Tapping into Digital Technologies in Corporate Entrepreneurship: An Exploratory Multiple Case Study

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Abstract: Digital technologies can enable entrepreneurial processes and outcomes. However, current implications for scholars and practitioners on how to exploit the emerging digital technologies for entrepreneurship in the corporate context, i.e., corporate entrepreneurship, remain unclear. This issue is even more relevant today where the growing pervasiveness of digital technologies finds increasing applicability in corporate entrepreneurship activities. This present study contributes to the academic debate on corporate entrepreneurship in the digital era by offering an exploratory multiple case study – based on semi-structured interviews – that involved four incumbent organizations to deepen the knowledge of the role played by digital technologies in corporate entrepreneurship. We provide empirical evidence on how incumbents can exploit the enabling role of digital technologies to foster corporate entrepreneurship activities. Specifically, we document three enabling mechanisms of digital technologies in corporate entrepreneurship: (i) increasing the number and heterogeneity of inputs for corporate entrepreneurship activities; (ii) increasing the visibility of actors and resources involved in corporate entrepreneurship activities; (iii) accelerating innovation adoption rate in incumbent organizations. The outcome of this study is a framework that discusses the managerial actions required to support incumbents in making corporate entrepreneurship more prolific through digital technologies. In doing so, this study contributes to research on corporate entrepreneurship in the digital era. Results are of interest also to managers and practitioners, providing them practical insights to exploit the enabling role of digital technologies for corporate entrepreneurship activities.

Keywords: Corporate Entrepreneurship, Digital Technologies, Digital Transformation, Multiple Case Study

1. Introduction

Digital technologies – e.g. artificial intelligence and 3-D printing – are significantly transforming entrepreneurial processes and outcomes (Nambisan et al., 2019; Autio et al., 2018). Specifically, digital technologies have upended two broad assumptions that underlie our extant understanding of entrepreneurial processes and outcomes. First, they have rendered entrepreneurial outcomes and processes less bounded (Elia et al., 2020; Nambisan, 2017). Second, they have led to less predefinition in the locus of entrepreneurial agency (Berger et al., 2021; Nambisan, 2017). However, despite the huge proliferation and potential of digital technologies, existing literature has largely neglected the role of digital technologies in corporate entrepreneurship, i.e., entrepreneurship in incumbent organizations (Petzsche et al., 2022; Arvidsson and Mønsted, 2018; Burgelman, 1983). To answer this call, we explored the role of digital technologies in facilitating corporate entrepreneurship practices through an exploratory multiple-case study (Yin, 1984) involving four incumbent organizations implementing corporate entrepreneurship activities with digital technologies. The outcome of this study is a framework that illustrates how incumbents can leverage the enabling role of digital technologies for corporate entrepreneurship at organizational and project level. In doing so, our paper contributes to the research stream of corporate entrepreneurship and digital technologies discussing the potential, applications, and managerial implications of digital technologies in corporate entrepreneurship activities. The paper contributes to digital corporate entrepreneurship research by studying the organizational and process levers that management can adopt to foster corporate entrepreneurship through digital technologies. Specifically, we provide two main contributions to research and practice in corporate entrepreneurship in the digital age. First, we shed light on how digital technologies enable corporate entrepreneurship at organizational and project levels. Second, we extend the concept of digital technologies as enablers as evidenced in digital entrepreneurship literature (von Briel et al., 2018) also in the corporate context.

2. Literature review

2.1 Corporate entrepreneurship

In a dynamic and uncertain environment such as that created by digital transformation, corporate entrepreneurship is envisioned as a process that can facilitate firms' efforts to innovate constantly and cope effectively with the competitive realities companies currently face (Fisher et al., 2021; Tucci et al., 2018). Corporate entrepreneurship, or entrepreneurship in incumbent organizations, has been a topic of interest to scholars and practitioners for over the last four decades (Urbano et al., 2022; Burgelman, 1983). In the digital age, (corporate) entrepreneurship is now more in demand than ever before and digital technologies can make corporate entrepreneurship increasingly potent and prolific (Arvidsson and Mønsted, 2018). Although the body of research on corporate entrepreneurship has expanded and aroused an increasing amount of attention along the years and given the pervasiveness of the digital technologies, the profound impact of digital technologies on corporate entrepreneurship has yet to be addressed.

