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DIGITAL CAPABILITIES AS MEDIATORS: FOSTERING MANAGERIAL AND SUSTAINABLE CAPABILITIES AMONG DIGITAL USERS AND PROVIDERS

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Abstract

Due to the degree of exposure to activities carried out through digital channels, digital transformation is no longer an avoidable option for companies. However, being exposed to an eminently digital environment does not automatically make companies able to embrace the benefits of digitalisation. Therefore, it is vital to explore the mechanisms that enable companies to transform their digital transformation efforts and activities into results. That is, what are the capabilities that enable firms, depending on their degree of digitalisation (being either digital users or digital providers), to achieve effective value generation and value appropriation? The analysis of a sample of 204 companies belonging to four European countries was performed on a causal competence model using PLS-SEM to answer the research questions. Results show that digital enterprises are “greener” only if the business model includes sustainability and that only for digital users is the degree of being a digital company positively related to managerial and sustainable capabilities. Similarly, we found an indirect, positive effect between being digital and having managerial and sustainable capabilities through the mediation of digital capabilities, especially for digital providers, exposing the complementarity of these capabilities.

Keywords: digital providers, digital users, digital capabilities, managerial capabilities, sustainable capabilities, mediation effect

JEL Classification: L21, M1, O32

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Introduction

In the current context, due to the degree of exposure to activities carried out through digital channels, the digitalisation of business activities is no longer an avoidable option for companies. The focus is now on the degree of intensity with which organisations must integrate information technologies into their products, services, and processes (Oesterreich and Teuteberg, 2016). During the pandemic, we witnessed how a drastic shift to more digital working models influenced the environment of our cities and surrounding ecosystems (Paraschiv et al., 2023). In fact, digitalisation is considered a very important transformative process to shape the next decade (Ghobakhloo et al., 2023; Paraschiv et al., 2023). However, regardless of the post-pandemic reality, this did not automatically make companies able to embrace the benefits of being digital (Paraschiv et al., 2023). Therefore, it is vital to explore the mechanisms enabling companies to translate their digitalisation efforts into results, since these capabilities will enable, depending on the degree of digitalisation, value generation, and appropriation (Hanelt et al., 2021).

Scholars and practitioners have paid increasing attention to sustainable digitalisation (European Digital SME Alliance, 2020; Cardinali and De Giovanni, 2022; Guandalini, 2022; Gravili et al., 2023). This is a process of adopting and integrating digital technologies minimising negative environmental, social, and economic impacts, with the aim of harnessing the benefits of digitalisation while ensuring responsible and green practices. In practice, Europe is at the forefront of ambitious climate objectives globally, including both sustainable development and digitalisation (Gil-Lamata et al., 2024). Emerging initiatives such as the European Green Digital Coalition (EGDC, 2021) or recommendations of the Council of the EU on digitalisation for the benefit of the environment (CEU, 2020) explicitly prove that digitalisation and sustainability are connected.

The interplay of both streams of change has the potential to generate important synergies (Hojnik and Ruzzier, 2016; Horbach, 2016). However, while scholars demonstrate the connection between digitalisation and sustainability (Guandalini, 2022; Ghobakhloo et al., 2023; Gravili et al., 2023), the literature still lacks a clear framework linking digital capabilities, sustainable capabilities, and the value that is generated regarding undertaking digital or green initiatives (Ukko et al., 2019; Bican and Brem, 2020; Gil-Lamata et al., 2024). The literature supporting the impact of applied digital capabilities in businesses on environmental sustainability is based on arguments related to facilitating the circular economy and sustainable operations (i.e., waste reduction, optimisation of resource consumption, digital delivery, digitisation of services, e-commerce sales and turnover, etc.) (Hojnik and Ruzzier, 2016; Horbach, 2016). However, there is no evidence that, just by being digital, businesses are implicitly more sustainable unless their business model is designed to be so (Bican and Brem, 2020). Indeed, there may be numerous negative externalities that make a digital activity, despite having a lower direct environmental impact, generate other impacts that indirectly overshadow its benefits (Cardinali and De Giovanni, 2022).

Digital companies often operate in complex and rapidly changing environments (Bertoncel et al., 2018; Verhoef et al., 2021). Effective managers can navigate this complexity, make sense of emerging trends, and make informed decisions to keep the company competitive. This leads to the third aspect of managing digital companies successfully, which is developing managerial capabilities, required to use the full potential of linking other organisational capabilities (i.e., digital and sustainable capabilities). Furthermore, managerial

capabilities can promote strategies that leverage digital technologies to support and advance the company's sustainability objectives, such as reducing carbon emissions, minimising waste, or enhancing social responsibility (Accenture, 2022).

In the paper, we follow the perspective of Wirtz (2018) to distinguish two groups of actors in the digital business: digital users (consumers of digital services and products) and digital providers (organisations that create, develop, and deliver these products and services). When analysing organisational capabilities and their relations, such a distinction is important since users need to develop different types of capabilities than providers and face different contexts (Wirtz, 2018; Verhoef et al., 2021).

