




# Entrepreneurial growth, value creation and new technologies

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## Abstract

A robust literature has provided compelling evidence showing how digital transformation impacts entrepreneurship activity. However, only a paucity of research has linked adoption of new technologies to innovation, value creation, knowledge transfer and performance across different stages of the entrepreneurial growth continuum. This special issue fills this gap in the literature by focusing on if, how and why adoption of digital technologies and embeddedness in the digital entrepreneurial ecosystem enhances innovative activity and firm performance during the early and later stages of market entry. In particular, this special issue examines how digital transformation facilitates entrepreneurial, innovation, and social outputs along the entrepreneurial journey as well as why and how digital technologies may facilitate the interaction between economic agents and re-combination of internal resources and capabilities with those available externally. In doing so, this special issue unpacks a nuanced relationship between the diversity of new technologies and knowledge, their suitability and applicability for entrepreneurship and at different growth stages. This study offers policy implications and future research roadmap.

**Keywords** Digital technology · Entrepreneurship · Digital entrepreneurial ecosystems · Value creation · Entrepreneurial growth

**JEL classification** L26 · O32 · O33

## 1 Introduction

Entrepreneurial activity is essential to withstand and recover from economic shocks and facilitate economic development (Link et al., 2007; Mickiewicz et al., 2017). As a potential source of regional economic growth, value creation, innovation and job creation (Carree & Thurik, 2010; Audretsch et al., 2015a), entrepreneurial activity is also seen as a conduit for social justice and a way out of poverty (Minniti & Levesque, 2008; Belitski et al., 2021). Therefore, creating micro and macroeconomic conditions conducive to entrepreneurial activity (Chowdhury et al., 2019) and entrepreneurial aspirations (Estrin et al., 2013) has

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remained a key priority for regional and national policymakers in developed and developing countries.

As discussed by Bergmann and Stephan (2013) and more recently by Mickiewicz et al. (2017), both developed and developing countries have evidenced a variation in the entrepreneurship activity related to a 'transition' from latent to nascent and emerging entrepreneurship (Audretsch et al., 2022a, b). The issue of entrepreneurial transition through various stages of entrepreneurship is linked to macro (Van der Zwan et al., 2013) and individual factors (Klonek et al., 2015) facilitating such transition and enabling entrepreneurs to enter the market. An increasing role in entrepreneurial transition is associated with the development of digital technology and so-called the fourth industrial revolution that has largely changed the routines, processes and practices, knowledge spillovers proximity that entrepreneurs rely on when starting and growing their businesses (World Economic Forum, 2016; Audretsch and Belitski, 2021a; Digitally Driven, 2020, 2021).

In contrast, there is a gap in the literature on combined analysis of the role of individual and organizational drivers of entrepreneurial activity such as the adoption of new technologies, access to resources, investment in internal capabilities and external knowledge collaboration (Audretsch & Belitski, 2020a, b, 2023), and macroeconomic, institutional drivers such as formal and informal institutions (Stenholm et al., 2013; Belitski et al., 2016; Audretsch et al., 2019a; Khlystova et al., 2022). Altogether a combination of individual and institutional and ecosystem factors (Spigel, 2017) embrace entrepreneurial decision-making and enable the sustainable transformation of entrepreneurial activity at the different stages of entrepreneurial growth (Van der Zwan et al., 2013). Moreover, we argue that the contextual influences such as the transformation of the digital landscape and the introduction of novel digital technologies, allowed for new opportunities identification and creation by entrepreneurs (Bryniolfsson & McAfee, 2014; European Commission, 2017). Adoption of digital technologies by entrepreneurs and the location in the ecosystem where digital technologies are commonplace has accelerated entrepreneurial growth (Belitski et al., 2023a).

To the best of our knowledge, the role that digital and knowledge-enabling technologies play in innovation, growth, and value creation at different entrepreneurship stages has yet to be investigated (Audretsch et al., 2017; Caiazza et al., 2020). Let us explain these gaps in more detail; how we propose exploring them in this special issue.

