following figure includes these words: digital, technology, 3D prints, platform, mobile, mobility, AI (Figure 3).

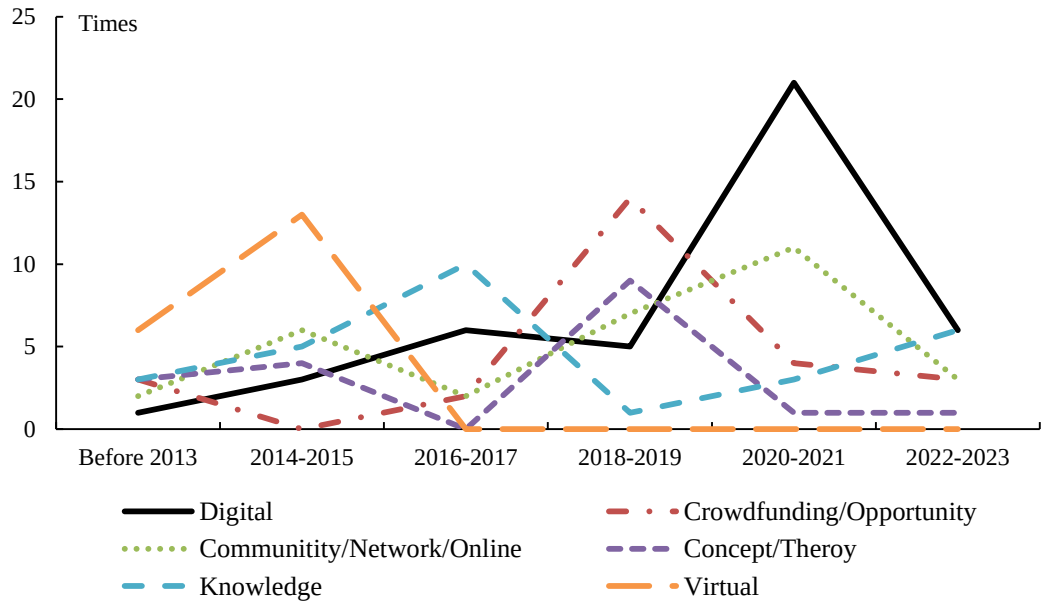

Figure 3. Term Co-occurrence Trend Analysis

3.2.1 User Virtual Community (Before 2015)

The environment of user virtual communities, characterized by freedom, openness, and sharing, fosters user entrepreneurship. After the initial conceptualization of user entrepreneurship, the predominant focus of research shifted towards understanding the motivations and entrepreneurial processes of user entrepreneurs within user virtual communities (hereafter referred to as user communities). Chandra and Leenders (Chandra & Leenders, 2012, pp. 464-476), using Second Life as their research context, asserted that the user entrepreneurship process in virtual worlds is analogous to that in the real world.

They argued that user entrepreneurship in virtual environments facilitates the discovery of more entrepreneurial opportunities in the real world. The innovative opportunities and scope of user entrepreneurship depend largely on social networks and weak ties between user entrepreneurs and society. The existence of user communities in the online space amplifies the weak ties between user entrepreneurs and society. Jung and Pawlowski (Jung & Pawlowski, 2015, pp. 193-203) investigated the reasons and cognition behind the emergence of user entrepreneurship in virtual worlds. They posited that social virtual network worlds provide users with extreme customization capabilities and the infrastructure of the online space allows users to fill the world with objects they design, satisfying needs for freedom and experiences not possible in reality. User communities play a supportive role in entrepreneurship, collectively generating new solutions and innovations within the community (Biraghi, Gambetti & Pace, 2018, pp. 392-402).

Scholars believe that the phenomenon of user entrepreneurship consistently occurs within their respective communities. With the continual proliferation and development of the internet, particularly within user communities, instances of user entrepreneurship reflect real-world entrepreneurial opportunities. For example, in the Reddit community, the Ask Me Anything (AMA) virtual events have become a platform for individuals to promote their products, services, or ideas, establishing their brands. User entrepreneurship, compared to its counterpart in physical communities, not only provides more opportunities but also broadens the scope of innovation and strengthens connections among entrepreneurs. The user entrepreneurship model underscores the immense potential of user communities in fostering innovation and an entrepreneurial spirit. As the foundational environment for user entrepreneurship, user communities enable users to share, create, collaborate, and even derive economic benefits.

