



# The promise of digital technologies for sustainable entrepreneurship: A systematic literature review and research agenda

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## ABSTRACT

Research on sustainable entrepreneurship increasingly recognizes the transformative potential of digital technologies to mitigate and counteract grand environmental and social challenges through entrepreneurial action. However, this emerging field of research, referred to as digital sustainable entrepreneurship, is currently dispersed and fragmented and lacks the consolidated foundation to progress further. This article further establishes this nascent stream by conducting a systematic literature review offering two main contributions. First, common themes are derived from the literature (i.e., enabling value for society and environment, stakeholder inclusion, venture viability, and entrepreneurial individuals) to unravel the field's current state. Second, previous work is discussed and integrated by applying a business model perspective. Specifically, the article offers a framework that contributes to the role of business models for merging sustainability and digital technologies, reconceptualizes digital technologies as business model actors, and further develops the entrepreneur-business model nexus. Based on this, we present a comprehensive and actionable research agenda and practical implications.

## 1. Introduction

Sustainability and digitalization are two omnipresent discourses guiding contemporary societal, political, and scientific debates (Dwivedi et al., 2022; Nishant, Kennedy et al., 2020; Pan, Carter, Tim, & Sandeep, 2022). Sustainability is concerned with the grand social and environmental challenges such as climate change and gaping inequalities that are becoming increasingly evident and are reflected in initiatives such as the UN Sustainable Development Goals (SDG) or the Climate Change Conference UK 2021 (COP26). In this vein, research began to embrace the concept of sustainable entrepreneurship as a vital source for advancing sustainable development efforts by creating positive social and environmental impact through financially viable businesses (Dean & McMullen, 2007; Hall, Daneke, & Lenox, 2010; Johnson & Schaltegger, 2020; Muñoz & Cohen, 2017). The discourse on digitalization is evolving around the transformative capacity of digital technologies and their pervasive infusion into everyday life (Nambisan, 2017; Yoo, Boland, Lyytinen, & Majchrzak, 2012). Digital technologies such as platforms, blockchain, artificial intelligence (AI), virtual reality (VR), or the internet of things (IoT) have transformed numerous industries (e.g., accommodation, agriculture, transportation) by providing companies

unprecedented benefits and novel opportunities to conduct business (Nambisan, 2017; von Briel, Davidsson, & Recker, 2018). Recently, scholars and public policies have started to consider digital technologies as key instruments to mitigate and counteract the most urgent environmental and social problems of our time (Dwivedi et al., 2022; Papagiannidis & Marikyan, 2022). This notion is further supported by a sharp upswing in the number of digital sustainable patents and increasing venture capital investments (Anderson & Caimi, 2022).

Extant entrepreneurship literature, however, has widely neglected an integrative perspective on sustainability and digitalization. Only recently, the combination of the two discourses has garnered more deliberate attention, giving momentum to the discussion on an integrated research stream broadly referred to as digital sustainable entrepreneurship (George, Merrill, & Schillebeeckx, 2021; Gregori & Holzmann, 2020). Scholars from various disciplines have sought to explain diverse specific aspects of this novel phenomenon by applying a heterogeneous spectrum of theoretical perspectives and methods. The research's scope is often confined to the potential and particular applications of selected digital technologies for sustainable entrepreneurship. Due to the novelty and multidisciplinary nature of these initial efforts, results are predominantly scattered and fragmented among diverse scientific

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outlets and communities. Digital sustainable entrepreneurship lacks a comprehensive overview that extracts, compares, relates, and synthesizes the diverse scholarly findings. This research gap hinders the development of a common ground necessary for the imperative advancement of the field and to launch and better position future research endeavors. In addition, it impedes our understanding of novel sustainable entrepreneurial initiatives that drive the much-needed transition towards positive social and environmental futures.

Responding to recent calls for more research on the intersection of sustainable entrepreneurship and digitalization (George et al., 2021; Gregori & Holzmann, 2020), this paper aims to engage with the issues presented by conducting a systematic literature review. The article has two main contributions: First, it unravels the current state of knowledge on digital sustainable entrepreneurship rendering it more accessible for scholars and practitioners. We derive and present central themes from the literature, elaborating on the role of digital technologies for sustainable entrepreneurship. These themes are comprised of enabling social and environmental value, stakeholder inclusion, venture viability, and the associated entrepreneurial individuals. Second, the article further discusses and consolidates the identified themes and develops promising avenues for future research. In particular, we draw on the business model perspective to integrate sustainability and digitalization, call for a (re-)conceptualization of digital technologies as business model actors, and further develop the entrepreneur-business model nexus. Based on these efforts, the article establishes a research agenda with actionable research questions which serve as a starting point for more systematic research. In doing so, this work adds to forming an emerging field of research with the potential to transform the theory and practice of entrepreneurship.

## 2. Conceptual boundaries

Following seminal notions (George et al., 2021; Gregori & Holzmann, 2020), digital sustainable entrepreneurship is concerned with the potential of digitalization for entrepreneurial activities dedicated to impacting the environment or broader society positively. The research field is thus constituted by the combination of sustainable entrepreneurship and digital technologies. Examining the latter's impact on sustainable entrepreneurship endeavors requires demarcating the respective conceptual boundaries to understand the focal phenomenon better.

### 2.1. Sustainability and entrepreneurship

The interest in social and environmental challenges has brought to light an increasing number of articles dedicated to the role of entrepreneurship for sustainability (Muñoz & Cohen, 2017; Terán-Yépez, Marín-Carrillo, Casado-Belmonte, & Capobianco-Uriarte, 2020). However, the uprise of this research stream has led to a proliferation of different attempts to name the phenomenon, such as social, environmental, or sustainable entrepreneurship (Markman, Waldron, Gianiodis, & Espina, 2019). Hence, sustainability and entrepreneurship still struggle to find common ground in the form of a generally accepted definition. The ambiguity of sustainable entrepreneurship is also reflected in an underdeveloped and unclear distinction from environmental or social entrepreneurship. The evident fundamental overlaps between social, environmental, and sustainable entrepreneurship have prompted a synonymous but often criticized use of terms (Antolin-Lopez, Martínez-del-Río, & Cespedes-Lorente, 2019; Muñoz & Cohen, 2017; Saebi, Foss, & Linder, 2019). The relations and boundaries between social and environmental entrepreneurship appear to be blurred. Indeed, for instance, a growing stream of literature informs us about how environmentally-oriented entrepreneurs could positively impact social systems (Schaper, 2010). In particular, these entrepreneurs enable the reaping of social benefits (e.g., reducing pollution increases the quality of life and the population's health) (Cohen & Winn, 2007). The

more integrative notions (e.g., Shepherd & Patzelt, 2020) that reflect the relations between social and environmental aspects increasingly prevail. Hence, we follow Johnson and Schaltegger (2020), who condense social, environmental, and sustainable entrepreneurship literature under one umbrella.

### 2.2. Digitalization and sustainable entrepreneurship

Entrepreneurship literature acknowledges the importance of new technologies (Beckman, Eisenhardt, Kotha, Meyer, & Rajagopalan, 2012). Lately, the proliferation of digital technologies with their unique characteristics and altered properties (Yoo, Henfridsson, & Lyytinen, 2010) has prompted severe consequences affecting the entrepreneurial process (Nambisan, 2017). In particular, scholars expect digitalization to shape the locus of opportunities and the required practices to effectively exploit them (Autio, Nambisan, Thomas, & Wright, 2018). The technologies' unique affordances and their impact on entrepreneurship have dawned a stream of research (Kraus, Palmer, Kailer, Kallinger, & Spitzer, 2019; Nambisan, 2017; Nambisan, Wright, & Feldman, 2019).

Digitalization can be defined as the adoption or use of digital technologies by different stakeholders in various contexts (Brennen & Kreiss, 2016), for instance, through applications and services. For Tilson, Lyytinen, and Sørensen (2010), digitalization marks: "the sociotechnical process of applying digitizing techniques to broader social and institutional contexts that render digital technologies infrastructural". First research endeavors on applying digital technologies for electronic opportunities' exploitation date back to the widespread availability of the internet (Timmers, 1998). However, in entrepreneurship research, the phenomenon has only recently gained momentum amplified by the emergence of rapidly growing digital start-ups like AirBnB, Uber, and Twitter. Recent works are devoted, for instance, to digital artifacts' potential benefits (e.g. rapid scaling, co-creation) for ventures (Huang, Henfridsson, Liu, & Newell, 2017; Rayna, Striukova, & Darlington, 2015). Further research has elaborated on how digital technologies can assist in creating value for customers (Hartmann, Zaki, Feldmann, & Neely, 2016; Holzmann, Breitenacker, Schwarz, & Gregori, 2020). There are also discussions on the positive effects of digital transformation on broader society (Katz, Koutroumpis, & Martin Callorda, 2014).

Scholars have recently started to elaborate on digital technologies' effects on sustainable entrepreneurship (George et al., 2021; Gregori & Holzmann, 2020), thereby providing the cornerstones of a platform for subsequent research. According to George et al. (2021), digital sustainability is defined as: "the organizational activities that seek to advance the sustainable development goals through creative deployment of technologies that create, use, transmit, or source electronic data". In a nutshell, research on digital sustainable entrepreneurship is concerned with digital technologies as a means that enable and support creating entrepreneurial initiatives that aim to conduct sustainable business (Gregori & Holzmann, 2020).

## 3. Methodology

### 3.1. Review approach

Adding to the rich tradition of performing literature reviews in entrepreneurship research (Gregori & Parastuty, 2021; Shepherd, Wennberg, Suddaby, & Wiklund, 2019; Stephan, 2018), we strive to grasp previous results on digital sustainable entrepreneurship by applying a systematic process (Tranfield, Denyer, & Smart, 2003). Systematic approaches aim at increasing the reproducibility of results through transparent and comprehensible presentations of the data collection and synthesis processes. This approach can further decrease the application of simple heuristics, reduce the probability of subjective bias and error, and help to ensure scientific rigor (Petticrew & Roberts, 2006; Tranfield et al., 2003). Systematic literature reviews aim to synthesize previous literature, elaborate and suggest promising future

research directions, and thus advance the field (Rauch, 2020). The review process is reported in Fig. 1 and described in depth in the following section.

### 3.2. Review process

Conducting a systematic review follows a logical sequence of successive steps: planning the review, conducting the review, and reporting and dissemination (Kraus, Breier, & Dasí-Rodríguez, 2020; Okoli, 2015; Tranfield et al., 2003). Planning the review includes identifying the research need and developing a review protocol that entails setting the research objective and the steps to be taken in the process. This protocol

provides the starting point for conducting the review but allows it to be adapted so as not to constrain the researchers' creativity (Tranfield et al., 2003). It is essential for the protocol to determine the conceptual boundaries that provide the foundation for the subsequent process steps. The conceptual boundaries of digital sustainable entrepreneurship, as defined by current articles (George et al., 2021; Gregori & Holzmann, 2020), require the fusion of research using the central terms "sustainable entrepreneurship" and "digitalization", which we elaborated on in the previous section. Next, the protocol entails the specification of an appropriate database to conduct the search. Given the infant stage of the research and to reflect potential multidisciplinary discussions, a comprehensive database is needed. Web of Science (WOS) meets these