Thus, the objective of this paper is twofold, unravelling the impact of the degree of digitalisation on organisational capabilities and exploring the role of digital capabilities as enablers of the development of both managerial and sustainable capabilities, given their relevance in digital contexts. For this purpose, this research builds upon a sample of 204 companies belonging to 4 European countries to answer the research questions. Data analysis was performed with a causal competence model.

To do so, the paper is structured as follows: first, a review of the scientific literature on the role of digital capabilities as enablers of managerial and sustainable capabilities is presented, introducing the hypotheses of the model. After, the research methodology is presented to continue with the results and discussion section and some conclusions.

1. Review of the scientific literature

1.1. Digitalisation and digital companies—basic concepts

There is frequent confusion between digitisation, digitalisation, and digital transformation (Gong and Ribiere, 2021). Digitisation involves the conversion of analogue information into a digital format, in order to improve the accessibility, shareability, and searchability of data. Moving beyond mere conversion, digitalisation encompasses a broader utilisation of digital tools to elevate processes, operations, and interactions. This involves the integration of digital systems into existing workflows to increase efficiency, streamline tasks, and optimise business functions. Finally, digital transformation represents a comprehensive and strategic endeavour that entails a fundamental rethinking of an organisation's operational dynamics and value delivery through the strategic employment of digital technologies. Here, we will primarily refer to the concept of digitalisation, since the undertaken research is assumed to cover companies that have already undergone digital transformation.

Digital companies are considered companies in which some or all of what would be physical in a traditional organisation exists in digital form (Hull et al., 2007, p. 293), this is, any product or service partly embodied in or enabled by ICTs. They are associated with the presence in the market offer of a digital artefact, a digital component, application, or media content that offers specific functionality or value to the end user (von Briel et al., 2018). The creation of digital artefacts as market offerings differs from that of traditional, non-digital goods (von Briel et al., 2018). Therefore, from a process perspective, not only the product/service but also the whole value chain may be considered a subject of digitalisation analysis (Vadana, 2020).

Digital companies involve various degrees in the use of digital processes or infrastructure, as well as the use of resources enhanced through digital technologies, differences that lead to considerations related to the degree of digitalisation (Wirtz, 2018; Hanelt et al., 2021). For example, Vadana et al. (2019) use a value-chain perspective to distinguish between companies with high and low degrees of digitalisation. Highly digitalised companies are those in which all the value chain's core activities are digitalised or coordinated by digital technologies.

Wirtz (2018, p. 63) distinguishes two groups of actors in digital business: digital providers and digital users. His approach demonstrates great flexibility in acting as a provider or user of digital services. Businesses, consumers, and administrations can act as both providers and users in different situations. On the one hand, digital providers are organisations that offer online services or digital information goods (Wentrup, 2016). In a broader sense, they can be seen as digital platform owners (Wareham et al., 2014; Blaschke et al., 2019) or internet intermediaries that provide basic infrastructure and platforms (OECD, 2012) through which digital interactions are developed. However, this can be done in combination with other non-digital activities, thus providing different degrees of digital adoption. Providers usually specialise in a particular field or technology, becoming dependent on the evolution of that dominant technology since the cost of change is high.

On the other hand, digital users may be associated with the users of the abovementioned digital platform (Huang et al., 2017) or, more specifically, platform end-users (Wareham et al., 2014; Parker et al., 2017), which refers to a natural or legal entity that uses the resources available on the digital platform. Digital users implement digital services and activities to develop their regular activities, so the more integrated those services and activities are in their value chain, the more digital we consider the company. Although digital users require some specific knowledge to use a particular technology, they are less dependent on it and are exposed to fewer rigidities than digital providers.

1.2. Capabilities in digital companies

Although in the analysed papers, terms such as competences/competencies, skills, and capabilities are used interchangeably with insufficient consensus on the meaning, in general, the content suggests that skills and competences/competencies refer to individuals, whereas capabilities are organisational (Hunter, 2013). In the paper, we will refer to organisational capabilities as the broadest concept presented in the literature.

The literature on digital companies refers to specific capabilities required by these entities, mainly represented by digital capabilities (those essential to be a digital provider or user – Helfat and Winter, 2011). Nevertheless, in the digital area, Baden- Fuller and Mangematin (2015, p. 7) state that developing digital businesses requires a “set of managerial capabilities and capacity of both thinking and doing”, to use technology to create, deliver, and capture value from innovation. Consequently, many scholars directly link digital capabilities with managerial capabilities (El Sawy et al., 2016; Holotiuk and Beimborn, 2017; Gauthier et al., 2018; Sousa and Rocha, 2019a,b; Ukko et al., 2019). Holotiuk and Beimborn (2017) identify critical success factors of digital business strategy as a set of capabilities related to sales and customer experience, organisation management, culture and leadership, human resources management, foresight, IT, operations, and partners. More recently, Ukko et al. (2019) claim that managerial capability is crucial in the context of digitality, and El Sawy et al. (2016)

explain how managerial capabilities refer to “abilities to utilise digitality in a business strategy, employees’ mindsets and skillsets, as well as the workplace”. Gauthier et al. (2018) refer to IT capabilities to manage internal issues, strategic capabilities to manage the external environment, and business model-specific capabilities to manage the interface in/out. Finally, Sousa and Rocha (2019a,b) define digital business as disruptive and identify specific capabilities needed to manage them, grouped into three dimensions: innovative, leadership, and managerial.