3.2.2 Knowledge-driven (2015-2017)

The opportunity identification for user entrepreneurship originates from their unique knowledge base (Agarwal & Shah, 2014, pp. 1109-1133; Chandra & Leenders, 2012, pp. 464-476). After studying the environmental requirements for the occurrence of user entrepreneurship, researchers have gradually shifted their focus to understanding the roots of user entrepreneurship. Scholars posit that user entrepreneurship is a form of entrepreneurial activity based on consumers' knowledge context, typically leveraging information advantages as the foundation for creating new ventures (Agarwal & Shah, 2014, pp. 1109-1133).

Many scholars have explained the advantages from knowledge-driven of user entrepreneurship from the perspective of Dynamic Capability Theory (DCT) (Teece, Pisano & Shuen, 1997, pp. 509-533). The success of an organization depends on its ability to acquire, generate, store, and use knowledge more effectively than its competitors (Holsapple & Joshi, 2001, pp. 39-54). The founders of user entrepreneurship are leading users who develop innovative products. They exhibit characteristics such as being highly familiar with the industry, having a strong passion for the industry, and possessing significant influence within the industry (Escobar, Schiavone, Khvatova et al., 2021, pp. 1-18). Consequently, compared to other entrepreneurs, they demonstrate possession of unique knowledge resources, where these resources play a crucial role in driving their entrepreneurial endeavors and success.

Specifically, products arising from user innovation often have substantial commercial value (Gambardella, Raasch & von Hippel, 2017, pp. 1450-1468). On one hand, consumers on the demand side hold sticky information (von Hippel, 1986, pp. 791-805), enabling them to create product

innovations more tailored to their needs at lower costs compared to manufacturers (Shah & Tripsas, 2016, pp. 285-307); On the other hand, the difficulty for ordinary consumers to access various information and prototype manufacturing has been gradually reduced through technologies such as social media and 3D printing (Claussen & Halbinger, 2021, p. 103943). For instance, Luis von Ahn, the founder of the Duolingo language learning application, is a computer scientist. He, along with Severin Hacker, co-founded the Duolingo free language learning platform in 2011 to address the issue of high costs for language learning courses in developing countries. Their aim was to make education accessible to everyone, thereby mitigating observed inequalities.

3.2.3 Crowdfunding Performance (2017-2019)

User entrepreneurship involves the acquisition and integration of resources within user communities (Franke & Shah, 2003, pp. 157-178). In comparison to non-user entrepreneurs, user entrepreneurs exhibit outstanding crowdfunding performance (Brem, Bilgram & Marchuk, 2019, pp. 348-360; Oo, Allison, Sahaym et al., 2019, p. 105895; Yu & Fleming, 2022, p. 104348). Scholars have discovered that successful crowdfunding projects for user entrepreneurs often attract media attention, contributing to enhanced brand visibility for the entrepreneurs. Media coverage and social media sharing help propagate the entrepreneur's project to a broader audience, providing robust market publicity. For users, the high degree of product innovation, entrepreneurial enthusiasm, and substantial similarity between user entrepreneurs' products and user needs motivate support for user entrepreneurship through crowdfunding (Oo, Allison, Sahaym et al., 2019, p. 105895).

Scholars have explored the reasons for excellent crowdfunding performance for user entrepreneurs. Non-economic entrepreneurial motivations of user entrepreneurship (Shah & Tripsas, 2007, pp. 123-140), innovation demand compatibility (Oo, Allison, Sahaym et al., 2019, p. 105895) and the identity originating from user communities (Füller, Schroll & von Hippel, 2013, pp. 1197-1209) bring natural credibility and reputation endorsements comparable to social entrepreneurship (Fursov & Linton, 2022, p. 121224; Mei & Genet, 2022). External entities in the user entrepreneurship ecosystem, facilitated by user communities, enable their participatory actions throughout the entire entrepreneurial process (Sonali, Smith & Reedy, 2012, pp. 1-30); Internal entities utilize crowdfunding activities to validate the market acceptance of their creative ideas or product concepts. They also obtain feedback from external entities and the market (Agarwal & Shah, 2014, pp. 1109-1133; Shane, 2000, pp. 448-469; von Hippel, de Jong & Flowers, 2012, pp. 1669-1681), leveraging their knowledge resources to continually enhance their reputation and credibility (Füller, Schroll & von Hippel, 2013, pp. 1197-1209). This dynamic contributes to attracting sufficient relational resources both internally and externally in user entrepreneurship.