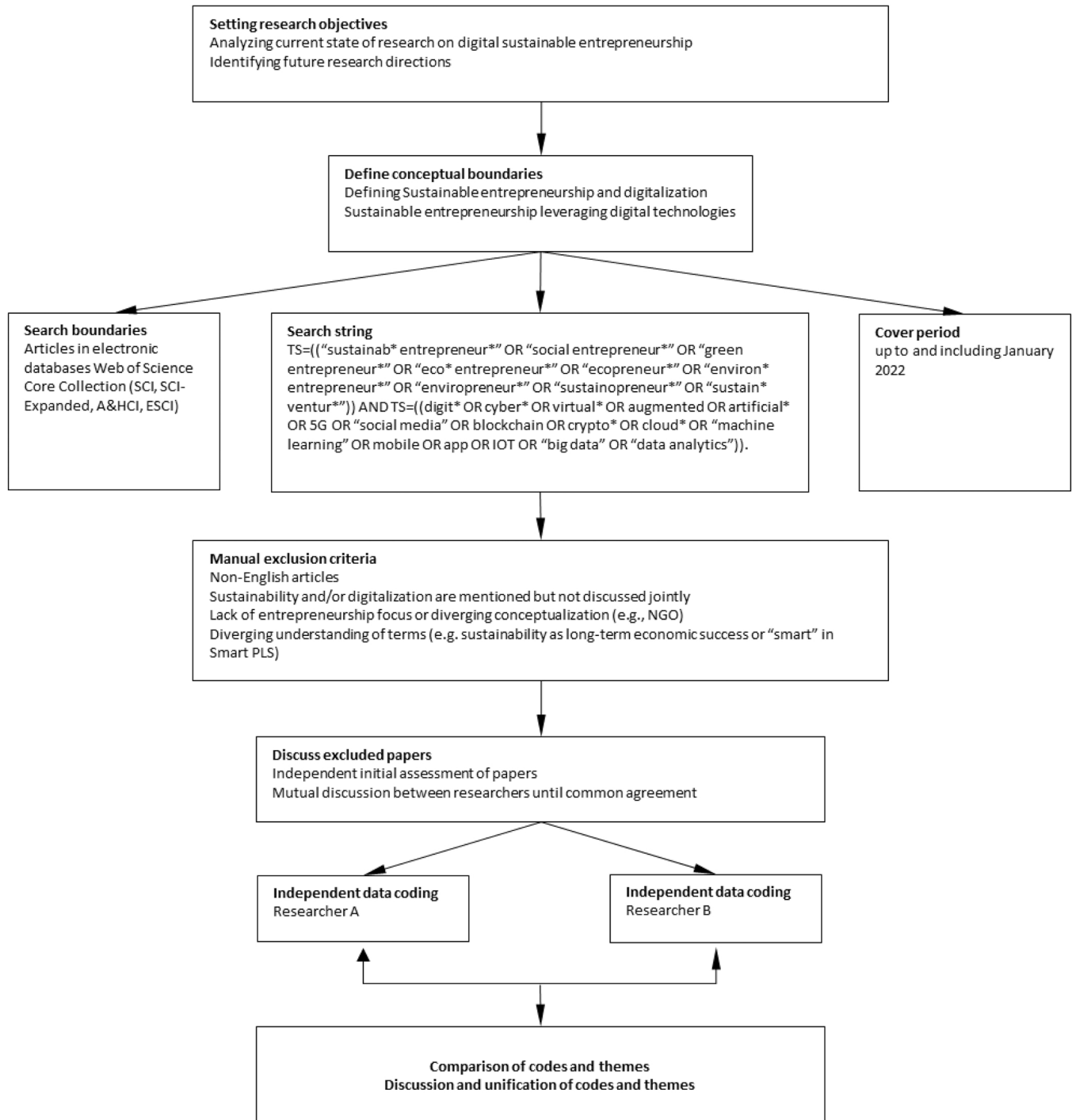


Fig. 1. Systematic review process.

requirements as it is recognized as one of the premier academic literature sources covering a multitude of disciplines. WOS includes more than 73 million journal publications and additional sources such as conference proceedings, books, theses, technical reports, news articles, and patents (Gusenbauer & Haddaway, 2020; Gusenbauer, 2019). The most exhaustive search is ensured using the WOS Core Collection comprising SSCI, SCI-Expanded, A&HCI, and ESCI indices.

The second step is *conducting the review*, which consists of identifying and selecting literature, quality assessments, and synthesis (Tranfield et al., 2003). Identifying and selecting literature begins with developing relevant keywords based on the conceptual boundaries. Sustainable entrepreneurship and digitalization are both characterized by dynamic and prolific terminologies. Thus, a variation of search terms was required. To identify relevant research on the role of digitalization for sustainable entrepreneurship and not to miss any substantial work within the field, we developed a sophisticated search string. We searched the WOS Core Collection for the following expressions included in the title, abstract, or keywords:  $TS=(("sustainab^*$

$entrepreneur^*$  OR  $"social\ entrepreneur^*" OR "green\ entrepreneur^*" OR "eco^* entrepreneur^*" OR "ecopreneur^*" OR "environ^* entrepreneur^*" OR "enviropreneur^*" OR "sustainopreneur^*" OR "sustain^* ventur^*") AND TS=((digit^* OR cyber^* OR virtual^* OR augmented OR artificial^* OR 5G OR "social media" OR blockchain OR crypto^* OR cloud^* OR "machine learning" OR mobile OR app OR IOT OR "big data" OR "data analytics"))$ . WOS can handle such long queries effectively (Gusenbauer & Haddaway, 2020). We refrained from limiting the timespan for our search, covering the entire available period from 1990 to January 2022.

Next, a systematic process recommends a quality assessment of the identified studies (Tranfield et al., 2003). Two senior researchers, who have several years of experience in research on both digital technologies and sustainable entrepreneurship, performed the search independently. Recent literature reviews suggest focusing on peer-reviewed journal articles as a proxy for a certain level of quality (Kraus et al., 2022; Shepherd et al., 2019; Snihur, Thomas, Garud, & Phillips, 2021). The WOS Core Collection is not restricted to journal publications. Still, the search retrieved peer-reviewed articles only (n = 162), thus rendering

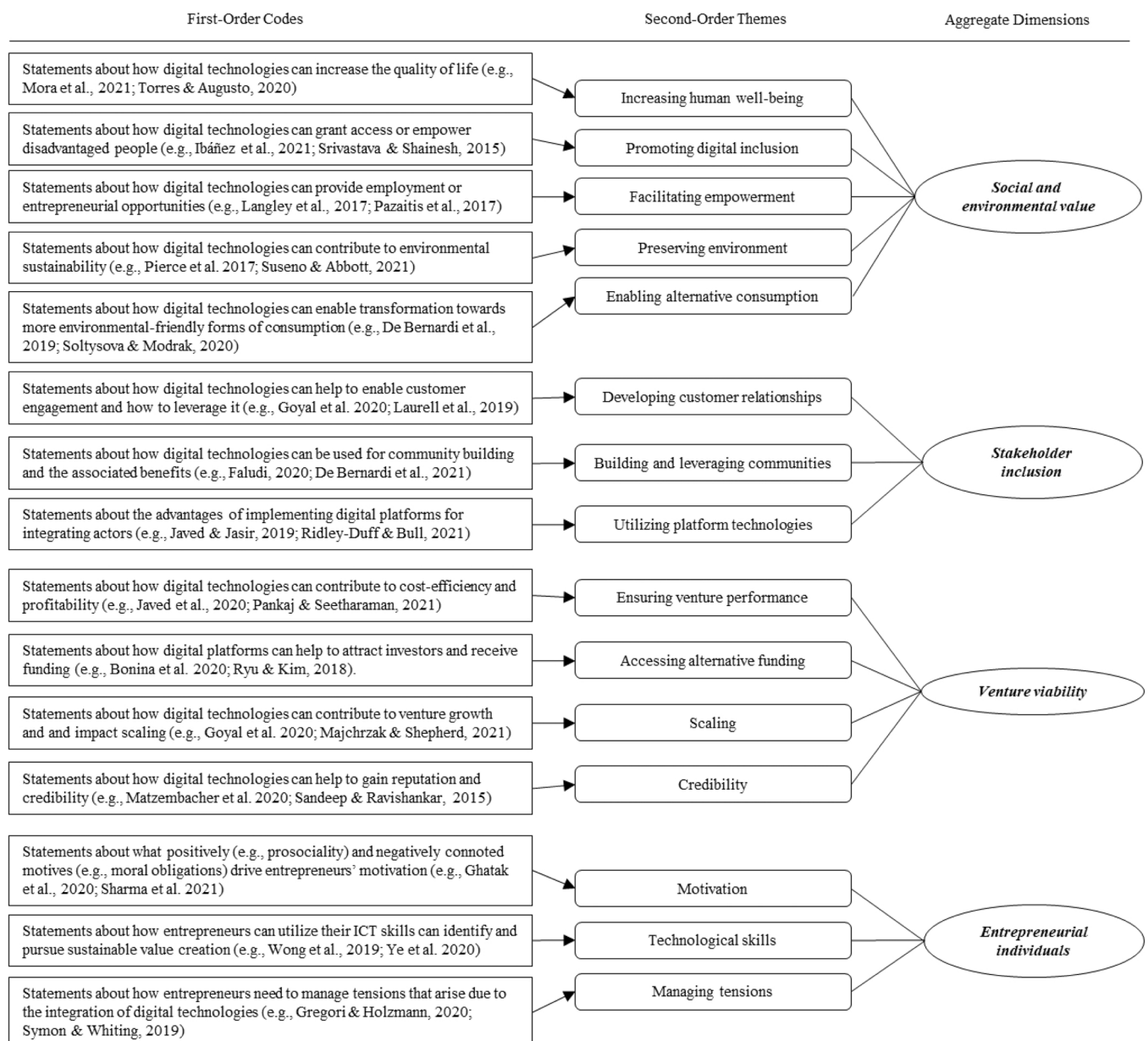


Fig. 2. Data structure.



the intended corresponding exclusion criterion "non-journal publication" obsolete. Complying with the systematic approach, the following exclusion criteria were developed to identify the most relevant articles: (1) non-English language, (2) digitalization and sustainability were mentioned but not discussed jointly, (3) missing entrepreneurial contextualization (e.g., NGOs), (4) diverging use of terms (e.g., sustainability defined as long-term economic success or "smart" in Smart PLS instead of smart technology). Subsequently, both researchers read the titles, abstracts, and keywords and excluded 73 articles based on the developed criteria. The full texts of the 89 remaining articles were then further investigated thoroughly, which led to the exclusion of 35 papers. Next, backward citation (i.e., checking the sampled articles' cited references for additional relevant studies) and snowballing (Briscoe, Bethel, & Rogers, 2020; Stephan, 2018) yielded five additional relevant peer-reviewed articles. The final sample consists of 59 papers, which is acceptable considering the limited amount of published research due to the immaturity and scattered nature of the field (Kraus et al., 2020), but also provides the opportunity for a more comprehensive discussion of each individual work (Kraus et al., 2019).

Conducting the review also includes the data analysis and synthesis (Tranfield et al., 2003), which followed a stepwise coding approach, including the formation of first-order codes, second-order themes, and aggregate dimensions (Gioia, Corley, & Hamilton, 2013). We analyzed and coded the sample articles in a content-focused manner. Both researchers engaged with the papers and developed first-order codes close to the original wording. In the following step, these first-order codes were compiled and reworked into second-order themes, which, in a final move, were condensed into aggregate dimensions (see Fig. 2). We conducted this process iteratively with constant discussion and comparison between the codes by both researchers. The rest of the article is concerned with the third step of the systematic approach – *reporting and dissemination*.

### 3.3. Descriptive analysis

The first three sampled papers were published in 2012. The discussion remained limited in the following years, up to and including 2018, with no or only a handful of articles per annum (see Fig. 3). In 2019, contributions increased significantly to nine before doubling to 18 in 2020. Lately, the field has gained considerable momentum, with 55.9 % of the total publications published since 2020. On closer scrutiny, it can be ascertained that first, a multitude of scientific outlets with diverging research scopes published at least one relevant piece, and second, a small number of scientific outlets appear to have emerged as catalysts of the discussion. With seven articles (11.9 %), *Sustainability* is the most frequent outlet, followed by the *Journal of Social Entrepreneurship* (4; 6.8 %), and *Technological Forecasting and Social Change* as well as the *World Journal of Entrepreneurship Management and Sustainable Development* with three articles respectively (5.1 % each). In recent years, digital sustainable entrepreneurship has also received considerable attention in

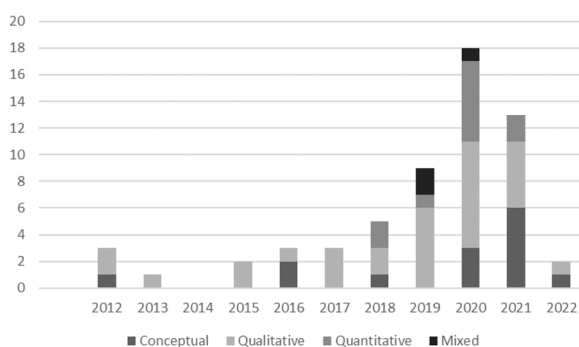


Fig. 3. Distribution of reviewed articles and applied methodologies (cover period ends with January 2022).

journals denominated and explicitly dedicated to either one of the research stream's two central components (i.e. *International Journal of Information Management*, *Journal of Cleaner Production*, and *Journal of Strategic Information Systems* featured two articles each).