2.2 Digital corporate entrepreneurship

Digital technologies herald a new era in entrepreneurship, one in which the traditional ways and forms of pursuing entrepreneurial opportunities are increasingly reframed (Jocevski et al., 2020; Nambisan, 2017; Ghezzi et al., 2013). Nambisan (2017) discusses the impact of digital technologies on entrepreneurship process and outcome. And more, Nambisan and colleagues (2019) shade lights on three themes that could potentially serve as the basis for future research on entrepreneurship with digital technologies, i.e., openness, affordances, and generativity. Recently, digital technologies have attracted a growing interest also in corporate context (Ben Arfi and Hikkerova, 2021; D'Angelo et al., 2021; Cavallo et al., 2020; Joshi et al., 2019). Scholars are increasingly considering digital technologies as key differentiating factors for corporations to operate in the dynamic digital context. For instance, Arvidsson and Mønsted (2018) highlight how the large diffusion of digital technologies can make corporate entrepreneurship activities more potent and prolific. However, despite the pervasiveness and the potential of digital technologies, literature provides limited empirical evidence on how digital technologies can support and enable corporate entrepreneurship (Ghosh et al., 2021; Soltanifar et al., 2021). For instance, Martin-Rojas and colleagues (2020) analyse the application of social media platforms for corporate entrepreneurship, Ghosh and colleagues (2021) discuss cloud technology in corporate entrepreneurship while Pinchot and Soltanifar (2021) study internet of things for entrepreneurship in corporations. However, we found very few contributions that study empirically digital technologies in corporate entrepreneurship. Accordingly, the role of digital technologies in corporate entrepreneurship remain largely underexplored. Thus, the aim of this paper is to bridge this gap in existing literature and answer the following research question: "How can digital technologies support corporate entrepreneurship?"

3. Methodology

To answer our research question, our study is based on an exploratory multiple case study (Ghezzi and Cavallo, 2020; Eisenhardt, 1989; Yin, 1984). Case sampling was performed theoretically (Meredith, 1998), and following our interpretive stance. We believe that this sample of companies adequately fits with the theoretical setting and, therefore, it is suitable to respond to the research question proposed as companies are incumbent organizations operating in heterogenous traditional sectors and implementing corporate entrepreneurship activities leveraging on digital technologies. In our multiple case study, data were collected through multiple sources of information (Yin, 1984). 20 semi-structured interviews were the primary source of information. The interviews lasted between 45 and 70 minutes and performed between March and May 2022. The six interviews for Company A took place in March and in April 2022 with the Chief Technology Officer, the Chief Innovation Officer, the Head of Innovation and Corporate Venture Capital, the Innovation Manager and two Innovation Specialists (one interview each). The six interviews of Company B took place in March 2022 with the Chief Information Officer, the Program Manager and one Fellow Intrapreneur (two interviews each). The four interviews of Company C were performed in March and April 2022 with the Chief Information Officer, Chief Innovation Officer, the Head of Innovation LAB, and the Innovation Officer (one interview each) and the four interviews of Company D happened in May 2022 with the Chief Information Officer, the Head of Innovation and R&D, the Innovation Manager and the Innovation Specialist (one interview each). The protocol of the interviews was consistent with the study's research question: the informants were asked to describe the corporate entrepreneurship practices of their organizations as well as the barriers faced, the benefits and outcomes obtained using digital technologies in corporate entrepreneurship. Several secondary sources of evidence and