Firstly, a particular gap in the literature is that while multilevel studies now distinguished between the individual and the context effects on entrepreneurial activity (Stenholm et al., 2013; Kim et al., 2016; Audretsch & Belitski, 2017), there is not much evidence of longitudinal changes related to entrepreneurial growth and transition. The use of qualitative methods in particular may explain the extent individual, regional and institutional factors that define the quality and quantity of entrepreneurial activity at different stages of growth and answer why and how questions. Given that there is significant variation in entrepreneurship activity not only across but also within industries and entrepreneurial ecosystems (Terjesen & Patel, 2017), understanding the depth and breadth of individual and contextual factors that enable and limit entrepreneurship may help us to gain a better understanding how resource endowments available to entrepreneurs and in the ecosystems could be used to create and exploit market opportunities (Mickiewicz et al., 2017) along the different stages of entrepreneurship. Accordingly, the first objective of this special issue is to examine whether and to which extent both the individual and context characteristics of ecosystems where entrepreneurs are

located jointly influence an individual's decision to engage in entrepreneurship, entrepreneurial aspiration and quality of entrepreneurship. To this effect, papers in the special issue draw on the knowledge-based view of entrepreneurship (KBV) (Alvarez & Busenitz, 2001; Audretsch & Belitski, 2021b) and knowledge spillovers of entrepreneurship and innovation theories (Acs et al., 2013; Audretsch & Belitski, 2022a; Audretsch et al., 2023).

Second, our contribution is to argue that KBV needs to be supplemented by resilience perspective, which is critical for entrepreneurial decision-making and survival (Coad & Guenther, 2013; Coad et al., 2016). In particular, we posit that organizational resilience is important in responding to exogenous shocks and is enhanced by adopting digital technologies. In addition to growing fast, adopting digital technologies has multiple effects on learning, innovation, and agility of large and small firms (Kuusisto, 2017). It is also an important mechanism of business model innovation and market exploration (Belitski & Mariani, 2023). Typically, digital technologies can prepare entrepreneurs to withstand and recover from exogenous shocks of different nature related to natural disasters, market and talent competition, and entry of multinationals in the industry, helping them to retain customers and sales, continue technological and organizational innovation and create new and reconfiguring existing knowledge under limited resources (Audretsch et al., 2021). Papers of this special issue find a uniform pattern of entrepreneurial behavior and responses to exogenous shocks using resources available to entrepreneurs.

Third, distinguishing between the individual and the contextual factors, such as entrepreneurial firm and manager characteristics as well as the framework conditions of digital entrepreneurial ecosystems (Sussan & Acs, 2017; Audretsch & Belitski, 2017; Spigel, 2017), this special issue focuses on variation in entrepreneurial and knowledge capital (Audretsch & Belitski, 2022b) and demonstrates how it changes entrepreneurial strategy for growth, innovation and value creation at different stages of entrepreneurship.

We aim to overcome the limitations of previous studies that have investigated the determinants of latent, nascent and emerging entrepreneurship (Audretsch et al., 2022a, c) and focus on different stages of entrepreneurial growth and variety of entrepreneurial activity, going beyond what is known as a binary treatment of entrepreneurship (Vivarelli, 2004). By applying qualitative, quantitative and mixed approaches to analyze data, papers in this special issue explicitly accounted for the fact that new market entry by a latent or nascent entrepreneur involves longitudinal selection choices and decision-making rather than the outcome of a single knowledge input such as digital technology, learning new skills or paying taxes. This special issue offers research on every of four stages of entrepreneurial activity such as pre-start-up and pre-profit stages for latent and nascent entrepreneurs (considering and intending to start a business), as well as early and mature stages such as emerging entrepreneurship activity and firm growth (Reynolds et al., 2005; Caiazza et al., 2020; Audretsch et al., 2021).

The remainder of this paper is structured as follows. The next section will outline the relationship between new technologies and new firm entry, while Sect. 3 the relationship between digitization, new technologies and entrepreneurial growth. Section 4 highlights constraints and opportunities for entrepreneurial growth. Section 5 describes the papers included in this special issue. Section 6 discusses the main findings and concludes with future research.

## 2 New technologies and new firm entry

Resources and capabilities available in the industry and society require entrepreneurs to combine and commercialize them in the market (Barney, 1991; Barney et al., 2001; Foss, 2011). Thus, the first stage of entrepreneurial growth consists of knowledge transfer and market exploration. Drawing on this argument, the knowledge-based view of a firm (Barney, 1991) and resource-based theory of entrepreneurship (Alvarez & Busenitz, 2001) explain why and under what boundary conditions these resources and capabilities can be transferred into new knowledge and new products.