On the other hand, scholars and practitioners are increasingly focusing on sustainable digitalisation, which integrates digital technologies while minimising negative environmental, social, and economic impacts. This approach leverages digitalisation benefits responsibly and requires a set of sustainable capabilities for successful implementation (Guandalini, 2022). Nevertheless, while being digital can boost sustainability potential, literature still lacks a clear framework directly linking digital and sustainability capabilities (Bican and Brem, 2020; GilLamata et al., 2024), and post-2020 research projects have emerged in this regard. Rodríguez-González et al. (2023) indicate digital organisational culture indirectly affect sustainable business performance as it improves absorptive capacity and supply chain resilience. Ali et al. (2020) find that banks’ strategies on big data analytics have an impact on internal processes and their financial and sustainable performance. They include elements of digital capabilities (big data analytics) among the key factors associated with sustainable capabilities. For their part, Barbeito- Caamaño and Chalmeta (2020) also studied the use of big data to analyse CSR practices and sustainable development based on the opinions, through online social networks, of firms’ stakeholders.

In fact, technological innovations are a core element in promoting sustainability capabilities (Hojnik and Ruzzier, 2016; Horbach, 2016). These innovations are fostered by digital capabilities that help to adopt cutting-edge digital solutions that boost environmental sustainability capabilities and business impact, including the areas of Big data and artificial intelligence (AI) (Jablonski, 2018; Barbeito- Caamaño and Chalmeta, 2020; Rîndaşu et al., 2023).

1.3. The role of digital capabilities as enablers of managerial and sustainable capabilities

Previous literature has studied which capabilities are important for digital businesses (i.e., Gauthier et al., 2018; Brunetti et al., 2020; Verhoef et al., 2021). However, there is still a need to investigate whether and how these sets are connected, which we consider an existing research gap. In this research, as presented in Section 1.1, we followed the view that digital companies might adopt two main roles: providers or users (Wirtz, 2018). As those different approaches might affect the relationship between being digital, digital capabilities and other capabilities in different ways, we explore the differences between digital users and providers for each of the hypotheses provided.

1.3.1. Hypothesis 1

As we described earlier, being digital means either producing digital products or services or being a user of them, and it has a particular impact on how operations are managed, human

resources are deployed, and marketing is used (Wirtz, 2018; Hanelt et al., 2021). From a process perspective, digitalisation has changed how people interact (internal communication and external stakeholders' interaction - Barbeito- Caamaño and Chalmeta (2020)). From a managerial point of view, digital companies become ubiquitous, allowing their processes to be more flexible to changing environmental conditions (Henfridsson et al., 2014). This enables more effective business organisation compared to traditional firms and facilitates ICT-based solutions that support, automate, or improve processes and operations (Vadana et al., 2019).

For example, in human resource management (HRM), the use of information technologies can enable enhanced HRM analytics and self-adaptive training for employees, as well as making the workplace and schemes more flexible, thus increasing the productivity of the organisation (Walsh and Volini, 2017; Gravili et al., 2023). However, at the same time, operating in a digital world induces social barriers to implementing the mission and vision of enterprises, due to difficulties developing social connections/bonds and team spirit and, ultimately, harming productivity, human resources, and performance (Heredia et al., 2022).

On the other hand, marketing and stakeholder management efforts are also heavily affected by digitalisation. The use of new marketing communication channels, such as social media, has opened new avenues for communicating with customers, enabling better social intelligence and customer feedback integration into streamlined operations (Barbeito- Caamaño and Chalmeta, 2020). This also occurs in stakeholder management, as new communication tools allow greater interaction possibilities with relevant stakeholders, even shortening distribution channels (Wirtz, 2018; Barbeito- Caamaño and Chalmeta, 2020; Centobelli et al., 2022). However, the rise of opportunities for interaction between different stakeholders and company managers makes it difficult to simultaneously discriminate between relevant topics, pressures and trends both for managers and stakeholders (Plaza-Úbeda et al., 2009; Barnett et al., 2020).

In any case, being exposed to more interactions with customers, suppliers, and stakeholders might finally lead to better chances of opportunity recognition and relevant market information gathering (Centobelli et al., 2022). In this way, being digital can help companies predict the environment better, helping them become more lean and financially optimised, thus improving managerial capabilities. Therefore, we propose the following:

H1: Being a digital company – a) digital user, b) digital provider – has a positive impact on managerial capabilities.

1.3.2. Hypothesis 2

In the business environment, it is possible to find signals on the generally positive impact that digital activities have on sustainable (environmental, social, and economic) capabilities (European Digital SME Alliance, 2020). However, the relationship between digitalisation and sustainable development requires further assessment and analysis (Cardinali and De Giovanni, 2022; GilLamata et al., 2024). For example, AI can influence global productivity, environmental outcomes, inclusion, and equality, among others, in the short and long term (Vinuesa et al., 2020), which can be positive but also negative. Therefore, “a global and scientific debate is required to develop common principles and legislation to shape a future

in which IA contributes positively to the achievement of all the SDGs [Sustainable Development Goals]” (Vinuesa et al., 2020, p. 7).

