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Enhancing Organizational Ambidexterity in SMEs. The Critical Role of Digital Technologies

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ABSTRACT:

Nowadays, small and medium enterprises (SMEs) are under increasing pressure to adapt, innovate, and maintain their competitiveness. Digital technologies, such as Artificial Intelligence (AI), Internet of Things (IoT), Cloud Computing, and Big Data, have become essential tools for achieving Organizational Ambidexterity (OA), which refers to the ability to balance innovation (exploration) with operational efficiency (exploitation).

This study investigates how digital technologies support Organizational Ambidexterity in SMEs exploring the relationships between technology adoption, strategic alignment, and organizational transformation.Using a robust theoretical framework that integrates the concepts of OA, the Technology-Organization-Environment (TOE) model, and leadership practices, this research employs a qualitative case study approach. Semi-structured interviews with Italian SMEs across both technological and traditional industries offer deep insights into the factors influencing technology adoption and the methods used to balance innovation with efficient operations.

The findings indicate that digital technologies play a critical role in enabling OA, yet SMEs encounter challenges such as limited resources, resistance to change, and an underdeveloped digital culture. Enabling factors include the presence of dedicated innovation teams, adaptable leadership styles, strategic collaborations, and technologies designed to align with workforce skills. Additionally, fostering a culture of learning and collaboration is crucial to bridging technological gaps and overcoming organizational inertia.From a managerial standpoint, this study underscores the importance of aligning technology adoption with long-term business objectives, continuously developing employee skills, and implementing agile frameworks to maintain adaptability and responsiveness. Managers should prioritize investment in scalable and impactful digital solutions while embracing iterative evaluation processes to optimize outcomes. This study adds to the literature on Organizational Ambidexterity (OA) and digital transformation by illustrating how SMEs can harness emerging technologies to succeed in rapidly changing environments. Future research should inspect deeper into leadership styles that promote OA, examine the perspectives of employees on digital innovation and digital technologies, and pursue cross-country comparisons to improve the broader applicability of these findings.

KEYWORDS: Small and medium-sized enterprises, Digital technology, Innovations, Artificial Intelligence, Digitalisation

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1 Introduction

In the evolving and dynamic landscape in which companies are working, the efficient use of Organizational Ambidexterity (OA) and the leverage of digital technologies is fundamental, especially for the small and medium enterprises (SMEs) which are the most present in the European Union territory (Rialti et al., 2020; Caputo et al., 2016; Bella and Katsinis, 2022). Organizational Ambidexterity refers to the simultaneous pursuit of exploitation and exploration activities, and its growing importance is evidenced by the increased research it has received since 2014 (Amjad and Nor, 2020). Organizational Ambidexterity is recognized for its association with increased firm performance (Fu et al., 2016; Zhang et al., 2016) and for its mediating role between the dynamic capabilities and proactive resilience of the companies and their competitive advantage (Jurksiene & Pundziene, 2016; Annamalah et al., 2023). This mediating role then underlines the integration of different capabilities in responding effectively to dynamic environments. Emerging technologies, such as cloud computing, along with IT capability, form a very crucial foundation for the implementation of Organizational Ambidexterity through rapid knowledge accumulation and resource reconfiguration enabled by them (Chang et al., 2019). For instance, IT ambidexterity, defined as the ability to both explore and exploit IT resources, enhances organizational agility and operational efficiency, key enablers of ambidextrous practices (Lee et al., 2015). Moreover, IT capabilities could play a crucial role in stimulating Organisational Ambidexterity (Trieu et al., 2023) since they could respond to a quickly changing environment (Bharadwaj, 2000; Chakravarty et al., 2013). Moving to the actual new digital technologies, cloud computing applications make Artificial Intelligence (AI) and big data more accessible to SMEs (Saratchandra et al., 2022). Furthermore, according to the evolution of the environment that companies experience, the hierarchical leadership style is evolving towards paradoxical leadership (PL) style, which embraces conflicting demands and ambiguity, that favours Organizational Ambidexterity and resilience (Trieu et al., 2023).

However, the application of new technologies, their impact on Organizational Ambidexterity and the role of incubators in this process is little known, both because the

technologies are in their infancy and because companies are just starting to adopt them. More in detail, it would be necessary to refine the OA using a contextual approach (Annamalah et al., 2023) and better investigate the connection between IT skills, ambidexterity, agility, and performance (Trieu et al., 2023). Concerning the actual capabilities needed to exploit new technologies, it is necessary to understand whether big data analytics (BDA) capabilities make a difference in SMEs (Rialti et al., 2020) and how new technologies are adopted using the Technology Acceptance Model (TAM) (Davis & Bagozzi, 1989; Benzidia et al., 2021). Furthermore, it would be interesting to explore how incubators and science parks and the application of cloud computing influence the diffusion of innovations and the use of new technologies in SMEs (Kumar et al., 2021; Saratchandra et al., 2022). Hence, this thesis would respond to the call of Rojas-Córdova et al. (2023) who ask for the creation of a common framework for OA adoption for any SMEs. Finally, this paper aims to investigate how the Incubators' internal dynamics and processes can support the culture of innovation and promote innovations inside SMEs (Bøllingtoft and Ulhøi, 2005; Scuotto et al., 2017; Ahmad and Ingle, 2011)

The purpose of this study is to tap into this research opportunity by answering the following research question:

How do emerging technologies enhance Organizational Ambidexterity in SMEs?

More in detail, this study aims to understand first how and which factors enable companies to adopt certain new digital technologies, then it analyses how these technologies could be leveraged to enhance and develop Organizational Ambidexterity. This research is done by first creating a theoretical framework by using existing literature on the actual use of new technologies, especially big data, AI, and cloud computing, in Organizational Ambidexterity in SMEs. Moreover, through a qualitative analysis of SMEs in Italy, this study aims to understand the processes, the culture and leadership needed in fostering the exploitation and exploration of innovations. The research is carried out by using a qualitative analysis, using semi-structured interviews on some selected companies to

gain a deep knowledge about organizational culture and dynamics that support technology-driven Organizational Ambidexterity. Finally, secondary data using existing knowledge is used to refine findings.

This study contributes to the existing literature in two ways. The first aim is to combine existing literature and interviews to develop the actual state of technology adoption in enhancing Organizational Ambidexterity, explaining which technologies are used and in which way can contribute to OA adoption, enriching the fragmented literature about technology-driven abilities to exploit and explore (Rialti et al., 2018; Saratchandra et al., 2022; Benzidia et al., 2021; Rialti et al, 2020). Secondly, following the definition of four archetypes of SMEs in adopting Organizational Ambidexterity(Rojas-Córdova et al., 2023), this study aims to improve the existing frameworks for OA adoption of SMEs, nurturing and adding dynamic capabilities (O'Reilly & Tushman,2013).

This study is divided into five sections. The first one, introductory, reviews the contextual background and provides the objectives of the study. The second section investigates the existing literature about the role of OA in SMEs, its foundations and the recent literature about it. Secondly it investigates which are the main new digital technologies to take into account, their main characteristics and the possible effects on SMEs. Finally, the second section would end with a theoretical framework that will summarise the findings and it would be used in the research. The third section delves into the methodology used and the data analysis carried out, while the fourth one provides empirical findings of the study, integrating the theoretical framework and the knowledge raised through qualitative research. The fifth and last section wraps up the main findings from a theoretical and managerial point of view, providing also limitations and avenues for future research.

2 Theoretical Background

2.1 Organizational Ambidexterity

Organizational Ambidexterity (OA) refers to the capability of the firm to both explore and exploit. Exploitation refers to the ability of firms to refine their processes and enhance actual efficiency while exploration refers to the ability to look at the future and innovate, experiment with new processes and technologies and take more risks (Gianzina-Kassotaki, 2017; March, 1991).

In the last few years, OA has been widely studied (Amjad & Md Nor, 2020) showing the interest and the importance of this matter for researchers. The seminal works of March (1991) and Tushman & O'Reilly (1996) posed the foundations for this subject and suggested that firms pursuing simultaneous exploration and exploitation can enhance performance compared to other firms that concentrate exclusively on one, with the sacrifice of the other. For this reason, firms should seek the most effective combination o exploration and exploitation to sustain their competitiveness in the short and long run (Luo et al., 2018). Despite the OA has been widely studied in different contexts, such as concerning technological innovations (O'Reilly & Tushman, 2004; Smith et al., 2017), organizational learning (Prieto-Pastor & Martin-Perez, 2015; Kostopoulos & Bozionelos, 2011), and strategic management (Papachroni et al., 2015; Kassotaki et al., 2019) there is still unclear how companies can achieve it (Birkinshaw & Gupta, 2013; Raisch & Birkinshaw, 2008; Gianzina-Kassotaki, 2017;).

2.1.1 Four Different Approaches to Organizational Ambidexterity

In this concern, many researchers have studied first what would be a good balance between exploration and exploitation activities, initially, they studied the main approaches that companies put in place in order to attain OA. There are four different approaches:

1. **Contextual Ambidexterity:** It involves the simultaneous balance of exploitation and exploration activities within the same business unit (O'Reilly & Tushman,

2013). It is considered a good source of sustained competitive advantage since whether it is used wisely can follow the VRIO framework and, therefore can develop strategic capabilities that are valuable, rare, inimitable and supported by the organization (Kassotaki, O., 2022). However, the simultaneous implementation of both activities in the same business unit is costly to achieve (Gibson & Birkinshaw, 2004; Simsek et al., 2009).

2. **Structural Ambidexterity**: In this case, exploration and exploitation are pursued in independent structural units (Huang & Kim, 2013) within an organization each with its strategies, structures and cultures (Tushman et al., 2010). This approach is common in the financial services sector where senior management teams have to coordinate to assess shared vision, commitment and knowledge integration systems among the independent units (Tushman & O'Reilly, 1996; Jansen et al., 2008)
3. **Cyclical Ambidexterity**: It consists of a long period of exploitation where there is relative stability and quick exploratory efforts within the same business unit (Tushman & O'Reilly, 1996; Cantarello et al., 2012). In this context routines, practices, control procedures, interpersonal relations, flexibility and managing conflicts are fundamental. This approach is widely used especially in companies with a strong technological core, such as software houses (Ardito et al., 2021; Simsek et al., 2009). Cyclical ambidexterity is correlated with innovative results and superior performance through innovation (Simsek et al., 2009).
4. **Reciprocal Ambidexterity**: It involves the sequential pursuit of exploitation and exploration through separate units, where the outputs of exploration from one unit become the input for the exploitation activities by another unit and vice versa (Gianzina-Kassotaki, 2017; Simsek et al., 2009). This type of ambidexterity *"requires information exchange, collaborative problem-solving, joint decision-making among units"* (Kassotaki, 2022). This particular approach is common in organizations that are engaging in strategic alliances, especially in the process of internationalization (Simsek et al., 2009).

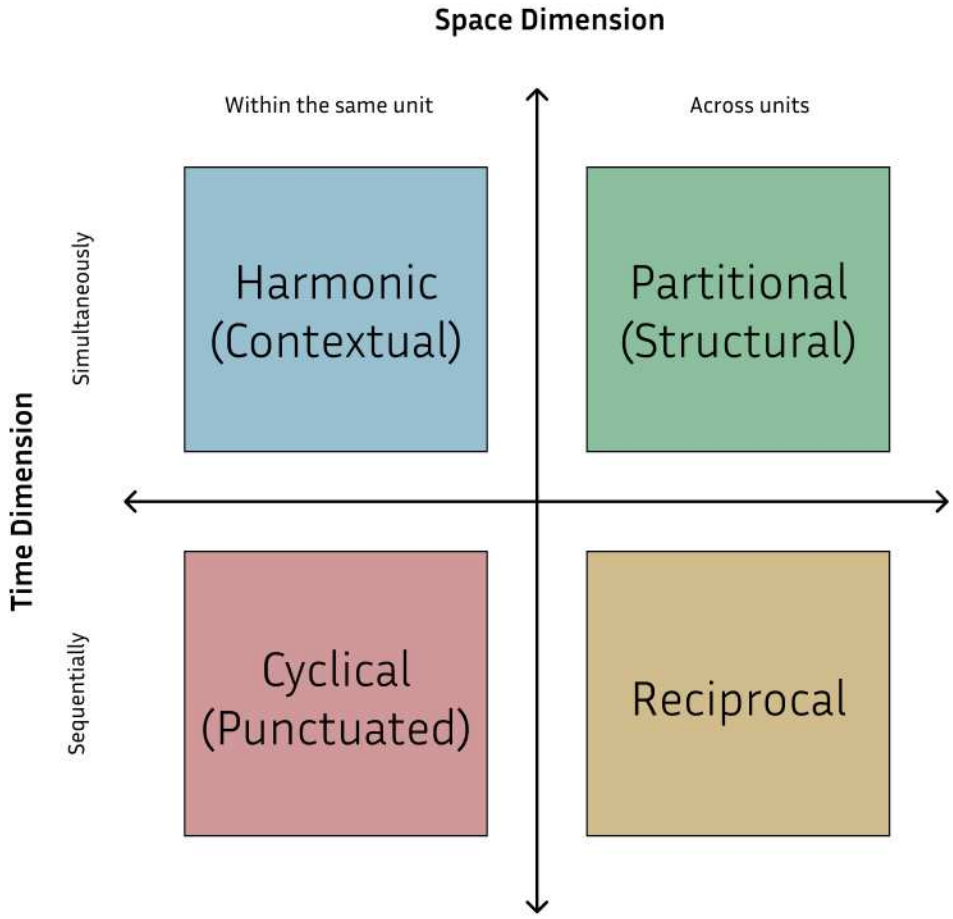

Figure 1: Different Approaches to OA (Simsek et al., 2009)

2.1.2 Drivers of Organizational Ambidexterity

The drivers of Organizational Ambidexterity are mainly three: Environmental Dynamics, Technological change, Organizational Leadership & Culture (Raisch et al., 2009; Soto-Acosta et al., 2018).

2.1.2.1 Environmental Dynamics

Concerning the first, OA is positively correlated with environmental dynamism (Boumgarden et al., 2012) since dynamic environments favour the development of

ambidexterity (Halevi et al., 2015; Lin & Ho, 2016) for example in high-tech service firms rather than in manufacturing ones (Junni et al., 2013)

Additionally, the ability of SMEs to remain competitive in the market thanks to OA is closely related to the volatility and unpredictability of the market environment (Andrade et al. 2019). In dynamic markets is more common to see a continuous research for new opportunities, the competition is fierce and intense and it is important to balance also the limited human and financial resources (Katou et al., 2021). On the contrary, companies operating in more stable markets tend to prefer long periods of exploitation with shorter bursts of exploration (Jansen et al., 2005; Junni et al., 2013). The ability to explore new opportunities and exploit existing competencies is significantly influenced by the level of unpredictability and change in their external environment (Andrade et al. 2019). It is necessary to develop the Technological Absorptive Capacity (TAC), which is the dynamic capability to engage in new processes, product development, and innovation using available knowledge, expertise, and equipment (Andrade et al. 2019).

Customer participation also plays a significant role in moderating the effects of organizational change and ambidexterity. Customer participation strengthens the positive effects of technical change on firm performance by providing valuable feedback and insights that help refine and improve innovations. However, it can attenuate the effects of administrative change by increasing coordination costs and prompting conflicts. This dual role of customer participation underscores the importance of engaging customers in the innovation process to enhance ambidexterity and drive performance (Chen et al., 2018).

2.1.2.2 Technological change

Technological change refers to the always faster evolution and innovation of technologies that affect the processes, products and environment of a company. Technology capacity allows firms to adapt and exploit the actual technologies for being competitive in

the market and even explore future technology adoptions for capitalizing on new opportunities. (Soto-Acosta et al., 2018).