Latent and nascent entrepreneurs are skillful in combining resources available to a firm internally and through external knowledge collaborations and knowledge spillovers (Belitski, 2019) to create and commercialize knowledge by establishing a new firm. This perspective is often described as the knowledge spillover of entrepreneurship (Acs et al., 2013) and innovation (Audretsch & Belitski, 2022a). The first stage of new firm entry relates to the search for and discovery of market opportunities (Mickiewicz et al., 2017). Individual firm characteristics, such as absorptive capacity (Zahra & George, 2002), as well as engagement with external partners (Audretsch et al., 2023), including within the ecosystems (Nambisan, 2017), facilitate the transformation of knowledge inputs into knowledge outputs. For example, national innovation and entrepreneurship support programs such as Small Business Innovation Research (SBIR) program in the United States, is an excellent example of how knowledge transfer and is organized. SBIR creates an ecosystem of agents and platforms where entrepreneurs at the early and later stages of firm growth may receive direct support in innovation activity and secure resources for innovation and market entry (Audretsch, 2003; Audretsch et al., 2019c). Over time SBIR program has stimulated technological innovation and knowledge transfer and is used mainly by small businesses to meet Federal research and development needs (Link et al., 2022; Link and van Hasselt, 2023).

Scholars who study the early stage of entrepreneurial growth, emphasized the role of new ideas and knowledge and their verification and validation in the market (Leyden & Link, 2015). For the opportunities to be identified and verified, the existing capabilities should be combined with resources and technology, such as cloud technology, mobility, social media, big data and analytics, robotics, Internet of Things and artificial intelligence extensively used at the market entry and growth stages (Li et al., 2016; Audretsch & Belitski, 2021a). Digital platforms (Kenney et al., 2015; Kenney & Zysman, 2020) and ChatGPT (Short & Short, 2023) are widely adopted by entrepreneurs at the early stages of market opportunity identification and exploration. Entrepreneurs, at any stage of their growth aim to integrate digital and knowledge-intensive technologies to reduce operational and transaction costs of knowledge search transfer and commercialization (Audretsch & Belitski, 2023; Saura et al., 2023a). The role of new technologies and digital platforms in facilitating knowledge search, exploration as well as market entry has been growing (Kenney et al., 2015), in particular, it changes the interactions between entrepreneurs and their external partners domestically and internationally (Audretsch et al., 2022a; Bi et al., 2017; Dholakia & Kshetri, 2004; Giones & Brem, 2017; Nambisan et al., 2017). Along with development of digital technologies and platforms, the entire digital entrepreneurial ecosystem has changed. It includes both digital and physical spaces enhancing the speed of knowledge transfer and social intercourse (Bejjani et al., 2023). In the early stages, location in a highly developed digital entrepreneurial ecosystem facilitates new business entry and helps to connect and signal other ecosystem

agents for collaboration (Nambisan et al., 2017). Digital entrepreneurial ecosystems speed up knowledge transfer between agents (e.g., such as consumers, suppliers, producers, and developers) and indirectly connect entrepreneurs to other stakeholders (Parker et al., 2016; Audretsch et al., 2023).

To enter the market and grow, entrepreneurs rely on digital entrepreneurial ecosystems capable of mobilizing resources and creating networks (Granovetter, 1973; Audretsch et al., 2019b, 2021). It enables latent and nascent entrepreneurs to acquire new skills and outsource operations to machines, to reduce business costs and increase customer engagement by being more digitally savvy (Digitally Driven, 2021). At the later stages of entrepreneurial growth, adopting complex digital technologies and mastering data sharing help entrepreneurs retain customers, create jobs, and continue exploring market opportunities (Digitally Driven, 2020).

While recent research in entrepreneurship and innovation ecosystems has demonstrated that digital and knowledge-enabling technologies facilitate the entrepreneurial growth continuum (Autio et al., 2018), there is a paucity of knowledge on how, when, and under what conditions these new technologies can support best entrepreneurial activity and different types of entrepreneurs. As entrepreneurship is a heterogeneous phenomenon, the multifacetedness of entrepreneurial characteristics and types needs to be considered further (Audretsch et al., 2015b). It remains on the knowledge frontier how entrepreneurs and regions adopt digital technologies to explore and exploit market opportunities via improvements in searching for new knowledge, processing and storing information and data, knowledge transfer, product validation and commercialization (Li et al., 2016; Belitski & Liversage, 2019).

