Supporting startups sustainability: Challenges of the interplay between digitalization, business model innovation and ecosystem

Amina HAMANI

Mines Saint-Étienne, Univ. Jean Monnet Lyon, UR COACTIS, Institut Henri Fayol, 158 cours Fauriel, 42023 Saint-Étienne, France

amina.hamani@emse.fr

Sophie PEILLON

Mines Saint-Étienne, Univ. Jean Monnet Lyon, UR COACTIS, Institut Henri Fayol, 158 cours Fauriel, 42023 Saint-Étienne, France

peillon@emse.fr

Jean-Michel DEGEORGE

Mines Saint-Étienne, Univ. Jean Monnet Lyon, UR COACTIS, Institut Henri Fayol, 158 cours Fauriel, 42023 Saint-Étienne, France

jean-michel.degeorge@emse.fr

Keywords: Business model innovation (BMI), digitalization, sustainability

Abstract

Although scholars recognize the role of digitalization and ecosystem in startups sustainability, little research has been done on the link between digitalization, business model innovation (BMI) and ecosystem to support startups' sustainability. We addressed this research gap by conducting a qualitative study using mainly semi-structured interviews. Our insights extend the knowledge on BMI by showing how digitalization enables BMI in startups context and to what extent the interplay between them and ecosystem supports startups' sustainability.

1. Introduction

Startup's sustainability is currently a major focus in the academic literature, as well as among entrepreneurship support structures and policymakers (Danarahmanto et al., 2020; Voinea et al., 2019). In that respect, digitalization is often considered as a driver of positive societal and environmental value that optimizes value for startups and their stakeholders(Gregori, 2020; Parida et al., 2019). Digitalization refers to the use of digital technologies and data to create income and to improve, replace, or transform processes and business activities (Clerck, 2017). Therefore, digitalization may lead startups to innovate their Business Model (BM) and has a profound influence on sustainability(Foss & Saebi, 2017; Voinea et al., 2019).

BM can be considered an activity system of interdependent activities, including those that are performed by the company itself and those performed externally by its partners, subcontractors, suppliers or customers (Zott & Amit, 2010). An activity system includes three elements: content, structure, and governance. Content includes the set of activities that are performed by the company, governance defines actors who oversee each activity, and structure refers to how these activities are linked. Therefore, we argue that digitalization supporting sustainability and allowing for new practices and value creation logics can be modulated at BM level and may or may not spur BMI. In this paper, BMI is searching for new ways to create value (Foss & Saebi, 2017)

In that respect, startups may face many challenges in combining environmental, social, and economic value, as they lack resources, legitimacy and their strategy often diverges in terms of objectives and practices (Boons & Laasch, 2019; Danarahmanto et al., 2020; Tiba et al., 2021). At the same time, scholars argue that startup ecosystem may support and favorite startups' sustainability (Tiba et al., 2021).

However, how startups create and align economic, societal and environmental value within their BMI through digitalization is poorly understood (Danarahmanto et al., 2020; Gregori, 2020; Voinea et al., 2019). Further, how startups' ecosystem supports these new sustained digital value creation is a major area for further research (Tiba et al., 2021; Wagner, 2021). Therefore, the present paper addresses the following research question: How does the interplay between digitalization, BMI and ecosystem spur sustainable value creation in the context of startups.

To answer these research questions, we particularly focus on startup founders, whose beliefs and values influence their engagement concerning sustainability and the way they perceive the combination of innovation, digitalization and sustainability(Cohen et al., 2020). This enables a discussion on how startup founders conduct the process of BMI through digitalization, and how this dynamic support sustainability in interaction with their ecosystem.

2. Literature review

2.1. Startups' sustainability through digitalization and BMI

Start-ups are known as innovative companies as driver of technologies changes (Kasych & Amelyaniuk, 2020; Wagner, 2021). Moreover, scholars frequently considered startups as technology venture or operating in the technology sector (Kasych & Amelyaniuk, 2020). However, recent scholars distinguish between digital startups and non-digital startups (Kollmann et al., 2021; Kraus et al., 2018). According to these authors, the difference between these two types of startups does not only concern their value proposition but also the way in which these value propositions are developed and delivered to customers. Indeed, digital startups rely on a value chain, value creation processes and digital expertise to operate (Dy et al., 2017). In contrast, non-digital startups rely on a traditional BM that develops products and services through a value chain in which digitalization is a supporting element allowing startups to improve their processes (Kollmann et al., 2021).