Additionally, the application of the so-called Industry 4.0, and the most recent Industry 5.0, to the circular economy is attracting great interest in the scientific community due to its high level of synergies (i.e., Khan et al., 2021; Ghobakhloo et al., 2023). However, we cannot claim that digitalisation is environmentally responsible per se, as noted above. At the organisational level, there are multiple possible negative externalities arising from the use of digital technologies (Cardinali and De Giovanni, 2022). These externalities can be both environmental, such as the difficulty of managing technological waste or the measurement of the environmental footprint in digital environments (Li and Huang, 2021), as well as social, derived from the loss of jobs (Morrar et al., 2017), or the increase in inequality due to the digital divide (Van Dijk, 2020). In any case, the current trend is to move towards a digitised, circular and low-carbon economy, which organisations’ business models (Bertoncel et al., 2018; Bican and Brem, 2020). Indeed, technological innovations are a central element in ensuring sustainable enterprises and fostering sustainability capabilities (i.e., how to use clean technologies, environmental management systems, sustainable urban planning, life cycle analysis tools, stakeholder relationship management tools, business process modelling tools, etc.) (Jablonski, 2018; Ghobakhloo et al., 2023; Rîndaşu et al., 2023).

More specifically, the literature suggests that being digital (in a broad sense) brings the following benefits related to sustainability (Table no. 1):

Table no. 1. Sustainability related benefits of operating in a digital world

Potential benefit	References
Identify potentially unethical/harmful operations that can be mitigated in real-time via intelligence and AI.	Vinuesa et al. (2020), Li et al. (2021)
Enable automated and transparent data reporting leading to trustworthy CSR and environmental reporting, and the inclusion of society into the business’ activities, facilitating community missions and civic engagement.	Jablonski (2018), Barbeito- Caamaño and Chalmeta (2020), Narula et al. (2021)
Enable enterprises to successfully implement lean operations and engage in green strategic management and green operations via resource efficiency, circular economy and limiting hazardous processes.	Khan et al. (2021), Agrawal et al. (2022)
Make enterprises entirely shift to digital marketing that limits the use of resources, reduces pollution and can offer better environmental value even via post/add green optimisation and colour choices.	Pantano and Di Pietro (2012), Hofacker et al. (2020)
Enable companies to engage in process innovation and deploy green R&D to re-engineer that process into an environmentally sustainable approach.	Tohanean et al. (2018), Guven (2020)
Help companies develop sustainable resilience to help them recover from disruptions in a sustainable manner.	Bigot and Germon (2021), Miceli et al. (2021)
Assist companies in improving their compliance with environmental standards (process monitoring) and become certified via ISO accreditations for green practices.	Canestrino et al. (2020), Matos et al. (2020)

In summary, digital companies are less restricted by physical assets and infrastructure than traditional businesses, which allows running operations with less impact on the environment for the business activity and carbon emissions from the transportation of people and goods. Therefore, we propose the following:

H2: Being a digital company – a) digital user, b) digital provider – has a positive impact on sustainable capabilities.

1.3.3. Hypotheses 3 and 4

Digital companies are open to numerous challenges derived from the nature of their environment. As a result, digital capabilities are required to support a digitally oriented value chain (Gauthier et al., 2018; Brunetti et al., 2020). Thus, we argue that the development of digital capabilities influences the development of other capabilities required for managing the company (i.e., managerial capabilities) and its interaction with the environment (i.e., sustainable capabilities) (Table no. 2).

Table no. 2. The role of Digital Capabilities

Characteristics of digital companies	Digital capabilities possessed or developed as a result of being a digital company	Influence on other capabilities as a result of being a digital company	Capability developed
Operating in the digital domain	Improved abilities to identify online opportunities and develop digital BM	Reinforces general capability to identify market opportunities and business model development	Managerial
Better access to digital communication channels	Development/use of IT capabilities in managing networks	Better communication with different stakeholders (i.e. suppliers) via these digital channels	Managerial
Wide variety of technologies to perform different tasks in digital environments	Development of the ability to select the most efficient available technology for each task	More flexible work processes to adapt to changes Having less pollutant/more energy-efficient processes/ operations	Managerial / Sustainable
Use of digital technologies	Enhanced internal communication between departments using digital channels.	Better cross-functional communication flows to transfer relevant information to decision-makers to make better-informed decisions concerning sustainable issues	Sustainable
Personalised and ad-hoc communication solutions in digital environments	Enhanced external communication with clients and stakeholders (i.e. social media)	Better engagement with stakeholders	Sustainable
High density of data available in digital environments	Development/use of better information systems	Effective environmental scanning and ecological responsiveness usually require significant levels of technical knowledge and active participation of employees	Sustainable
Being ubiquitous (not restricted by space)	Management of processes dealing with synchronous/non-synchronous and online/on-site activities.	Lower consumption and dependence on resources	Sustainable
Remote work enabled	Improvement of digital competences of employees/managers while having a reduced footprint (business centre-wise)	More flexible work processes to adapt to environmental changes	Sustainable
Improved process monitoring and optimisation	Development/use of IT solutions to monitor different aspects of processes	Less pollutant/more energy-efficient processes/operations. Better optimisation of production/lean operations.	Sustainable