### 3 New technologies and entrepreneurial growth

The second stage of entrepreneurial growth consists of market exploitation and growth. At this stage, emerging entrepreneurs will use digital technologies to combine available resources (Antonelli et al., 2010) and apply them to new venture growth (Bergmann & Stephan, 2013; Klonek et al., 2015) and scaling (Belitski et al., 2023a). While its worth adopting the KBV approach to understand how resources and capabilities are transformed into innovation outputs within the entrepreneurial growth continuum, we acknowledge the fact that insufficient attention is being paid to the role of cross-border digital communications as well as how to use organizational capabilities and resilience to withstand recover and adapt to exogenous shocks and ever-changing business context, so that market opportunities are continued to be created by entrepreneurs. At the later stages of entrepreneurial growth, entrepreneurs become more familiar with the products they develop, collaboration partners and markets. Hence, the function of new technologies is to complement those resources and capabilities available to entrepreneurs. As entrepreneurs grow their business exploration activities are replaced by exploitation, with entrepreneurs entering a routinized regime of doing business (Agarwal & Audretsch, 2001), changing Schumpeterian to Kirznerian perspectives of entrepreneurial activity and cognition (Kirzner, 1989). The role of new digital technologies at this stage is to enhance absorptive capacity and dynamic capabilities (Zahra & George, 2002), further connecting to entrepreneurial ecosystems agents and improve efficiency of data collection, management and transfer (Feld, 2012; Spigel, 2017; Cantner et al., 2021). Over time, entrepreneurial activity focuses on technologies

through which economic and societal value can be created, with digital technology addressing such questions as how, when, and which technology should be adopted by entrepreneurs to facilitate their entrepreneurial journey, maximize returns to technology adoption and facilitate growth (Nambisan et al., 2017).

At the second stage of entrepreneurial growth, one would expect greater embeddedness of entrepreneurs in the ecosystem and being more selective with what technology and digital tools to adopt in order to maximize the use of resources available in the ecosystem and expand nationally and internationally (Feld, 2012; Mack & Qian, 2016; Audretsch & Belitski, 2017; Tsvetkova, 2015). At this stage, managers and policymakers would want to know how digital technologies could be implemented quickly and more efficiently when facing exogenous shocks, risks and market uncertainty, and increased competition. Digital entrepreneurial ecosystems where emerging entrepreneurs operate are known to facilitate digital infrastructure governance and digital user citizenship and create a digital marketplace as key determinants in supporting entrepreneurial high-growth orientation and scaling (Sussan & Acs, 2017; Elia et al., 2020). While prior research has highlighted an important role of interactions among entrepreneurs at digital platforms and through use of technologies for high-growth and scaling, we have yet to understand how digitalization helps entrepreneurs at the later stages to create and sustain value and continue to innovate. The focus of digital technology adoption at this stage is to maximize the use of available resources and minimize operational and transaction costs associated with increasing size of business, how knowledge transfer management can be organized effectively, what are the boundary conditions which support the emergence of growth-oriented (Estrin et al., 2013) and productive entrepreneurs (Chowdhury et al., 2019; Khlystova & Kalyuzhnova, 2023) at every stage of the entrepreneurial growth continuum.

We argue, that high-growth and productive entrepreneurship is increasingly anchored in the context, and digital entrepreneurial ecosystems further facilitate the productive use of technology and business practices. In a world of Zoom and Microsoft, knowledge is transferred across international borders in no time, and the focus of new technologies is to allow entrepreneurs to access technology and make them participate in dynamic and global digital communications for further discovery and knowledge sourcing to create value and grow.

#### **4 Constraints and opportunities across entrepreneurial growth stages**

Entrepreneurial activity and innovation entail high risk and uncertainty (McMullen & Shepherd, 2006), operating in an environment with continuously changing institutional, informational, and socio-economic contexts (Audretsch & Link, 2012; Audretsch et al., 2015b). New technologies such as artificial intelligence and cloud computing, Internet of Things as well as digital platforms further increase the amount of information, at the same time, these technologies aim to reduce the risk of knowledge transfer and management by systemizing data and producing highly specialized and tailored knowledge (Short & Short, 2023). While the adoption of digital technologies increases efficiency, a growing concern is related to the technostress of entrepreneurs (Thurik et al., 2023) and the ability of managers and business owners to overcome technology and time constraints (Majchrzak & Markus, 2012) and continue to benefit by availability of digital affordances in firms and ecosystems (Autio et al., 2018; Belitski et al., 2023b). Despite the challenges related to new digital technologies