In that respect, digitalization is often considered as a driver of positive societal and environmental value that optimizes value for startups and their stakeholders (Gregori, 2020; Parida et al., 2019). At the same time, scholars reveal that startups BM contribute to societal changes and help to face societal, and environment challenges (Wagner, 2021). This supposes the implementation of changes and sustainability through digitalization (Parida et al., 2019; Voinea et al., 2019; Danarahmanto et al., 2020). Therefore, digitalization goes far beyond technology and implies strategy rethinking, meaning that startups managers must find new logics to capitalize on their BMI in order to spur sustained value creation (Gregori, 2020).

BMI has recently aroused important academic research and business practices and the recognition of changes due to BMI is a fundamental approach to realize innovations for sustainability. According to Bocken et al (2014), BMI can help companies achieve triple-

bottom line results that is, social, environmental, and financial goals. In this article, we use the term BMI to refer to two situations that imply a certain degree of novelty or originality: BM reconfiguration and BM design (Foss & Saebi, 2017). The first situation arises from the initial BM of an established company, while the second situation refers to the creation of a completely new BM for either a company or an industry (Foss & Saebi, 2017; Snihur & Zott, 2019).

Moreover, BMI is particularly important in startups' early years (Snihur & Zott, 2019). Indeed, startups often seek to test and validate their initial BM, especially in those early years(Bocken & Snihur, 2020). Further, some researchers argue that the BM of startups is shaped and refined in the early years and becomes more resistant to change over time (Foss & Saebi, 2017; Snihur & Zott, 2019). In that respect, several startups have succeeded in changing their BM by developing new technologies or relying on and adjusting existing technologies (Cavallo et al., 2019).

However, the introduction of technology may be more complex and may have undesirable effects on startups performance and sustainability (Balboni et al., 2019; Cozzolino & Rothaermel, 2018). Thus, startups should think about how to use technologies and seize the opportunities through their BMI (Foss & Saebi, 2017; Snihur & Zott, 2019). In that respect, scholars have frequently focused on startups' founders as driver of sustainability changes (Tiba et al., 2021; Wagner, 2021). Indeed, startups 'founders often identify and grape opportunities, process and activities that improve social and ecological impacts (Wagner, 2021). However, recent research note that startups' founders cannot contribute to sustainability without interaction with their ecosystem (Tiba et al., 2021; Wagner, 2021). Thus, startups should collaborate with actors to capture knowledge and resources to support the sustainability of their activities. The next section treats the ways in which startups may contribute to sustainability and the role of their ecosystem.

1.1. Startups' contribution to sustainability and the role of their ecosystem:

Startups may contribute to sustainability in two different ways. First, startups might develop solutions, process and technologies, which solves directly ecological or social issues (Tiba et al., 2020). Those startups are known as social entrepreneur and can be seen as firms working on "true sustainability" (Dyllick & Muff, 2016; Tiba et al., 2021). Moreover, startups may take responsibility for the social and environmental impacts of their business operations

(Cohen et al., 2020). In that respect, existing research argue that suitability are more complexes, that need specific resources and knowledge and often implies the collaboration of different actors (Cohen et al., 2020; Tiba et al., 2021; Wagner, 2021). Thus, startup particularly because of their liability of smallness cannot engage in suitability without the contribution of their ecosystem. Accordingly, emerging scholars are investigating the link between startups sustainability and the role of their ecosystem.