Concerning the conceptualization of sustainability, it became evident that most papers (44; 74.6 %) applied notions particularly emphasizing a combination of social and economic dimensions of value creation. Conversely, a focus on creating the value trinity was found in 15 articles (25.4 %). Concerning the research design, the sampled articles display methodological plurality. Yet, most sampled articles (31; 52.5 %) applied qualitative methodologies, with case study research being the most common (e.g., Battisti, Agarwal, & Brem, 2022; Pankaj & Seetharaman, 2021; Sandeep & Ravishankar, 2015). Conceptual and theoretical papers (14, 23.7 %) (e.g., Dale & Kyle, 2016; George et al., 2021), quantitative methods (11; 18.6 %) such as structural equation modeling (e.g., Ibáñez, Guerrero, Yáñez-Valdés, & Barros-Celume, 2021; Ye, Zhou, Anwar, Siddiquei, & Asmi, 2020), and mixed-methods studies (3; 5.1 %) (e.g., Carroll & Casselman, 2019; Faludi, 2020) are less frequent, but appear to have been applied more often recently (see Fig. 3).

## 4. Findings

### 4.1. Social and environmental value

One of the themes identified is how digital technologies are essential for realizing value for society and the environment. The literature argues that digital technologies' specificities and affordances enable entrepreneurial action that facilitates sustainability.

When discussing digital technologies as enablers of sustainability, the focus mainly lies on social aspects. Applying sociological perspectives, scholars, for instance, initiated discussions on whether digital technologies can be instrumental in reducing inequality (Dale & Kyle, 2016). In general, the literature argues that digitalization is closely related to human well-being (Torres & Augusto, 2020). Findings reflect on technologies' potential to increase the quality of life and reduce poverty (Gino & Staats, 2012; Mora, Morales-Morales, Pujol-López, & Mollá-Sirvent, 2021). For example, business models that leverage digital solutions allow to easily track and monitor affected individuals in times of crisis and then offer support to tend to their needs (Ibáñez et al., 2021). Specifically, crowd-based digital innovations are discussed as solutions to alleviate suffering in this regard (Majchrzak & Shepherd, 2021). A central notion through which positive social change is achieved is digitally enabled inclusiveness. Digital inclusiveness refers to entrepreneurially connecting disadvantaged people and providing them with access to innovations (Ibáñez et al., 2021), services (Srivastava & Shainesh, 2015), education (Torres & Augusto, 2020), or government information (Goyal, Agrawal, & Sergi, 2020) that would not be accessible otherwise. Doing so is especially important in regions where the overall adoption of digital technology is low (Torres & Augusto, 2020). The value of inclusiveness is further related to empowering individuals as ventures aim to enable individuals to participate in democratic processes (Arora, 2016; Calzada, 2020), engage with new work opportunities (Soltysova & Modrak, 2020) or become entrepreneurial (Langley, Zirngiebl, Sbeih, & Devoldere, 2017; Pankaj & Seetharaman, 2021; Pazaitis, Kostakis, & Bauwens, 2017).

Reducing negative environmental impact has received less attention. Articles note the potential of digital solutions for environmental sustainability (Pierce, Ricciardi, & Zardini, 2017; Suseno & Abbott, 2021; Zeng, 2018) or the role of large-scale data analysis in informing environmentally-friendly outcomes (Mora et al., 2021). In this vein, digital entrepreneurial solutions might reduce travel and living space and foster environmental education (Devereaux, 2021). Moreover, scholars argue that digital technologies are a driver for a broader transition of the economy, entailing alternative forms of consumption to reduce negative environmental impact (De Bernardi, Bertello, & Venuti,

2019; Soltysova & Modrak, 2020).

#### 4.2. Stakeholder inclusion

Prior work stresses the potential of digital technologies for the inclusion of diverse stakeholders. Digital technologies are considered an essential means of offering novel possibilities for ventures to broaden the set of stakeholders they can integrate into their business (Gregori & Holzmann, 2020). Findings provide insights into digital technologies' role in developing customer relationships (Laurell, Sandström, & Suseno, 2019; Matzembacher, Raudsaar, Barcellos, & Mets, 2020) and building and leveraging communities (Faludi, 2020; Ryu & Kim, 2018). Scholars particularly emphasize the role of platform technology (Tarafdar, Singh, & Anekal, 2013) and its specific success factors (Chandna, 2022). Moreover, sustainable entrepreneurs are often challenged to take on a connecting role between stakeholders (Battisti, 2019). Digital technologies as communication devices, such as social media, are found to be central in establishing connections and building networks with diverse audiences (Kao & Luarn, 2020).

Customers remain a central stakeholder, and digitally-enabled customer engagement can result in novel business models (Goyal et al., 2020) and support the establishment of a sustainable venture (Matzembacher et al., 2020). However, developing customer relations is also essential for furthering the public discourse on emerging and pressing sustainability issues driven largely by entrepreneurs. For example, scholars draw attention to the necessity of getting customers involved and engaged in sustainability-driven crowdfunding campaigns to gain momentum and increase campaign success (Laurell et al., 2019).

Communities are considered essential resources in creating sustainable innovation, but they need to be actively built to leverage the associated benefits. Digital technologies can assist in community-building by connecting a wide range of beneficiaries (Faludi, 2020; Ross, Mitchell, & May, 2012). Applications that leverage open source principles, such as wikis and crowdsourcing, are deemed particularly relevant (De Bernardi, Bertello, Forliano, & Orlandi, 2021). Sustainable ventures benefit from communities because they actively drive change through the active participation of their members (Ryu & Kim, 2018). They do so, for instance, by contributing additional or missing data or by detecting inaccuracies in existing data (Ross et al., 2012). Users in online communities often constantly scan and monitor emerging needs and thus create data. But entrepreneurs can also increasingly rely on open data that is freely available for use and sharing (Corrales-Garay, Mora-Valentín, & Ortiz-de-Urbina-Criado, 2020). Data can be used, for instance, to identify new market demands, develop new business models, and inform decisions on prioritizing particular needs (Battisti, 2019; Corrales-Garay et al., 2020; Ratten, 2018). Research has further envisioned that AI could provide valuable support in human intellectual decision-making (Popkova & Sergi, 2020).

A central notion for stakeholder inclusion is digital platforms that render valuable support by providing an effective form of communication, collaboration, and the sharing of resources and knowledge (Javed & Yasir, 2019; Majchrzak & Shepherd, 2021; Ridley-Duff & Bull, 2021; Tajvidi & Tajvidi, 2020). These platforms further allow for a reduction of spatial, informational, temporal, and financial separation between different actors (Tarafdar et al., 2013) as they, for instance, enable victims to co-create with other actors and enable novel forms of social venturing (Majchrzak & Shepherd, 2021). Digital platforms can further spark co-creation activities in product development by helping to garner insights on technology usage in real-life settings (Baran & Berkowicz, 2021). Moreover, research argues that employee and venture performance can be increased in stressful and competitive environments by implementing AI-based platforms that apply machine learning and big-data analytics (Battisti et al., 2022). Our findings also indicate that digital platforms need to acknowledge the multiple and often diverging needs of the various stakeholders involved. Hence, the design of digital platforms to deliver socioenvironmental value is of particular

importance. The platform designs are measured against their enhancements in customer experience. Scholars stress the importance of user-friendly interfaces, reliability, and functioning algorithms for accurate and efficient matching (Chandna, 2022; Negrutiu, Vasiliu, & Enache, 2020). Studies provide first insights concerning cryptocurrency platforms that might positively affect sustainable value creation due to their non-exclusive nature that integrates a wide range of stakeholders (Mora et al., 2021).

#### 4.3. Venture viability

Like other forms of entrepreneurship, sustainable entrepreneurs face constraints and limitations regarding their financial resources, which are amplified through potential trade-offs between socioenvironmental value creation and financial returns. In this regard, we identified different ways of how digital technologies contribute to the venture viability of sustainable entrepreneurial projects by ensuring venture performance, accessing alternative funding sources, scaling, and credibility.

The articles highlight digital technologies' potential for improving the financial viability of ventures. Digital technologies enable cost-efficient, more profitable, sustainable venturing. Ventures benefit from leveraging digital technologies as they allow for more efficient ways of doing sustainable business (Symon & Whiting, 2019). In this vein, scholars particularly emphasize the role of ICT and freely available software tools that provide digital infrastructures, increasing operations' effectiveness and efficiency (Carroll & Casselman, 2019; Javed & Yasir, 2019; Javed, Yasir, Ali, & Majid, 2020; Ross et al., 2012). In addition to the potential savings in expenditures, scholars stress the positive effect of digital technologies on the financial viability of sustainable ventures (Pankaj & Seetharaman, 2021). Mainly, platform-based approaches are discussed to overcome financial constraints and realize positive outcomes for the ventures' profitability and survival (Matzembacher et al., 2020; Soltysova & Modrak, 2020).

Furthermore, sustainable entrepreneurs can leverage platforms to access alternative funding sources. Empirical results inform us that setting up crowdfunding campaigns can be helpful as sustainable entrepreneurs can attract more investors compared to other non-sustainable campaigns. However, they do not only attract more investors, but the total amount of funding also increases depending on the demonstrated social contribution and the constructed narrative of the project in question (Ryder & Vogeley, 2018; Ryu & Kim, 2018; Zeng, 2018). In line with this, studies further suggest that funding success is driven by a venture's collectivistic orientation (Bonina, López-Berzosa, & Scarlata, 2020).

The distinct affordances of digital technologies are also considered crucial for scaling both the venture and its impact. Increasing reach through digital means is a core point here, allowing sustainable entrepreneurs to improve geographical access, overcome preconditions of spatial proximity and, thus, reach other markets and previously unserved target groups (Goyal et al., 2020; Parthiban, Qureshi, Bandyopadhyay, Bhatt, & Jaikumar, 2020; Srivastava & Shainesh, 2015). Scholars elaborate on digital technology's influence on effectively scaling the venture's intended impact. The socioenvironmental impact can be scaled and magnified through the generativity of digital solutions, linking multiple forms of value and including affected individuals (Gregori & Holzmann, 2020; Majchrzak & Shepherd, 2021; Pankaj & Seetharaman, 2021). Besides the desired impact, digital technologies can also promote the development of the venture itself. The analyzed articles, for instance, discuss the application of digital tools as efficient means to follow and implement lean principles for scaling and growing (Cabrera & Byrne, 2021; Carroll & Casselman, 2019).

All new ventures are subject to the liability of newness, but sustainable initiatives also repeatedly face reticence due to problems of coordination and trust (George et al., 2021). Overcoming these hurdles is crucial for venture viability, and the application of digital

communication channels is one of the identified ways to build the necessary credibility. Communicating and doing business in the digital realm can increase awareness and recognition and make communication more transparent and traceable, which is especially important for sustainable entrepreneurship in traditionally unsustainable industries (Matzembacher et al., 2020; Negrutiu et al., 2020). The discussion here primarily revolves around social media. Social media is a promising approach to conveying the ventures' values to its stakeholder, forming intimate and interactive relationships (Tajvidi & Tajvidi, 2020) and ultimately trusting relationships (Kao & Luarn, 2020; Veleva, 2021). Scholars have further concluded that ventures consciously mimic mainstream business models to attract stakeholders and ease their transition (Sandeep & Ravishankar, 2015).

#### 4.4. Entrepreneurial individuals

We further identified a theme concerned with the role of the entrepreneurial individuals and especially with their characteristics and behavior. The articles touch upon the particularities of the digital sustainability context and what individual combinations of motives and skills are essential to engage with entrepreneurship and manage its tensions.

There is a vivid discourse on what motivates individuals to engage in digital sustainable venturing resulting in diverging interpretations and explanation attempts. Scholars ponder the relevance of positively connoted motives such as prosociality (Ryu & Kim, 2018; Sharma, Mishra, & Mishra, 2021; Suseno & Abbott, 2021), passion for identifying and solving pressing challenges (Wong, Hsieh, Wu, & Hu, 2019), or empathy (Ghatak, Chatterjee, & Bhowmick, 2020). Individual beliefs that originate from individuals' ethical orientation, spirituality, and religious beliefs further drive motivation (Calzada, 2020; Sandeep & Ravishankar, 2015). Besides these factors, the impetus to engage with digital sustainable entrepreneurship can also be rooted in more negatively perceived causes such as moral obligations (Ghatak et al., 2020), guilty feelings due to a previous lack of social contribution (Sandeep & Ravishankar, 2015), or witnessing the social exclusion of relatives (Lin, Peng, Ren, & Lin, 2018). While these aspects are typical for entrepreneurship for sustainability, the screened articles emphasize the connection with technological skills as a prerequisite to engaging with entrepreneurial initiatives in this context. Articles stress the necessary digital entrepreneurial capabilities, including ICT skills and knowledge, personal technological innovativeness, or experience with digital technology (Ghatak et al., 2020; Suseno & Abbott, 2021; Wong et al., 2019; Ye et al., 2020) to identify, develop, and implement sustainable solutions.