Although the cited literature is not very explicit on the role of digital capabilities in the development of other capabilities, digital capabilities are not solely enough for successful operation in the digital domain (Sousa and Rocha, 2019a,b). For example, digital companies operate in environments characterised by a high density of available data, opening great avenues for improving decision-making processes only possible if the company is able to implement adequate information systems (Heredia et al., 2022). Moreover, given the challenges digital companies face, digital capabilities become crucial for controlling potential negative externalities, such as managing technological waste or the measurement of digital operations' environmental footprint (Li and Huang, 2021), among others. In this particular case, digital capabilities, such as the development of integrated and accurate information systems or IT solutions to monitor the value chain, have the potential to counterbalance these negative impacts.

Thus, digital capabilities play an essential role as enablers of those capabilities required to manage organisations correctly and their impact on the environment. Therefore, we propose:

H3: Digital capabilities mediate the relationship between being a digital company – a) digital user, b) digital provider – and managerial capabilities.

H4: Digital capabilities mediate the relationship between being a digital company – a) digital user, b) digital provider – and sustainable capabilities.

2. Research methodology

The research presented in this paper was developed under an EU-funded project that aimed “to develop an innovative, transnational framework that will improve the knowledge and skills of academic institutions to produce more market-oriented digital and responsible entrepreneurship (DREP) curricula” (DIGI-GRENT, 2024). This project covered the identification of the capabilities needed by responsible and digital companies, especially given the dearth of empirical academic literature in this area (Kraus et al., 2019). The presented research is based on a literature review focusing on the following keywords: skills, competencies, capabilities, digital, managerial, sustainable; with the Scopus, Web of Science, EBSCO, and Google Scholar databases; and research questionnaire development.

2.1. Sample characteristics

The sample of the study is composed of companies belonging to four European countries in which the project was implemented (Greece, Italy, Poland, and Spain). The computer-assisted web interview [CAWI] method was used to survey the chief executive officer [CEO] or other equivalent operations executives. The data collection process was carried out between March and May 2019. We eventually obtained 205 valid surveys (around 50 per country).

After conducting some tests, we did not find significant differences among the responses in the different countries, regarding the variables' means. For example, for the number of employees ($t = 0.317$), age of the company ($t = 0.820$) or digital characteristics of the company ($t = 1.079$ for digital users and $t = 0.911$ for digital providers), none were significant at 5% (see the characteristics of the sample in Table no. 3).

Table no. 3. Characteristics of the sample

Item	Range	Italy	Greece	Poland	Spain	Total	Total %
Number of employees	Under 10	2	12	11	25	50	24.4%
	11 to 25	24	9	8	10	51	24.9%
	26 to 50	9	7	7	7	30	14.6%
	51 to 250	10	7	10	7	34	16.6%
	More than 250	6	13	17	4	40	19.5%
	Total	51	48	53	53	205	100.0%
Age of the company	Less than 1 year	3	0	2	3	8	3.9%
	1 to 5 years	14	2	7	8	31	15.1%
	More than 5 years	34	46	44	42	166	81.0%
	Total	51	48	53	53	205	100.0%
Digital characteristic of the company	Digital users	35	44	45	52	176	67.2%
	Digital providers	22	29	19	16	86	32.8%
	Total	57	73	64	68	262	100%

All variables (Table no. 4) were measured with a 7-point Likert scale, where 1 indicated that the feature is not implemented at all or is not important/relevant, and 7 indicated that the feature is fully implemented or very important/relevant.

Table no. 4. Measurement instruments

Variables/Constructs	Items/Scales	References
Independent Variables		
Digital User (To what extent do you implement the following digital activities in your company as "user"?)	Use of e-commerce/m-commerce; Use of digital supply channels; Use of digital platforms; Use of social media; Use of digital infrastructure in business operations; Use of digital technologies (i.e. business analytics, the Internet of Things, big data, advanced manufacturing, 3D printing, cloud and cyber-solutions); Use of ICT for managing business operations.	Wareham et al. (2014), Huang et al. (2017), Parker et al. (2017), Wirtz (2018)
Digital Provider (To what extent do you implement the following digital activities in your company as developers/providers)	Development of digital products; Provision of digital products; Development of digital services; Provision of digital services; Development of digital platforms; Provision of digital platforms.	Wareham et al. (2014), Wentrup (2016), Wirtz (2018), Blaschke et al. (2019)
Digital Capabilities (Please, assess your/your company's capabilities in the following areas)	ICT management; Digital security; Social media marketing / digital marketing; E-commerce/m-commerce; Digital communication and social networks; Digital innovation; Online business: online business model generation, online opportunity recognition.	Helfat and Winter (2011), Holotiuk and Beimbom (2017), Gauthier et al. (2018), Sousa and Rocha (2019a,b)