In this sense, we identify two streams of research that consider startups ecosystem differently. First, emergent research focuses on entrepreneurial ecosystem and investigate the extent to which such ecosystem might be favourable to startups sustainability (Tiba et al., 2021). The unit of analysis of such ecosystem is regions and it includes particularly investor's government incubator, accelerator, universities, and research. Moreover, other stream of research investigate business ecosystem of startups and how it support startups' sustainability. In this perspective, the ecosystem is considered as "*the part of the environment with which the focal company is most in interaction*" (Warnier et al., 2018, p. 119). Thus, this approach allows the company to define the part of the environment that is relevant to their BM (Warnier et al., 2018). Such ecosystem includes particularly clients, suppliers, partners, etc.

Accordingly, those ecosystems offer new opportunities in terms of value creation and capture through the relationships established with the various stakeholders in those ecosystems to innovate in terms of BM and support sustainability (Demil et al., 2018; Hannah & Eisenhardt, 2018). If scholars recognized the contribution of entrepreneurial ecosystem in startups sustainability, that of the business ecosystem may be limited (Wagner, 2021). Although, startups ecosystem is likely to evolve due to the redefinition of relationships with partners who are favourable to sustainability, these situations are not frequent. Indeed, startups lack of resources and legitimacy and are depending directly on their clients and suppliers (Tiba et al., 2020; Wagner, 2021).

3. Research methodology

Our research approach is qualitative. We investigated fifteen start-ups selected from different business sectors in order to have a heterogeneous sample. We distinguish in our paper between digital and no-digital startups. Furthermore, the startups involved in this research were founded in different years. The most recent startups has been operating for a few years.

This factor is relevant because BMI of startups is shaped and refined in the early years and becomes more resistant to change over time, according to (Foss & Saebi, 2017; Snihur & Zott, 2019). We decided to maintain the anonymity of all of the startups. The Table 1 lists some information about the 15 startups and their sector of activity.

Startups	Business activity	Employees	Creation
S1	Development and implementation of 3D vision systems programs to integrate into industrial robots to made mould plans	7	2018
S2	Production and commercialisation of standard and connected shin guards for amateurs through digital interface developed by the startup	7	2015
S3	Development of a medical products in the form of a bracelet to facilitate arterial blood sampling by avoiding any possible errors.	4	2019
S4	Assisting tourism companies through a digital interface to assist their clients in their trips and holidays	8	2019
S5	Technological platform specialized in real estate transactions for professionals and individuals	2	2019
S6	Developing 3D printing medicinal services used in the operating room to reduce time hospitalization	2	2020
S7	Creation of fictional universe and personage through books and video games	6	2019
S8	Development of software and consulting's services in artificial intelligence and bigdata	5	2017
S9	Technological platform that searches and manages geographical data to optimize energy, climate & social transitions in the territories	7	2019
S10	Technological platform that connects people who need to send their parcels and optimize delivery charges to airline passengers.	3	2019
S11	Streaming platform that broadcasts short movies and series made by amateurs and semi-professionals.	5	2019
S12	Technological platform for developing mobile applications that warn the practitioners of nature sports of all the potential dangers on their road	1	2018
S13	Technological platform that connects people with judicial officers from all regions of France	2	2019
S14	Technological platform that connects air companies' travellers with people who need to send their packages.	2	2021
S15	Production of organic snacks, meals, and cakes, to maintain the balance of gut microbiota and support healthy digestive and immune	3	2021

Table 1. Details about the 15 startups selected

Moreover, the data mainly come from 15 semi-structured interviews conducted between July 2021 and October 2021 with start-ups founders. Each interview lasted from 30 minutes to 1 hour. All interviews were recorded and transcribed. We completed these interviews with secondary data; we had access to internal reports and general information about the startups

collected from the press and the internet.

To analyse these data, we implemented thematic coding using the Nvivo 12 software. We developed our first categories of codes relating to BM and BMI categories according to Snihur & Zott's (2019) work, to identify the elements relating to content, structure and activities, and their changes over time. Relying on Snihur & Zott's (2019) work, we consider that BMI emerge by adding new activities (novel content), bringing in new partners to perform specific activities (novel governance), or linking activities in novel ways (novel structure). As the different activities are strongly independent, a change in one component can trigger an evolution of another element.