There are articles discussing the negative association between digitalization and sustainability. Significant challenges identified include value appropriation of digitally produced products and services (Fish & Srinivasan, 2012; Pazaitis et al., 2017), the digital divide increasing social inequality (Darcy, Yerbury, & Maxwell, 2019; Huang & Cox, 2016; Parthiban et al., 2020), and the antagonistic relationship between technological development and environmental protection (Soltsova & Modrak, 2020). In situations where the characteristics of digital technologies can stand in harsh contrast to an entrepreneur's sustainability aspirations, tensions arise that need to be managed (Gregori & Holzmann, 2020). For instance, digital connectivity can lead to meaningful work in social ventures due to enabling an intense engagement with their customers, but this can also result in an over-engagement and cause negative emotional experiences (Symon & Whiting, 2019). Aware of such challenges and the need to combine sustainability knowledge and digital skills, scholars are attempting to offer strategy canvases that integrate socioenvironmental and technological aspects (Ribeiro, Oliveira, & Souza, 2021).

## 5. Discussion and agenda for future research

The investigated articles offer a wide range of different perspectives, methods, and findings. Nonetheless, we identified a lack of theoretical concepts that can contribute to integrating digitalization and sustainability. Hence, this article contributes to theory by developing an interface for the research streams involved and offering a fruitful research agenda. This work proposes the business model as a potential interface for two reasons. First, business models have emerged as an accepted and frequent theoretical foundation in scholarly research across various scientific disciplines and journal outlets. Business model literature has also successfully informed studies on sustainable and digital entrepreneurship (e.g., Ghezzi & Cavallo, 2020; Lüdeke-Freund, 2020), pointing toward the potential to find common ground through this lens. This unifying potential is also reflected in some of the sampled articles as they apply or refer to the business model perspective (e.g., George et al., 2021; Gregori & Holzmann, 2020; Langley et al., 2017; Matzembacher et al., 2020; Veleva, 2021).

Second, based on the fundamental premises of this stream of research, we argue that the business model allows us to theorize, develop, and integrate the core themes that emerged from our review. We build on the discussion of business models as logics of value consisting of interlocked components (Amit & Zott, 2015). In contrast to early business model research, we apply a multidimensional value conceptualization beyond mere financial value capture and also consider socioenvironmental value (Gregori, Wdowiak, Schwarz, & Holzmann, 2019; Lüdeke-Freund, 2020; Schaltegger, Hansen, & Lüdeke-Freund, 2016). We view business models as composed of and enacted by heterogeneous actors (Demil & Lecocq, 2015; Doganova & Eyquem-Renault, 2009). From this vantage point, the central actors are the entrepreneur, diverse stakeholders, and technology. In addition, the business model offers an open-ended perspective that is compatible with other lenses, which can supplement research in this context. The following sections discuss the article's theoretical and practical implications in detail.

### 5.1. Theoretical contributions

Based on the previous arguments, this article contributes to the literature by leveraging business models in combination with other perspectives as a productive approach to advance the theoretical development of the link between digitalization, sustainability, and entrepreneurship (Dwivedi et al., 2022; George et al., 2021; Gregori & Holzmann, 2020; Nishant, Kennedy et al., 2020). We develop a comprehensive framework as shown in Fig. 4, which integrates the themes from the literature review and significantly expands upon this previous work. The analyzed literature has focused extensively on the outcomes of the successful application of digital technologies for sustainable entrepreneurship. The business model concept allows us to go beyond this by theorizing how these outcomes can be achieved, acting as an interface between digitalization, sustainability, the different actors, and the outcomes on a business and societal level. Specifically, we integrate sustainability and digital technologies by applying a business model perspective, we (re-)conceptualize digital technologies as business model actors, and we develop the entrepreneur-business model nexus. Subsequently, we present these three perspectives and elaborate on their theoretical implications in detail and provide corresponding research propositions. Based on this discussion, we have compiled a research agenda with actionable research questions, the applied perspectives, potential research methods, and exemplary technologies shown in Table 1. The framework, together with the agenda, offers analytical guidance for future research endeavors.

#### 5.1.1. Integrating sustainability and digital technologies through business models

According to our results, the positive relationship between

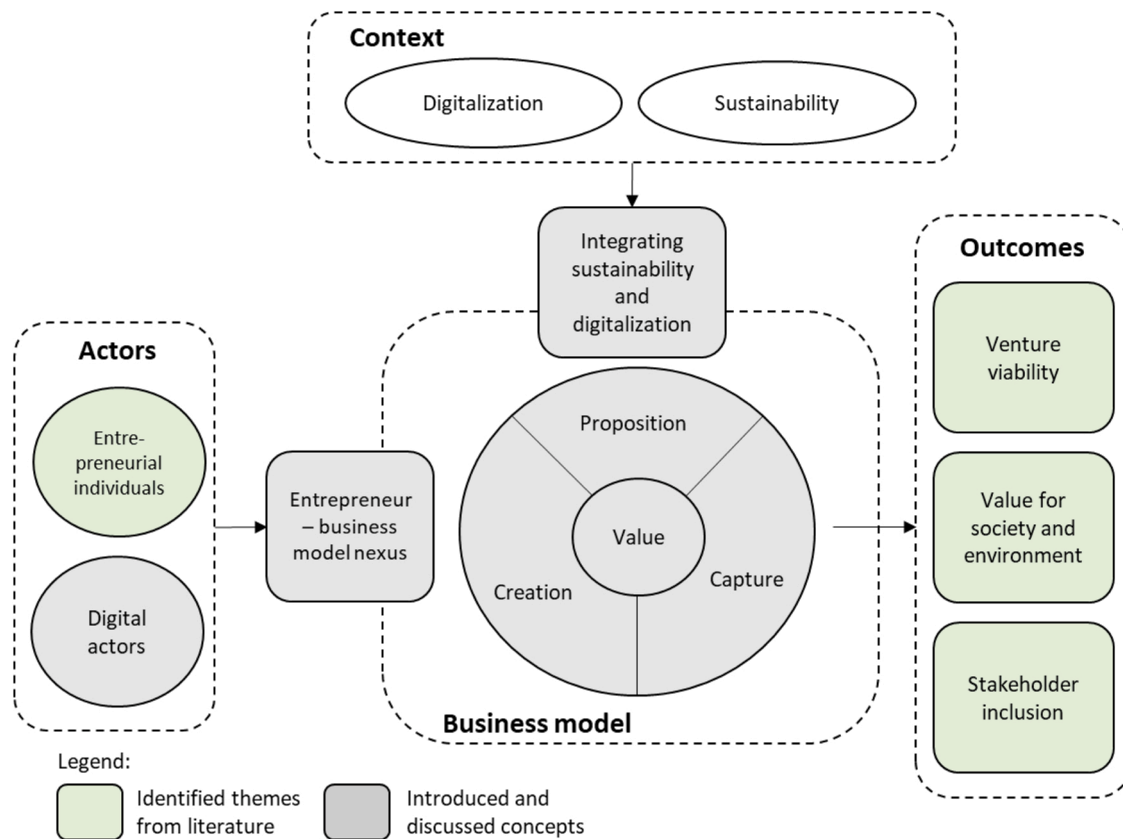


Fig. 4. Framework for integrating digital technologies for sustainable entrepreneurship through business models.

sustainability and digitalization is still opaque, and discussion is largely limited to the macro level. We identified a focus on the potential of the relationship and less on its realization through concrete entrepreneurial action. Enabling forms of non-economic gain through the creative deployment of digital technology is one of the main themes in the analyzed literature (e.g., Ibáñez et al., 2021; Majchrzak & Shepherd, 2021; Srivastava & Shainesh, 2015; Torres & Augusto, 2020). From a business model perspective, the identified themes, such as digital inclusiveness, enable entrepreneurs to develop novel value propositions. Realizing value from novel technologies is a core tenet of business model research (Chesbrough & Rosenbloom, 2002; Holzmann, Breitenacker, & Schwarz, 2019). This stream primarily informed us, for instance, about the nature and gestalt of the business models applied and how digital technologies are leveraged in business models to create customer value (Hartmann et al., 2016; Holzmann, Breitenacker, Soomro, & Schwarz, 2017). However, we lack a more in-depth understanding of how more sustainable value propositions can be developed and successfully communicated to diverse stakeholder groups. This issue is far from trivial. Previous research has shown the challenges that result from depicting the benefits for society and the environment of radically new technologies (Bohnsack & Pinkse, 2017; Khan & Bohnsack, 2020). Sustainable entrepreneurs are expected to struggle with similar problems (George et al., 2021). While first studies propose ways to leverage digital technology to develop a blended value proposition (Gregori & Holzmann, 2020), we need further research on how entrepreneurs approach and deal with this challenging task.

These novel socioenvironmental value propositions need adequate value creation systems and mechanisms. In particular, new ventures typically lack efficient organizational structures and production systems which puts them at a disadvantage when competing with established companies. Digital technologies are found to contribute to more efficient value creation for sustainability as they can reduce the costs of setting up and running the business (e.g., Javed et al., 2020; Javed & Yasir, 2019;

Ross et al., 2012). Furthermore, findings show their considerable potential for efficiently scaling sustainable solutions and their impact (Carroll & Casselman, 2019; Majchrzak & Shepherd, 2021). Research on the scaling of the socioenvironmental value has increased our understanding of why some entrepreneurs decide to scale their businesses while others neglect to do so (Smith, Kistruck, & Cannatelli, 2016). However, besides these individual-level determinants, there is a lack of clear accounts of when sustainable entrepreneurs should scale and how such a process can be structured (Shepherd & Patzelt, 2020). The findings provide first insights on how digital technologies can help successfully overcome these complex challenges, but additional research is needed to identify the key digital resources required. In a similar vein, more research should be conducted examining the advantages and challenges of digital solutions for developing value creation systems that fuse multiple forms of value.

Value and its creation are fundamentally intertwined and need to be associated with appropriate value capture mechanisms to secure venture viability. The reviewed articles mainly focus on alternative forms of financing, such as crowdfunding (Bonina et al., 2020; Ryu & Kim, 2018), and there is thus a dearth of research on alternative digital payment solutions in the context of sustainable entrepreneurship. Other digital vending applications such as marketplaces that overcome spatial, informational, temporal, and financial restrictions, accelerate and ease financial transactions, and enable dynamic pricing mechanisms have received little attention in this context (Cohen, Lobel, & Paes Leme, 2020; Tarafdar et al., 2013). We also lack insights on digital solutions, including (social) cryptocurrencies and corresponding initial coin offerings, that have the potential for positive societal change by democratizing financial markets (Kher, Terjesen, & Liu, 2021; Mora et al., 2021). Hence, we call for additional research on how sustainable entrepreneurs engage with these technologies and their concrete potential and implications for venture viability. From a value capture perspective, it would be especially fruitful to investigate the determinants of the