Variables/Constructs	Items/Scales	References
Dependent variables		
Managerial Capabilities (Please, assess your/your company's capabilities in the following areas)	Opportunity recognition; Networking; Flexibility and adaptability; Communication with stakeholders: customer/supplier and others; Interpersonal relations/teamwork; Organising business: day-to-day operation management, business process management, etc.; Business architecture: strategy, long-range management, etc.; Financial management; Access to early-stage financing.	El Sawy et al. (2016), Walsh and Volini (2017), Ukko et al. (2019), Vadana et al. (2019)
Sustainable Capabilities (Please, assess your/your company's capabilities in the following areas)	Business ethics; Corporate social responsibility; Sustainable strategic management; Sustainable operations management; Sustainable marketing; Sustainable research and development; Sustainable business model development; Sustainable challenges anticipation: foresighted thinking; Social/environmental/economical (CSR) problems identification and management; Understanding sustainable-relevant systems and subsystems; Understanding sustainable-relevant standards.	Hojnik and Ruzzier (2016), Horbach (2016), Morrar et al. (2017), Jablonski (2018)

To account for possible alternative explanations, some control variables were introduced in the model:

- **Size:** it was measured using the number of employees in 5 categories (Under 10; 11 to 25; 26 to 50; 51 to 250, and more than 250), collected from the Amadeus database.
- **Firm age:** since firms' organisational capabilities might evolve over time to adapt to environmental and internal requirements as organisations grow, we compiled the number of years since the company was founded in 3 groups (less than 1 year ago; from 1 to 5 years ago, and more than 5 years ago) from the Amadeus database.
- **Target Market:** to control for the extent to which the company's scope of operations influences the development of capabilities, we introduced the categorical variable main target market, with four categories (1=local, 2=national, 3=European and 4=international).
- **Ecological values:** in order to account for potential institutional effects, we included a variable that reflects societal values on activism related to ecology and social and environmental protection, based on the most recent European Values Study 2017. This database provides country-specific information about different values of Europeans, i.e. morality, society, politics, work, and family. Although collected prior to our study, social values are considered stable over short periods. We introduced this variable as the citizens' degree of social activism on environmental issues, measured as the proportion of each country's population involved in conservation, environmental, ecological, or animal rights associations or movements.

2.2. Data analysis

The analysis of the data and the proposed models was conducted using SmartPLS 2.0. M3 software (Ringle et al., 2005) and running the Partial Least Squares - Structural Equation Modelling (PLS-SEM) technique based on principal components (Chin, 1998; Richter et al.,

2016; Hair et al., 2022). Following common practice's recommendations for measurement model assessment, we analysed the constructs/items correlations, Cronbach's alpha, the average variance extracted (AVE), the composite reliability (CR) and the discriminant validity (Richter et al., 2016). In our model, all the constructs' scales use reflective indicators, which in PLS are determined by the constructs, thus becoming covariates of them (Hair et al., 2022).

We first assessed the individual reliability of items by checking their loadings on each one's constructs, keeping all initial items in the final model, as their removal did not justify the improvement of the model's reliability. Cronbach's alpha and CR were measured to evaluate internal consistency reliability, both exceeding the 0.7 benchmarks in all cases, values considered satisfactory (Hair et al., 2022).

Discriminant validity evaluate how well a specific construct's measures are distinct from those of other constructs within the same model. This was assessed using two methods, as outlined by Chin (1998). Firstly, a comparison was made between the AVE's square root and the correlations between constructs (see the diagonal of Table no. 5 and the off-diagonal intersections, respectively). Apart from the fact that the AVE value is above the needed 0.5 level (Hair et al., 2022), table no. 5 shows that the square root of the average variance extracted is greater than the correlations, indicating that each construct is more closely related to its own measure than to the others.

Table no. 5. Intercorrelations

Multi-item constructs	DIGITAL_CAP	DIGITAL_PROVIDERS	DIGITAL_USERS	SUST_CAP	MANAGERIAL_CAP
DIGITAL_CAP	0.759				
DIGITAL_PROVIDERS	0.504	0.861			
DIGITAL_USERS	0.443	0.329	0.711		
SUST_CAP	0.472	0.086	0.184	0.821	
MANAGERIAL_CAP	0.582	0.154	0.316	0.559	0.750

The second method for assessing discriminant validity involves evaluating each item's relation to other constructs within the model. When examining items' weight on their respective constructs and cross-loadings of other model's constructs, all items exhibited higher loadings for their own constructs than for others. Additionally, the constructs shared more variance with their own items than with others, supporting both the convergent and discriminant validity of the scales used.

To assess the structural model and minimising errors, we examine the endogenous constructs' R^2 levels to examine their explained variance. In our study, we estimated two models. Model 1 (basic model) included the direct effects between being digital and managerial and sustainable capabilities. Model 2 incorporated digital capabilities as a mediator variable (see Figure no. 1 for the theoretical model).

Results support the predictive capability of this model, since the R^2 of the dependent variable surpasses the level of .1 and Stone-Geisser test reveals a Q^2 indicator's value for the endogenous variables of 0.174 and 0.202 (Hair et al., 2022).