For instance, Kickstarter, as a crowdfunding platform specifically designed for fundraising creative initiatives, supports a variety of projects, including games, music, and films. Since its inception, Kickstarter has successfully launched over 200,000 projects, accumulating over $6 billion in crowdfunding, with support from more than 20 million backers.

3.2.4 Digital Technology (2019-Present)

User entrepreneurship is continually evolving in tandem with the development of digital technology. Since 2019, similar keywords such as "3D Print" and "Digital Technology" have consistently emerged in articles related to user entrepreneurship. Concurrently, during this period, there has been a historical peak in articles with user entrepreneurship as the central theme. This paper considers it as one of the compelling pieces of evidence of the gradual growth of user entrepreneurship alongside the continuous

development of digital technology. In the early stages of the development of user entrepreneurship, some scholars did not acknowledge users' capacity and willingness to participate in product or service innovation and commercialize them (Priem, Li & Carr, 2012, pp. 346-374). However, with the widespread adoption of digital technology, users' productivity has gradually been liberated from constrained environments (Schiavone, Tutore & Cucari, 2020, pp. 683-696). The innovativeness of products or services led by user entrepreneurship is the source of its productivity. Digital technology enhances the efficiency and effectiveness of user-led collaborative innovation, and improving the likelihood of user entrepreneurs starting businesses under non-profit motivation.

Scholars predominantly approach the impact of digital technology on user entrepreneurship from the perspective of the commercialization process. Consistent research findings suggest that digital technology can facilitate the success of the entrepreneurial process. Regarding the mechanisms through which digital technology fosters user entrepreneurship, some scholars argue that the commercialization process of user entrepreneurship involves the collaborative engagement of digital platforms and digital infrastructure. This process strengthens the connections between user entrepreneurs and the general public, culminating in the production of powerful digital artifacts (Schiavone, Tutore & Cucari, 2020, pp. 683-696). Other scholars, considering the premise of the facilitating effects of digital technology, delineate different stages of user entrepreneurship.

While many scholars have conducted in-depth research on the impact and mechanisms of digital technology empowering user entrepreneurship from various perspectives, we believe that there are still some deficiencies in the current researches. First, based on our descriptive analysis of articles on user entrepreneurship, those focusing on the commercialization process of user entrepreneurship and involving research on entrepreneurial intentions have been prevalent. However, in the domain of articles centered on digital technology, despite studies demonstrating the positive influence of digital technology on user entrepreneurship, there is a lack of systematic exploration from the perspective of entrepreneurial intentions, investigating the mechanisms of the role of digital technology. Second, in the current research on the process of user entrepreneurship, although researchers have examined the empowering role of digital technology from various angles, there is a gap in explaining how digital technology accentuates the uniqueness of user entrepreneurship compared to other entrepreneurial approaches. Therefore, to provide guidance for further exploration of these issues, in the following sections, we will present a theoretical framework to underpin subsequent research.

4. Discussion and Agenda for Future Research

The purpose of our systematic literature review is to comprehensively examine the current state of research on user entrepreneurship and propose recommendations for future research directions to elevate the stature of user entrepreneurship studies. Regarding the first and second questions posed in this paper, we have summarized and elucidated in the third section, not only providing scholars engaged in user entrepreneurship-related research with a detailed analysis of research trends since the inception of the user entrepreneurship concept but also furnishing compelling evidence for the close connection between user entrepreneurship and digital technology, with the latter continuously empowering user entrepreneurship. However, we have also identified certain limitations in current research. Therefore, to address the final of the three questions we have posed, this paper presents two theoretical frameworks and posits research propositions. While offering research directions for the future, it explains the uniqueness of user entrepreneurship under the empowerment of digital

technology, contributing both theoretically and practically. The theoretical contributions of this paper are twofold: firstly, building on the application of the MOA model to integrate existing research on entrepreneurial intentions in user entrepreneurship, we systematically, for the first time, explain the empowering process of digital technology from the perspective of the entrepreneurial intentions of user entrepreneurship. Secondly, by synthesizing the Effectuation entrepreneurial decision logic and relevant studies on digital transformation, we integrate a model of the commercialization process of user entrepreneurship, explaining how user entrepreneurship demonstrates unique entrepreneurial spontaneity and collectivity through digital technology.