**Table 1**  
Opportunities for future research.

Research avenues, theoretical perspectives, and potential methods	Exemplary research questions			
	Business model in general	Value proposition <i>Exemplary technologies:</i> Artificial intelligence, big data	Value creation <i>Exemplary technologies:</i> Digital platforms, social media	Value capture <i>Exemplary technologies:</i> (Social-) Cryptocurrencies, tokens
Integrating sustainability and digital technologies through business models <i>Perspectives</i> Componential business model approach <i>Potential research methods:</i> Cluster analysis, QCA, inference statistic	<ul style="list-style-type: none"> <li>• What are different and coherent business model configurations and archetypes for digital sustainable entrepreneurship?</li> <li>• How can digital technologies contribute to aligning individual business model components to form coherent business models?</li> </ul>	<ul style="list-style-type: none"> <li>• How can novel forms of economic, environmental, and social value be extracted from digital technologies, and how does this lead to blended value propositions?</li> <li>• How can the benefits of digital technology for socioenvironmental value be effectively communicated to diverse stakeholders?</li> </ul>	<ul style="list-style-type: none"> <li>• How can digital technologies be leveraged for impact scaling, and what are the key digital resources?</li> <li>• What are the challenges and advantages of combining economic, environmental, and social value creation, and how can digital technologies contribute to achieving multiple forms of value?</li> </ul>	<ul style="list-style-type: none"> <li>• What novel digital payment methods are applicable in sustainable entrepreneurship, and how can they alter value capture mechanisms?</li> <li>• What are the determinants for customers' perception, acceptance, and use of novel digital payment options for sustainability?</li> </ul>
(Re-)conceptualizing digital technologies as business model actors <i>Perspectives</i> Sociomateriality, practice perspective <i>Potential research methods:</i> Longitudinal qualitative analysis, netnography	<ul style="list-style-type: none"> <li>• How does digital agency co-constitute novel business model configurations for sustainability?</li> <li>• How can entrepreneurs deal with dynamic technologies and unprompted changes, and how does this influence the business's trajectory over time?</li> </ul>	<ul style="list-style-type: none"> <li>• How do digital technologies' emergent and generative character affect how specific stakeholder groups are addressed?</li> </ul>	<ul style="list-style-type: none"> <li>• How and why is digital connectivity entrepreneurially enacted to develop stakeholder relationships and overcome spatial proximity?</li> <li>• How are stable customer relations and communities with shared sustainable values achieved in emergent digital networks?</li> </ul>	<ul style="list-style-type: none"> <li>• How do sustainable entrepreneurs use predefined forms of monetization of external digital solutions, and how do their predetermined and opaque functions influence the financial value capture?</li> </ul>
Developing the entrepreneur-business model nexus <i>Perspectives</i> Design perspective <i>Potential research methods:</i> Action research	<ul style="list-style-type: none"> <li>• What specific tools and methods are needed to support entrepreneurs to develop digital sustainable business models?</li> <li>• What personal sustainability knowledge and digital skills are needed for developing coherent business models, and how do they interplay?</li> </ul>	<ul style="list-style-type: none"> <li>• How can entrepreneurs use digital technologies to identify latent socioenvironmental stakeholder needs and new stakeholder segments?</li> </ul>	<ul style="list-style-type: none"> <li>• How can business model innovation ameliorate tensions between sustainability and digitalization, and how can entrepreneurs successfully manage these processes?</li> <li>• How do entrepreneurs identify and choose technologies which affordances are supportive of socioenvironmental value creation?</li> </ul>	<ul style="list-style-type: none"> <li>• What are the key digital resources and activities to plan and get access to alternative funding sources and attract impact financing?</li> <li>• How can entrepreneurs implement digital solutions to depict or quantify socioenvironmental value capture?</li> </ul>

customers' perception, acceptance, and use of these technologies (Papagiannidis & Marikyan, 2022).

Based on the idea of the interconnectedness of business model components, future research is advised to not only investigate each of the discussed research avenues in an isolated way but to identify coherent business model configurations and archetypes for digital sustainable entrepreneurship. Research needs to be attentive to the changing meanings and values of sustainability and digitalization and how they relate. Value, in this sense, is not a static and predefined concept but is constituted through the practices of a multitude of actors, including entrepreneurs (Gregori & Holzmann, 2022). Values are further not isolated and demarcated but relational. Different values co-exist, are connected, or are even contingent upon each other, resulting in a complex web of interdependencies. What is of value is thus contested, negotiated, and continuously changes. Recent events such as pandemics, global conflicts, or climate and financial crises (Pan et al., 2022) have intervened in these debates and altered the meaning of sustainability and the relative importance of specific sustainable development goals. Reprioritization of values can evoke new challenges that require entrepreneurs to adapt. In particular, investigating how these values are then manifested in the design of the business model elements offers fertile ground for additional research. In this regard, cluster analysis and qualitative comparative analysis (QCA) are promising approaches for this endeavor (Holzmann et al., 2017, 2020; Nishant & Ravishankar, 2020).

**Proposition 1.** Research should leverage business models to examine the novel mechanisms that shape how sustainability and digitalization interact along the lines of value proposition, creation, and capture.

### 5.1.2. (Re-)conceptualizing digital technologies as business model actors

We identified the theorization of digital technology as central. Our findings show that digitalization is rarely defined and primarily discussed through the technologies in question, such as mobile apps, big data, platforms, or extended reality (e.g., Devereaux, 2021; Fish & Srinivasan, 2012; Ibáñez et al., 2021). These technologies are often considered as tools for entrepreneurs to use in their ventures to achieve specific ends (George et al., 2021). Such perspectives, however, not only foster a dynamic terminology (Zaheer, Breyer, & Dumay, 2019) and isolated research silos that thwart the further development of the field, they also understate the generative and emergent character of digital technology (Nambisan et al., 2019; Nambisan, 2017). To circumvent this, we build on the analyzed research and propose a sociomaterial perspective for digital sustainability and entrepreneurship (Gregori & Holzmann, 2022; Pankaj & Seetharaman, 2021; Symon & Whiting, 2019). The premises of sociomateriality allow future work to theorize digital technologies as a central actor with agency in the business model.

Sociomateriality strives to move away from analyzing technology through its impacts on or interactions with human actors toward how technological and human actors are co-constituted in practice (Orlikowski & Scott, 2008). Thus, it focuses on entrepreneurial and digital agencies' relations, intermingling, and inseparability in entrepreneurial processes (Nambisan, 2017). Our review revealed, for instance, how meaning-making in social ventures is constantly permeated by negotiations of individuals and digital devices (Symon & Whiting, 2019). This results in a reformulation of central notions of digital technologies, including connectivity, which is identified to be essential for social and environmental value creation, e.g., developing stakeholder relationships and overcoming spatial proximity (e.g., Faludi, 2020; Parthiban et al.,

2020; Ross et al., 2012; Srivastava & Shainesh, 2015). The sociomaterial lens considers connectivity not as an inherent characteristic of technology but rather as an enactment carried out in a chain of human and digital agencies. How this connectivity is achieved through sustainable entrepreneurship in emergent digital networks and made durable over time remains a crucial question. Building on the idea of continuous co-constitution, future studies can go beyond the research on the adoption of technology that changes pre-existing businesses towards the dynamic achievement of more novel business model configurations for socioenvironmental value.

In a related aspect, the effects of digital technology are not linear or predictable based on the heterogeneous inputs but can produce unprompted changes that provoke reactions (Orlikowski, 2007; Suchman, 2007). Digital technologies are thus actors intervening in how businesses are constructed. In this vein, Pankaj and Seetharaman (2021) propose that sociomaterial relationships give rise to dynamic information system structures that materialize shared value and affects the business' focus on multiple forms of value creation. However, how to deal, work, and engage with such dynamics and spontaneous changes, especially in cases where the entrepreneurs did not develop the corresponding technology, such as in many platform solutions and social media applications (e.g., Kao & Luarn, 2020; Laurell et al., 2019; Lee & Jung, 2018), is yet to be explored. For instance, external solutions provide predefined forms of monetization in which exact functioning is obfuscated and hidden from its users (Kitchin, 2017). This raises the question of how sustainable entrepreneurs use such predetermined value capture mechanisms and how their opaque functions influence the business model. We propose qualitative longitudinal process research to investigate this emergent and generative character of digital technologies in the business modeling process (Langley, 1999). Researchers can thus trace how different actors are entangled and how business models are affected by diverse sociomaterial practices. Furthermore, netnography provides rigorous guidelines for exploring digital sites, which is especially important to research entrepreneurial activities on commercial platform ecosystems (Gregori & Holzmann, 2022).

**Proposition 2.** Research should apply a sociomaterial perspective emphasizing digital agency to investigate the constitutive role of digital technologies for socioenvironmental value creation and for the manner in which entrepreneurship is practiced.

#### 5.1.3. Developing the entrepreneur-business model nexus

Our findings also reflect the entrepreneur's central role, offering another promising theme for future work. Research reveals several important facets, such as the necessary pro-social motivation and digital skills as precursors of entrepreneurial motivation (Ghatak et al., 2020; Ryu & Kim, 2018; Suseno & Abbott, 2021). But we have identified a lack of research on how such aspects are interwoven in venture development processes. From a design perspective, business models are considered artifacts that reflect an entrepreneur's envisioned opportunities (Saroghi, AdelRastkhiz, & Hornsby, 2021). Their development and subsequent implementation are fundamental entrepreneurial tasks (McDonald & Eisenhardt, 2020; Zott & Amit, 2010) that can further our knowledge in this regard.

Designing coherent business models poses a severe challenge for entrepreneurs. Prior research informed us that business models are complex activity-actor systems (Afuah & Tucci, 2001). Designing a business model can be constrained, for instance, by the entrepreneur's competence (Rohrbeck, Konnertz, & Knab, 2013), thinking patterns (Snihur & Zott, 2020), and creativity (Svejenova, Planellas, & Vives, 2010). Our findings indicate the specific entrepreneurial characteristics needed to identify, develop, and implement solutions for social and environmental issues due to the complex nature of sustainability issues. In addition, entrepreneurs require the necessary skills and know-how in terms of digitalization. Entrepreneurs must be aware of the potential and functionality of often complex technologies like AI, Big Data, or

blockchain for sustainable development before designing business models. Specific knowledge in this regard is essential for entrepreneurs to identify latent socioenvironmental needs of underserved customer segments as a prerequisite of novel value propositions (Ibáñez et al., 2021; Majchrzak & Shepherd, 2021). Hence, although digital technologies can expand the sustainable entrepreneur's repertoire in designing business models, it also holds severe challenges because of the need to align technological affordances and restrictions with value creation for sustainability. In addition, our review revealed little insight into the entrepreneurs' concrete activities to identify and implement a specific technology that supports their value creation aspirations.

Business model design processes can be investigated through canvases that are recognized as powerful supporting tools. Through their componential structure, they enable the channeling of attention on relevant internal and external aspects, and by acknowledging interdependence between components (Amit & Zott, 2015), they allow for a stylistic but comprehensive portrayal of the envisioned opportunity. We identified specialized canvases like the digital social innovation canvas (Ribeiro et al., 2021) that seek to consider the altered contingency factors. The canvas integrates aspects such as proposed social value, beneficiaries, and stakeholder engagement but also scalability, and technological enablers to facilitate entrepreneurial decision-making and raise awareness of the unprecedented advances of digital technologies. Such attempts can also be beneficial in exploring how tensions between sustainability and digitalization (e.g., Fish & Srinivasan, 2012; Gregori & Holzmann, 2020; Soltysova & Modrak, 2020) manifest in ventures and what coping strategies entrepreneurs apply to engage with such tensions. Action research is a recommended approach that future research can leverage to develop appropriate tools and methods to support sustainable entrepreneurs (Bocken, Schuit, & Kraaijenhagen, 2018).

**Proposition 3.** Research should apply design perspectives to investigate how business modeling outcomes are affected by the relationship between the characteristics of entrepreneurs and digital technologies.

#### 5.2. Practical implications

While the developed framework and proposed research agenda can guide future work, the article also offers implications supporting practitioners in facilitating the much-needed change towards a more sustainable development. Sustainable entrepreneurs can build on our findings to leverage digital technologies' promises for stakeholder inclusion, venture viability, and coherent business models. However, the article also points out some accompanying challenges, such as developing socioenvironmental value propositions for radically new technologies. We urge practitioners to engage with the identified challenges and draw appropriate conclusions from the provided discussions. Relatedly, we suggest that sustainable entrepreneurs use digital technologies such as AI or platforms in a responsible fashion. Responsible behavior is crucial to circumvent potential dark sides and avoid unintended socioenvironmental consequences that may result from a lack of knowledge or careless use.

Furthermore, entrepreneurs often resort to available digital technologies, e.g., established platform solutions. Developers of digital technologies need to be aware of their pivotal role in entrepreneurial processes for sustainability. They are advised to address sustainable usage of their technologies proactively. Such efforts require elaborating on how technology can contribute to a more sustainable future. Relevant strategies here can focus on sustainability in communication, for instance, highlighting these aspects in information materials or through respective use cases. Digital technology developers could establish support systems, such as granting cost benefits to sustainable entrepreneurial initiatives to emphasize their importance.

The findings of this study can also inform public policy. We show the relevance of entrepreneurial initiatives to develop regions, for instance,

increasing well-being, promoting digital inclusion, and preserving the environment. This task, however, is extensive and exceeds the possible contributions of individuals and organizations, rendering governmental support crucial (Sharma et al., 2021). Policy makers can utilize the knowledge about the advantages and challenges of entrepreneurial initiatives to develop supportive ecosystems that foster productive sustainable entrepreneurial action. Ecosystems would then allow for alignment, channel dispersed efforts, and create a vivid network of experts, companies, and entrepreneurial initiatives (Pazaitis et al., 2017). Supported by promising digital technologies such as AI (Nishant, Kennedy et al., 2020), this could increase the effectiveness and efficiency of operations through prioritization and reduction of redundancies. Collective intelligence could further contribute to mitigating and counteracting sustainability challenges. To circumvent the antagonistic relationship between digitalization and sustainability (Fish & Srinivasan, 2012), we advise that the development of support systems should apply an integrative view. Various initiatives can contribute, including funding programs, incentive systems such as tax benefits, or information campaigns.