Moreover, to analyze startups' sustained practices, we rely on the Sustainable Development Goals developed by The United Nations in 2015, which represent the most widely accepted framework that articulates both social and environmental value (Tiba et al., 2021). Startups' practices were considered as sustainable when they address one or more of these goals. Indeed, The UN states that companies in all industries have a responsibility to contribute to achieving the SDGs through practices such as the use of renewable energy, the creation of fair working conditions, and innovation and the development of novel solutions.

4. Results and discussion

Our findings provide broad support for our theoretical conceptualization on how digitalization enables BMI in startups and to what extent the interplay between them supports startups sustainability in interaction with their ecosystem.

Our results show that startups founders and their ecosystem directly influence practices related to BM and sustainability. This finding is in line with previous research that highlights the importance of startups' founders and their ecosystem in sustainability (Cohen et al., 2020). In that respect, our study highlights two ways though which BMI and digitalization support startups sustainability.

First, our results show that some startups' founders (in interaction with their ecosystem) discover and pursuit opportunities in digitalization to create an innovative BM to solves environmental or social impacts. For example, the startup (S3) is developing a medical device in the form of a bracelet to facilitate arterial blood sampling by avoiding any possible errors

and patient suffering. Those startups continue to innovate in their BM (adding new activities as she adopts Ecommerce to sell her products) to market their product and achieve an economic goal.

Moreover, we find that startups who do not work directly on environmental or social sector, reconfigure their BM (in interaction with their ecosystem) mainly to achieve an economic goal and not for integrating sustainability aspect. However, their process of BMI through digitalization allow integrating support sustainability and integrating many different sustainable practices especially about employees and Wellbeing at Work. For example, the startup (S1) traditionally offered 3D scanning services for industrial and art establishments. It then invested in an R&D program with some of its customers and is now developing programs to integrate 3D vision systems in industrial robots to manufacture mold plans. According to the founder of startup (S1), their new value proposition has a positive impact on ecology and socially:

« *already through our product offer... there is business productivity, but also ecology, w…we have robotic ecological processes…we have well-being at work because we remove difficult tasks for people, we robotize them"*

However, different opinions on this issue emerge from the interviews. Although founders have recognized that digitalization combined with BMI may positively affect their sustainability, most interviewees considered that their new sustainable practices were a consequence of BMI through digitalization and not due to their full engagement in sustainability. These startups generally prioritize economic value creation over social or environmental creation.

Moreover, we show that some startups face many challenges in creating social and environmental value, irrespective of their economic value creation goals. Our analysis identifies different sustainability challenges that startups perceive when changing their BM through digitalization. To take up these challenges, we find that some startup founders make new choices about their BMI. For example, startup (S14) adopts E-commerce platform and search for supplier from aboard. Indeed, the startup didn't find local supplier and local client as she attempts initially, so they can't reclaim the proximity with products of French origin and local origin which limit their impact on transport as she promised:

"*The biggest problem …It's not easy to find small organic products with the nutritional qualities we need, the availability is not necessarily there so that's what is complicated*…"

In that respect, digitization offers a quick and easy alternative to overcome these challenges and reach an economic goal but which can have an impact on the environment.

Our result show that digitalization had important role to spur BMI which encourage the creation of sustainable value. The research results emphasized that the contribution of digitalization to sustainability though BMI may differ in digital startups and non-digital startups. This is in line with Kollmann et al (2021) and Kraus et al (2018), stating that the difference between these two types of startups does not only concern their value proposition but also the way in which these value propositions are developed and delivered to customers. Particularly, our result reveal that digital startups build their business activity around opportunities in digitalization, which they recognize and exploit by creating an innovative BM in order to preserve environment and positively affect society. We find that non-digital startups which already discover and exploit the opportunities arising from environment and social problem through traditional BM. These startups use digitalization to reconfigurate their traditional BM in order to achieve economics goals. Those startups working in true sustainability place value not only on reducing their possible harmful effects on the environment and society but they seek new logics to create positive impacts (Dyllick & Muff, 2016). The other type of digital startups uses additional digitalization to achieve more economic benefits by reconfiguration of their initial BM. these startups have less ambitious aims to innovate heir BM to create sustainable value.