Moreover, environmental dynamism has a stronger effect on the relationship between Technological Absorptive Capacity (TAC) and exploratory activities rather than to exploitative ones (Andrade et al., 2019). Therefore, in dynamic markets, SMEs are more likely to develop new knowledge, technologies, and processes enhancing their technical expertise. At the same time, the study suggests that SMEs with higher technological capabilities are better positioned to respond to the demands of a dynamic environment since they are more engaged in achieving OA (Andrade et al. 2019). This continuous relationship that Technological Absorptive Capacity (TAC) has on both drivers, the environmental dynamism and the technological change, makes it fundamental for achieving Organizational Ambidexterity. TAC is even more important now in the era of Industry 4.0, characterized by technological innovations including cloud computing, big data, digitization, Internet of Things (IoT), and cyber-physical systems. These technologies make the process more autonomous, automated and intelligent thanks for instance to machine learning (ML) development (Mahmood et al., 2020).

The role of middle management and organizational linkages is also pivotal in managing technological transitions and achieving ambidexterity since technological change requires robust linkages between organizational units responsible for developing new technologies and those managing complementary assets needed for commercialization. Middle managers play a central role in creating and maintaining these linkages by facilitating communication, collaboration, and resource allocation across different units (Taylor & Helfat, 2008).

2.1.2.3 Organizational Leadership & Culture

Organizational characteristics are fundamental for the development of Organizational Ambidexterity since it sees the whole process and sets the culture regarding innovation and also how the management team approaches innovation.

Firstly, considering the top management culture, Mammassis et al. (2019) understood that CEO learning goal orientation is positively associated with OA since it favours the creation of a culture of learning and flexibility which is fundamental for achieving both exploration and exploitation activities. On the other hand, a CEO's performance approach goal, which favours short-term goals and performance over learning, negatively affects OA. Moreover, these effects are enhanced thanks to the environmental dynamism: in a volatile market, the positive effect of a CEO's learning goal orientation is enhanced while the negative impacts of a performance approach orientation are intensified as well (Mammassis et al, 2019). Therefore, it is preferable that, especially in highly dynamic markets, managers pursue the culture of learning whether they want to pursue Organizational Ambidexterity (Mammassis et al, 2019).

This positive relationship leads companies to create a new way of being leaders. Paradoxical Leadership (PL), characterized by the ability to manage and balance conflicting demands, is increasingly relevant in the face of the complexities introduced by digital technologies (Klonek et al., 2022). PL is fundamental for employees who are encouraged to engage in both exploitation and exploration activities (Mammassis et al, 2019). This is particularly important in the SME context where the resources could be limited (Partanen et al., 2020) and where Strategic Flexibility plays a crucial role in balancing the relationship between technological adoption, paradoxical leadership, and corporate sustainable performance (Partanen et al., 2020, Nwachukwu & Vu, 2020). This ability leads SMEs to adjust strategically their operations quickly to respond to market changes, therefore supporting ambidextrous activities that are nurtured by Paradoxical Leadership (Hossain et al., 2023).

This flexibility allows organizations to adjust their strategies and operations quickly in response to new information or shifts in the market, thereby supporting the ambidextrous activities encouraged by paradoxical leadership. Finally, Paradoxical Leadership is even more important in the context of SMEs and their application to IT competencies: a study by Trieu et al. (2023) showed that leaders who exhibit paradoxical behaviours are better positioned to leverage IT capabilities effectively making the companies more

resilient and ambidextrous. Paradoxical Leadership also became pivotal for companies since it favours employees' learning, and nowadays it has become crucial once Industry 4.0 is advancing.

The Intellectual Capital (IC) of a company can be divided into three main groups: Human capital, is the knowledge, skills and capabilities of employees to improve their job performance (Becker, 1964). Structural Capital (SC) is a mix of processes and frameworks that an organization utilizes to facilitate its business operations, such as patents, IPR, copyrights, et cetera (Zameer et al., 2020). Relational Capital is the value derived from an organization's relationships with its external stakeholders, including customers, suppliers, partners, and other entities in its business network. It includes aspects such as trust, loyalty, and customer relationships (Mubarik et al., 2016; Eisenhardt & Sull, 2001). An analysis of 217 SMEs showed that all these three dimensions significantly impact OA and this highlights the importance of companies to develop specific policies to cultivate Intelectual Capital to balance innovation and exploitation activities (Mahmood et al., 2020)

2.1.3 Organizational Ambidexterity and Performance

After dealing with the description of OA and explaining its main drivers, it is important to elaborate on how Organizational Ambidexterity could lead companies to increase performance. Researchers have found a positive correlation between the ability to manage simultaneously both exploitative and explorative activities and the superior performance it can bring (Junni et al., 2013). This relationship is particularly influenced by different factors, one of the most important ones is the industry type: evidence suggests that this correlation is particularly high in non-manufacturing industries (Simsek et al., 2009; Raisch, & Birsinshaw, 2008). Moreover, as explained before, OA is more pronounced in dynamic environments (Simsek et al., 2009).

Dravev et al. (2020) interestingly review the enhancement in performance for the pharmaceutical and energy sectors. They implemented a Data Envelopment Analysis (DEA),

which is a non-parametric technique for evaluating efficiency scores based on a wide range of inputs and outputs. In their study, they implemented three different measures to compute the effectiveness of OA in enhancing: financial performance, innovation performance and sustainability performance.

Concerning financial performance, they studied the relationship between revenue growth, as a measure of short-term financial outcomes, and market-to-book (MB) ratio as a measure of the long-term market valuation. Secondly, regarding innovation performance, they investigate the balance between a firm's innovation activities in its core business areas versus new or disruptive sectors. It reflects the firm's ability to exploit existing capabilities while exploring new markets or technologies. Finally, referring to sustainable performance, researchers have studied the commitment of companies to pursuing both financial and sustainability objectives by using the market-to-book ratio (MB) efficiency and sustainability performance measured using the Green Ranking Index for measuring how companies can ambidextrously pursue financial and sustainability performance. Companies that have a high score in this section pose importance on both exploiting the current operations and exploiting new ways of doing business with a particular focus on corporate social responsibility (CSR) (Dranev et al., 2020).

Key results of this research highlighted the importance of OA for companies; however, this positive outcome heavily depends on the industry. Energy companies showed an enhanced performance when they focused on OA and sustainability efforts, on the contrary, in the pharmaceutical industry, the orientation towards sustainability matters results in diminished performance (Dranev et al., 2020). As explained by Junni et al. (2013), the empirical evidence indicates that organizational ambidexterity is associated with firm performance but is highly industry-sensitive.

Moreover, another thesis in favour of the industry sensitivity about OA is the evidence about how the Supply Chain Ambidexterity (SCA) negatively affects performance in manufacturing companies, and this effect is even amplified in SMEs due to their lack of

resources (Hannan & Freeman, 1984; Partanen et al, 2020). Junni's thesis (2013) about the unsuitability of OA for manufacturing companies is confirmed by the research of Partanen et al (2020). This unsuitability could be overcome thanks to alliances in specific functions of the supply chain (Lavie et al., 2011), or by co-explore and co-exploit activities by different SMEs (Kauppila, 2015). However, both Kauppila (2015) and Andriopoulos & Lewis (2009) study that OA does not enhance firm performance in manufacturing companies. SMEs could enhance network capabilities and strategic information flow (Klein & Rai, 2009), to reduce the negative effect of OA on performance. However, SMEs usually lack resources and developing these capabilities requires SMEs to invest in building and maintaining strong relationships with external partners and in IT systems for information sharing (Partanen et al., 2020).

Finally, after explaining the different approaches that SMEs could face OA, developing the different drivers that facilitate OA blooming and showing the evidence of OA in performance it is necessary to explore the role of new technologies and understand if the industry sensitivity is still present or if digital technologies. This thesis aims to reformulate the new drivers that help OA evolution, understand how organizational commitment is important and which are the effects of OA on performance nowadays. Finally, it has the objective to evaluate the actual industry sensitivity of OA and investigate whether new technologies such as Artificial intelligence (AI), Machine Learning (ML) and the Internet of Things (IoT) have narrowed the difficulties of manufacturing companies.

Theoretical Foundations	**References**
Organizational Ambidexterity (OA) involves balancing exploration (innovation and risk-taking) and exploitation (efficiency).	(March, 1991); (Gianzina-Kassotaki, 2017)
Firms pursuing both exploration and exploitation simultaneously outperform firms focusing solely on one.	(March, 1991); (Tushman & O'Reilly, 1996); (Luo et al., 2018)
OA remains challenging for companies to implement effectively.	(Birkinshaw & Gupta, 2013); (Gianzina-Kassotaki, 2017); (Raisch & Birkinshaw, 2008)
Contextual Ambidexterity: Balancing exploration and exploitation within a single unit. Structural Ambidexterity: Separating exploration and exploitation into distinct units. Cyclical Ambidexterity: Alternating periods of exploitation with bursts of exploration. Reciprocal Ambidexterity: Sequentially pursuing exploration and exploitation across units.	(O'Reilly & Tushman, 2013); (Kassotaki, 2022); (Gibson & Birkinshaw, 2004); (Simsek et al., 2009)
Environmental Dynamics: Dynamic environments positively correlate with OA. Technological Change: Faster technological evolution fosters OA through adaptability and innovation. Organizational Leadership & Culture: CEO learning orientation and Paradoxical Leadership enhance OA by balancing demands. Intellectual Capital significantly supports OA implementation.	(Boumgarden et al., 2012); (Halevi et al., 2015); (Lin & Ho, 2016); (Andrade et al., 2019); (Jansen et al., 2005); (Junni et al., 2013); (Soto-Acosta et al., 2018); (Andrade et al., 2019)
OA correlates positively with financial, innovation, and sustainability performance.	(Junni et al., 2013); (Simsek et al., 2009); (Raisch & Birkinshaw, 2008)
Industry sensitivity impacts OA performance: high in energy sectors but low in other sectors.	(Dranev et al., 2020)
Manufacturing firms face difficulties with OA, but strategic alliances and co-exploration mitigate challenges.	(Kauppila, 2015); (Lavie et al., 2011)

Figure 2. Theoretical foundations of Organizational Ambidexterity

2.2 Emerging Digital Technologies

Nowadays, people are living in a very turbulent world and new technologies are always exploding. Digital technologies disrupted the economy by leading companies to change their organizations, processes and operations (Gilchrist, 2016). More in detail, digital technologies boosted productivity, even in manufacturing by delivering a faster, cheaper and more efficient product or service (Koh et al., 2019), streamlined operations (Pappas et al, 2019) and promoted global connectivity (Belhadi et al., 2022).

Moreover, digital technologies have a crucial role in enhancing operational efficiency by implementing technologies such as cloud computing, cybersecurity and advanced analytics thanks to big data (Mahmood et al, 2020). These tools are the enablers of radical and incremental innovations (He & Wong, 2004) and even make SMEs internationalize, reducing entry barriers (Bianchi & Mathews 2016) and operational costs since digital technologies could allow companies to not have a physical office, warehouse and even a physical presence in many different countries for internationalize (Cassetta et al., 2020).

For assessing the drivers that bring companies to adopt a certain technology I will utilize two main frameworks: the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework. Both are used for analysing the factors and the drivers that are fundamental for technology adoption, however, the former introduces the concept of Perceived Usefulness (PU) which is the belief held by potential users that utilizing a particular system will enhance their job performance and the concept of Perceived Ease of Use (PEOU) which is the belief of those potential users that using a certain system will require minimal effort (Zhu et al., 2003). The first model tries to understand how PU and PEOU interact with each other and favour technology adoption.

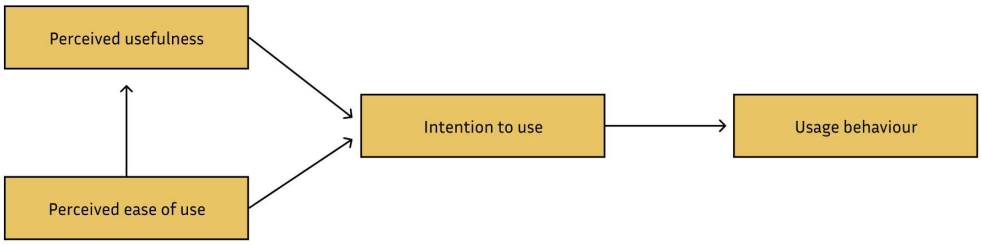

Figure 3. TAM Original Framework (Alwahaishi et al., 2013)

On the other hand, the TOE framework offers a broader view analysing three main contexts: Environmental, which is the external and macro circumstances in which a company operates, Organisational, which underlines how the organization behaves in deciding whether to adopt or not technology and the Technology Context, which highlights the main characteristics, factors and uses of the specific technology.

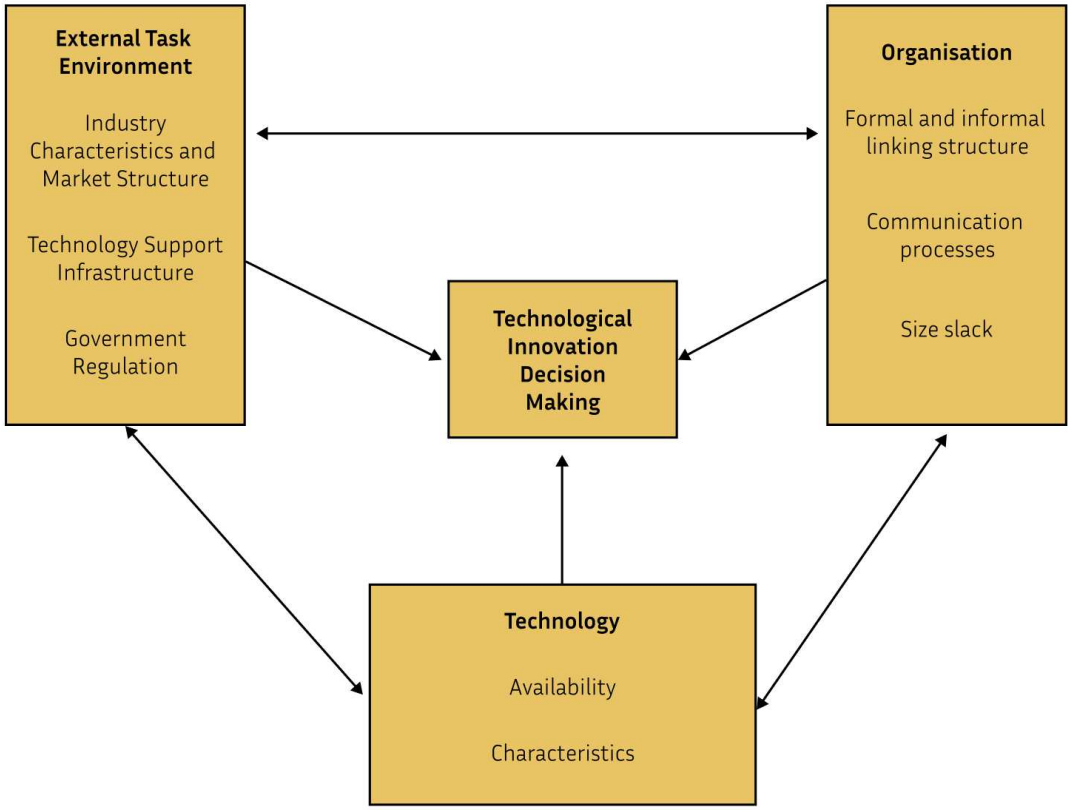

Figure 4. The technology–organization–environment framework (Zhu et al., 2006)

In this thesis, I will use a combination of these two frameworks, developed by Qin, Shi, Lyu, and Mo (2020) in which they merge both frameworks to have a more precise and holistic view. As it is shown in **Figure 5**, in this hybrid framework researchers first define the variables and drivers that can affect Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), which will affect the intention of companies to use and embark on a new technology.