4.1 The Accidental and Collective User Entrepreneurship with Digital Technology

4.1.1 Iterative and Evolutionary Process Model of User Entrepreneurship

The previous model of the user entrepreneurship process suggests that user entrepreneurship begins with unmet consumer needs. In this process, consumers, driven by prior knowledge, interact in the community and society. After completing the user innovation and prototyping phase, user innovators make entrepreneurial decisions through opportunity recognition and establish companies to enter the market (Shah & Tripsas, 2007, pp. 123-140). This paper argues that models of this kind lack the representation of the spontaneous and collective nature inherent in the user entrepreneurship process. Therefore, compared to previous models that depict a linear process, under the empowerment of digital technology, the user entrepreneurship process should exhibit an iterative and evolving pattern. The process of user entrepreneurship is continuous and multi-agent, filled with contingency (Shah & Tripsas, 2007, pp. 123-140). Based on our research on the user entrepreneurial innovation process, as well as the descriptions of the user entrepreneurship process and Effectuation logic process by Shah (Shah & Tripsas, 2007, pp. 123-140) and Read (Read, Dew, Sarasvathy et al., 2009, pp. 1-18) respectively, we posit that user entrepreneurship involves an iterative loop process in the innovation, decision-making and establishment stage.

As Figure 4, we term this process the Interaction-Activation-Development-Estimation dynamic process model (IADE model). Before utilizing the IADE model to elucidate the commercialization process of user entrepreneurship, some preliminary explanations are necessary to facilitate a clearer understanding of the model's components. The model consists of three concentric rectangles, representing different stages of user entrepreneurship. The innermost circle represents the user innovation stage in digitization, the middle circle represents the user entrepreneurial decision-making stage in digitization, and the outermost circle represents the user entrepreneurial operation stage in digital transformation. Additionally, to enhance the model's conciseness, we have only annotated the significance of each side and each corner on the outermost rectangle. Specifically, we have annotated at each corner the details of how digital technology drives the IADE process from which aspects. In reality, the geometric significance of all the rectangle remains consistent with those marked on the outermost rectangle. Below we will provide a detailed explanation of the model:

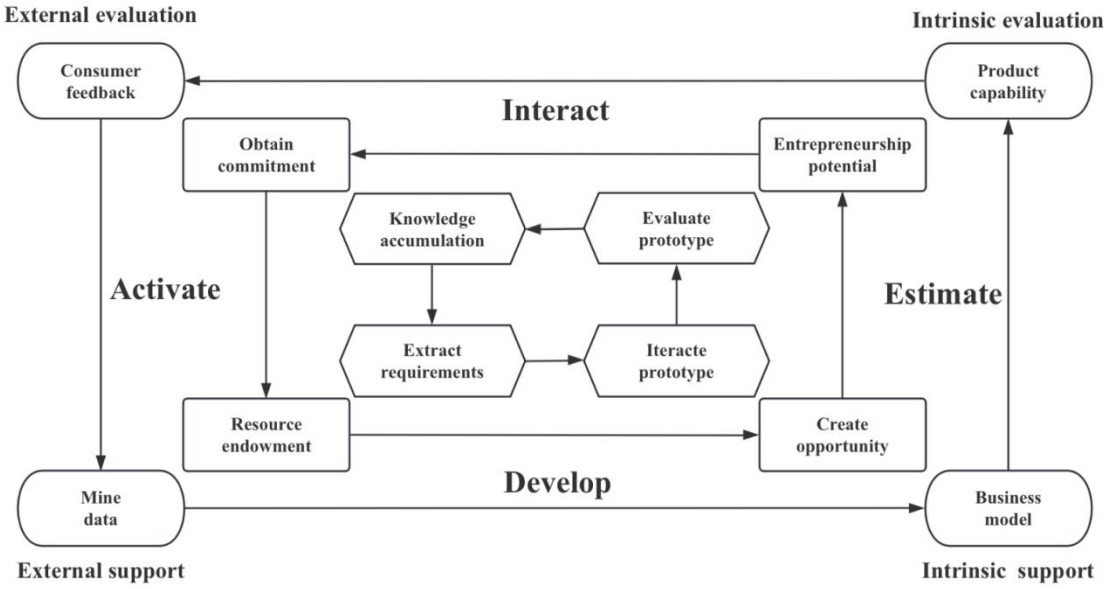

Figure 4. The IADE Model of User Entrepreneurship Guided by Digital Technology under Effectuation Logic