adoption and access to digital platforms, Thompson et al. (2018) suggest that these challenges can be alleviated through increased training and learning case studies of firms that successfully adopted technologies, employing digital leaders, developing shared meanings and communities of practice, for example, building trust within the organization and with external partners, reducing transactional and operational costs of collaboration and use of technology, sharing information, preserving it in shared platforms, and delegation of product creation and co-creation to external partners and shared technology.

Entrepreneurial firms which are digitally uncertain, meaning they have not adopted digital technologies and may not find it essential for their business model (Digitally Driven, 2020, 2021), are likely to experience lower growth rates or select themselves out of market entry where the cost of operations and transaction costs are high. Digital technologies in digitally advanced entrepreneurial firms may leverage the need for more internal resources and capabilities when collaborating internationally and in highly competitive markets where platform technologies should reduce operational, coordination, and transaction costs. On the contrary, digitally uncertain entrepreneurs that attempt to increase their knowledge transfer and market exploitation will be unable to match their capabilities to competition from other digitally advanced entrepreneurs for customers and markets. Adoption of digital technologies in many industries is a necessary condition to maximize positive externalities such as access to external knowledge and learning from knowledge spillovers (Audretsch & Belitski, 2020a) and for the network effects, which can also help digitally uncertain entrepreneurs to share technologies or outsource some tasks to external partners. As the level of adoption of digital technology increases, so does their breadth; entrepreneurs at different stages of growth can evidence the direct benefits through cost minimization and increased capabilities. Firms which adopt digital technologies may be able to outreach their customers better nationally and internationally and to understand the benefits of such knowledge collaborations (i.e., meeting their needs by contributing to the product design, co-development of products, delegation, outsourcing, etc.) (Gawer & Cusumano, 2014; Steininger, 2019). Specific technologies may be more conducive to innovation and be more easily combined with existing firm capabilities and skills than other technologies. However, the use of digital technologies also enables entrepreneurs to adapt to changing environments, such as exogenous shocks from the COVID-19 pandemic (Belitski et al., 2022). The latest COVID-19 pandemic crisis has evidenced the accelerated growth of technology adoption in regions and countries where digital technologies and infrastructure were less developed and where the adoption of digital solutions enabled firms to survive and better exploit market opportunities such as withstanding the lockdowns, limited mobility and entering new markets (Modgil et al., 2022; Digitally Driven, 2021).

## 5 Overview of special issue articles

This special issue contains eight papers that all focus on the role and impact of new technologies and their impact on entrepreneurial growth and value creation. The first paper of this special issue by Amini Sedeh et al. (2023), entitled “Unraveling the Resource Puzzle: Exploring Entrepreneurial Resource Management and the Quest for New Venture Success” examines how firms use different resource management strategies in different contexts. Using a fuzzy-set analysis of more than 500 new ventures in the U.S., the authors identify

four distinct configurations of resource structuring, bundling, and leveraging that collectively explain the profitability of entrepreneurial firms operating in different contexts. Entrepreneurs should thus leverage their technological capabilities and resources to compete in highly dynamic and competitive industries.

The second paper by Cunningham et al. (2023), entitled “MSME Technology Adoption, Entrepreneurial Mindset, and Value Creation: Configurational and Co-constitutive Approaches,” examines the effectiveness of an entrepreneurial mindset – cognition and opportunity recognition – as a determinant of technology adoption for entrepreneurial firms. Set in the Danube region of Europe taking high-performance computing (HPC), the study is centered on micro, small and medium-sized companies (MSMEs) in the automotive, electronics, and IT sectors, which are traditionally characterized by the relatively rapid uptake of HPC. The study employs a novel approach of fuzzy set qualitative comparative analysis and concludes that cognition is not necessary for technology adoption, but opportunity recognition is. Furthermore, opportunity recognition combined with organizational or environmental factors can enable technology adoption among MSMEs. Firms with a high level of entrepreneurial orientation have higher performance due to top management promoting entrepreneurial behavior.