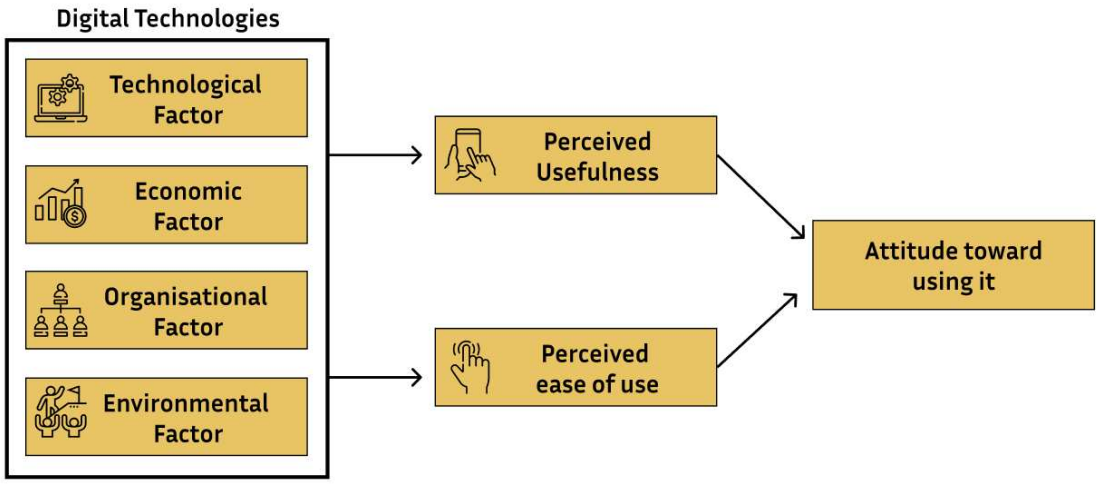

Figure 5. TAM-TOE derivative integration model (Qin et al., 2020)

Generally speaking, researchers have found that digital technology adoption for SMEs could be problematic due to resource constraints (Jabbour et al., 2018; Partanen et al., 2020), skills deficit (Erol et al., 2016) and also organizational problems around the resistance to change and poor innovative and digital culture that is still present in many SMEs (Bierwolf, R., 2017). Once strategizing the adoption of digital technologies in SMEs it is important to have a customized approach in order to meet the heterogenous needs and capabilities of each SME (Cimini et al., 2019). Furthermore, SMEs should create some policies to upskill the workforce and create a culture of innovation inside the organization (Rehman et al., 2014).

In the next chapters I will explore the main emergent digital technologies that are, according to the research, the most useful and utilized by the SMEs. I will begin by

discussing Big Data (BD) and Artificial Intelligence (AI), moving to Internet of Things (IoT), Cloud Computing and ending up introducing the Blockchain and its uses.

2.2.1 Big Data and ML

With the term Big Data, researchers refer to the creation of an immense volume of data, caused by the digitization of our world, where its complexity overcomes the capabilities of the traditional information systems (Manyika et al., 2011). The key attributes of BD are commonly called the 5Vs, as an evolution of the 3Vs developed by Laney (2001), which are:

- **Velocity**: the speed at which data is created
- **Volume**: the quantity of data created
- **Variety**: the different types of data created
- **Value**: the marginal increment that data has on value creation
- **Veracity**: the importance and reliability of data in the decision-making process.

Big Data can be used by SMEs in many ways, it can enhance the decision-making process for instance in the supply chain and resource allocation by providing useful insights based on a plethora of different data available (Justy et al. 2023). Moreover, analysing BD would be beneficial for ameliorating marketing strategies, for instance entering new markets or addressing new targets, personalising customer interactions and even predicting customers' buying behaviours (Saleem et al., 2020; Suoniemi et al., 2020). Big Data would be crucial even in manufacturing companies in improving operational efficiency since it can allow real-time data monitoring for streamlining operations, ameliorating maintenance and decreasing downtime (Justy et al., 2023). Finally, the use of Big Data can help companies respond dynamically to market changes, assess the risks more accurately and make more informed risk management decisions (Saleem et al., 2020).

Concerning the application of the TOE framework in defining the factors that help the development of big data technologies, Bany Mohammad et al. (2022) investigated the banking sector and they noticed that the quality of the data companies possess and the

complexity of the implementation make the difference whether or not to develop big data technologies (Tassey, 2008). Moreover, this technology needs complete top management support to provide resources, promote its use, integrate it into the company's processes and operations and keep fostering talent acquisitions for continuously enhancing Business Intelligence Analytics (BIA) (Watson et al., 2007; Al-Bashayreh et al., 2022). The quality of the infrastructure used is also very important to allow companies to extract insights and convert them into strategies (Bany Mohammad, 2022). Furthermore, concerning the external environment, competitors' adoption of Big Data Analytics (BDA) techniques positively influence also the followers on adopting the same technique. Finally, companies should be aware and precisely respect the Government policies and regulations concerning the use of Big Data, for instance concerning the respect of the privacy (Davenport, 2006; Alsmadi et al., 2022)

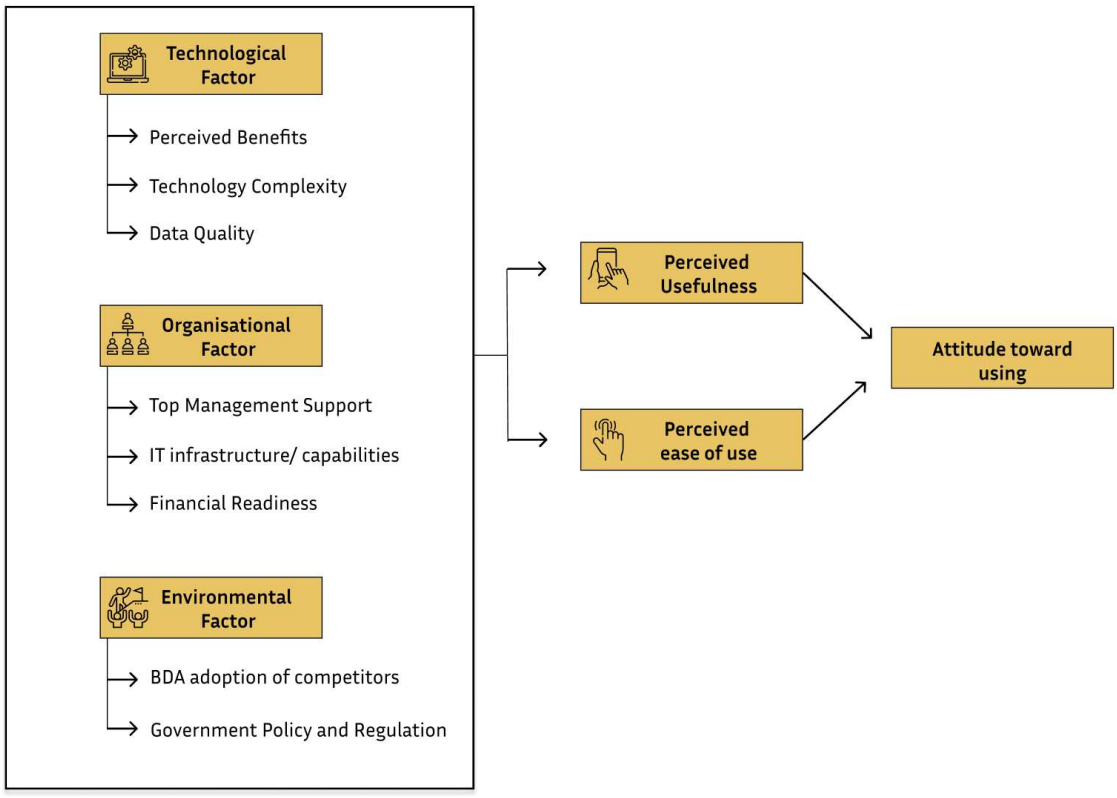

Figure 6. Big Data Adoption Model (Bany Mohammad et al., 2022)

However, SMEs find some challenges in the adoption of data-driven solutions firstly because of limited financial and technological resources useful for implementing and maintaining the necessary infrastructure (Justy et al., 2023). Secondly, the research conducted by Justy et al. (2023) evidenced that there is resistance to technological adoption in the organizational culture and scepticism around the benefits of Big Data.
Additionally, the data stored by companies can be very sensitive, and its storage must comply with GDPR regulations regarding data protection. However, many SMEs lack the necessary expertise to effectively implement data protection and ensure data security (Jasmontaitė-Zaniewicz et al., 2021). This lack of expertise poses a significant challenge to adopting data-driven solutions. Furthermore, effective data analysis requires specialized personnel who can retrieve, clean, and process the data. Such skilled professionals are often beyond the financial reach of SMEs, which struggle to recruit and retain talent (Bornstein et al., 2020).

2.2.2 Artificial Intelligence

After discussing Big Data and its implications in SMEs, it is time to dive into one application of the plethora of data flowing inside an organization and introduce Artificial Intelligence (AI). AI is a product coming from the magnitude of data that companies are using nowadays and can be described as “the ability of a machine to learn from experience, adjust to new inputs and perform human-like tasks” (Duan et al., 2019). The main difference that AI has compared to other traditional machines is that “they solve the tasks for which they are designed in a way that would require consciousness and intelligence in the case of humans”. (Boden, 2006).

AI encompasses various techniques, among the most famous is important to underline: Machine Learning (ML), which provides machines the ability to automatically learn and improve, from past behaviours, and errors and through the reiteration of processes (Sarker, 2021) and Deep Learning (DL) which is a subset of ML that structures algorithms to create an “artificial neural network” that can be used to make decisions on its own (Jamshidi et al., 2020).

Concerning Machine Learning (ML), there are three main paradigms that ML can utilize for learning and improving its activity (Paul et al., 2020):

- **Supervised Learning:** involves training a model with labelled data, an example is spam detection in emails: the model has been trained to recognize that in the presence of certain words, emails, and links that email would be spam.
- **Unsupervised Learning:** in contrast to the previous one, here the model is trained using unlabeled data, the outcome is to detect some patterns, clusters or relationships (Aydogan, 2021). An example is customer segmentation in the marketing area to detect purchasing behaviours, demographics and habits.
- **Semi-Supervised Learning:** This technique stays in the middle of the previous two, therefore the model is trained using both labelled and unlabeled data (Aydogan, 2021). For instance, image recognition could be performed using semi-supervised learning in which the model since the model could be trained using a small dataset of images and then the knowledge is refined using a huge unlabeled dataset of images. This technique is useful when labelling data is costly.
- **Reinforcement Learning:** this technique concerns teaching an agent to engage with an environment and determine best possible actions through a trial-and-error method that gives continuous feedback to the model in order to enhance its understanding. (Aydogan, 2021)

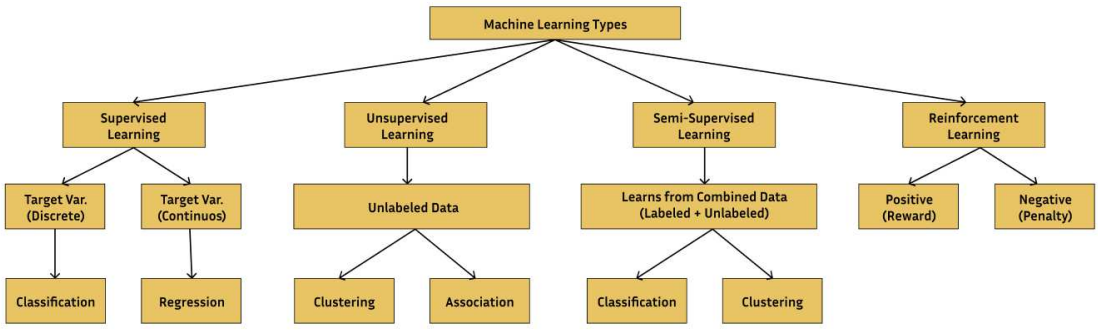

Figure 7: Different types of machine learning techniques (Sarker, 2021)

I will not dwell too much on the drivers that help in the implementation and adoption of AI as they are very similar to those of big data where the support of the top management, the ability to have important talent and the external pressure of consumers and competitors generally have a positive influence in the implantation of AI in companies. On the contrary, the compliance with regulations, the complexity of the technology and the massive investments that can be expected could have a negative impact and thus limit and slow down the implementation of this technology in companies (Al-Khatib, 2023).

AI can be utilized to automate repetitive tasks, such as back-office work, remote controlling assets, such as inventory management or logistic enhancement through understanding better practices thanks to the plethora of data available. AI can be utilized to enhance the customer experience by using real-time data and providing information such as the iOS App Maps or can improve customer retention by recommending better products in line with customers' preferences (Simek & Sperka, 2019). Moreover, AI can optimize manufacturing efficiency by managing better the supply chain and reducing waste. It can also leverage vast amount of data and allow SMEs to make data-driven refined decisions (Belgaum et al., 2021). However, Artificial Intelligence has also some drawbacks like the previous technologies, such as the high cost of implementation, massive effort for designing a clear strategy, and shortage of high-skilled employees.

2.2.3 Internet of Things (IoT)

The Internet of Things (IoT) refers to devices interconnected through a network, capable of transmitting and receiving data with other IoT devices and the Cloud (Ahmed et al., 2021). IoT could be considered a transformative technology that can create and reformulate entire industries since it can have a wide range of applications and benefits that can enhance the overall performance of the company (Islam et al., 2020; Ehie & Chilton, 2020). Furthermore, IoT devices also enable companies to interact with employees and facilitate decision-making by providing on-time information, which can improve operations within the value (Slack & Brandon-Jones, 2018). According to Mikalef & Gupta

(2021), IoT features such as automation, evolvement, interactivity, and flexibility enhance creativity in a firm.

The adoption of IoT devices can create opportunities for companies such as cost savings, enhancement of products and services and risk mitigation (Ebersold & Glass, 2015). Moreover, the Internet of Things is predicted to be one of the major tech trends for the next ten years and it will become fundamental for the future development of technologies and applications (Coombs et al., 2016; Botta et al., 2016). For instance, IoT could be used in healthcare for monitoring the well-being of people using wireless body sensor networks (Poncholi, 2012) or for enhancing ambulances making them “smart” upgrading the devices inside the vehicle, improving the ambulance route and interconnecting the machines inside the ambulance with the hospital's central database to improve the intervention and have real-time information on the patient (Gotadki, Mohan, Attarwala, & Gajare, 2014).

In the manufacturing sector, IoT can be utilized for designing efficient production systems with streamlined automated workflows, and for ameliorating machine’s health since real-time data can enhance predictive maintenance, finally, IoT could be used also in high-risk environments using wearable devices and monitor employees’ breathing, toxic-gas exposure to ensure safe working conditions (Mathew, Pillai, & Palade, 2018). Finally, IoT could be beneficial also for urban poor communities by facilitating improved access to essential services such as healthcare, education, and food security (Roy, Zalzala, & Kumar, 2016).

Moving to the application of the TOE model, concerning the technological factors, technology readiness is fundamental, which is the ability of SMEs to adopt, use and benefit from digital technologies (Parra et al., 2021; Heder, 2017). Moreover, the quality of IT infrastructure is crucial and even the access to the internet to exploit IoT at its full potential (Parra et al., 2021). In addition, organisational factors such as technology attitudes, beliefs, and behaviours are vital for new technology adoption (Parra et al., 2021).