As mentioned earlier, during the innovation stage, user entrepreneurs accumulate knowledge through interactions within virtual online user communities. By activating this knowledge, such as consumer needs or background expertise, they drive the creation or improvement of prototypes. Subsequently, they assess these prototypes within the virtual community, forming a cycle. In this stage, individuals leverage online user communities to transform physical information into digital data, ensuring the continuity of the cycle. The more iterations in this cyclical process, the easier the transition to the next stage.

The decision-making stage is crucial for user entrepreneurs to form entrepreneurial intentions. The reputation and credibility accumulated within virtual communities can attract a substantial following, aiding in resource acquisition through digital platforms, e.g., advertising or crowdfunding. By continually obtaining entrepreneurial goals and resources, user entrepreneurs unintentionally create new entrepreneurial opportunities. Throughout this process, user entrepreneurs alter the means of acquiring resources through digital technology, relying on digital upgrades to sustain this cycle. With an increasing number of iterations, entrepreneurial intentions are formed, leading to the next stage.

In the establishment stage, given the prior digital transformation and upgrade efforts, user entrepreneurs face less difficulty in the digital transformation of entrepreneurship. They readily accept the formation of a foundational business model by activating data value through digital mining in the market. Throughout the continuous cycle, user entrepreneurs further stabilize their enterprises through digital transformation. Notably, entrepreneurial decision-making logic often shifts between Effectuation and Causation based on the uncertainty level in the market (Kalinic, Sarasvathy & Forza, 2014, pp. 635-647), with Effectuation logic frequently appearing in markets with high uncertainty levels (Read, Dew, Sarasvathy et al., 2009, pp. 1-18). Considering that user entrepreneurship often occurs in markets with high uncertainty and vague user demands, we believe that, as the company stabilizes and market uncertainty decreases, user entrepreneurs are likely to transition towards Causation entrepreneurial decision-making logic (Agarwal & Shah, 2014, pp. 1109-1133).

In summary, the IADE model's significance lies in its integration of digital transformation, user entrepreneurship stages, and Effectuation decision-making logic. On the one hand, analyze the model from the inside out, it emphasizes the accidental, iterative and evolutionary nature of the user entrepreneurship process with the empowerment of digital technology. On the other hand, by analyzing each individual rectangle of the model, we emphasize the driving role of digital technology in the IADE process, explaining its relationship with the characteristics of multi-agent entrepreneurship in user entrepreneurship at each corner. Specifically, we propose that digital technology drives the cycles of the IADE process through external evaluation, external support, intrinsic support, and intrinsic evaluation. For instance, in the establishment phase, user entrepreneurs communicate with the online user community and the external environment to gather a vast amount of consumer feedback through external evaluation. Subsequently, leveraging big data technology for data mining, mature big data technology can extract and generate low-cost, commercially valuable, and strategically significant big data content based on users' online behavior in user communities (Bendle & Wang, 2016, pp. 115-124). In circumstances where users may lack subjective intention and professional knowledge, incorporating users into the processes of innovation and entrepreneurship becomes feasible (Erevelles, Fukawa & Swayne, 2016, pp. 897-904; Xie, Wu, Xiao et al., 2016, pp. 1034-1048). Further developing the data and accumulating based on the Digitalization phase, user entrepreneurs obtain assistance for their products, especially those improving business models. Finally, through self-assessment, digital technology, as described in our previous section (4.2), enhances entrepreneurial intentions based on increased confidence in product capabilities, completing a cycle in this stage. Thus, the user entrepreneurship process involves interaction between internal and external entities, exhibiting collective characteristics.

Based on our proposed IADE model, we suggest that studying enterprises related to user entrepreneurship may offer valuable research material for investigating the birth of digital-native companies and the process of digital transformation. In summary, we recommend that future research further employs our conceptual model to explore the advantages brought about by accidental and collective characteristics of user entrepreneurship during digitization. User entrepreneurship may provide empirical evidence for studying the essence and mechanisms of digitization transformation.