The third paper by Colombelli et al. (2023), entitled “When computer science is not Enough: Universities knowledge specializations behind artificial intelligence startups in Italy,” analyzes the contribution of universities in generating AI startups in the 110 Italian NUTS3 regions. The results of the paper suggest that regions focusing on computer science and engineering positively generate entrepreneurship associated with AI. Universities play an essential role in generating AI-related startups. The diverse scientific specialization such as computer & information sciences and computing, information and communication technologies of universities thereby serve as input factors required to favor new firm creation and technological improvement at the local level, confirming the increasing engagement of universities and research centers in the process of creation and application of new technologies, such as AI.

The fourth paper by Chen et al. (2023), entitled “Entrepreneurial growth in digital business ecosystems: An integrated framework blending the knowledge-based view of the firm and business ecosystems,” investigates how firms seek entrepreneurial growth by re-configuring their knowledge bases in digital business ecosystems. The study proposes and develops a conceptual framework that blends the critical elements of business ecosystems and the knowledge-based view. The paper identifies three pathways for entrepreneurial growth in digital business ecosystems through a longitudinal case study of Chinese textile manufacturing firms: internal exploitation, internal and external exploration pathways. In addition, the authors emphasize that knowledge transfer might complement these three pathways yet does not directly contribute to growth.

The fifth paper by Khlystova and Kalyuzhnova (2023), entitled “The impact of the creative industries and digitalization on regional resilience and productive entrepreneurship,” concludes that the combination of entrepreneurship and adoption of digital technologies in a region helps to create a resilient regional environment. The article examines how combined digitalization and the creative industries affect regional resilience and productive entrepreneurship and enable regions to withstand and recover from crises. The authors use datasets from Eurostat Regional Statistics and the European Social Survey, including 1,397 industry performance observations from 314 NUTS3 regions across 11 European countries (Austria,



Bulgaria, Czech Republic, Denmark, Spain, Finland, Hungary, Italy, Portugal, Romania, and Slovakia) for the period 2008–2015. The results reveal that combining digitization and creative industries contributes to entrepreneurship and regional resilience.

The sixth paper by Saura et al. (2023b), entitled “Leveraging SMEs technologies adoption in the Covid-19 pandemic: A case study on Twitter-based user-generated content,” focuses on how the COVID-19 pandemic has forced many entrepreneurs and small and medium enterprises (SMEs) to adapt their business models and business strategies. In order to identify the main innovations and technologies adopted by SMEs during the pandemic, the authors used a database of 21 million tweets related to the coronavirus to identify those that contained the hashtag #SMEs. The final sample of 56,941 tweets was analyzed using several data-mining techniques, such as sentiment analysis, topic modeling, and textual analysis. The results revealed 16 topics (7 positive: free support against Covid-19, webinars tools, time optimizer and efficiency, business solutions tools, advisors tools, software for process support and backup tools; 4 negative: government support, payment systems, cybersecurity problems and customers solutions in the cloud, and four neutral: social media and e-commerce, specialized startups software, CRMs and finance and big data analysis tools). Hence, a variety of digital tools and strategies have been used to adapt to changing market conditions and withstand exogenous shocks.

The seventh paper by Mahdiraji et al. (2023), entitled “A synthesis of challenges of adopting digital platforms in SMEs: An intuitionistic multi-layer decision-making framework,” investigates the main challenges of digital platforms (DPs) toward transformational entrepreneurship in emerging countries. The study conducts a systematic literature review to identify the main challenges of DPs, screening the most prominent challenges toward transformational entrepreneurship, analyzing the causal relationship of the challenges, and determining the importance and the role of the DP challenges for SMEs in emerging countries. Furthermore, a multi-layer decision-making approach is applied to screen the most significant challenges toward transformational entrepreneurship, analyze the relationship among the challenges and determine the importance and the role of DP challenges. The paper concludes by suggesting the best strategies to overcome the challenges of the digitalization process in emerging countries.

Finally, Wales et al. (2023) study entitled “Entrepreneurial orientation as a theory of new value creation” inductively derives entrepreneurial orientation as a theory of new value creation based upon an increase in consumer benefits (or reduction in costs) made possible through a commitment to continuous novelty within an organization’s product-market offerings. Besides theoretical contributions, this paper offers insights into how and why entrepreneurial orientation creates new value through product-market variance as well as what to expect from entrepreneurial orientation and when entrepreneurial orientation may be most gainfully employed in pursuing firm growth.