Financial readiness and governmental support, especially in training programs, also play significant roles (Organisation for Economic Co-operation and Development, 2019). These factors are crucial because the main barriers to IoT adoption in SMEs are the high costs of implementation and a lack of knowledge about new digital technologies (Cant & Wiid, 2016).

2.2.4 Cloud Computing

Cloud Computing has been widely discussed in the past years. Cloud Computing could be defined as *"a set of network-enabled services, providing scalable, QoS guaranteed, normally personalised, inexpensive computing platforms on demand, which could be accessed in a simple and pervasive way"* Wang et al. (2010).

Cloud Computing has many advantages, firstly it allows SMEs to achieve low maintenance and investment costs while ensuring high service quality, reducing capital expenditure on IT infrastructure (Jede & Teuteberg, 2015). It particularly fits SMEs since it has low entry costs (Chong et al., 2014) and enhances resource optimisation, scalability and flexibility (Doherty et al., 2015; Marian & Hamburg, 2013). In the era of big data, Cloud Computing enables SMEs to access data and services without massive investments in hardware (Agostino et al., 2013). Then, Cloud service models are categorised according to the specific computing needs of users and correspond to various levels of the cloud computing framework. These include **Infrastructure As A Service (IaaS)** which allows SMEs to rent virtual servers and storage**, Platform As A Service (PaaS)** which offers a platform in the Cloud for hosting and developing applications, and **Software As A Service (SaaS),** where SMEs can simply access to software delivered via subscription. These configurations match any need to promote efficiency and technological advancement of companies (Ariwa & Ibe, 2013).

Moving to the application of the TOE framework, Khayer et al. (2020) investigated firstly the technological factors, beginning with the Relative Advantage of the Cloud, the adoption of this technology is favoured once companies understand the usefulness

concerning operational efficiency, productivity, reduced IT costs, and new business opportunities. (Alkhater et al., 2018). Moreover, Service Quality is crucial: SMEs usually do not have technical resources and skills and rely on third-party computing services that should be reliable and efficient, ensuring robust security measures (Alkhater et al., 2018; Khayer et al., 2020). Since companies are dealing with a new technology another important driver that drives its adoption is the Perceived Risk of Cloud Computing, referring to security and privacy concerns for instance, these are significant inhibitors of cloud adoption (Oliveira et al., 2014).

Concerning the Organizational factors the Support of Top Management is essential for allocating resources and participating in the adoption process (Gangwar, Date, & Ramaswamy, 2015), however, the top management team should be aware and technically competent not to underutilise cloud capabilities or fail to integrate cloud computing with existing systems (Brender & Markov, 2013). Furthermore, cloud computing adoption is also favoured when there are some facilitating conditions such as compatibility with existing systems and technological infrastructure (Rahi, Ghani, & Ngah, 2019). Finally, concerning the external and Environmental factors, the role of Cloud Providers is fundamental since they should not act simply as vendors but should be partners with SMEs to foster trust and collaboration (Maqueira-Marín et al., 2017; Hsu et al., 2014). At the same time, SMEs should be aware that relying on a single cloud provider could limit their flexibility over one service (Kramer, 2014). Moreover, the physical location is also a crucial factor for Cloud adoption since SMEs should ensure data sovereignty, privacy protection, and legal compliance (Bao et al., 2013). Finally, the adoption of any new technology and therefore of cloud computing is influenced positively by social influence and negatively by resistance to change that can be present in society (Dwivedi et al., 2017), decision-makers should think about these conditions as well once deciding whether adopt Cloud Computing or not (Hoque & Sorwar, 2017).

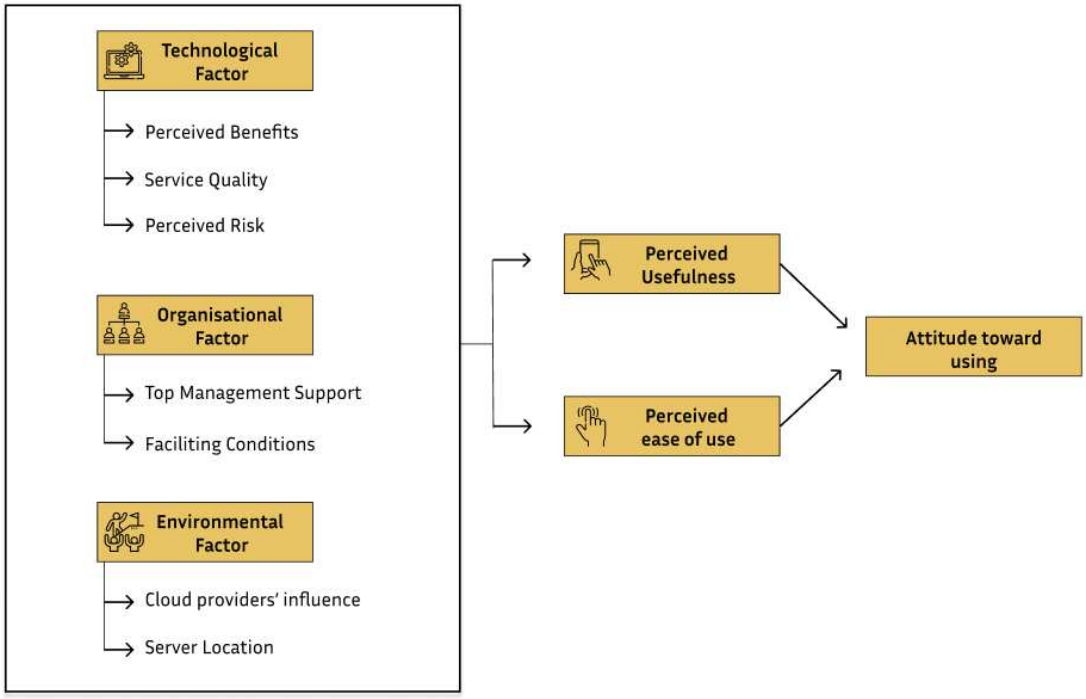

Figure 8. . Drivers of Cloud Computing adoption leading to exploratory and exploitative innovation (Khayer, Talukder, Bao, and Hossain, 2020)

2.2.5 Blockchain

Blockchain is a type of Distributed Ledger Technology (DLT) where transactions are recorded with a unique and immutable cryptographic signature which is called an hash (Schmidt & Wagner, 2019; Kouhizadeh & Sarkis, 2018). All transactions are grouped into interconnected blocks that form a chain. These blocks contain three main things: the data, the previous hash, and the actual hash of the block (Benzidia, Makaoui, & Subramanian, 2021). A hash is fundamental to validating the information in the system. It is like a password or a digital fingerprint which is unique, unrepeatable, and cannot be modified by any ledger (Babich & Hilary, 2019). The "previous hash" refers to where the data comes from, and the "actual hash" is the fingerprint used to add and validate further blocks in the chain (Benzidia, Makaoui, & Subramanian, 2021).

Blockchain offers several advantages for SMEs, including enhanced security, transparency, and efficiency in operations. It reduces transaction costs by eliminating

intermediaries and provides a reliable system for tracking assets and verifying transactions (Casino, Dasaklis, & Patsakis, 2019). Additionally, blockchain can improve supply chain management, ensuring the traceability and authenticity of products (Kshetri, 2018). For instance, Blockchain can enable faster and more transparent transactions in the finance sector, reducing also fraud (Peters & Panayi, 2016). Since information inside the blockchain is continuously validated, it can enhance the traceability, efficiency and authenticity of products in the supply chain (Kamble, Gunasekaran, & Sharma, 2019). Finally, it can be used in healthcare to efficiently and securely store patient records, ensure patient privacy, reduce administrative costs and prevent data breaches (Dubovitskaya et al., 2017).

However, blockchain presents some drawbacks due to its high complexity, SMEs lack the expertise and resources to manage blockchain systems effectively (Lo et al., 2017). Moreover, Blockchain presents massive initial investments for infrastructures, expertise and maintenance that are difficult for SMEs with limited budgets (Wong et al., 2020). Energy consumption and Electronic Waste are other important points since Blockchain is known for high energy consumption during its reiterative consensus process which can raise environmental and operational concerns, especially for SMEs (Fernando & Saravannan, 2021). Finally, blockchain has not yet been regulated in some countries, therefore SMEs can find difficulties in being compliant across different regions and they can find regulatory challenges that hamper blockchain adoption (Lanzini, Ubacht, & de Greeff, 2021).

Theoretical Foundations	References
Digital technologies have disrupted economies, driving companies to change their organizational processes and operations	(Gilchrist, 2016)
These technologies have boosted productivity by delivering faster, cheaper, and more efficient products or services , streamlined operations, and promoted global connectivity	(Koh et al., 2019); (Pappas et al., 2019); (Belhadi et al., 2022).
Digital tools such as cloud computing, cybersecurity, and advanced analytics (leveraging big data) enhance operational efficiency	(Mahmood et al., 2020)
Digital technologies enable both radical and incremental innovations and assist SMEs in reducing entry barriers and operational costs during internationalization	(He and Wong, 2004); (Bianchi & Mathews, 2016); (Cassetta et al., 2020)
SMEs face resource constraints, skill deficits, and organizational resistance to change due to poor digital and innovative cultures	(Jabbour et al., 2018); (Partanen et al., 2020); (Erol et al., 2016); (Bierwolf, 2017)
SMEs need customized approaches to meet their heterogeneous needs for the adoption of OA	(Cimini et al., 2019)
Implementing workforce upskilling policies and fostering a culture of innovation within the organization is crucial	(Rehman et al., 2014)

Figure 9. Theoretical foundations of digital technologies

2.3 Theoretical Framework

The Theoretical Framework outlines firstly the derivative of the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) model concerning the factors that facilitate the development of new technologies in Small and Medium Enterprises (SMEs), taking into account Technological, Economic, Organisational and Environmental components. Moreover, the focus has moved to how these technologies can help actual operations, refining the processes in use and how impactful they will be in the future, and investigating how digital technologies can revolutionise Organizational Ambidexterity. This framework forms the basis of my analysis to explore how new technologies can enhance the adoption of Organizational Ambidexterity in SMEs.

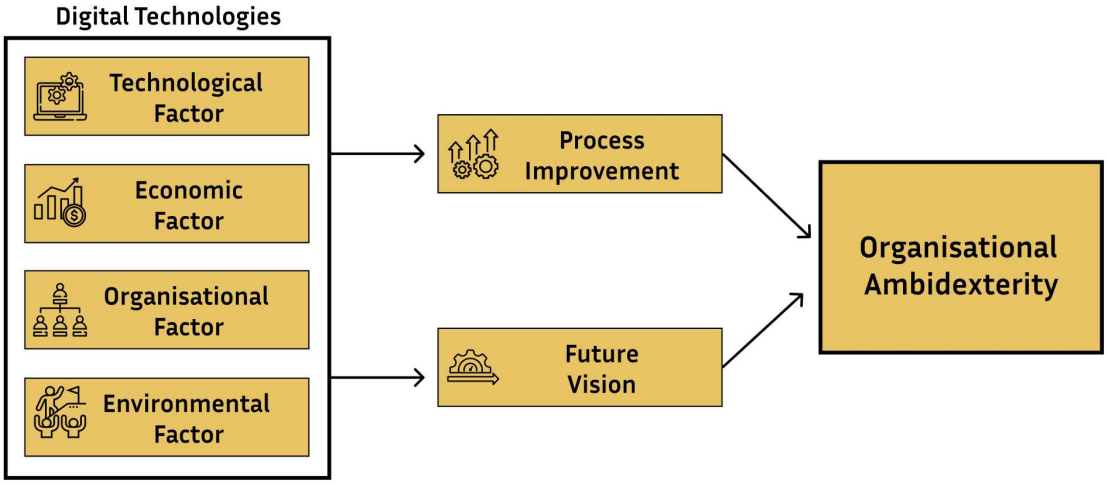

Figure 9. Theoretical Framework

In this thesis, the focus is on understanding how digital factors influence the development of OA in SMEs. The analysis will delve into the role of new digital technologies on impacting technological capacity, leadership and organizational culture on fostering innovation and balancing exploratory and exploitative activities.

3 Methods

3.1 Research Approach

The research methodology used in my thesis is the one explained by Saunders et al. (2016), in which authors suggested the use of the research onion as an instrument to clearly define the different stages to address a research question. The research onion underlines the six main stages. Initially, researchers should choose the research philosophies among positivism, interpretivism, pragmatism, critical realism, and postmodernism. In my dissertation, I use an interpretivism philosophy since I use qualitative research based on the experiences of managers and employees, to assess different methods of approaching and using digital technologies to exploit and explore processes. Interpretivism is particularly used to understand dynamics through the subjective and personal experiences of individuals (Creswell & Poth, 2017).

Moving on, defining the approach that would be followed is crucial. There are two main approaches: Inductive and Deductive. The former involves creating new theories and hypotheses based on observed data while the latter is the opposite, the main objective is to test existing theories through empirical observation (Saunders et al., 2016). In my study, I use an inductive approach since there is a lack of literature about how SMEs use digital technologies to attain Organisational Ambidexterity. In fact, Inductive research is particularly effective in exploratory studies that address emerging trends where existing theories fall short (Bryman, 2012). Finally, exploratory research is particularly advised to contexts in which researhers try to develop new knowledge from empirical observations (Reinhardt, 2023).

Furthermore, many strategies can be used for creating primary data: experiments, surveys, case studies, action research, archival research, and grounded theory ethnography (Saunders et al., 2016). In my thesis, I will use multiple case studies, and interview companies in different sectors to generalize my findings. This framework is particularly suitable for deep investigations around real-life contexts (Yin, 2018). Among various

methods such as multi, mixed, or mono method, I chose to follow a mono-method qualitative analysis, using just semi-structured interviews because best suited the aim of grasping the majority of information from interviewees. In fact, qualitative methods, in particular semi-structured interviews, permit a deeper investigation (Adams et al., 2007). Finally, since I would like to spot the current influence that digital technologies have in supporting exploration and exploitation activities, I chose a cross-sectional time horizon despite a longitudinal horizon. A longitudinal time horizon focuses on collecting data at multiple points over time, allowing researchers to study how a phenomenon evolves or develops. In contrast, a cross-sectional time horizon captures data at a single point in time, providing a snapshot of the phenomenon as it exists in that specific moment.

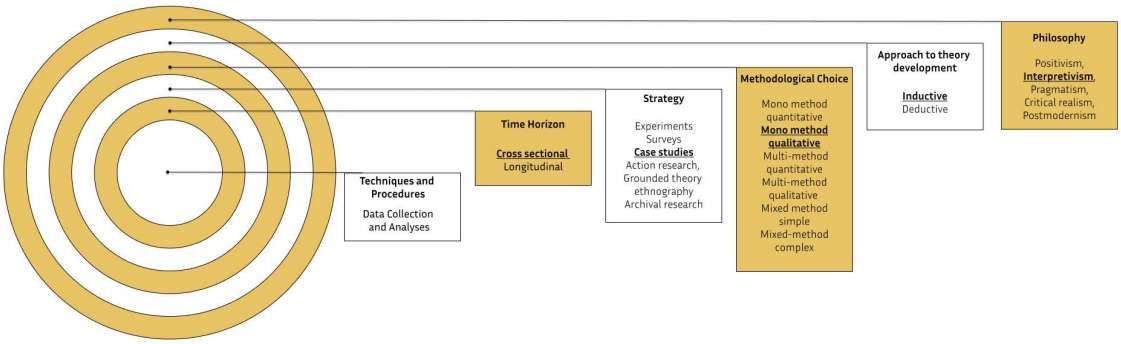

Figure 10. Research Onion Framework (Saunders et al., 2016)

3.2 Sample Firms

In my research, I focused my attention on Italian SMEs, since in Italy 98% of companies have less than 250 employees (Unioncamere, 2023). In 2021, Italian SMEs generated 904 billions of GDP, which is a consistent part considering that the total GDP in 2021 was about 2155 billion (Mengistu & Panizzolo, 2021). Moreover, I found it interesting to understand Italian SMEs better since in recent years they embraced new technologies such as Industry 4.0, IoT devices, AI, and automation (Sauer et al., 2021).