Another essential aspect is educating individuals (Calvo, Lyon, Morales, & Wade, 2020; Ghatak et al., 2020). Findings demonstrate the unprecedented potential of digital sustainability, but it is also pointed out that entrepreneurs must combine digital skills and knowledge about sustainability. In acquiring the required skills, policy makers and educational institutions can support aspiring entrepreneurs by developing tailored formats on digital sustainability. Case study teaching and practice-oriented knowledge transfer emphasizing the possibilities and perils is promising. Based on our findings, education should shape pro-social motivation, compassion, and empathy while nurturing digital skills and technological innovativeness. It is crucial to expand students' awareness and understanding of the topic, build their self-efficacy, and, consequently, the intention to spark future digital sustainable entrepreneurship activities (Gregori, Holzmann et al., 2021).

### 5.3. Limitations and future research

This article followed a systematic literature review approach that entails several advantages, such as increased rigor. However, this method also has limitations, making room for further research. The selection and elimination of articles to compile a comprehensive and appropriate sample were guided by current recommendations of systematic review approaches. We opted, for instance, to introduce quality criteria using WOS-indexed and peer-reviewed outlets as a proxy. Although the chosen search engine is recognized as one of the premier sources and fits the article's research aim, it further narrows down the potential references that formed the basis for this review. In particular, this choice omits other sources, such as book chapters or conference proceedings, that may contain relevant information. As such, the presented themes have to be considered with respect to the sampled articles and the authors' interpretations. In addition, the paper offers a theoretical framework leveraging the unifying potential of business models, an actionable research agenda, and propositions to further the theory and practice of digital sustainable entrepreneurship. We are aware that the ideas, research methods, and technologies presented in the research agenda are only a few of many possibilities. This article invites future research to explore other approaches to expand upon the developed framework and research agenda and gain a deeper understanding of the emerging field. For example, with a few exceptions, the analyzed articles postulate a positive relationship between digital technologies and sustainable entrepreneurship. Future research could elaborate more on critical perspectives and explore the negative consequences and dark sides of digitalization. We also found that scholars are currently predominantly interested in social aspects of sustainable development. Hence, the relation between digital technologies and environmental sustainability in entrepreneurship warrants further attention.

## 6. Conclusions

Our common world is facing severe social and environmental challenges. This article furthers our understanding of the promise of digital technologies to mitigate these challenges through entrepreneurship by conducting a systematic analysis of the academic discourse. In doing so, we offer two central contributions: First, the article provides a comprehensive overview of current research that scholars can utilize as a basis to engage with this crucial topic. The results suggest that the field has recently gained noticeable traction, pointing to early signs of emergence. We identified four central themes in the literature (i.e., enabling social and environmental value creation, stakeholder inclusion, venture viability, and entrepreneurial individuals) that can guide future research by providing the potential to position itself more clearly and to contribute to the respective field's further development. The second significant contribution of this work is the discussion and presentation of a comprehensive and actionable research agenda and propositions. We offer a theoretical framework based on the business model lens that integrates the identified themes and goes beyond them by adding and discussing promising theoretical concepts. We hope that this article sparks additional research and supports practitioners in identifying the potential promises of digital technologies for sustainable entrepreneurship as a way to tackle the most profound challenges of our times together.

### CRedit authorship contribution statement

**Patrick Holzmann:** Conceptualization; Formal analysis; Investigation; Methodology; Supervision; Validation; Visualization; Writing - original draft; Writing - review & editing. **Patrick Gregori:** Conceptualization; Formal analysis; Investigation; Methodology; Validation; Visualization; Writing - original draft; Writing - review & editing.

### References

- Afuah, A., & Tucci, C. L. (2001). *Internet business models and strategies: Text and cases*. New York: McGraw-Hill/Irwin.
- Amit, R., & Zott, C. (2015). Crafting business architecture: the antecedents of business model design. *Strategic Entrepreneurship Journal*, 9(4), 331–350. <https://doi.org/10.1002/sej.1200>
- Anderson, J., Caimi, G., (2022). A Three-Part Game Plan for Delivering Sustainability Digitally. Retrieved April 11, 2022, from (<https://www.bain.com/insights/a-three-part-game-plan-for-delivering-sustainability-digitally/>).
- Antolin-Lopez, R., Martinez-del-Rio, J., & Cespedes-Lorente, J. J. (2019). Environmental entrepreneurship as a multi-component and dynamic construct: Duality of goals, environmental agency, and environmental value creation. *Business Ethics: A European Review*, 28(4), 407–422. <https://doi.org/10.1111/beer.12229>
- Arora, P. (2016). Bottom of the data pyramid: Big data and the global south. *International Journal of Communication*, 10, 1681–1699.
- Autio, E., Nambisan, S., Thomas, L. D. W., & Wright, M. (2018). Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*, 12(1), 72–95. <https://doi.org/10.1002/sej.1266>
- Baran, G., & Berkowicz, A. (2021). Digital platform ecosystems as living labs for sustainable entrepreneurship and innovation: A conceptual model proposal. *Sustainability*, 13(11), 6494. <https://doi.org/10.3390/su13116494>
- Battisti, S. (2019). Digital social entrepreneurs as bridges in public-private partnerships. *Journal of Social Entrepreneurship*, 10(2), 135–158. <https://doi.org/10.1080/19420676.2018.1541006>
- Battisti, S., Agarwal, N., & Brem, A. (2022). Creating new tech entrepreneurs with digital platforms: Meta-organizations for shared value in data-driven retail ecosystems. *Technological Forecasting and Social Change*, 175, Article 121392. <https://doi.org/10.1016/j.techfore.2021.121392>
- Beckman, C., Eisenhardt, K., Kotha, S., Meyer, A., & Rajagopalan, N. (2012). Technology entrepreneurship. *Strategic Entrepreneurship Journal*, 6(2), 89–93. <https://doi.org/10.1002/sej.1134>
- Bocken, N. M. P., Schuit, C. S. C., & Kraaijenhagen, C. (2018). Experimenting with a circular business model: Lessons from eight cases. *Environmental Innovation and Societal Transitions*, 28, 79–95. <https://doi.org/10.1016/j.eist.2018.02.001>
- Bohnsack, R., & Pinkse, J. (2017). Value propositions for disruptive technologies: Reconfiguration tactics in the case of electric vehicles. *California Management Review*, 59(4), 79–96. <https://doi.org/10.1177/0008125617717711>
- Bonina, C., López-Berzosa, D., & Scarlata, M. (2020). Social, commercial, or both? An exploratory study of the identity orientation of digital social innovations. *Information Systems Journal*, (Online first), 695–716. <https://doi.org/10.1111/isj.12290>