## 6 Discussion

This special issue is an attempt to better understand how the digital entrepreneurial context, induced by the adoption of new technologies and internal capabilities and resources, shapes entrepreneurship activity across different stages of the entrepreneurial growth continuum. In this special issue, we argue that the influence of individual capabilities and resources, digital

technology types and the effect of knowledge spillovers on entrepreneurial outputs changes along the stages of entrepreneurship. In the early stages of the entrepreneurial process, the lack of resources forces entrepreneurs do adopt “safer” and more common digital technologies, such as social media, mobility and big data, enabling them to attract customer attention and validate new products. However, for those firms who move from the latent to nascent to emerging stages, the adoption of digital technologies is more complex and long-term, as the objectives and prospective of technology adoption is no longer short-term or market specific. Adoption of digital technologies is no longer to compete with latent entrepreneurs in regional markets, rather than being able to create new products and services in the most competitive industries and internationally. Greater access to resources and capabilities at the later stages of market entry and growth continuum imply that it becomes easier for entrepreneurs to combine technologies with those available from external partners and enrich the firm’s resources and capabilities (Li et al., 2016; Kobarg et al., 2019). Adopting new technologies aims for greater social and digital engagement with customers and partners and minimizing transaction and operational costs of doing business.

It has important managerial and policy-making implications. A better understanding of the interplay between the adoption of digital technologies on the one hand and innovation and value creation on the other hand across different stages of entrepreneurial continuum enables policymakers and managers to plan better and strategize resources and capabilities to prepare for market entry and expansion. The main issue during the more advanced stages of market entry is how to use digital technologies to sustain innovation efforts, win customers, retain existing customers, and create jobs.

Despite robust research on the role of digitalization and digital transformation for entrepreneurship, there is a paucity of knowledge in the extant literature as to what extent entrepreneurs are able to create market opportunities by employing digital technologies and platforms at every stage of entrepreneurship growth. Further research will shed light on how and to what extent market, competition, and technology risks and uncertainty can be leveraged and accommodated by digital technologies and platforms as perceived by entrepreneurs (Cutolo & Kenney, 2021) throughout the entrepreneurial growth continuum (Estrin et al., 2013; Mickiewicz et al., 2017; Belitski & Desai, 2021). New technologies that can support latent entrepreneurs and emerging entrepreneurs are not always the same. For example, investments in digital technologies such as business analytics, social media technology, mobile applications and development, cloud computing, Internet of things, machine learning, blockchain, and artificial intelligence vary widely across industries and regions where entrepreneurs aim to start their business. New technologies relevant at earlier and later stages of entrepreneurship can help us unpack the black box of various entrepreneurship and the conduits entrepreneurs use to create and transfer economic value (Acs et al., 2013).

Heterogeneity in both the technology and entrepreneurship outcomes invalidates a “one-size-fits-all” approach to understanding the relationship and presents a ripe and relevant research agenda (Nambisan et al., 2017; Cunningham et al., 2018). Some technologies may play a more decisive role at the nascent stages of entrepreneurship (e.g., cloud computing, social media, big data collection, and big data analytics) when the resources of entrepreneurs are limited. Other technologies, such as Internet of things, artificial intelligence, and blockchain, have become increasingly influential at the emergent and could be effectively used at both early and mature stages of the entrepreneurship lifecycle (Van der Zwan et al., 2013). The ability to use technologies to market entry and growth will affect the social and

societal implications of the use of new technologies, hence increasing both economic and societal value creation through the utilization of these new technologies. Given that “entrepreneurship” itself is a heterogeneous phenomenon (Audretsch et al., 2022d), there may be different responses to new technologies for economic agents and society (Audretsch et al., 2017).

This special issue advances the extant literature on knowledge transfer and use of digital technologies at different stages of entrepreneurial growth continuum in two important ways. First, past resource-based rationales (Barney, 1991; Barney et al., 2001) suggest that entrepreneurial activity leads to innovation and creates economic and social value because entrepreneurship produces valuable resources and ideas that enhance economic development and spillover new firms. As a strategic action, entrepreneurial activity is an active behavioral posture (Wales et al., 2011), e.g., a sustained commitment to novel product-market experiments and adopting new knowledge and technologies.