This study had zix case companies in total, ranging from the most traditional sectors to the most innovative ones. Firstly, I interviewed IMEL s.p.a., which is a medium company

with around 58 employees and a 34-million-euro turnover, it is one of the most famous companies in Italy for the creation and implementation of industrial painting systems. Studying how the traditional manufacturing sector has been innovated and how digital technologies are used nowadays has been interesting. Moreover, I interviewed Energetica Group srl, a company of 13 people that put in place strategies for energy production and saving by studying wood biomass, heat pumps, solar thermal and photovoltaic systems, as well as home automation integration and building electrical design. Moreover, Agritech s.r.l. has been interviewed to gain insights about the innovation culture in the agricultural sector since they are implementing digital twins and data analysis in a sector where there are tensions between maintaining traditional practices or adapting to modern agricultural policies and international pressures (Gibson, 2006). Furthermore, I got access to information about Bimar Pharma s.r.l. and Kiratech s.p.a., the former is a small company of five employees that focuses on developing and selling cosmetic products; The study focused the attention to the role of digital technologies in disrupting research and development on new products and on new ways that a small company can find to communicate with the customers while the latter is a technology consulting firm that helps companies approach digital by taking an approach toward cloud computing, in this scenario a Senior Cloud Engineer and Project Manager helped me mapping what companies need to digitalize and which is the approach of a consulting tech company to exploitation and innovation. Finally, I asked the Chief Operation Officer (COO) of Serenis Health s.r.l. to explain to me how an online psychotherapy company focused on providing accessible mental health care through digital platforms can take advantage of new digital technology, and therefore, understand how digital technologies could change the healthcare sector.

3.3 Data Collection

Semi-structured interviews were the main source of information since they address a broad range of biases by allowing flexibility in question design, which enhances the inclusiveness and validity of data collected (McIntosh & Morse, 2015). The length of the interviews ranged from less than one hour to one hour and a half, depending on the

availability of the interviewees. Rather than a classic and fixed interview, semi-structured interviews allowed participants to freely express their point of view, which could be influenced by the sector in which they work and the background each participant has. It is remarkable how an engineer has delved into the various technical aspects of digital technologies while a person with a more managerial and consulting background has instead emphasized the strategic and operational aspects.

In total, the six interviews have been held online through Google Meet. Thanks to this method, I could reach different professionals all over Italy. The participants were interviewed by the author of this dissertation, and participants received the questions in advance. At the beginning of each interview, the author explained the main objectives of the research in order to clarify to the participants the direction of the interview. The first interview took place on the 10th of September 2024 while the last one took place on the 30th October 2024. All the meetings were one-to-one meetings and have been conducted in one language, Italian. Conducting the interviews using the mother tongue of the author has been beneficial for grasping better all the nuances of the interviews.

The framework followed in the semi-structured interviews, which was integral in Appendix 1, was firstly to understand how digital technologies have impacted the companies, how they select the ones to implement, and the strategy behind the implementation. Furthermore, attention has been moved to organizational ambition, investigating first if they were following such a strategy and how impactful digital technologies have been. There are also some case studies and examples that can help understand the strategy. Finally, some final questions about the future of digital technologies in their companies and how they plan to develop dynamic capabilities to stay updated.

3.4 Data Analysis

Conducting research using interviews has been beneficial however, it is much more important to code the primary data retrieved to find patterns and understand better the behaviour of SMEs around digital technologies and Organizational Ambidexterity.

Initially, the interviews were recorded, with the interviewees' permission, and transcribed manually. Transcription software was also used, however, it became apparent that it was not suitable, as it omitted relevant parts of the conversations and oversimplified the content. For this reason, manual transcription of the salient points was opted for although it was a longer and more laborious process. This approach made it possible not only to capture the most important information but also to organize it and link it effectively to the research objectives.

Furthermore, a thematic approach was used to categorise the various responses of participants. Braun and Clarke's (2006) framework guided this analysis, beginning with familiarization with the data by reading the transcriptions and taking brief notes, followed by initial coding of key concepts labelling and grouping codes into meaningful themes, and reviewing and refining these themes. This structured process allowed for an in-depth exploration of recurring patterns, ultimately enriching the findings with well-defined, evidence-based themes and eliminating redundancies.

I organized the evidence collected from the interviews by grouping my notes into macro subcategories aligned with my research questions. This approach allowed me to consolidate the findings from various interviews, capturing multiple perspectives from the companies to ensure a comprehensive and holistic analysis.

3.5 Assessment of Quality of Data

The quality of resources was assessed to ensure two main concepts in research: reliability and validity.

Concerning the former, it can be divided into internal, external and construct validity. Internal validity aims to minimize biases and confound variables (Broniatowski & Tucker, 2017), while external validity ensure the generalizability of findings that should apply to various contexts and sectors in order to enhance the outcomes of study (Lynch, 1983).

Finally, construct validity involves the degree to which the measures used in the study accurately reflects the concepts being investigated (Rubio et al., 2003).

Concerning the latter, realiability ensures consistecy and stability of data across time and context. Reliability can be challenging in management research since findings can be referred and highly influenced to specific context in which companies operate (Denyer, D. et al., 2011), furthermore, subjectivity in both the respondents and the interviewer can be impactful on results and can limit the generalizability of results (Mcdonald, Schoenebeck & Forte, 2019).

In order to avoid these possible threats, the interview process have been standardized, all respondents were contacted by email and all received the same questions. Along with the questions, a document summarising the research question I was conducting and a general overview of what Organisational Ambidexterity is was also included, therefore- the respondents better understood what my objective was and could minimise possible bias. Additionally, generalization of concepts was facilitated by ensuring that each participant represented a different type of company and sector within the SME landscape. In cases where responses were highly specific to a particular sector, the data analysis focused on identifying common patterns that could be applicable across Italian SMEs.

Finally, reliability of the results was supported by ensuring anonymity from the outset of the interviews, even if no company opted to remain anonymous. Each company provided insights specific to its own context, allowing the analysis to identify patterns across different sectors. Additionally, similarities in behavior related to digital technologies were noted, even among companies with distinct approaches in order to reduce subjectivity.

4 Findings

4.1 Adoption and Impact of Digital Technologies

The interviews revealed important takeaways concerning four main dimensions: Technological, Economic, Organisational and Environmental factors. The next paragraphs will dive into these macro groups to precisely indicate how Italian SMEs would decide on which technologies to deploy and how. There would be examples of practices used by interviewed companies to decide which technology to develop and deploy.

4.1.1 Technological Factors

Initially, concerning the technological factors there are needs, especially in the traditional sectors such as agriculture and manufacturing companies to use all the data generated by the machines or available in the crop fields that are not accomplished due to a cultural disdain that the sectors have.

> *“There is an infinite amount of data that those who work in industries do not perceive. Machines create data every second and it is a waste not to use it in order to improve the process minutely. The real problem is not extracting the data but understanding how to organise it and make sense of it.” (Interviewee 1, IMEL spa)*

Even more, the propensity to use new technologies is even less when one considers that many traditional companies have not yet implemented market-standard tools.

> *"There is the problem of not having an Excel where you don't know the costs, you don't know anything, you don't even know what you did maybe not even the year before, and the following year you say, well, I'll do it again, but you don't even know how much better, more efficient, or less efficient." (Interviewee 3, Agrobit srl)*

Moreover, technology adoption is dependent to how is accessible to users without technical expertise. In these sectors usually, employees do not have familiarity with particular

technologies and devices and it is necessary to narrow the distance between man and technology so that innovations are also affordable for everyone.

> *"By photographing crop fields, every farmer can use his mobile phone to get an estimate of the fertilisers and treatments needed and consequently an estimate of the costs to be incurred" (Interviewee 3, Agrobit srl)*

On this concern, even the most technological sectors agree, every solution that would be deployed should be easy to use by the final user. According to most of them is unnecessary deploying the most updated technologies if the potential uselfulness of that technology does not balance the easiness of use.

Furthermore, especially one company raised the interest around digital technology by job contractors since they need to accurately track warehouse materials, develop production plans aligned with orders to optimize resources and enhance efficiency, manage shipments effectively, and maintain traceability of each batch. This enables quick recall or inspection in case of a malfunction, ensuring high standards in quality control and streamlined shipping processes.

> *"There are subcontractors who implement machine interconnection because their customers, usually automotive giants, need them to know: what is in the warehouse, how to create a production plan consistent with the orders received and how to manage shipments so that they can recall a batch in case it has malformations"*

No respondents have any intention of using blockchain, this technology, is considered disruptive and potentially very interesting, but there are many difficulties. First and foremost at the regulatory level, as it is a transnational technology there is still no certainty as to how it can be used and many technologies are not taking it into consideration at the moment.

> *"Could be very useful for information transparency and cybersecurity, but we have no plans for that yet" (Interviewee 4, Kiratech spa).*

"It is still too difficult a technology to apply for a company as small as ours, it could be used for product tracking but we can't be the only ones doing it, there should be a commitment from the whole industry" (Interviewee 5, Bimar Pharma srl).

4.1.2 Economic Factors

Secondly, for most respondents the economic factors are relevant for the deployment of new technologies, most of them argue that technology investment should be compensated with cost savings in the future. Respondents from the most traditional sectors say that the investment in technology is not prioritary therefore it is crucial that bring some important effects in the economics of companies.

"Many companies no longer make ten-year plans, so time-to-market is crucial. It is necessary to bring in solutions that improve their production processes, that are easy and inexpensive to install, and that generate an economic return in the short term, both in terms of increased production and in greater control over resources and reduced waste." (Interviewee 1, IMEL spa)

Digital technology implementations depend on its cost-effectiveness and on its potential for monetization. Digital technologies can directly or indirectly increase revenue or efficiency and those technologies able to do so, are prioritized.

"When choosing the technologies to be implemented, it is natural to think about how they can improve the product we offer on the market; in our case, AI could greatly reduce the bureaucratic burden, thus saving the company money directly, but it can also be used to provide support and assistance even outside 'human' service hours, improving the efficiency of the entire team and thus saving the company money indirectly" (Interviewee 6, Serenis Health srl)

On the other hand, other companies are equally concerned around economic factors and they have already set a proven system for monitoring the efficiency of their technologies to assess how they improve processes and costs. Just one respondent employed KPIs (Key Performace Indicators) for computing the financial outcome of implementing

some technologies, however specific analitycs behind the efficiency of innovation has not being detected in the respondants.

> *"To understand whether there has been process optimisation, we use OEE (Overall Equipment Effectiveness), which is a measure that combines three main parameters: machine performance, availability of raw material and quality of finished products. This indicator tells us both how the automation and the interconnection between machines is working but also makes us able to recognise if a machine is malfunctioning if we see major swings in this indicator" (Interviewee 1, IMEL spa)*

Finally, most technological companies have a flexible budget around the development of new technologies sicne they consider them embedded in their competitive advantage and it if necessary to continuously develop and find new digital technologies that can help streamline and scale the processes.

> *"We have a dedicated new technology team that is committed to deconstructing and understanding how processes can be improved through the use of new digital technologies. This team has a budget that is periodically reviewed based on the results obtained to understand where and how to invest." (Interviewee 6, Serenis srl)*
>
> *"We do not have a fixed budget but every quarter is reviewed since many new technologies pop out every day ad it is important to select not the technologies that are fashionable at the time but those that really need investment and can improve the services we offer to customers" (Interviewee 4, Kiratech spa)*

4.1.3 Organisational Factors

Even if the Leadership and culture factors have not been precisely investigated, respondents explicitly provide important takeaways. Most of them consider it crucial to have a leadership team that is willing to implement new technologies, open to new discoveries, and prone to implementing new solutions.

> *"Our company was created through the meeting of myself, an agronomist and farm manager for over 15 years, and my partner who was a data manager within*

the automotive industry. Our union led to an important knowledge of the sector and a new, more analytical vision that could be applied." (Interviewee 3, Agritech srl)

Some respondents, both from a manufacturing and technological sectors explained how the projectuality around technology development is crucial for deploying new digital solutions.

"In a sector where the propensity to invest in new technologies is low, projectuality is necessary. Set up a well-tested project with an end goal which must remain the same even if the strategy slightly changes. Achieving that goal must be consistent with what the market is demanding, which is why time-to-market is increasingly crucial." (Interviewee 1, IMEL spa)

"Digital technologies implementation must align with the long-term strategic vision of the company, many companies focused on the short-term outcome since many times resources are limited and they pursued rapid results. On the other side, finding a technology that meets and align with the long-term objectives of the company ensures adaptability of the strategy and longstanding commitment" (Interviewee 6, Serenis Health srl)

Moreover, one respondent explained that its company set a mandatory meeting in which tech employees, such as DevOps, Software Engineers and more discuss different technologies that can be useful for their customers.

"We have a fortnightly two-hour appointment where one person per meeting presents a new technology that could be implemented in certain projects. In addition to the technical staff, there is also the Service Director, a sales figure who reviews all contracts and checks if up-selling services can be done by integrating new technologies. Lately these meetings have dealt with integrating AI into companies' internal use through better data management." (Interviewee 4, Kiratech spa)

In addition, another tech company argued that before any specific digital technology is implemented, there has to be a clear use case of it within the organization. This includes developing the necessary competencies and hiring expertise for delivering the strategy effectively. For example, even the organizational structure may have to be changed in order to accommodate the technology being integrated. Lastly, there has to be a need for measurement of the strategy on continuous basis for its impact and evolve it further.

> *"Before developing AI we had to understand how it would be useful to us, find a use case to have a motivation to implement it, and then we got the expertise by hiring a person who had worked and worked in that field. This led to the creation of a Chief Innovation Officer and a change of organisation to improve the visibility and capacity of the CIO." (Interviewee 6, Serenis Health srl)*

Furthermore, two respondents explain how important are the partnerships, since they can help the strategic vision of the company and can enhance technology development.

> *"Once we had the idea of what to do, we looked for a partner who could help us implement the whole software part. The choice fell on a software house that shared our mission and could be complementary to what we were trying to accomplish." (Interviewee 3, Agritech srl)*

In addition to this, partnerships can really help also small and medium companies to be competitive in the market.

> *"We are one of Tesla's 25 global partners for the development of the Tesla Powerwall storage system as the solution for optimising the solar energy produced by the photovoltaic system. We are a company with 11 employees and without this partnership we would not have been able to attract national interests." (Interviewee 2, Energetica srl)*

4.1.4 Environmental Factors

The attention on the technologies deployed by the competitors is crucial, both in high tech sectors and in the traditional ones. The firsts need digital technologies to

differentiate the prodcuts and lock-in competitive and fast-changing markets while the second ones are investing in new digital technologies to remain competitive against less expensive and cheap companies from the East European and Asian market.

> *"We always have our eyes on our competitors to see how they use technologies, which have enormous potential to understand how to use them differently and better. [...] It is necessary to divide technologies that are only used for marketing and those that really improve processes." (Interviewee 4, Kiratech spa)*
>
> *"Our industry is an industry where you don't know what you will make in three years and focusing on new plant production is not feasible as Asian or Eastern European companies can guarantee almost the same product at much lower prices. Customers must choose us because of the differentiation we make compared to our competitors, for example in terms of resource control and process automation that can be done using digital tecnhologies." (Interviewee 1, IMEL spa)*

As an additional proof, if a technology is seen as potentially disruptive or essential for maintaining a competitive edge in the future, it might be prioritized despite current costs.