Finally, our analysis identifies different challenges that startups perceive in creating social and environmental value through digitalization. Our research highlights the contribution of startups' ecosystem (mostly client and supplier) in the emergence and the exploitation of opportunities in sustainability and digitalization through BMI. This result is in line with emergent scholars, which focus on entrepreneurial ecosystem or in sustainable ecosystem. They state that Startups do not work in isolation and their engagement depends on a combination of external pressures they are part of a wider ecosystem. Particularly, our research shows that some startups find difficulties to create sustainable ecosystem for their BM. Thus, two possibilities are offered to those startups according to the approach of ecosystem: either the startups might position their self in the ecosystem, which seems relevant to their BM, or they might participate in the creation of a new ecosystem based on the choices made on their

BM (Demil et al., 2018).

5. Conclusion

Our research examined the perspective of founders of startups on digitalization and BMI to support the achievement of sustainability. We establish an understanding of different BMI trajectory through digitalization in digital and no-digital startups.

Our study distinguishes between startups who creating an innovative BM in order to preserve environment and positively affect society and those who reducing their possible harmful effects on the environment and society but seeking to create positive impacts of their business operation on environmental and social area. The startups from those two perspectives have to maintain dynamic equilibrium between social, environment and economic goals as state by the literature. In that respect, our study suggest that the achievement of this equilibrium rely on the creation of constancy equilibrium between BM's elements (which implies BM innovation) and on the overall understanding of the impact of digitalization can have on their operation. For example, startups who want to develop a new value proposition have to use an appropriate resource with positive impact, include the technologies used in this purpose. The startup should also estimate the impact of the activities that implies the development of this value proposition and have to select the appropriate ecosystem for it BMI.

Accordingly, achieving dynamic equilibrium between environmental, social value and economics profits using digitalization demands not only implementing an appropriate business model (BM design) but also creating dynamic consistency between the different elements of BM through BM reconfiguration. Particularly, that the way value creation translates into a BMI for sustainability through digitalization dependent on the overall understanding of the impact of digitalization can have on their operation and selection of appropriate ecosystem for their BMI.

Our research reveals the role of startups ecosystem on their BMI though digitalization. We show that this ecosystem may promote or contrary limit their sustainability. By doing so, we highlight a new perspective to study startups sustainability by connecting BMI and ecosystem. In that respect, scholars find it difficult to find a theory, which explains the relationship between innovation and sustainability in startups' context (cohen et al, 2020). Then, we

propose particularly to investigate more the connection between the concept of ecosystem and BMI to spur startups' sustainability. We extend the knowledge about startups' sustainability by showing that it depends on BMI and on the overall understanding of the impact of digitalization can have on their operation and selection of appropriate ecosystem for their BMI. We show that ecosystem of startups not only influence startups sustainability and affect their BMI but also that ecosystem orientation might limit startups sustainability. Then, we propose particularly to investigate more the connection between the concept of ecosystem and BMI to spur startups' sustainability. In that respect, scholars find it difficult to find a theory, which explains the relationship between innovation and sustainability in startups' context (cohen et al, 2020).

Our findings offer practical implications, which may help both support structure and startups. Our research suggests that support programs should be customized based on both sustainable BM and consider its ecosystem regarding its roles and potential contribution on startups' sustainability. By doing so, young ventures can reduce the time, cost and energy they expend establishing relationships.

Reference :

Balboni, B., Bortoluzzi, G., Pugliese, R., & Tracogna, A. (2019). Business model evolution, contextual ambidexterity and the growth performance of high-tech start-ups. *Journal of Business Research, 99*, 115-124.

Bocken, N., & Snihur, Y. (2020). Lean Startup and the business model : Experimenting for novelty and impact. *Long Range Planning, 53*(4), 101953.

Boons, F., & Laasch, O. (2019). Business models for sustainable development : A process perspective. *Journal of Business Models*, 9-12 Pages.