archival data were also added to supplement the interview data, including 23 strategic reports, 20 financial statements, 17 reports, and external documents and sources – 35 internet pages, 20 articles. This array of sources led to "data triangulation" essential for qualitative research to be trustworthy and persuasive (Siggelkow, 2007). Following the suggestions provided by Yin (2013), for each case study, we first analysed the role of each digital technology adopted in the corporate entrepreneurship activity. Thereafter, to identify the common patterns of actions and differences among each case study, a cross-case comparison was undertaken. Specifically, Company A is an incumbent firm operating in the energy sector and oriented to become a "life company". This company pursues sustain regeneration, i.e., development of new products/services (Covin and Miles, 1999) leveraging on a platform-based intrapreneurship program with the goal to collect internal entrepreneurial ideas from the employees of the organization. Company B is an IT multinational company oriented to organizational rejuvenation, i.e., the improvement of the organizational functioning of the organization (Covin and Miles, 1999). In particular, the company leverages on internal programs aimed to foster a digital entrepreneurial mindset culture and improve organizational processes. Company C is a large enterprise operating in the insurance sector pursuing strategic renewal, i.e., the pursuit of a new strategic direction (Covin and Miles, 1999) to digitalize their business. They established an "Innovation Community" composed by 30 internal employees selected from different departments with the role to create innovative solutions. Finally, Company D is a manufacturing company that established an outpost program in Italy, China, and America aimed to collect ideas from external stakeholders such as clients, or internal employees for developing new market opportunities in a logic of domain redefinition, taking the competitive battle to a new product-market arena (Covin and Miles, 1999).

4. Findings

4.1 Company A

Company A adopts an internal web platform to collect ideas emerged from "Call for Ideas" intrapreneurship programs, as well as business units needs. Company A leverages also on platform that connects the Innovation department with external actors, e.g., Corporate Venture Capital unit. Moreover, Company A can leverage on a shared Idea Knowledge Management (IKM) System that hosts the development process of the most promising ideas. To rapidly experiment ideas, Company A adopts rapid prototyping technology (CAD and 3D printing technology). These technologies allow to build the prototype in bootcamp days and present the solutions to the high-level management for the final evaluation. The digital technologies helped the company to perform and enable the following capabilities: (i) intercept embryonal internal and external ideas; (ii) contact solver from various background and geographic locations; (iii) generate further opportunities for entrepreneurial projects; (iv) guarantee an alignment among the business needs and the entrepreneurial resources; (v) improve the alignment among the business needs and entrepreneurial resources and (vi) develop a safe space environment for the employees to innovate.

4.2 Company B

Company B has a space dedicated to experiment ideas and formed by four main sections: (i) a collaboration hub dedicated to hackathons and workshops; (ii) a makerspace with digital tools such as 3D printers, a laser cutter, a PCB milling machine for creating prototypes; (iii) a room dedicated to augmented and virtual reality applications and (iv) a dedicated space to deep learning techniques. These digital tools allow Company B employees to experiment and to look at problems from different perspectives. Company B leverages on an internal web platform supported by social media applications to connect employees that can communicate among each others, join teams, and share ideas to develop corporate entrepreneurial projects. Moreover, the company leverages on an IKM system that collects and monitor established projects and teams involved in the innovation programs engaging employees from different geographical locations. Further, Company uses an artificial intelligence algorithm that allows to identify and filters specific innovation projects according to specific business needs. These digital technologies help the company to perform and enable the following capabilities: (i) increase the number of participants involved in the corporate entrepreneurship program; (ii) increase the control and visibility over the process and (iii) facilitate cross-department collaboration.

4.3 Company C

Company C launched the first community of clients 'Beta Tester' to facilitate experimentation. These activities are made possible through a digital web platform "Company C collab.it" that connects 22.000 users with the

goal of testing the ideas coming from the intrapreneurship program in a rapid way. Company C can leverage also on an Innovation Community, which involves every year a group of about thirty employees from various backgrounds and with different seniority and expertise. The participants, called explorers, are ambassadors that devote up to 20% of their working time to develop new entrepreneurial ideas. Employees, grouped in teams, meet virtually on collaborative platform where they follow different entrepreneurial projects from ideation to prototyping up to piloting. These digital technologies help the company to perform and enabled the following capabilities: (i) increase the efficiency of the entrepreneurial process; (ii) increase transparency of the resources involved and (iii) improve the reporting to high-level management.