> *"As far as Artificial Intelligence is concerned, we are not yet sure how it will be implemented, we have ideas of possible implementations but to be up-to-date and competent in a very competitive market like ours, it is necessary to think about the next technology to be developed." (Interviewee 6, Serenis Health srl)*

The same concept about the importance of the help of government was mention by another respondent highlighting how traditional sectors are very sensible concerning the adoption of determinate technologies whether there is tax deduction or Governamental support.

> *"Regarding Industry 4.0, many companies started to innovate their machinery because the state repaid, according to the Piano Nazionale Impresa 4.0, up to 250% of the investment value with tax deductions and direct investments if certain*

targets were met. For some customers it is crucial to meet those requirements to get the Governement aid and it is necessary to be aware of how the law works and how to allow our customers to get those incentives, otherwise, they would never invest." (Interviewee 1, IMEL spa)

During the interviews, environmental sustainability in the context of pollution, renewables, and resource management was not mentioned. However, an interviewee explained that in the energy sector, it is fundamental to match technology to the necessity of meeting energy challenges.

"When considering new technologies to be implemented in our products, we always look at what impact they can have on the environment and what benefits they can bring to the customer, including legislative and fiscal benefits, in terms of tax reductions and state support." (Interviewee 2, Energetica srl)

4.2 Organizational Ambidexterity in Practice

After discussing how companies choose and implement new digital technology, respondents were asked to describe how Organizational Ambidexterity is applied in their company. The focus of this phase was to understand how digital technologies enhance operational processes foster innovation practices and examine the strategic frameworks established to support these advancements.

Firstly, companies showed important examples of projects in which technology helped the companies. For a consulting tech company, Artificial Intelligence (AI) and Cloud Solutions are the main drivers for optimizing processes and helping companies to innovate. Concerning AI, it has been applied to the main internal processes first. Moreover, AI improved also data analysis for creating new services and forecasting possible innovations in the future while ameliorating current processes just by using a Generative Pre-trained Transformer (GPT) platform:

"We use AI to improve our decisions as well, the ability of artificial intelligence is to be able to view thousands of projects and give an indication of what the

solutions to a new challenge might be. Obviously each decision is then made by analysing other factors but AI is able to give a very important overview." (Interviewee 4, Kiratech spa)

" AI is used on a daily basis to review the dozens of emails we send every day, after uploading several emails and 'teaching' the tone of voice used then AI can also be used to automate and speed up many emails while maintaining the same line of communication as those written by me" (Interviewee 5, Bimar Pharma srl)

Concerning the latter, cloud computing has been crucial for enhancing internal processes but also was the main driver to ameliorate customers' platform.

"Internally, we use SharePoint to improve the collaboration and scalability of our projects, but the cloud has been instrumental in particular for our customers. Especially when working with the public sector, we see how file management and security has improved, upgrading current platforms while improving speed and efficiency." (Interviewee 4, Kiratech spa)

Additionally, AI can increase stakeholder value reducing administrative burdens, can balance better internal resources and even if, at the moment, certain AI agents are not cheap they can reduce personnel costs. According to this company, the market must also be ready to embrace that technology.

" Therapists could use AI to keep medical records up-to-date and save time in compiling them, just as it works in some other areas with doctors using AI to write diagnoses. At the moment, however, therapists are not yet ready and do not yet understand the potential of this technology." (Interviewee 6, Serenis Health srl)

One respondent figured out how the analysis of data and the creation of digital twins enhance both existing agricultural processes by monitoring crop health and resource use while innovating.

"Using the smartphones, farmers can recreate digital twins of their crops and better manage the fertilisers needed and the time needed to manage that crop. The

cloud computing is used to manage the data from the photos but the photos themselves are not saved to save space and thus reduce costs." (Interviewee 3, Agrobit srl)

This is an example of Organizational Ambidexterity since integrating smartphone technology to create digital twins is a project that balances innovation, enhancing data accessibility, with the improvement of existing agricultural processes, . This project enhances data accessibility and operational efficiency

Another example of Organizational Ambidexterity can be seen in the decision of update the e-commerce platforms, two respondents argued that the adoption of a specific e-commerce platform leveraged digital technologies.

"Adopting a new ecommerce such as Shopify allowed us to improve current processes, such as analysing leads data, displaying products and adding various payment methods in an easy way. It advanced our innovation because we were ready to use new tools such as SEO tools and social media integrations, which also changed our strategy" (Interviewee 5, Bimar srl)

The main challenges that companies faced in balancing Exploration and Exploitation are first the resource allocations. SMEs are usually resource concerned and it is usually difficult to allocate a solid amount of investment in digital technologies.

"Our industry does not invest much in new technologies without state support, as investments in production are already very high and little R&D budget remains." (Interviewee 1, IMEL spa)

"Innovate is not always feasible even more whether you are still improving existing operations, especially at the beginning is import to exploit existing processes" (Interviewee 3 , Agrobit srl)

Moreover, companies cannot efficiently balance the risk of continuously innovating and exploiting new digital technologies while ensuring that existing processes remain

efficient. Moreover, integrating new technologies in traditional operations is a huge challenge, especially in traditional sectors. This requires overcoming resistance to change, and new digital technologies must be user-friendly.

> *"It cannot be possible to focus on both since I have many employees that are using the same tools since twenty or more years and at the same time I cannot change completely the processes and make them inefficient" (Interviewee 6, Bimar Pharma srl)*

Companies tried to overcome these challenges firstly by allocating a flexible budget that can be augmented if the projects are doing well or vice versa decreased if there is no necessity to keep investing in it. Moreover, prior work before new digital technologies implementation is important like ensuring pilot tests. Finally, every respondent argued that training employees is vital to keep the innovation culture alive and minimize the decrease in productivity when implementing new technologies.

> *"In order to reduce the risk of adopting new technologies, we relied on partnerships with two companies that helped us to develop the technologies in the best possible way by making them easily usable" (Interviewee 3 , Agrobit srl)*

> *"Once we decide to implement a certain technology, we run pilot tests on one single project, even internally, to understand how best to implement it once it is included in customer contracts" (Interviewee 4, Kiratech spa)*

> *"Training courses for employees on how to use drones to capture images of their crops and how to interpret the data the application generates were the first things we introduced because before coming out with a specific App, it was necessary for users to be able to use it, since in agricultural sector there is low interest on digital technologies" (Interviewee 3, Agrobit srl)*

4.3 Future Perspective on Organizational Ambidexterity and Digital Technology

Finally, the respondents deep-dived the near future and the applications of new technologies. Generally, with the presence of new digital technologies, the time horizon for strategising is getting shorter and shorter. They were asked how they think digital technologies will be used in the coming years and how they think they will improve processes and innovation. However, according to the few most technological respondents, it is important to forecast which technologies would be useful in the future to prepare an application that is easy to use by the user.

The majority respondents from companies in the manufacturing sector argue that long term plans are difficult to forecast since many customers consider the time horizon of three or five years as a long-term plan.

> *"Long-term plans are increasingly shaky, many customers do not know what will happen to their company in the next three years, and time-to-market is crucial. Many of our customers have and will have a low investment in new technology and are looking for the lowest investment that will bring them the most benefit." (Interviewee 1, IMEL spa)*

For instance, concerning the AI and Machine Learning, for many respondents AI will continue to be integrated into operations to drive innovation and improve strategic planning. AI will be implemented more and more specifically in processes, according to many we are now in an initial situation where AI is very generalised. In the coming years, artificial intelligence will be implemented much more specifically in certain areas.

> *"The focus in the future is to usefully implement AI in many customer processes. The endeavour is to implement it not only as advertising or for aarketing purposes but to find real applications that can improve customer applications" (Interviewee 4, Kiratech spa)*

" The development of AI and Big Data will be important to further automate and optimize agricultural processes. These technologies are seen as crucial for improving decision-making and operational efficiency" (Interviewee 3, Agrobit srl)

Secondly, cloud computing for many respondents will become crucial for future digital technologies employment. Cloud solutions offer scalability and flexibility, enabling businesses to adapt quickly to changing needs, however, many SMEs are not ready to implement those technologies since there is a digital lack among employees and in the culture of the company.

" I believe that working in the cloud may be the future of the coming years, but it is difficult to implement such solutions in companies where you don't have people who know these dynamics and technologies. In companies like mine, which are small, the people who work there have been here for many years and are used to working in a certain way. For example, I created a Google Drive to share files in neat folders among colleagues and it was already a revolution, before that employees sent each other documents by e-mail or using the company's internal network." Interviewee 5, Bimar Pharma srl)

Moreover, Internet of Things (IoT) devices would become more present in the operations of companies. IoT devices will enable real-time data processing and analytics, improving operational efficiency.

Interconnection among machines will be more and more important in the future as well as the joint use of multiple technologies in the IoT domain. This sector will improve through a deeper analysis of the data it obtains, the implementation in the cloud can improve data delivery, and finally, the use of AI will redefine and improve the uses that these devices can perform in the enterprise.

"We started by introducing small devices that monitored certain data to improve maintenance, then thanks to other devices later on, we were able to implement an application that not only provides maintenance but also an estimate, using historical data, of production costs. In the future, IoT devices will be more and more

powerful, allowing us to use real-time data that is continuously updated and increasingly accurate." (Interviewee 1, IMEL spa)

Finally, cybersecurity information security is extremely pervasive for implementing upcoming technologies. Many companies interviewed were focused on evaluating new technologies to be implemented also based on the security they provide. As new technologies advance, the risks to which companies are exposed also grow. Storing critical documents in the cloud can save time and reduce costs; however, it is essential to ensure data security and establish safeguards so that, even in the event of a cyberattack or cloud failure, the information remains accessible and protected.

"One of our most important projects was to import the data of 1000 Italian municipalities concerning their citizens into the cloud. The first need was to ensure that the information was stored correctly and could not be seen by anyone. Subsequently, we started talking about how we would modify and improve their operations, but first and foremost it was crucial to ensure that this information could not be easily leaked" (Interviewee 4, Kiratech spa)

"We have sensitive patient data and we are a medical centre. Consequently, since we use digital technologies to perform our main activity, it is necessary to ensure that this information remains within the company and indeed can only be seen by medical staff and not by all employees" (Interviewee 6, Serenis srl)

4.4 Summary of the key findings and the revised framework

This research explores how Italian SMEs use digital technologies to enable Organizational Ambidexterity. As a general view, the use of digital technologies and especially the use of data is underutilized, especially in traditional sectors due to cultural resistance and inadequate knowledge of digital technologies. However, some companies are innovating and the seed of innovation, even in the traditional industries, is slowly spreading. Moreover, user accessibility and simplicity are pivotal, both in traditional and most technological sectors respondents think that the distance between technologies and humans

should be narrowed, ensuring that every type of person, regardless of their technical ability, can use any technology. Despite its disruptive potential, blockchain adoption is restricted because of regulatory uncertainties and resource restrictions.

From an economic point of view, investment decisions are usually made considering short-term returns, efficiency, and resource optimization. The implementation of technologies is not always evaluated; when firms employ KPIs, they typically use measurements assessing actual benefits of technological adoption, such as OEE (Overall Equipment Effectiveness). Furthermore, the way they budget investments in technologies varies among sectors, most convenient sectors allocate fewer resources to investing in new technologies while most technological companies use a flexible budget in order to adapt the investment to emerging technologies. Lastly, it is clear that digital technologies that increase revenue or efficiency are the ones that are prioritized to be developed and the economic factors are vital.

Concerning the organizational point of view, technologies flourish where the leadership is open to using them and is willing to implement them strategically. Some respondents raise the importance of partnerships, especially in SMEs, where limited resources can hamper the technology deployment, and therefore is important to find partners to grow together and cooperate for the implementation of some projects. Most technological companies underline the importance of cross-functional and knowledge-sharing meetings in order to promote a culture of innovation and continuous advancement, as well as continuous training of employees. Additionally, sometimes it is necessary to change the company structure in order to improve the aptitude for new technologies and innovation.

Furthermore, talking about environmental factors, companies are always aware of what the competition is doing and act accordingly. Some companies focus on improving the current technologies to outperform the competition. In contrast, others try to find alternative solutions to differentiate themselves from the competition and pursue a strategic

approach of singularity. In the most traditional sectors, Government incentives are fundamental to influence technology adoption, for instance, the tax deduction for Industry 4.0 deployment is one of the biggest drivers for technology deployment. Environmental sustainability remains underexplored, except for the most energetical sectors, it is not one of the main drivers of technology adoption.

Finally, concerning the future deployment of digital technologies, respondents are confident that Artificial Intelligence will become used even more in many fields such as automation and data analysis. AI would become fundamental for ameliorating operational efficiency and innovation, for example, it will enhance long-term planning anticipating situations and challenges of an increasingly dynamic world. The infrastructure behind new technologies will be backed by Cloud Computing allowing companies to scale operations and enabling even the smallest companies to develop cutting-edge technology at an affordable cost. Cloud computing will improve internal and external collaboration improving decision-making. Moreover, IoT devices will be crucial for real-time monitoring, process automation, and data-driven decision-making. Especially in the most traditional sectors, IoT would be a determinant for optimizing maintenance, decreasing downtime, and managing resources effectively. All these technologies present challenges for their deployment as well, firstly the resistance to change of companies and secondly the major investments that some technologies require. Another important challenge is ensuring robust cybersecurity measures to safeguard data infrastructure and sensitive information.

Here, it presents the revised theoretical framework that has been used for understanding how digital technologies would help the deployment of Organizational Ambidexterity. The major findings extrapolated from the interviews have been summarised and included in the revised theoretical framework.

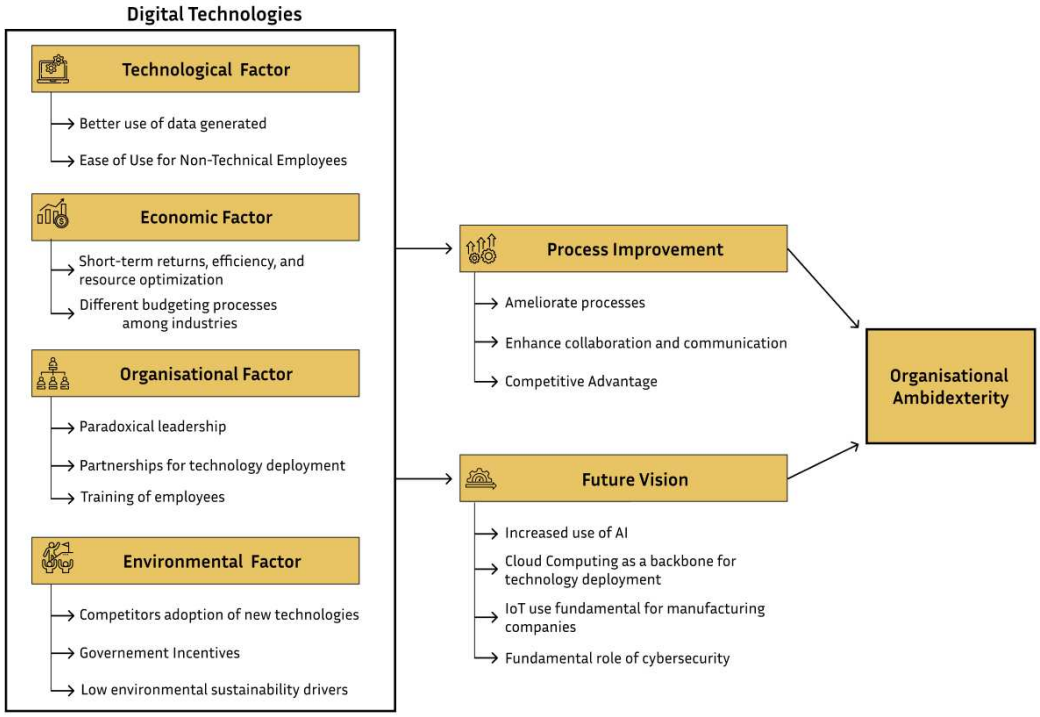

Figure 11. Revised Theoretical Framework

5 Discussion

5.1 Theoretical Implications

Moving to the theoretical implications that this dissertation brought, this study contributes to the literature on organizational ambidexterity (OA) by highlighting the role of digital technologies as both enablers and barriers within the dual-objective framework of balancing exploration and exploitation, particularly in resource-constrained environments like SMEs. It extends the work of Tushman and O'Reilly (1996) by demonstrating that technological tools, such as AI, IoT, and cloud computing, not only enhance operational efficiency but also serve as mediators in resolving the tensions between exploration and exploitation. This mediation capability represents a novel perspective in the discussion of ambidexterity, offering evidence that digital technologies facilitate cyclical and reciprocal ambidexterity strategies in dynamic environments.