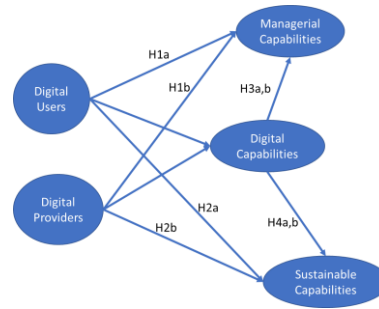


Figure no. 1. Empirical model

3. Results and discussion

To test the formulated hypotheses, the variables relationships can be evaluated through their coefficient values and statistical significance, which are analysed below.

When we addressed the effect of being a digital company, we proposed that it would have a positive impact on managerial capabilities (H1) and sustainable capabilities (H2) (with distinction to the effect of the user (a) and provider (b)). We found support for H1a in our model ($b = .330$, $p < .001$), although the relation between digital provider and managerial capabilities was found to be non-significant ($b = .054$, $p > .1$), therefore not finding support for H1b in our data.

H2a suggested a direct and positive relationship between being a digital user and sustainable capabilities, finding significance in our results ($b = .189$, $p < .01$). Therefore, we found support for H2a. However, the link between the provision of digital services or products and sustainable capabilities' development was found to be non-significant ($b = .012$, $p > .1$), consequently not finding support for H2b in our data.

Model 2 tests the mediating role of digital capabilities. In this way, H3 proposed that digital capabilities mediate the relationship between being a digital company and managerial capabilities. H4 was the same for sustainable capabilities. We used bootstrapping to test the presence of significant indirect effects in our sample (Table no. 6).

Table no. 6. Significance analysis of the mediation effect on the empirical model

Hypothesis	Relation	Direct effect	97,5% Confidence Interval of the Direct Effect	t-value	Significance	Indirect effect	t-value	Significance
H3a	Digital User -> Managerial Capabilities	0.099	[-0.020; 0.234]	0.089	$p > 0.1$	0.201	4.785	$p < 0.001$
H3b	Digital Provider -> Managerial Capabilities	-0.201	[-0.336; -0.074]	2.967	0.003	0.260	5.906	$p < 0.001$

Hypothesis	Relation	Direct effect	97,5% Confidence Interval of the Direct Effect	t-value	Significance	Indirect effect	t-value	Significance
H4a	Digital User -> Sustainable Capabilities	0.007	[-0.164; 0.155]	0.089	0.929	0.169	4.553	p<0.001
H4b	Digital Provider -> Sustainable Capabilities	-0.203	[-0.350; -0.016]	2411	0.016	0.219	4.796	p<0.001

For the case of H3, the model incorporating digital capabilities as a mediator indicates that the direct effect of the degree of being a digital user on the development of managerial capabilities is non-significant, while the indirect effect (i.e., via digital capabilities) is positive and significant, thus providing support for H3a. The results for H3b are interesting: being a digital provider has a negative and significant direct effect on managerial capabilities, while the indirect effect through digital capabilities is positive and significant. As the mediated effect is greater than the direct effect, the total effect remains positive and significant ($b = 0.70$, $p < .001$), thus giving partial support to H3b.

Lastly, for the case of H4a, the direct effect of being a digital user over sustainable capabilities was non-significant, while the indirect (mediated) effect was positive and significant, supporting this hypothesis. When analysing the impact of being a digital provider on sustainable capabilities development (H4b), the results replicate what was described for H3b; that is, the direct effect is negative and significant, but the indirect effect through digital capabilities is positive, significant and greater, thus making the overall effect still positive and significant ($b = 0.019$, $p < .001$). Thus, H4b receives partial support.

These results show the need for further discussion on the following topics:

- Digital is “greener”

The results indicate that, effectively, there is a positive relationship between operating in a digital environment and the development of sustainable capabilities. However, this relationship is not direct and automatic, as there might also be other forces influencing this relationship. As argued before, digital is not green by definition. Although the digital world strongly supports circular economy liberating pressure from certain traditional environmental problems, it also generates new ones derived from the “disembodiment” of companies (i.e., difficulties in measuring the real impact of digital operations, managing technological waste or the indirect carbon emissions derived from energy production – Sharma and Dash (2022)). Therefore, the potential to make companies more sustainable is in the development of green and digital business models, needing other capabilities to reap the benefits of being digital.

Consequently, the starting point of the discussion of whether digital businesses are indeed sustainable starts from the conception of the business model rather than digitalisation per se. Being digital can boost the sustainability potential (both in capabilities and in actual value). Nevertheless, as Bican and Brem (2020) point out, no clear framework proves the evident link between digital and sustainability capabilities. The core debate of the literature in this regard resides in the facilitation of a circular economy and sustainable operations (i.e. waste reduction, resource consumption, digital delivery of services, etc.). However, there is limited evidence that, just by being digital, companies are implicitly more sustainable (unless their business model is shaped in such a way) (Bican and Brem, 2020).

Moreover, technological innovations (fostered by digital capabilities) become crucial for sustainable enterprises and fostering sustainability capabilities, such as cleantech and environmental management systems. To this end, certain digital capabilities can significantly boost sustainability capabilities and business impact (Jablonski, 2018; Barbeito- Caamaño and Chalmeta, 2020). Within such digital boundaries, a bridge with sustainability capability interests, related to circular economy, may use the aforementioned digital solutions to facilitate the implementation of practices such as regeneration, sharing, optimisation, looping, virtualisation, and exchange (Jablonski, 2018).