Second, by combining the role of individual, institutional and ecosystem context to explain how value creation, innovation and survival can be enhanced at each stage of entrepreneurial growth (Coad et al., 2016; Audretsch et al., 2022a, c). Altogether insights from this special issue will help scholars, business owners and policymakers to understand the enablers and boundary conditions internally and externally leading to differences in innovation, growth and value creation at the early and later stages of entrepreneurial growth. Papers in this special issue emphasize the economic and societal implications of digitalization and knowledge transfer and discuss practical mechanisms to increase economic and societal values such as well-being, connectivity, mobility, and job creation in entrepreneurial firms in developed and developing countries.

## 7 Future research in the field

We hope the selection of works in this special issue furthers our understanding of entrepreneurship activity at different stages of entrepreneurial growth and the role of technology in enabling new market entry, growth and innovation. Subsequent research is likely to evolve around the following four literature strands.

The first strand of literature addresses public policy and the influence of public sector investment in entrepreneurship programmes. These programmes are crucial in nurturing growth in firms, universities, and research organisations. However, there is limited comprehension of how MSME firms leverage new technology for value creation. There is also a critique of current technology adoption frameworks for lacking context sensitivity. This special issue advocates for a technology adoption framework integrating technology, entrepreneurial thought, and contextual elements to further entrepreneurial growth. Future research will build on Cunningham et al. (2023) study that sheds new light on this understudied issue however we still wider lack research of contextual factors relating to technology adoption. The argument that the technology adoption framework should integrate technology, entrepreneurial mindset and contextual elements that influence value creation that contributes to entrepreneurial growth. In addition, future research could also provide more insights into investigating industry and regional distribution of resources in development of digital infrastructure and its effect on the long-term performance of entrepreneurs.

The second strand delves into digital affordances and technology transfer throughout the entrepreneurial journey. Colombelli et al. (2023) underscore the importance of digital technologies in entrepreneurial endeavors. For more clarity, it is imperative to understand how such technologies play a pivotal role at various entrepreneurial stages and how they're incorporated into business models. Future research will enhance our understanding of how new technologies serve as a means for entrepreneurial development and implicit mechanisms of knowledge spillovers. Future research on digital technologies and affordances for entrepreneurs studies should add to the growing research agenda on what digital affordances represent and how they enable to shape entrepreneurial activities not only to enter the market but retain growth and customers. In this regard it is useful to explore how digital technologies are embedded into business models of latent, emerging and mature entrepreneurs.

The third strand emphasizes regional and organizational resilience, spotlighting the mandate of productive entrepreneurs in knowledge transfer across various sectors. Although previous studies, such as by Brakman et al. (2015), have shown the benefits of knowledge-intensive sectors for regional growth, there's a research gap concerning industry impacts on regional resilience. Future research should address how digital tools impact industries, potentially aiding regional resilience, especially during crises like COVID-19. While prior research has mainly focused on Great Recession crisis in 2008–2009 and 2012 years future research will study the dynamics of these sectors during the COVID-19 crises and other shocks to come. Future research could introduce response mechanisms for the knowledge-intensive and creative industries enabling them to better withstand to and recover from crises.

Finally, the fourth strand concerns the Schumpeterian and Kirznerian perspectives on entrepreneurship, questioning whether it's about discovering new opportunities or leveraging existing ones. Research indicates that firms adept at organizational learning are better positioned for value creation, especially in tech-rich settings, as exemplified by Wales et al. (2023). Given this, future research should focus on discerning which technologies facilitate firms in fulfilling customers' needs and achieving product-market fit. Future research will build on it and will draw attention to the importance of considering a other stakeholders in addition to consumer and expanding the demand perspective when investigating issues around entrepreneurial growth, value creation and new technologies. In this vein, future research will bring to the forefront critical questions including the need for a deeper understanding of which new technologies (i.e., artificial intelligence, cloud computing, social media, big data analytics, etc.) best enable organizations to make more productive steps forward between successive new entries as they iterate towards more accurate solutions to customers 'jobs to be done' and better product-market alignment. Setting an agenda for future research in the field of technology transfer, scholars are encouraged to further discuss issues such as whether and how an entrepreneurial life cycle stage may influence the criticality of various technologies for enabling new product-market entries and vice versa. There is a need to do more industry and product specific research to consider how investment in technology and knowledge is combined with internal capabilities and learning resulting in new product and service trials.

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