4.4 Company D

Company D adopts a Product Lifetime Management system (PLM) system for corporate entrepreneurship projects and a gate-model project management system for the ongoing projects to the departments, who can monitor and provide feedbacks through the platform. The innovation department of Company D leverages on two main digital tools. First, a PLM system based on Cloud that hosts the concept of an idea and support the prototyping phase by collecting necessary info. This is shared among all the departments, who can contribute with information and feedbacks and approve the projects through the milestones. Second, a cloud-based 3D machine is used as internal prototyping builder. This 3D machine permits to pursue mass customization by generating small batches of personalized caps. Leveraging on the 3D machine, Company D was able to target a new segment market. Moreover, by testing its offer on a new e-shop, the company was able to access a higher volume of costumers also dispersed geographically who can customize and configure their offer directly from the web platform. These digital technologies helped the company to perform and enable the following capabilities: (i) increase the connection among departments; (ii) facilitate visibility of the actors involved in the entrepreneurial process and (iii) generate stepping stones for future innovations.

5. Discussion

In the following chapter the results are discussed, and an integrated framework has been proposed answering to this research question: "How digital technologies can support corporate entrepreneurship?". The framework (Figure 1) resulted as outcome of our multiple case study. Overall, independently from the typology of digital technologies adopted or the corporate entrepreneurship form analyzed in the cases under investigation, the framework presents digital technologies as enablers for corporate entrepreneurship at organizational and project level and specifically for these activities: (i) idea inflows; (ii) monitoring and controlling the progress; and (iii) the idea testing.

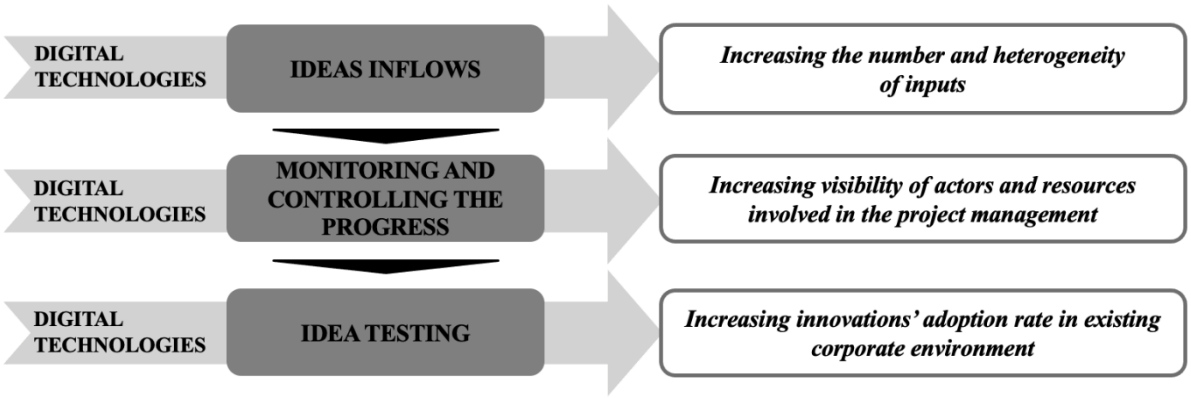

Figure 1: Research framework.

5.1 Digital technologies as enablers of corporate entrepreneurship

Our multiple case study highlights key insights regarding the role of digital technologies in corporate entrepreneurship. The first key finding concerns the role of digital technologies in enabling corporate entrepreneurship. Our study presents digital technologies as tools that support the entrepreneurial activity also in corporate context. For example, the innovation department of Company A, composed by ten employees, had not the capacity to manage the increasing number of incoming entrepreneurial and innovative ideas. By adopting an IKM system, the innovation team had the possibility to simultaneous handle the information of the

innovative projects, and set up an intrapreneurial program involving and connecting all the employees across the company. Similarly in Company B, the application of an internal web platform for hosting the virtual rooms and virtual prototyping tools, enable the company to perform a hackathon program involving about 80.000 participants. The possibility to engage this type of number of participants enable the department to collect several new ideas for the internal incubator of the company. Instead, Company D is able to address a new market and satisfy a completely new target of customers leveraging on the enabling possibilities offered by the 3D printing technology and web platforms. As a result, the concept of digital technologies as enablers for corporate entrepreneurship is line with the positive view present in entrepreneurship literature (Von Briel et al., 2018). Specifically, independently from the sector under investigation, the selected companies adopted digital technologies as enablers of three main activities of the entrepreneurial process inside corporations: (i) ideas inflows; (ii) monitoring and controlling the process; and (iii) idea testing activity. These phases emerged from the cases can be also related with the three phases "recognition of opportunity", "appropriation of opportunity" and "exploitation of opportunity" evidenced by the dynamic capabilities theory (Teece, 2007). More specifically, we identify three main enabling effects enabled by digital technologies: (i) increasing the number and heterogeneity of inputs; (ii) increasing visibility of actors and resources involved in the project management, and (iii) increasing innovations' adoption rate in existing corporate environment. Finally, to introduce the digital technologies in corporate entrepreneurship practices, companies should implement activities also at process level. Specifically, we identify two main implications at process level: (i) the redefinition of processes and roles of the innovation department; (ii) the establishment of a digital and entrepreneurial culture. Based on the above considerations, we propose the following propositions:

P1: Digital technologies can act as enablers of corporate entrepreneurship at organizational and project level.

P2: Digital technologies influence three main activities of the entrepreneurial process inside corporations: (i) idea inflows; (ii) monitoring and controlling the progress; and (iii) idea testing.

5.2 First enabling effect: Increasing the number and heterogeneity of inputs

By applying digital technologies in the "idea inflows" activity incumbents can increase the number and heterogeneity of inputs for new idea generation creating value for the organization. In other words, digital technologies allow to increase the alertness of the company to internal and external environment changes, thus facilitating firms to reduce costs in collecting internal and external ideas and inputs (for example by facilitating ideas gathering and improve problem solving by proposing ad-hoc challenges). Social media and web platforms emerged as the suitable digital technologies for this first enabling effect. Specifically, Company A adopts an internal web platform for scouting internal employees' ideas from internal departments from the business to the operations areas, to intercept embryonal business opportunities and include them in corporate venturing programs, as well as to interact with more than 20.000 experts coming from various backgrounds and locations. By including social media applications in the internal platform, Company B allows employees and stakeholders worldwide to interact and work together, for instance by autonomously create news teams, and propose continuously new solutions and enrich existing ideas with comments and feedbacks. This first enabling effect of digital technologies in corporate entrepreneurship is related to the nature and degree of openness, facilitated by digital technologies in corporate entrepreneurship—in terms of who can participate (actors), what they can contribute (inputs), how they can contribute (process), and to what ends (outcomes)(Nambisan et al., 2019, p.3). More specifically, this enabling capability generate various secondary effects for corporate entrepreneurship. First, it contributes to boost a digital entrepreneurial culture within the organization and mitigate middle managers "myopy" (Ghezzi, 2012; Braganza et al., 2009) and risk aversion towards the "new". Second, it allows the organization to acquire a depth understanding of the external environment and at the same time increasing their alertness to internal and external environment changes. This allows also to reduce costs in collecting ideas and inputs by facilitating ideas inflows.

5.3 Second enabling effect: Increasing visibility of actors and resources involved in the project management

By applying digital technologies in "monitoring and controlling progress" activity, incumbents can increase visibility of actors and resources involved in the project management providing organizational benefits. In particular, this allows to reduce complexity and coordination costs of handling resources and capabilities involved in the innovative projects and thus supporting the decision making of management on corporate

entrepreneurship activities. IKM, PLM systems, CID tools, AI, and ML technology emerged as the suitable digital technologies for this second enabling effect. Specifically, Company B adopts an AI algorithm that searches in a database the current entrepreneurial and corporate innovative projects and filter them according to specific company requirements. The company uses this tool to prioritize the ideas and develop concepts aligned with business current needs. For example, Company B was in search for solutions to improve their presence on social media market. Supported by the AI algorithm, the company selected ten worldwide most suitable idea applications, and started their development. Finally, one of these solutions was then commercialized and became part of the value proposition of Company B. While Company C designs, maps, and visualizes the entrepreneurial process of its concepts through CID tools to plan and control their advancement. This second enabling effect can be related to the concept of affordances, defined as the action potential or possibilities offered by digital technology in relation to corporate entrepreneurship (Nambisan et al., 2019, p.3). This second enabling effect provided by digital technologies create various secondary effects for corporate entrepreneurship in incumbent organizations. First, it allows to reduce complexity and coordination costs to manage heterogeneous actors and ideas involved in corporate entrepreneurship activities. Second, it supports the decision making of management providing a comprehensive and interacting guidelines suitable for corporate entrepreneurship and innovation projects in digital context (Ghosh et al., 2021). Third, it allows to measure and control existing resources, therefore providing practical insights to high-level management and aligning them concerning the development of their entrepreneurial activities (Ghezzi et al., 2013; Ghezzi et al., 2009). Fourth, by adopting collaborative digital tools opened to all corporate departments, it is possible to increase the engagement of employees in corporate entrepreneurship activities in organizations.