- Digital users vs. digital providers

In this paper, we argue that modern economies focus on digitalisation, in which communication, transactions, and even product and service development are done, to some extent, through digital channels. Likewise, the question posed at the beginning of the paper was not around being digital or not, but its degree. In the digitalisation process, companies adopt two main roles: providers or users of digital products/services (Wirtz, 2018). Our empirical analysis examined the impact of these roles on the development of other internal capabilities, especially those needed to succeed in a digital context. The results show that only for digital users, higher degrees of digitalisation are positively related to managerial and sustainable capabilities. This may be due to the greater flexibility digital users may find when deciding which aspects of their operations and activities, integrate digital activities and, as such, perceive digital integration as something essentially beneficial. Digital providers on their own are immersed in the digital world, which might also bring instability, high rates of change, and complexity.

When dealing with digitalisation, results show that for digital providers, the characteristics of the digital world have a negative direct effect on managerial and sustainable capabilities and a positive one on digital capabilities; however, as digital capabilities reinforce the development of managerial and sustainable capabilities, the overall effect remains positive. That is, being a digital company per se does not have an effect on the development of other capabilities for digital providers. However, we found that digital capabilities play a crucial role, as mechanisms to transform the pressures they receive from the digital environment into other capabilities. In heavy digital environments (i.e., those for digital providers), companies sustain too much pressure to focus on other priorities such as implementing green solutions or managing the company. In these cases, companies need to concentrate on technology to survive, needing to develop capabilities to control their technology, revealed as a useful method for the development of managerial and sustainable capabilities.

- Digital capabilities and complementarity of capabilities

Digital capabilities are important for digital businesses but also for the traditional businesses that want or have to operate in the digital world. However, as we pointed out before, a wider set of capabilities that complement each other is required. The positive impact of digital capabilities on enterprises' sustainable capabilities can be showcased in industry (Accenture, 2022). In fact, developing digital capabilities can help companies build synergies and other capabilities (i.e., managerial) while also helping in transforming the opportunities coming from the digital world (i.e., easier access to direct customers) into improved performance or competitive advantage (Heredia et al., 2022).

The development of capabilities and their complementarity is also essential at an individual level, as the higher level of individual capabilities reinforces organisational capabilities. The lack of basic digital capabilities prevents the creation of digital businesses, the adoption of digital technologies, and possibly benefiting from digital opportunities (OECD/European Union, 2019).

Although we did not find a direct, positive relation between digital and managerial capabilities in our research, we found an indirect positive effect through the use of digital capabilities; thus, further investigation is needed. For example, the ability to identify the market opportunity would reinforce digital market opportunities identification in the traditional economy and vice versa. Similarly, proficiency in using digital communication and social networks will allow companies to communicate more efficiently with stakeholders, building cooperative networks, and leading to better business results.

Conclusions, limitations and future lines of research

Digitalisation has become an indispensable component of daily operations of many businesses in the modern economy. Thus, digitalisation is not just an isolated element, but can affect other capabilities related to the way a company manages its operations internally (i.e., managerial capabilities) and its relations with the environment (i.e., sustainable capabilities). Nevertheless, there is still a substantial research gap in literature regarding the impact of digitalisation on companies' capabilities (managerial and sustainable).

The results of the analysis show that digital enterprises are "greener" only if the business model includes sustainability. Our results also show that only in the case of digital users, digitalisation is direct and positively related to managerial and sustainable capabilities. Similarly, although we did not find a direct, positive impact when incorporating digital capabilities into the main relation between being digital and managerial and sustainable capabilities in our research, we found an indirect, positive effect through the use of digital capabilities. Thus, we can claim that such a relation and complementarity of capabilities exist. This aspect of our study requires more research.

Our research is limited by the following main aspects:

- We employed one sample of digital users and digital providers for the presented analysis. The surveyed companies could declare and consider themselves as digital users and digital providers at the same time, which means that the two different groups accounted for the same organisations.
- The surveyed companies were established firms, which might influence the dynamics of the analysed capabilities (digital, managerial, and sustainable) compared to other types of ventures (e.g., start-ups). Therefore, the generalisability of our study is limited, although we believe that our model and suggestions on relations between capabilities are valid and independent of the specific case study.
- Although in our paper we refer to digital companies and digitalisation, in our research, we did not measure the actual degree of digitalisation of the surveyed companies. We assumed that since the representatives of the entities declared their companies to be digital (user or provider), the digitalisation of the operations took place or was performed during the time of the research.

- All data coming from the same source (single company) may result in some bias that could be explored in future research.

- In our study, we used cross-sectional data to study the relations between variables, but future research should include panel data to capture all the possible relations under the variables object of study, to conduct a more thorough causality study.

Lastly, the latest research linking digitalisation with sustainability (sustainable digitalisation) increases the relevance of the topic. The research results align with the current trends, showing that the post-COVID-19 pandemic reality and the development of AI accelerated digitalisation. These factors not only put focus on digital companies but also put a lot of pressure on all businesses, regardless of their operations, to become digital and develop digital capabilities.

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