- Brennen, J.S., & Kreiss, D. (2016). Digitalization. In *The International Encyclopedia of Communication Theory and Philosophy* (pp. 1–11). (<https://doi.org/10.1002/9781118766804.wbiect111>).
- von Briel, F., Davidsson, P., & Recker, J. (2018). Digital technologies as external enablers of new venture creation in the IT hardware sector. *Entrepreneurship Theory and Practice*, 42(1), 47–69. <https://doi.org/10.1177/1042258717732779>
- Briscoe, S., Bethel, A., & Rogers, M. (2020). Conduct and reporting of citation searching in Cochrane systematic reviews: A cross-sectional study. *Research Synthesis Methods*, 11(2), 169–180. <https://doi.org/10.1002/jrsm.1355>
- Cabrera, L., & Byrne, C. (2021). Comparing organisational and alternative regional citizenships: the case of 'Entrepreneurial regional citizenship' in ASEAN. *Australian Journal of International Affairs*. <https://doi.org/10.1080/10357718.2021.1875982>
- Calvo, S., Lyon, F., Morales, A., & Wade, J. (2020). Educating at scale for sustainable development and social enterprise growth: The impact of online learning and a massive open online course (MOOC). *Sustainability*, 12(8). <https://doi.org/10.3390/SU12083247>
- Calzada, I. (2020). Democratizing smart cities? Penta-Helix multistakeholder social innovation framework. *Smart Cities*, 3(4), 1145–1172. <https://doi.org/10.3390/smartcities3040057>
- Carroll, R., & Casselman, R. M. (2019). The lean discovery process: The case of raiserve. *Journal of Small Business and Enterprise Development*, 26(6–7), 765–782. <https://doi.org/10.1108/JSBED-04-2019-0124>
- Chandna, V. (2022). Social entrepreneurship and digital platforms: Crowdfunding in the sharing-economy era. *Business Horizons*, 65(1), 21–31. <https://doi.org/10.1016/j.bushor.2021.09.005>
- Chesbrough, H. W., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Industrial and Corporate Change*, 11(3), 529–555. <https://doi.org/10.1093/icc/11.3.529>
- Cohen, B., & Winn, M. I. (2007). Market imperfections, opportunity and sustainable entrepreneurship. *Journal of Business Venturing*, 22(1), 29–49. <https://doi.org/10.1016/j.jbusvent.2004.12.001>
- Cohen, M. C., Lobel, I., & Paes Leme, R. (2020). Feature-based dynamic pricing. *Management Science*, 66(11), 4921–4943. <https://doi.org/10.1287/mnsc.2019.3485>
- Corrales-Garay, D., Mora-Valentin, E. M., & Ortiz-de-Urbina-Criado, M. (2020). Entrepreneurship through open data: An opportunity for sustainable development. *Sustainability (Switzerland)*, 12(12). <https://doi.org/10.3390/su12125148>
- Dale, J., & Kyle, D. (2016). Smart humanitarianism: Re-imagining human rights in the age of enterprise. *Critical Sociology*, 42(6), 783–797. <https://doi.org/10.1177/0896920516640041>
- Darcy, S., Yerbury, H., & Maxwell, H. (2019). Disability citizenship and digital capital: the case of engagement with a social enterprise telco. *Information Communication and Society*, 22(4), 538–553. <https://doi.org/10.1080/1369118X.2018.1548632>
- De Bernardi, P., Bertello, A., Forliano, C., & Orlandi, L. B. (2021). Beyond the 'ivory tower': Comparing academic and non-academic knowledge on social entrepreneurship. *International Entrepreneurship and Management Journal*. <https://doi.org/10.1007/s11365-021-00783-1>
- De Bernardi, P., Bertello, A., & Venuti, F. (2019). Online and on-site interactions within alternative food networks: Sustainability impact of knowledge-sharing practices. *Sustainability*, 11(5), 10–14. <https://doi.org/10.3390/su11051457>
- Dean, T. J., & McMullen, J. S. (2007). Toward a theory of sustainable entrepreneurship: Reducing environmental degradation through entrepreneurial action. *Journal of Business Venturing*, 22(1), 50–76. <https://doi.org/10.1016/j.jbusvent.2005.09.003>
- Demil, B., & Lecocq, X. (2015). Crafting an innovative business model in an established company: The role of artifacts. In *Business Models and Modelling (Advances in Strategic Management, Vol. 33)* (pp. 31–58). (<https://doi.org/10.1108/S0742-33222015000033003>).
- Devereaux, A. (2021). The digital Wild West: On social entrepreneurship in extended reality. *Journal of Entrepreneurship and Public Policy*, 10(2), 198–217. <https://doi.org/10.1108/JE>
- Doganova, L., & Eyquem-Renault, M. (2009). What do business models do? *Research Policy*, 38(10), 1559–1570. <https://doi.org/10.1016/j.respol.2009.08.002>
- Dwivedi, Y. K., Hughes, L., Kar, A. K., Baabdullah, A. M., Grover, P., Abbas, R., & Wade, M. (2022). Climate change and COP26: Are digital technologies and information management part of the problem or the solution? An editorial reflection and call to action. *International Journal of Information Management*, 63, Article 102456. <https://doi.org/10.1016/j.ijinfomgt.2021.102456>
- Faludi, J. (2020). How to create social value through digital social innovation? Unlocking the potential of the social value creation of digital start-ups. *Journal of Social Entrepreneurship*, 0(0), 1–18. <https://doi.org/10.1080/19420676.2020.1823871>
- Fish, A., & Srinivasan, R. (2012). Digital labor is the new killer app. *New Media and Society*, 14(1), 137–152. <https://doi.org/10.1177/1461444811412159>
- George, G., Merrill, R. K., & Schillebeeckx, S. J. D. (2021). Digital sustainability and entrepreneurship: how digital innovations are helping tackle climate change and sustainable development. *Entrepreneurship: Theory and Practice*, 45(5), 999–1027. <https://doi.org/10.1177/1042258719899425>
- Ghata, A., Chatterjee, S., & Bhowmick, B. (2020). Intention towards digital social entrepreneurship: An integrated model. *Journal of Social Entrepreneurship*. <https://doi.org/10.1080/19420676.2020.1826563>
- Ghezzi, A., & Cavallo, A. (2020). Agile business model innovation in digital entrepreneurship: lean startup approaches. *Journal of Business Research*, 110, 519–537. <https://doi.org/10.1016/j.jbusres.2018.06.013>
- Gino, F., & Staats, B. R. (2012). The microwork solution. *Harvard Business Review*, 90(12), 1–8.
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research. *Organizational Research Methods*, 16(1), 15–31. <https://doi.org/10.1177/1094428112452151>
- Goyal, S., Agrawal, A., & Sergi, B. S. (2020). Social entrepreneurship for scalable solutions addressing sustainable development goals (SDGs) at BoP in India. *Qualitative Research in Organizations and Management: An International Journal*. <https://doi.org/10.1108/QROM-07-2020-1992>
- Gregori, P., & Holzmann, P. (2020). Digital sustainable entrepreneurship: A business model perspective on embedding digital technologies for social and environmental value creation. *Journal of Cleaner Production*, Article 122817. <https://doi.org/10.1016/j.jclepro.2020.122817>
- Gregori, P., & Holzmann, P. (2022). Entrepreneurial practices and the constitution of environmental value for sustainability. *Business Strategy and the Environment*. <https://doi.org/10.1002/bse.3077>
- Gregori, P., Holzmann, P., & Schwarz, E. J. (2021). My future entrepreneurial self: antecedents of entrepreneurial identity aspiration. *Education + Training*, 63(7/8), 1175–1194. <https://doi.org/10.1108/ET-02-2021-0059>
- Gregori, P., & Parastuty, Z. (2021). Investigating the process of entrepreneurial team member exits: a systematic review and future research directions. *Review of Managerial Science*, 15(4), 847–878. <https://doi.org/10.1007/s11846-020-00377-1>
- Gregori, P., Wdowiak, M. A., Schwarz, E. J., & Holzmann, P. (2019). Exploring value creation in sustainable entrepreneurship: Insights from the institutional logics perspective and the business model lens. *Sustainability*, 11(9), 2505. <https://doi.org/10.3390/su11092505>
- Gusenbauer, M. (2019). Google Scholar to overshadow them all? Comparing the sizes of 12 academic search engines and bibliographic databases. *Scientometrics*, 118(1), 177–214. <https://doi.org/10.1007/s11192-018-2958-5>
- Gusenbauer, M., & Haddaway, N. R. (2020). Which academic search systems are suitable for systematic reviews or meta-analyses? Evaluating retrieval qualities of Google Scholar, PubMed, and 26 other resources. *Research Synthesis Methods*, 11(2), 181–217. <https://doi.org/10.1002/jrsm.1378>
- Hall, J. K., Daneke, G. A., & Lenox, M. J. (2010). Sustainable development and entrepreneurship: Past contributions and future directions. *Journal of Business Venturing*, 25(5), 439–448. <https://doi.org/10.1016/j.jbusvent.2010.01.002>
- Hartmann, P. M., Zaki, M., Feldmann, N., & Neely, A. (2016). Capturing value from big data – A taxonomy of data-driven business models used by start-up firms. *International Journal of Operations & Production Management*, 36(10), 1382–1406. <https://doi.org/10.1108/IJOPM-02-2014-0098>
- Holzmann, P., Breitenacker, R. J., & Schwarz, E. J. (2019). Business model patterns for 3D printer manufacturers. *Journal of Manufacturing Technology Management*, 31(6), 1281–1300. <https://doi.org/10.1108/JMTM-09-2018-0313>
- Holzmann, P., Breitenacker, R. J., Schwarz, E. J., & Gregori, P. (2020). Business model design for novel technologies in nascent industries: An investigation of 3D printing service providers. *Technological Forecasting and Social Change*, 159, Article 120193. <https://doi.org/10.1016/j.techfore.2020.120193>
- Holzmann, P., Breitenacker, R. J., Soomro, A. A., & Schwarz, E. J. (2017). User entrepreneur business models in 3D printing. *Journal of Manufacturing Technology Management*, 28(1), 75–94. <https://doi.org/10.1108/JMTM-12-2015-0115>
- Huang, J., Henfridsson, O., Liu, M. J., & Newell, S. (2017). Growing on steroids: Rapidly scaling the user base of digital ventures through digital innovation. *MIS Quarterly*, 41(1), 301–314. <https://doi.org/10.25300/MISQ/2017/41.1.16>
- Huang, S.-C., & Cox, J. L. (2016). Establishing a social entrepreneurial system to bridge the digital divide for the poor: a case study for Taiwan. *Universal Access in the Information Society*, 15(2), 219–236. <https://doi.org/10.1007/s10209-014-0379-7>
- Ibáñez, M. J., Guerrero, M., Yáñez-Valdés, C., & Barros-Celume, S. (2021). Digital social entrepreneurship: the N-Helix response to stakeholders' COVID-19 needs. *The Journal of Technology Transfer*. <https://doi.org/10.1007/s10961-021-09855-4>
- Javed, A., & Yasir, M. (2019). Virtual social enterprise: modeling sustainability of an enterprise by digital intervention. *World Journal of Entrepreneurship, Management and Sustainable Development*, 15(2), 182–196. <https://doi.org/10.1108/wjemdsd-03-2018-0032>
- Javed, A., Yasir, M., Ali, M., & Majid, A. (2020). ICT-enabled innovation, enterprise value creation and the rise of electronic social enterprise. *World Journal of Entrepreneurship, Management and Sustainable Development*. <https://doi.org/10.1108/WJEMSD-01-2020-0004>
- Johnson, M. P., & Schaltegger, S. (2020). Entrepreneurship for sustainable development: A review and multilevel causal mechanism framework. *Entrepreneurship Theory and Practice*, 44(6), 1141–1173. <https://doi.org/10.1177/1042258719885368>
- Kao, S. W., & Luarn, P. (2020). Topic modeling analysis of social enterprises: Twitter evidence. *Sustainability*, 12(8). <https://doi.org/10.3390/SU12083419>
- Katz, R., Koutrompis, P., & Martin Callorda, F. (2014). Using a digitization index to measure the economic and social impact of digital agendas. *Info*, 16(1), 32–44. <https://doi.org/10.1108/info-10-2013-0051>
- Khan, S. A., & Bohnsack, R. (2020). Influencing the disruptive potential of sustainable technologies through value proposition design: The case of vehicle-to-grid technology. *Journal of Cleaner Production*, 254, Article 120018. <https://doi.org/10.1016/j.jclepro.2020.120018>
- Kher, R., Terjesen, S., & Liu, C. (2021). Blockchain, bitcoin, and ICOs: A review and research agenda. *Small Business Economics*, 56(4), 1699–1720. <https://doi.org/10.1007/s11187-019-00286-y>
- Kitchin, R. (2017). Thinking critically about and researching algorithms. *Information, Communication & Society*, 20(1), 14–29. <https://doi.org/10.1080/1369118X.2016.1154087>
- Kraus, S., Breier, M., & Dasí-Rodríguez, S. (2020). The art of crafting a systematic literature review in entrepreneurship research. *International Entrepreneurship and*