Cohen, J., Marques, C., Lameira, J., Sousa, M. J., & Au-Yong-Oliveira, M. (2020). The Interrelationship between Corporate Social Responsibility and Strategic Innovation In Aveiro-based Startups. *International Journal of Business Research and Management (IJBRM), 11*(3), 65-86.

Cozzolino, A., & Rothaermel, F. T. (2018). Discontinuities, competition, and cooperation : Coopetitive dynamics between incumbents and entrants. *Strategic Management Journal, 39*(12), 3053-3085.

Danarahmanto, P. A., Primiana, I., Azis, Y., & Kaltum, U. (2020). The sustainable performance of the digital start-up company based on customer participation, innovation, and business model. *Business: Theory and Practice, 21*(1), 115-124.

Demil, B., Lecocq, X., & Warnier, V. (2018). "Business model thinking", business ecosystems and platforms : The new perspective on the environment of the organization. *M@n@gement, 21*(4), 1213-1228.

Dy, A. M., Marlow, S., & Martin, L. (2017). A Web of opportunity or the same old story? Women digital entrepreneurs and intersectionality theory. *Human Relations, 70*(3), 286-311.

Dyllick, T., & Muff, K. (2016). Clarifying the Meaning of Sustainable Business : Introducing a Typology From Business-as-Usual to True Business Sustainability. *Organization & Environment, 29*(2), 156-174.

Foss, N. J., & Saebi, T. (2017). Fifteen Years of Research on Business Model Innovation : How Far Have We Come, and Where Should We Go? *Journal of Management, 43*(1), 200-227.

Gregori, P. (2020). Digital sustainable entrepreneurship : A business model perspective on embedding digital technologies for social and environmental value creation. *Journal of Cleaner Production*, 9.

Hannah, D. P., & Eisenhardt, K. M. (2018). How firms navigate cooperation and competition in nascent ecosystems. *Strategic Management Journal, 39*(12), 3163-3192.

Kasych, A., & Amelyaniuk, A. (2020). The Nature of Startup Development : Concepts, Theories, Trends, Conditions. *Littera Scripta, 13*(1).

Kollmann, T., Stöckmann, C., Niemand, T., Hensellek, S., & de Cruppe, K. (2021). A configurational approach to entrepreneurial orientation and cooperation explaining product/service innovation in digital vs. Non-digital startups. *Journal of Business Research, 125*, 508-519.

Kraus, S., Palmer, C., Kailer, N., Kallinger, F. L., & Spitzer, J. (2018). Digital entrepreneurship : A research agenda on new business models for the twenty-first century. *International Journal of Entrepreneurial Behavior & Research, 25*(2), 353-375.

Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing Literature on Digitalization, Business Model Innovation, and Sustainable Industry : Past Achievements and Future Promises. *Sustainability, 11*(2), 391.

Tiba, S., van Rijnsoever, F. J., & Hekkert, M. P. (2020). The lighthouse effect : How successful entrepreneurs influence the sustainability-orientation of entrepreneurial ecosystems. *Journal of Cleaner Production, 264*, 121616.

Tiba, S., van Rijnsoever, F. J., & Hekkert, M. P. (2021). Sustainability startups and where to find them : Investigating the share of sustainability startups across entrepreneurial ecosystems and the causal drivers of differences. *Journal of Cleaner Production, 306*, 127054.

Voinea, C. L., Logger, M., Rauf, F., & Roijakkers, N. (2019). Drivers for Sustainable Business Models in Start-Ups : Multiple Case Studies. *Sustainability, 11*(24), 6884.

Wagner, S. M. (2021). Startups in the supply chain ecosystem : An organizing framework and research opportunities. *International Journal of Physical Distribution & Logistics Management, 51*(10), 1130-1157.

Warnier, V., Lecocq, X., & Demil, B. (2018). Les business models dans les champs de l'innovation et de l'entrepreneuriat. Discussion et pistes de recherche. *Revue de l'Entrepreneuriat, 17*(2), 113-131.

Zott, C., & Amit, R. (2010). Business Model Design : An Activity System Perspective. *Long Range Planning*, *43*(2), 216-226.