One surprising finding of this study is the duality of digital technologies: while they enable ambidexterity by enhancing operational efficiency and fostering innovation, they also act as barriers due to regulatory uncertainties and resource constraints. For example, blockchain, even if disruptive, faces adoption challenges from limited Technological Absorptive Capacity (TAC) and insufficient readiness for Industry 4.0 technologies. This finding builds on the work of Soto-Acosta et al. (2018) and Mahmood et al. (2020), extending their discussions by identifying the critical role of TAC in overcoming cultural resistance and regulatory issues. Furthermore, this study suggests that SMEs can enhance TAC through leadership initiatives, such as training programs and organizational restructuring, in order to mitigate resistance to digital change.

Another finding is the contextual preference for different ambidexterity strategies based on industry constraints and goals. While prior studies, for instance Cantarello et al., 2012; and Kauppila, 2015, have discussed structural and contextual ambidexterity, this study introduces a nuanced perspective by illustrating how SMEs in traditional sectors often rely on cyclical ambidexterity, alternating between exploitation and exploration based

on market conditions. This finding challenges the work of Simsek et al. (2009) by suggesting that SMEs may not strictly adhere to one strategy but instead adopt hybrid approaches tailored to their unique constraints.

Furthermore, leadership emerges as another critical enabler of OA in this study, particularly in SMEs. Leaders who promote a culture of innovation, flexibility, and learning not only drive the adoption of digital technologies but also address resistance to change, aligning with the findings of Mammassis et al. (2019). However, this study advances the literature by showing that leadership's role extends beyond cultural transformation to include fostering technological adaptability and cross-functional collaboration. These findings emphasize the potential of resistance to digital change as an opportunity for leadership to realign organizational processes and achieve ambidexterity.

Lastly, the environmental implications of this study highlight the strategic impact of the technology adoption of competitors, particularly in dynamic and competitive markets. This finding supports the work of Boumgarden et al. (2012) while extending it by showing how government incentives, such as tax deductions and financial aid, influence SMEs' readiness for digital transformation in traditional sectors. Contrary to expectations, the conservation of the natural environment is not a significant driver for adopting new technologies, except in the energy sector. This observation is in contrasts with the broader literature on sustainability in technology adoption, indicating a potential research gap in aligning technological advancements with environmental objectives.

In summary, the findings on organizational ambidexterity add to prior discussions of balancing exploratory and exploitative balance, especially in resource-constrained SMEs, by introducing digital technologies both as enablers and barriers within this double-objective framework. While literature acknowledges existing challenges for ambidexterity, such as resource limitations and resistance to change, the findings position such challenges within the enablement capabilities of digital tools like AI, IoT, and cloud computing in supporting the cyclical and reciprocal approaches to ambidexterity. Interestingly,

the integration of these technologies not only improves operational efficiency but also drives innovation, thus suggesting that technological advancement has acted as a mediator between the conflicting needs of exploration and exploitation (Andrade et al., 2019; Mahmood et al., 2020). In fact, this development of a learning-oriented culture for innovation and process optimization also aligns with the role of leadership in overcoming resistance to digital transformation. The findings present a very important aspect of the hidden potential of resistance to digital change if not dealt with for the true achievement of ambidexterity by SMEs. Therefore, though these findings are exploratory, the study has placed strong emphasis on the roles of leadership and technological adaptability in developing organizational ambidexterity under constraints.

5.2 Managerial Implications

Concerning the managerial implications arising in this study, firstly, managers should align digital technology strategy with long-term objectives. Strategic long-term alignment is essential for ensuring that technology adoption contributes massively to sustainable competitive advantage. In order to do so, before implementing technologies, companies should develop use cases for each specific technology to ensure that each technology can find its place in the company and that the investment is meaningful, as SMEs always deal with resource constraints. Moreover, when developing new digital solutions, SMEs should consider user-friendliness and accessibility as the primary priorities. This would guarantee that every employee, regardless of digital proficiency, can easily utilise that technology.

Furthermore, managers should also establish training programs for upskilling employees and users to reduce resistance to new digital technologies. This approach would be so helpful to guarantee a culture of continuous learning in the companies. Another responsibility in implementing new digital solutions companies should ensure also cybersecurity protocols and invest in cybersecurity measures to mitigate the risk of leakage of sensitive data and cyber-attacks. Finally, talking about the economics behind technology implementation, a tool is implemented if it demonstrates clear cost-effectiveness while

maintaining flexibility in budgets. Few companies use KPIs for tracking innovation and technology deployment, the ones that use this approach focus on evaluating the financial and operational impact of new technologies to understand whether the technology deployment is worth it. Additionally, especially in traditional sectors, companies should consider Government incentives for technological advancement support, the awareness of policy support can influence technology adoption and reduce financial barriers, especially for manufacturing companies.

Moving to the Organizational Ambidexterity and, therefore, the balance between exploration and exploitation activities, companies should decide first the approach to balance current operations and innovations; there is no correct approach for doing so. However, each company should find the correct process for itself to ensure the realisation of organisational ambidexterity. This requires developing dedicated innovation teams or a flexible organisational structure to ensure that digital technologies can simultaneously streamline current operations and pursue innovation, creating a self-reinforcing result for both short-term and long-term objectives. Organisational Ambidexterity is fundamental in dynamic and highly competitive markets since it helps companies continuously monitor competitors' technology activity and advancements, identifying opportunities for differentiation. Leadership can be pivotal in fostering Organisational Ambidexterity in two main ways: by encouraging experimentation inside the company, allocating a flexible budget for technology deployment, especially in the most traditional sectors, and at the same time by leveraging partnerships to access external expertise while saving resources. This ensures the maintenance of a balance between exploration and exploitation activities. On this concern, pilot testing is fundamental, companies should ameliorate and streamline operations to ensure iterative and adaptive implementation of digital technologies. The continuous interplay between technology implementations and feedback loops can enhance the potentiality of the solution deployed, mitigating also the risk of overinvesting or misaligned solutions.

5.3 Limitations

Although this study tried to provide a holistic approach to how Italian SMEs use digital technologies to develop Organisational Ambidexterity, there are, however, limitations. Firstly, the data has been collected from a limited number of Italian SMEs; the unique cultural, economic, and organisational factors influencing Italian SMEs might not fully reflect the dynamics of digital technologies in different contexts. Moreover, the study employs a cross-sectional data collection approach. This method could limit the assessment of the long-term impact of digital technologies on OA since some technologies are in their infancy and could evolve rapidly, especially in dynamic markets. Finally, this approach could be influenced by environmental and cultural aspects that have not been investigated, as the study focused more on technological, economic, and organizational factors.

Moreover, despite the study's being as objective as possible, researcher and respondent bias could be present. The responses can be influenced by interviewees' roles, experience and familiarity with digital technologies as well as the researcher's interpretations and experience. Furthermore, the findings may be influenced by specific market conditions at the time of interviews, since these digital technologies would develop at a rapid pace, the same analysis could be different whether performed in the near future. Finally, some respondents are not not all implementing the same technologies and the reluctance to implement some technologies may have influenced the results obtained.

5.4 Suggestions for future research

This study focuses on the actual state of the use of digital technologies for achieving Organizational Ambidexterity in Italian SMEs. However, there are plenty of possibilities to extend this research. Firstly, future research can focus on the international context and dive into different cultural and economic contexts, this would generalize the findings and enrich the research among digital technologies and OA. Future research can focus

on other European countries or even understand the differences between continents since the approaches to OA can be very different depending on the culture of the companies and the management involved. Secondly, this study provides a cross-sectional study of OA and digital technologies, a longitudinal study which tracks the evolution of the use of digital technologies for achieving OA would be beneficial for investigating the long-term effects of emerging technologies and the approaches taken into account by different companies. Furthermore, a longitudinal approach can depict also the rapid evolution of digital technologies and can evaluate their real impact on operations and the integration for ameliorating exploration and exploitation.

Thirdly, this research touched on the organisational part but there are still many things to investigate. For example, it would be useful to go deeper into the types of leadership that can help OA. In the process of investigation, this research focused mainly on middle and senior management. Future research will also have to focus on capturing views among employees in order to more adequately understand their perceptions of innovation, digital technology integration, and the general process of OA. This would serve to highlight the potential gaps in communication, skill development, and cultural alignment, thus providing a more holistic view of how OA is fostered at all levels of the organization. Moreover, this study highlights the absence of blockchain in this study although the potentiality would be massive. Understanding the main barriers to blockchain implementation and its potential for developing OA would be interesting. At the same time, since cybersecurity will remain fundamental for the further development of digital technologies, it would be beneficial to understand its development and relations with OA. Furthermore, as stated before, this study focused on Italian SMEs. For achieving a comprehensive view of digital technologies and OA future research could compare SMEs to large organisations in order to understand the strategic, organizational, and environmental differences that can influence the application of digital technologies that foster OA. Finally, since environmental sustainability was underexplored in this study, future research can investigate how digital technologies can affect OA and environmental sustainability encouraging long-term investments.

References

Adams, J., Khan, H. T. A., Raeside, R., & White, D. (2007). *Research Methods for Graduate Business and Social Science Students*. Response Books.

Agostino, A., Søilen, K. S., & Gerritsen, B. (2013). Cloud solution in business intelligence for SMEs - vendor and customer perspectives. *Journal of Intelligence Studies in Business*, 3(3), 5-28.

Ahmad, A. & Ingle, S. (2011). Relationships matter Case study of a university campus incubator. International Journal of Entrepreneurial Behaviour and Research 17(6) 626-644. http://dx.doi.org/10.1108/13552551111174701

Al-Bashayreh, M., Almajali, D., Altamimi, A., Masa'deh, R. E., & Al-Okaily, M. (2022). An empirical investigation of reasons influencing student acceptance and rejection of mobile learning apps usage. *Sustainability*, 14, 4325.

Al-Khatib, A. W. (2023). Drivers of generative artificial intelligence to fostering exploitative and exploratory innovation: A TOE framework. *Technology in Society*, 75(2023), 102403. https://doi.org/10.1016/j.techsoc.2023.102403

Alimohammadlou, M., & Alinejad, S. (2023). Challenges of blockchain implementation in SMEs' supply chains: An integrated IT2F-BWM and IT2F-DEMATEL method. *Electronic Commerce Research*. https://doi.org/10.1007/s10660-023-09696-3

Alkhater, N., Walters, R., & Wills, G. (2018). An empirical study of factors influencing cloud adoption among private sector organisations. *Telematics and Informatics*, 35(1), 38-54.

Alkhater, N., Walters, R., & Wills, G. (2018). An empirical study of factors influencing cloud adoption among private sector organisations. *Telematics and Informatics*, 35(1), 38-54.

Alsmadi, A., Alfityani, A., Alhwamdeh, L., Al_hazimeh, A., & Al-Gasawneh, J. (2022). Intentions to use FinTech in the Jordanian banking industry. *International Journal of Data and Network Science*, 6, 1351-1358

Alwahaishi, S., & Snášel, V. (2013). Modeling the determinants affecting consumers' acceptance and use of information and communications technology. International *Journal of E-Adoption*, 5(2), 25–39. https://doi.org/10.4018/jea.2013040103

Amjad, A., & Nor, K. (2020). A Bibliometric Analysis of Two Decades of Global Research on Organizational Ambidexterity using the Scopus Database. *International*

Journal of Engineering and Advanced Technology (2020) 9(4) 385-390. http://dx.doi.org/10.35940/ijeat.D6728.049420

Andrade, J., Franco, M., & Mendes, L. (2021). Technological capacity and organisational ambidexterity: The moderating role of environmental dynamism on Portuguese technological SMEs. *Review of Managerial Science*, 15(2111–2136). https://doi.org/10.1007/s11846-020-00416-x

Andrade, V., Filho, R. L., Tavares, M. S., & Lucena, M. M. (2019). The impact of market dynamism on the relationship between strategic flexibility and performance: Evidence from Brazil. *Journal of Business Research*, 101, 278-286.

Andriopoulos, C., & Lewis, M. W. (2009). Exploitation-exploration tensions and organizational ambidexterity: Managing paradoxes of innovation. *Organization Science*, 20(4), 696-717.

Annamalah, S., Paraman, P., Ahmed, S., Pertheban, T., Marimuthu, A., Venkatachalam, K., & Tran, K. (2023). Exploitation, exploration and ambidextrous strategies of SMEs in accelerating organisational effectiveness. Journal of Global Operations and Strategic Sourcing. http://dx.doi.org/10.1108/JGOSS-08-2022-0090

Ardito, L., Petruzzelli, A. M., Panniello, U., & Garavelli, A. C. (2021). Unveiling the performance effects of ambidextrous knowledge sharing and strategic flexibility in the public sector: Evidence from the Italian local governments. *Public Management Review*, 23(2), 184-206.

Asghari, S., & Navimipour, N. J. (2018). Nature inspired meta-heuristic algorithms for solving the service composition problem in cloud environments. *International Journal of Communication Systems*, 31(12).

Aydogan, M. (2021). A comprehensive guide to machine learning paradigms: From supervised to unsupervised learning. Medium. Retrieved from https://mustafa-aydogan.medium.com/a-comprehensive-guide-to-machine-learning-paradigms-from-supervised-to-unsupervised-learning-ee239c60d503

Babich, V., & Hilary, G. (2019). Distributed ledgers and operations: What operations management researchers should know about blockchain technology. Manufacturing & Service Operations Management, 21(1), 209-222. https://doi.org/10.1287/msom.2018.0733

Bany Mohammad, A., Al-Okaily, M., Al-Majali, M., & Masa'deh, R. (2022). Business intelligence and analytics (BIA) usage in the banking industry sector: An application of the TOE framework. *Journal of Open Innovation: Technology, Market, and Complexity,* 8(189). https://doi.org/10.3390/joitmc8040189

Bao, Y., et al. (2013). Exploring gender differences on general and specific computer self-efficacy in mobile learning adoption. *Journal of Educational Computing Research*, 49(1), 111-132.

Beck, R., Avital, M., Rossi, M., & Thatcher, J. (2017). Blockchain Technology in Business and Information Systems Research. Business & Information Systems Engineering, 59(5), 381-384. 10.1007/s12599-017-0505-1

Belgaum, M. R., Alansari, Z., Musa, S., Alam, M. M., & Mazliham, M. S. (2021). Role of artificial intelligence in cloud computing, IoT and SDN: Reliability and scalability issues. *International Journal of Electrical and Computer Engineering*, 11(5), 4458-4470.