Proposition: *Research should follow the IADE model to investigate the relationship between digital transformation and the accidental and collective user entrepreneurship process and explore how to complement it from the perspective of sustainable user entrepreneurship characteristic.*

4.2 Implication for Practice

The research findings significantly contribute to understanding the unique characteristics of user entrepreneurship and offer valuable insights for operational practices in user entrepreneurship with the empowerment of digital technology. Additionally, while the theoretical framework established in this paper guides research on user entrepreneurship, it also provides direction and recommendations for government agencies in formulating practical management measures.

According to the theoretic framework suggests that user entrepreneurship should be based on the Effectuation entrepreneurial decision-making logic, and different process stage characteristics should guide the selection of suitable iterative evolution processes to ensure the scientificity and success rate of the entrepreneurial process. The user entrepreneurship process exhibits clearly defined hierarchical stages, each requiring the user entrepreneurship manager to analyze effectively based on the stage and the problems at hand. Following the IADE dynamic process allows the formulation of practical

problem-solving solutions. Furthermore, for policymakers, enhancing the development of the digital ecosystem involves determining the position and role of digital-native enterprises within the ecosystem. This understanding can better assist society in navigating challenges related to digital transformation in areas such as management, methodologies, and information (Kraus, Jones, Kailer et al., 2021). Therefore, policymakers need to increase their emphasis on user entrepreneurship, disseminating and promoting relevant knowledge about user entrepreneurship in society.

4.3 Limitations and Future Research

The research limitations include: Firstly, the number of databases and the search strategy employed in retrieving user entrepreneurship literature might require refinement, potentially leading to omissions in the quantity of literature obtained. For instance, to ensure the quality of selected articles, we chose high-quality, peer-reviewed journal articles for inclusion in our study. This implies that we overlooked conference papers and books that could have been helpful in enhancing our review content. Future research could improve our research strategy based on our study, aiming to acquire more effective articles for relevant research. Second, our study emphasizes how digital technology fosters the development of user entrepreneurship but overlooks the possibility of negative relationships between digital technology and user entrepreneurship. For example, the rapid dissemination of user entrepreneurship-related products in the market and their continued iteration and evolution by others in the commercialization process may lead to unclear divisions of intellectual property. We call for other scholars to explore the theoretical framework proposed in this paper from the opposite perspective and continually refine it. Third, the theoretical frameworks in this paper lack empirical validation. Future research could employ empirical methods such as questionnaire surveys and Qualitative Comparative Analysis (QCA) to substantiate the propositions proposed in this study. Finally, although this study has made some conceptual contributions to distinguish the concept of user entrepreneurship, it has not provided more boundary conditions for user entrepreneurship to help the public better identify it. Future research, building on this paper, could extract the boundary conditions of user entrepreneurship from the perspective of sustainable entrepreneurship, contributing to the relevant research on sustainable entrepreneurship and user entrepreneurship.

5. Conclusion

This study represents the first systematic literature review of user entrepreneurship, examining 40 relevant papers to explore the positive relationship between user entrepreneurship and digital technology. The study yields three main research outcomes. Firstly, we provide a comprehensive overview of the trends of user entrepreneurship and clarify the empowering role of digital technology in this context. Secondly, we expanded research on user entrepreneurship and the relationship with digital technology, which means that user entrepreneurship may also contribute to providing more possible entrepreneurial opportunities. Thirdly, drawing from relevant theories and research findings, we constructed a theoretical framework to emphasize the unique characteristics of user entrepreneurship and to provide theoretical guidance for a deeper understanding of these features from the perspective of digital technology empowerment. To sum up, this paper makes significant theoretical contributions to advancing research on enhance s attention to user entrepreneurship in the digital age while providing practical guidance and insights for user entrepreneurship behavior patterns in reality. Crucially, by highlighting its characteristics, and showcasing the advantages of user entrepreneurship with the empowerment of digital technology, we aim to address the key question of how to establish

robust and sustainable competitiveness for new ventures through digital technology. By deriving answers to these questions, we aspire to trigger the interest of scholars and practitioners in the fields of innovation, entrepreneurship, and management.

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