5.4 Third enabling effect: Increasing innovations' adoption rate in existing corporate environment

By applying digital technologies in the "idea testing" activity incumbents can accelerate corporate innovation adoption rate in corporate environment, and thus providing benefits also at project-level. Specifically, this third enabling effect allows the company to make the entrepreneurial process faster and thus increasing the customer-acceptance of innovations outcome. CAD tools, 3D printing, and Web platforms emerged as the suitable digital technologies for this third enabling effect.

For example, Company A adopts rapid prototyping systems to finalize in few weeks the ideas reaching the testing phase and propose the prototypes to the top management for the final decision. Company C instead adopts a web platform involving internal and external users that provides continuous and rapid feedbacks on weekly base on projects uploaded by the innovation team. This third enabling effect is related to the notion of generativity, defined as the capacity exhibited by digital technologies to produce unprompted change (through 'blending' or recombination) by large, varied, unrelated, unaccredited and uncoordinated entities/actors (Nambisan et. al., 2019, p.3). This third enabling effect provided by digital technologies generates various secondary effects for corporate entrepreneurship in incumbent organizations. First, it enables the company to speed up experimentation and testing process, while reducing costs in terms of prototyping, feasibility analysis, evaluation, and customer acceptance (Sanasi et al., 2021). Second, it improves experimentation process also in term of time reducing the experimentation cycle in incumbent organizations (Ghezzi, 2020). However, it is necessary to consider the investments and skills required to adopt digital technologies such as CAD software and generate the required output.

6. Conclusions

Our study contributes to the debate on corporate entrepreneurship in the digital era in many aspects. First, this study confirms the view of digital technologies as enablers of entrepreneurship (Von Briel et al., 2018) also in the corporate context. More specifically, this study highlights how digital technologies enable corporate entrepreneurship at the organizational and project levels. In particular, we shed light on digital technologies as enablers for corporate entrepreneurship for these activities: (i) idea inflows; (ii) monitoring and controlling the progress; and (iii) idea testing. In detail, by applying digital technologies in the "idea inflows" activity, incumbents can increase the number and heterogeneity of inputs for new idea generation creating value for the organization. By applying digital technologies in "monitoring and controlling progress" activity, incumbents can increase the visibility of actors and resources involved in the project management providing organizational benefits. By applying digital technologies in the "idea testing" activity, incumbents can accelerate corporate innovation adoption rate in the corporate environment, thus providing benefits also at the project-level. Second, our research revises the concepts of openness, affordances, and generativity (Nambisan et al., 2019) in the

corporate entrepreneurship context. From a managerial perspective, we believe the paper provides managers and practitioners operating in the field of corporate entrepreneurship and digital technologies with a set of tools, insights and examples. For instance, to successfully introduce digital technologies in corporate entrepreneurship, we suggest incumbent organizations perform the following activities: (i) the redefinition of processes and roles of the innovation department and (ii) the establishment of a digital and entrepreneurial culture. This finding is confirmed also by Ghosh and colleagues (2021) that highlight the need to develop a cultural transformation towards a digital operating model to favor digital corporate entrepreneurship. Despite the possibilities offered by digital technologies, the downside of digital technologies is a topic that deserves further attention. Finally, this research is not excepted from limitations. Our framework represents a foundation for future studies on corporate entrepreneurship in the digital age. Based on the framework proposed, future research could investigate more in-depth the relationship between specific digital technologies and enabling effects for corporate entrepreneurship. Moreover, future studies can analyze the enabling effects of digital technologies according to the corporate entrepreneurship form investigated (Covin and Miles, 1999). Future research can mend this study's limitations – related to the limited size and industry specificity of the sample consider and the observer bias characterizing qualitative method – by validating and customizing the framework in different contexts with different digital technology maturity. Finally, future studies applying mixed-method research can corroborate and extend the findings of this study.

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