- Management Journal*, 16(3), 1023–1042. <https://doi.org/10.1007/s11365-020-00635-4>
- Kraus, S., Durst, S., Ferreira, J. J., Veiga, P., Kailer, N., & Weinmann, A. (2022). Digital transformation in business and management research: An overview of the current status quo. *International Journal of Information Management*, 63, Article 102466. <https://doi.org/10.1016/j.ijinfomgt.2021.102466>
- Kraus, S., Palmer, C., Kailer, N., Kallinger, F. L., & Spitzer, J. (2019). Digital entrepreneurship. *International Journal of Entrepreneurial Behavior & Research*, 25(2), 353–375. <https://doi.org/10.1108/IJEBR-06-2018-0425>
- Langley, A. (1999). Strategies for theorizing from process data. *The Academy of Management Review*, 24(4), 691. <https://doi.org/10.2307/259349>
- Langley, D. J., Zirngiebl, M., Sbeih, J., & Devoldere, B. (2017). Trajectories to reconcile sharing and commercialization in the maker movement. *Business Horizons*, 60(6), 783–794. <https://doi.org/10.1016/j.bushor.2017.07.005>
- Laurell, C., Sandström, C., & Suseno, Y. (2019). Assessing the interplay between crowdfunding and sustainability in social media. *Technological Forecasting and Social Change*, 141(June 2018), 117–127. <https://doi.org/10.1016/j.techfore.2018.07.015>
- Lee, E. S., & Jung, K. (2018). Dynamics of social economy self-organized on social media: Following social entrepreneur forum and social economy network on Facebook. *Quality and Quantity*, 52(2), 635–651. <https://doi.org/10.1007/s11135-017-0663-8>
- Lin, P. M. C., Peng, K., Ren, L., & Lin, C. (2018). International journal of hospitality management hospitality co-creation with mobility-impaired people. *International Journal of Hospitality Management*, 77(September 2017), 0–1. <https://doi.org/10.1016/j.ijhm.2018.08.013>
- Lüdeke-Freund, F. (2020). Sustainable entrepreneurship, innovation, and business models: Integrative framework and propositions for future research. *Business Strategy and the Environment*, 29(2), 665–681. <https://doi.org/10.1002/bse.2396>
- Majchrzak, A., & Shepherd, D. A. (2021). Can digital innovations help reduce suffering? A crowd-based digital innovation framework of compassion venturing. *Information and Organization*, 31(1), Article 100338. <https://doi.org/10.1016/j.infoandorg.2021.100338>
- Markman, G. D., Waldron, T. L., Gianiodis, P. T., & Espina, M. I. (2019). E Pluribus Unum: Impact entrepreneurship as a solution to grand challenges. *Academy of Management Perspectives*, 33(4), 371–382. <https://doi.org/10.5465/amp.2019.0130>
- Matzembacher, D. E., Raudsaar, M., Barcellos, M. D. D., & Mets, T. (2020). Business models' innovations to overcome hybridity-related tensions in sustainable entrepreneurship. *Sustainability*, 12(11), 4503. <https://doi.org/10.3390/su12114503>
- McDonald, R. M., & Eisenhardt, K. M. (2020). Parallel play: Startups, nascent markets, and effective business-model design. *Administrative Science Quarterly*, 65(2), 483–523. <https://doi.org/10.1177/0001839219852349>
- Mora, H., Morales-Morales, M. R., Pujol-López, F. A., & Mollá-Sirvent, R. (2021). Social cryptocurrencies as model for enhancing sustainable development. *Kybernetes*. <https://doi.org/10.1108/K-05-2020-0259>
- Muñoz, P., & Cohen, B. (2017). Sustainable entrepreneurship research: Taking stock and looking ahead. *Business Strategy and the Environment*. <https://doi.org/10.1002/bse.2000>
- Nambisan, S. (2017). Digital entrepreneurship: Toward a digital technology perspective of entrepreneurship. *Entrepreneurship Theory and Practice*, 41(6), 1029–1055. <https://doi.org/10.1111/etap.12254>
- Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research Policy*, 48(8), Article 103773. <https://doi.org/10.1016/j.respol.2019.03.018>
- Negruțiu, C., Vasiliu, C., & Enache, C. (2020). Sustainable entrepreneurship in the transport and retail supply chain sector. *Journal of Risk and Financial Management*, 13(11), 267. <https://doi.org/10.3390/jrfm13110267>
- Nishant, R., Kennedy, M., & Corbett, J. (2020). Artificial intelligence for sustainability: Challenges, opportunities, and a research agenda. *International Journal of Information Management*, 53, Article 102104. <https://doi.org/10.1016/j.ijinfomgt.2020.102104>
- Nishant, R., & Ravishanker, M. N. (2020). QCA and the harnessing of unstructured qualitative data. *Information Systems Journal*, 30(5), 845–865. <https://doi.org/10.1111/isj.12281>
- Okoli, C. (2015). A guide to conducting a standalone systematic literature review. *Communications of the Association for Information Systems*, 37. <https://doi.org/10.17705/1CAIS.03743>
- Orlikowski, W. J. (2007). Sociomaterial practices: Exploring technology at work. *Organization Studies*, 28(9), 1435–1448. <https://doi.org/10.1177/0170840607081138>
- Orlikowski, W. J., & Scott, S. V. (2008). Sociomateriality: Challenging the separation of technology, work and organization. *The Academy of Management Annals*, 2(1), 433–474. <https://doi.org/10.1080/19416520802211644>
- Pan, S. L., Carter, L., Tim, Y., & Sandeep, M. S. (2022). Digital sustainability, climate change, and information systems solutions: Opportunities for future research. *International Journal of Information Management*, 63, Article 102444. <https://doi.org/10.1016/j.ijinfomgt.2021.102444>
- Pankaj, L., & Seetharaman, P. (2021). The balancing act of social enterprise: An IT emergence perspective. *International Journal of Information Management*, 57, Article 102302. <https://doi.org/10.1016/j.ijinfomgt.2020.102302>
- Papagiannidis, S., & Marikyan, D. (2022). Environmental sustainability: A technology acceptance perspective. *International Journal of Information Management*, 63, Article 102445. <https://doi.org/10.1016/j.ijinfomgt.2021.102445>
- Parthiban, R., Qureshi, I., Bandyopadhyay, S., Bhatt, B., & Jaikumar, S. (2020). Leveraging ICT to overcome complementary institutional voids: Insights from institutional work by a social enterprise to help marginalized. *Information Systems Frontiers*, 22(3), 633–653. <https://doi.org/10.1007/s10796-020-09991-6>
- Pazaitis, A., Kostakis, V., & Bauwens, M. (2017). Digital economy and the rise of open cooperativism: the case of the Enspirial network. *Transfer*, 23(2), 177–192. <https://doi.org/10.1177/1024258916683865>
- Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide*. Oxford: Blackwell Publishing Ltd.,
- Pierce, P., Ricciardi, F., & Zardini, A. (2017). Smart cities as organizational fields: A framework for mapping sustainability-enabling configurations. *Sustainability*, 9(9), 1–21. <https://doi.org/10.3390/su9091506>
- Popkova, E. G., & Sergi, B. S. (2020). Human capital and AI in industry 4.0. Convergence and divergence in social entrepreneurship in Russia. *Journal of Intellectual Capital*, 21(4), 565–581. <https://doi.org/10.1108/JIC-09-2019-0224>
- Ratten, V. (2018). Social entrepreneurship through digital communication in farming. *World Journal of Entrepreneurship, Management and Sustainable Development*, 14(1), 99–110. <https://doi.org/10.1108/wjemsd-07-2017-0045>
- Rauch, A. (2020). Opportunities and threats in reviewing entrepreneurship theory and practice. *Entrepreneurship Theory and Practice*, 44(5), 847–860. <https://doi.org/10.1177/1042258719879635>
- Rayna, T., Striukova, L., & Darlington, J. (2015). Co-creation and user innovation: The role of online 3D printing platforms. *Journal of Engineering and Technology Management*, 37, 90–102. <https://doi.org/10.1016/j.jengtecman.2015.07.002>
- Ribeiro, G. C., Oliveira, K. K. S., & Souza, R. A. C. (2021). DSI strategy canvas: Modelling the digital social innovation strategy. *Journal of Social Entrepreneurship*, 1–29. <https://doi.org/10.1080/19420676.2021.1987971>
- Ridley-Duff, R., & Bull, M. (2021). Common pool resource institutions: The rise of internet platforms in the social solidarity economy. *Business Strategy and the Environment*, 30(3), 1436–1453. <https://doi.org/10.1002/bse.2707>
- Rohrbeck, R., Konnertz, L., & Knab, S. (2013). Collaborative business modelling for systemic and sustainability innovations. *International Journal of Technology Management*, 63(1/2), 4. <https://doi.org/10.1504/IJTM.2013.055577>
- Ross, T., Mitchell, V. A., & May, A. J. (2012). Bottom-up grassroots innovation in transport: Motivations, barriers and enablers. *Transportation Planning and Technology*, 35(4), 469–489. <https://doi.org/10.1080/03081060.2012.680820>
- Ryder, P., & Vogeley, J. (2018). Telling the impact investment story through digital media: An Indonesian case study. *Communication Research and Practice*, 4(4), 375–395. <https://doi.org/10.1080/22041451.2017.1387956>
- Ryu, S., & Kim, Y. G. (2018). Money is not everything: A typology of crowdfunding project creators. *Journal of Strategic Information Systems*, 27(4), 350–368. <https://doi.org/10.1016/j.jsis.2018.10.004>
- Saebi, T., Foss, N. J., & Linder, S. (2019). Social entrepreneurship research: Past achievements and future promises. *Journal of Management*, 45(1), 70–95. <https://doi.org/10.1177/0149206318793196>
- Sandeep, M. S., & Ravishanker, M. N. (2015). Social innovations in outsourcing: An empirical investigation of impact sourcing companies in India. *Journal of Strategic Information Systems*, 24(4), 270–288. <https://doi.org/10.1016/j.jsis.2015.09.002>
- Saroghi, H., AdelRastkhiz, S. E., & Hornsby, J. (2021). Heterogeneity of entrepreneurial opportunities as design artifacts: A business model perspective. *Journal of Business Venturing Insights*, 16, Article e00277. <https://doi.org/10.1016/j.jbvi.2021.e00277>
- Schaltegger, S., Hansen, E. G., & Lüdeke-Freund, F. (2016). Business models for sustainability: Origins, present research, and future avenues. *Organization & Environment*, 29(1), 3–10. <https://doi.org/10.1177/1086026615599806>
- Schaper, M. (2010). Understanding the green entrepreneur. In M. Schaper (Ed.), *Making Ecopreneurs: Developing Sustainable Entrepreneurship* (2nd ed., pp. 7–20). Farnham: Gower Publishing.
- Sharma, R., Mishra, R., & Mishra, A. (2021). Determinants of satisfaction among social entrepreneurs in e-Government services. *International Journal of Information Management*, 60, Article 102386. <https://doi.org/10.1016/j.ijinfomgt.2021.102386>
- Shepherd, D. A., & Patzelt, H. (2020). A call for research on the scaling of organizations and the scaling of social impact. *Entrepreneurship Theory and Practice*. <https://doi.org/10.1177/1042258720950599>
- Shepherd, D. A., Wennberg, K., Suddaby, R., & Wiklund, J. (2019). What are we explaining? A review and agenda on initiating, engaging, performing, and contextualizing entrepreneurship. *Journal of Management*, 45(1), 159–196. <https://doi.org/10.1177/0149206318799443>
- Smith, B. R., Kistruck, G. M., & Cannatelli, B. (2016). The impact of moral intensity and desire for control on scaling decisions in social entrepreneurship. *Journal of Business Ethics*, 133(4), 677–689. <https://doi.org/10.1007/s10551-014-2447-6>
- Snihur, Y., Thomas, L. D. W., Garud, R., & Phillips, N. (2021). Entrepreneurial framing: A literature review and future research directions. *Entrepreneurship Theory and Practice*. <https://doi.org/10.1177/10422587211000336>
- Snihur, Y., & Zott, C. (2020). The genesis and metamorphosis of novelty imprints: How business model innovation emerges in young ventures. *Academy of Management Journal*, 63(2), 554–583. <https://doi.org/10.5465/amj.2017.0706>
- Soltysova, Z., & Modrak, V. (2020). Challenges of the sharing economy for SMEs: A literature review. *Sustainability*, 12(16), 6504. <https://doi.org/10.3390/su12166504>
- Srivastava, S. C., & Shainesh, G. (2015). Bridging the service divide through digitally enabled service innovations: Evidence from Indian healthcare service providers. *MIS Quarterly*, 39(1), 245–267. <https://doi.org/10.25300/MISQ/2015/39.1.11>
- Stephan, U. (2018). Entrepreneurs' mental health and well-being: A review and research agenda. *Academy of Management Perspectives*, 32(3), 290–322. <https://doi.org/10.5465/amp.2017.0001>
- Suchman, L. (2007). *Human-machine reconfigurations: Plans and situated actions* (2nd ed.). Cambridge: Cambridge University Press.,
- Suseno, Y., & Abbott, L. (2021). Women entrepreneurs' digital social innovation: Linking gender, entrepreneurship, social innovation and information systems. *Information Systems Journal*, 31(5), 717–744. <https://doi.org/10.1111/isj.12327>

- Svejenova, S., Planellas, M., & Vives, L. (2010). An individual business model in the making: A Chef's quest for creative freedom. *Longest Range Planning*, 43(2-3), 408-430. <https://doi.org/10.1016/j.lrp.2010.02.002>
- Symon, G., & Whiting, R. (2019). The sociomaterial negotiation of social entrepreneurs' meaningful work. *Journal of Management Studies*, 56(3), 655-684. <https://doi.org/10.1111/joms.12421>
- Tajvidi, R., & Tajvidi, M. (2020). The growth of cyber entrepreneurship in the food industry: virtual community engagement in the COVID-19 era. *British Food Journal*. <https://doi.org/10.1108/BFJ-06-2020-0559>
- Tarafdar, M., Singh, R., & Anekal, P. (2013). Impact of ICT-enabled product and process innovations at the Bottom of the Pyramid: A market separations perspective. *Journal of Information Technology*, 28(4), 279-295. <https://doi.org/10.1057/jit.2013.21>
- Terán-Yépez, E., Marín-Carrillo, G. M., Casado-Belmonte, M. D. P., & Capobianco-Uriarte, M. D. L. M. (2020). Sustainable entrepreneurship: Review of its evolution and new trends. *Journal of Cleaner Production*, 252, Article 119742. <https://doi.org/10.1016/j.jclepro.2019.119742>
- Tilson, D., Lyytinen, K., & Sorensen, C. (2010). Research commentary – Digital infrastructures: The missing IS research agenda. *Information Systems Research*, 21(4), 748-759. <https://doi.org/10.1287/isre.1100.0318>
- Timmers, P. (1998). Business models for electronic markets. *Electronic Markets*, 8(2), 3-8. <https://doi.org/10.1080/10196789800000016>
- Torres, P., & Augusto, M. (2020). Digitalisation, social entrepreneurship and national well-being. *Technological Forecasting and Social Change*, 161(June), Article 120279. <https://doi.org/10.1016/j.techfore.2020.120279>
- Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207-222. <https://doi.org/10.1111/1467-8551.00375>
- Veleva, V. (2021). The role of entrepreneurs in advancing sustainable lifestyles: Challenges, impacts, and future opportunities. *Journal of Cleaner Production*, 283. <https://doi.org/10.1016/j.jclepro.2020.124658>
- Wong, C. Y., Hsieh, Y. C., Wu, C. Y., & Hu, M. C. (2019). Academic entrepreneurship for social innovation in Taiwan: The cases of the ourcitylove platform and the forest app. *Science, Technology and Society*, 24(3), 446-464. <https://doi.org/10.1177/0971721819873182>
- Ye, Q., Zhou, R., Anwar, M. A., Siddiquei, A. N., & Asmi, F. (2020). Entrepreneurs and environmental sustainability in the digital era: Regional and institutional perspectives. *International Journal of Environmental Research and Public Health*, 17(4), 1355. <https://doi.org/10.3390/ijerph17041355>
- Yoo, Y., Boland, R. J., Lyytinen, K., & Majchrzak, A. (2012). Organizing for innovation in the digitized world. *Organization Science*, 23(5), 1398-1408. <https://doi.org/10.1287/orsc.1120.0771>
- Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). Research commentary – The new organizing logic of digital innovation: An agenda for information systems research. *Information Systems Research*, 21(4), 724-735. <https://doi.org/10.1287/isre.1100.0322>
- Zaheer, H., Breyer, Y., & Dumay, J. (2019). Digital entrepreneurship: An interdisciplinary structured literature review and research agenda. *Technological Forecasting and Social Change*, 148, Article 119735. <https://doi.org/10.1016/j.techfore.2019.119735>
- Zeng, J. (2018). Fostering path of ecological sustainable entrepreneurship within big data network system. *International Entrepreneurship and Management Journal*, 14(1), 79-95. <https://doi.org/10.1007/s11365-017-0466-3>
- Zott, C., & Amit, R. (2010). Business model design: An activity system perspective. *Longest Range Planning*, 43(2-3), 216-226. <https://doi.org/10.1016/j.lrp.2009.07.004>