Benzidia, S., Makaoui, N., & Subramanian, N. (2021). Impact of ambidexterity of blockchain technology and social factors on new product development: A supply chain and Industry 4.0 perspective. Technological Forecasting & Social Change, 169, 120819. https://doi.org/10.1016/j.techfore.2021.120819

Benzidia, S., Makaoui, N., & Subramanian, N. (2021). Impact of ambidexterity of blockchain technology and social factors on new product development: A supply chain and Industry 4.0 perspective. Technological Forecasting and Social Change 169. DOI: 10.1016/j.techfore.2021.120819

Bharadwaj, A. (2000). A resource-based perspective on information technology capability and firm performance: An empirical investigation. MIS Quarterly: Management Information Systems 24(1) 169-193. https://doi.org/10.2307/3250983

Bierwolf, R. (2017). Towards project management 2030: Why is change needed? *IEEE Engineering Management Review*, 45(1), 21-26.

Birkinshaw, J., & Gupta, K. (2013). Clarifying the distinctive contributions of ambidexterity to the field of organization studies. Academy of Management Perspectives, 27(4), 287-298.

Boden, M. A. (2006). *Mind as machine: A history of cognitive science*. Oxford University Press.

Bøllingtoft A. and Ulhøi, J. (2005). The networked business incubator - Leveraging entrepreneurial agency?. Journal of Business Venturing 20(2) 265-290. http://dx.doi.org/10.1016/j.jbusvent.2003.12.005

Bornstein, M., Casado, M., & Li, J. (2020, October 15). Emerging architectures for modern data infrastructure: 2020. Andreessen Horowitz. https://a16z.com/emerging-architectures-for-modern-data-infrastructure-2020/

Botta, A., Donato, W., Persico, V., & Pescapé, A. (2016). Integration of Cloud computing and Internet of Things: A survey. *Future Generation Computer Systems*, 56, 684–700. http://dx.doi.org/10.1016/j.future.2015.09.021

Boumgarden, P., Nickerson, J., & Zenger, T. R. (2012). Sailing into the wind: Exploring the relationships among ambidexterity, vacillation, and organizational performance. *Strategic Management Journal*, 33(6), 587-610.

Broniatowski, D., & Tucker, C. (2017). Assessing causal claims about complex engineered systems with quantitative data: internal, external, and construct validity. *Systems Engineering*, 20, 483 - 496. https://doi.org/10.1002/sys.21414.

Bryan, J. D., & Zuva, T. (2021). A review on TAM and TOE framework progression and how these models integrate. *Advances in Science, Technology and Engineering Systems Journal*, 6(3), 137-145.

Bryan, J. D., & Zuva, T. (2021). A review on TAM and TOE framework progression and how these models integrate. *Advances in Science, Technology and Engineering Systems Journal*, 6(3), 137-145.

Bryman, A. (2012). *Social research methods* (4th ed.). Oxford University Press.

Campbell, J. L., Quincy, C., Osserman, J., & Pedersen, O. K. (2013). Coding in-depth semistructured interviews: Problems of unitization and intercoder reliability and agreement. *Sociological Methods & Research, 42*(3), 294-320. https://doi.org/10.1177/0049124113500475

Cant, M. C., & Wiid, J. A. (2016). Internet-based ICT usage by South African SMEs: The barriers faced by SMEs. *Journal of Applied Business Research*, 32(6), 1877–1887. https://doi.org/10.19030/jabr.v32i6.9889

Cantarello, S., Martini, A., & Nosella, A. (2012). A multi-level model for organizational ambidexterity in the search phase of the innovation process. *Creativity and Innovation Management*, 21(1), 28-48.

Caputo, F., M. D. Giudice, F. Evangelista, & G. Russo. (2016). Corporate Disclosure and Intellectual Capital: The Light Side of Information Asymmetry. International Journal of Managerial and Financial Accounting 8 (1): 75–96. http://dx.doi.org/10.1504/IJMFA.2016.076668

Casino, F., Dasaklis, T. K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues. Telematics and Informatics, 36, 55-81.

Chakravarty, A., Grewal, R. & Sambamurthy, V. (2013) Information Technology Competencies, Organizational Agility, and Firm Performance: Enabling and Facilitating Roles. Information Systems Research, 24, 976-997. https://doi.org/10.1287/isre.2013.0500

Chang, Y., Wong, S., Eze, U., & Lee, H. (2019). The effect of IT ambidexterity and cloud computing absorptive capacity on competitive advantage. *Ind. Manag. Data Syst.*, 119, 613-638. https://doi.org/10.1108/IMDS-05-2018-0196.

Chen, Y., Tang, G., Jin, J., Li, J., & Paillé, P. (2018). Linking market orientation and environmental performance: The influence of environmental strategy, employee's environmental involvement, and environmental product quality. *Business Strategy and the Environment*, 27(7), 1097-1109.

Cimini, C., Boffelli, A., Lagorio, A., Kalchschmidt, M., & Pinto, R. (2021). How do Industry 4.0 technologies influence organisational change? An empirical analysis of Italian SMEs. *Journal of Manufacturing Technology Management*, 32(3), 695-721. https://doi.org/10.1108/JMTM-04-2019-0135 .

Coombs, C., Hislop, D., Barnard, S., & Ellison, I. (2016). The impact of the internet of things on mobile workers. *4th International Workshop on the Changing Nature of Work (CNoW)*, Dublin, Ireland, 11 December 2016. Retrieved from https://dspace.lboro.ac.uk/2134/23702

Creswell, J. W., & Poth, C. N. (2017). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Thousand Oaks, CA: SAGE Publications.

Davenport, T. H. (2006). Competing on analytics. *Harvard Business Review*, February 2006. Retrieved from https://www.hbrreprints.org

Davis, F.D., Bagozzi, R.P. & Warshaw, P.R. (1989) User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. Management Science, 35, 982-1003. http://dx.doi.org/10.1287/mnsc.35.8.982

Denyer, D., Kutsch, E., Lee-Kelley, E., & Hall, M. (2011). Exploring reliability in information systems programmes. *International Journal of Project Management*, 29, 442-454. https://doi.org/10.1016/J.IJPROMAN.2011.02.002.

Di Bella, L., Katsinis, A., Lagüera-González, J., Odenthal, L., Hell, M., Lozar, B. (2023). Annual Report on European SMEs 2022/2023. Publications Office of the European Union. DOI: 10.2760/028705.

Doherty, E., Carcary, M., & Conway, G. (2015). Migrating to the cloud. *Journal of Small Business and Enterprise Development*, 22(3), 512-527.

Duan, Y., Edwards, J., & Dwivedi, Y. (2019). Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda. *International Journal of Information Management*, 48, 63-71. https://doi.org/10.1016/j.ijinfomgt.2019.01.021

Dubovitskaya, A., Xu, Z., Ryu, S., Schumacher, M., & Wang, F. (2017). Secure and trustable electronic medical records sharing using blockchain. AMIA Annual Symposium Proceedings, 2017, 650-659.

Dwivedi, Y. K., et al. (2015). Research on information systems failures and successes: Status update and future directions. *Information Systems Frontiers*, 17(1), 143-157.

Dwivedi, Y. K., et al. (2017). An empirical validation of a unified model of electronic government adoption (UMEGA). *Government Information Quarterly*, 34(2), 211-230.

Ebersold, K., & Glass, R. (2015). The impact of disruptive technology: the Internet of Things. *Issues in Information Systems*, 16(IV), 194-201.

Erol, S., Jäger, A., Hold, P., Ott, K., & Sihn, W. (2016). Tangible Industry 4.0: A scenario-based approach to learning for the future of production. Procedia CIRP, 54, 13-18. Elsevier B.V.

Fernando, Y., & Saravannan, R. (2021). Blockchain Technology: Energy Efficiency and Ethical Compliance. Journal of Governance and Integrity.

Fu, N., Ma, Q., Bosak, J & Flood, P. (2016). Intellectual capital and organizational ambidexterity in Chinese and Irish professional service firms. Journal of Organizational Effectiveness 3(2) 94-114. http://dx.doi.org/10.1108/JOEPP-03-2016-0021

Gangwar, H., Date, H., & Ramaswamy, R. (2015). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. *Journal of Enterprise Information Management*, 28(1), 107-130.

Gianzina-Kassotaki, O. (2017). Ambidexterity in organizations: An overview of literature and challenges for future research. *International Journal of Business and Management*, 12(3), 1-14.

Gianzina-Kassotaki, O. (2017). Ambidexterity in organizations: An overview of literature and challenges for future research. *International Journal of Business and Management*, 12(3), 1-14.

Gianzina-Kassotaki, O. (2017). Leadership and ambidexterity: A multilevel analysis of the aerospace and defense organizations. [Dissertation]. Warwick Business School. http://wrap.warwick. ac.uk/95904/1/WRAP_Theses_Gianzina-Kassotaki_2017.pdf

Gibson, C. B., & Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of Management Journal*, 47(2), 209-226.

Gibson, J. (2006). Markets in Tradition - Traditional Agricultural Communities in Italy and the Impact of GMOs. *Scriptorium*, 3, 243-252. https://doi.org/10.2966/SCRIP.030306.243.

Gilchrist, A. (2016), Industry 4.0: The Industrial Internet of Things, *Apress*, Berkeley, CA, doi: 10.1007/978-1-4842-2047-4.

Gotadki, S., Mohan, R., Attarwala, M., & Gajare, M. P. (2014). Intelligent ambulance. *International Journal of Engineering and Technical Research*, 2(4). ISSN: 2321-0869.

Haffar, M., Al-Karaghouli, W., & Ghoneim, A. (2020). BDA, drivers, and barriers in SMEs. Journal of Enterprise Information Management, 33(1), 19-37. https://doi.org/10.1108/JEIM-03-2019-0074

Halevi, G., Carmeli, A., & Brueller, N. N. (2015). Ambidexterity in SBUs: TMT behavioral integration and environmental dynamism. *Human Resource Management*, 54(S1), s223-s238.

Hanifah, H.,Abdul Halim, H., Ahmad, N., & Vafaei-Zadeh, A. (2019). Emanating the key factors of innovation performance: leveraging on the innovation culture among SMEs in Malaysia. Journal of Asia Business Studies, 559-587, 13(4). http://dx.doi.org/10.1108/JABS-04-2018-0130

He, Z. L., & Wong, P. K. (2004). Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organization Science*, 15(4), 481-494.

Heder, M. (2017, September). From NASA to EU: The evolution of the TRL scale in public sector innovation. *The Innovation Journal*, 22, 1–23. Archived from the original on October 11, 2017.

Hitt, M.A., Bierman, L., Shimizu, K. & Kochhar, R. (2001). Direct and moderating effects of human capital on strategy and performance in professional service firms: a resource-based perspective. *Academic Management Journal* 44 (1), 13–28.

Hoque, R., & Sorwar, G. (2017). Understanding factors influencing the adoption of mHealth by the elderly: An extension of the UTAUT model. *International Journal of Medical Informatics*, 101, 75-84.

Hossain, M., Sultana, S., & Ghosh, R. (2023). The role of paradoxical leadership in enhancing the strategic flexibility of SMEs: Insights from the IT sector. *Journal of Business Research*, 137, 439-450.

Hsu, P. F., Ray, S., & Li-Hsieh, Y. Y. (2014). Examining cloud computing adoption intention, pricing mechanism, and deployment model. *International Journal of Information Management*, 34(4), 474-488.

Huang, J., & Kim, H. (2013). Enhancing organizational ambidexterity through human resource management practices: A social exchange perspective. *Organization Science*, 24(6), 1704-1720.

Huges, M., Huges, P., Morgan, R., Hodgkinson, I., & Lee, Y. (2021). Strategic entrepreneurship behaviour and the innovation ambidexterity of young technology-based firms in incubators. International Small Business Journal: Researching Entrepreneurship (2021) 39(3) 202-227. https://doi.org/10.1177/0266242620943776

Jaafreh, A. B. (2018). The effect factors in the adoption of Internet of Things (IoT) technology in the SME in KSA: An empirical study. *International Review of Management and Business Research*, 7(1), 135-148.

Jamshidi, M., Lalbakhsh, A., Talla, J., Peroutka, Z., Hadjilooei, F., Lalbakhsh, P., Jamshidi, M., La Spada, L., Mirmozafari, M., Dehghani, M., et al. (2020). Artificial intelligence and COVID-19: Deep learning approaches for diagnosis and treatment. *IEEE Access*, 8, 109581-109595.

Jansen, J. J., Tempelaar, M. P., Van den Bosch, F. A., & Volberda, H. W. (2008). Structural differentiation and ambidexterity: The mediating role of integration mechanisms. *Organization Science*, 20(4), 797-811.

Jansen, J. J., Van Den Bosch, F. A., & Volberda, H. W. (2005). Managing potential and realized absorptive capacity: How do organizational antecedents matter? *Academy of Management Journal*, 48(6), 999-1015.

Jasmontaitė-Zaniewicz, L., Calvi, A., Nagy, R., & Barnard-Wills, D. (Eds.). (2021). The GDPR made simple(r) for SMEs. VUBPRESS. https://doi.org/10.46944/9789461171092

Jede, A., & Teuteberg, F. (2015). Integrating cloud computing in supply chain processes. *Journal of Enterprise Information Management*, 28(6), 872–904.

Junni, P., Sarala, R. M., Tarba, S. Y., & Weber, Y. (2013). The role of human resources and organizational culture in ambidexterity performance outcomes: A meta-analysis. *Human Resource Management*, 52(5), 747-772.

Jurksiene, L., & Pundziene, A. (2016). The relationship between dynamic capabilities and firm competitive advantage: The mediating role of organizational ambidexterity. European Business Review 28(4) 431-448. https://doi.org/10.1108/EBR-09-2015-0088

Justy, T., Pellegrin-Boucher, E., Lescop, D., Granata, J., & Gupta, S. (2023). On the edge of Big Data: Drivers and barriers to data analytics adoption in SMEs. Technovation, 127. https://doi.org/10.1016/j.technovation.2023.102850

Kamble, S. S., Gunasekaran, A., & Sharma, R. (2019). Modeling the blockchain enabled traceability in agriculture supply chain. International Journal of Information Management, 52, 101967.

Kassotaki, O. (2019). Explaining ambidextrous leadership in the aerospace and defense organizations. *European Management Journal*, 37(2019), 552-563. https://doi.org/10.1016/j.emj.2019.04.001

Kassotaki, O. (2022). Review of Organizational Ambidexterity Research. SAGE Open 12(1). https://doi.org/10.1177/21582440221082127

Katou, A. A., Budhwar, P., & Patel, C. (2021). Examining the roles of middle managers in promoting the implementation of high-performance work systems in subsidiaries of multinational corporations. *International Journal of Human Resource Management*, 32(2), 341-369.

Kauppila, O. P. (2015). Alliance management capability and firm performance: Using resource-based theory to look inside the process black box. *Long Range Planning*, 48(3), 151-167.

Khayer, A., Talukder, M. S., Bao, Y., & Hossain, M. N. (2020). Cloud computing adoption and its impact on SMEs' performance for cloud supported operations: A dual-stage analytical approach. *Technology in Society*, 60, 101225. https://doi.org/10.1016/j.techsoc.2019.101225

Klonek, F. E., Gerpott, F. H., & Parker, S. K. (2022). Paradoxical leadership: How leaders can manage tensions between exploration and exploitation. *Journal of Management*, 48(4), 1147-1175.

Koh, L., Orzes, G. & Jia, F. (2019). The fourth industrial revolution (industry 4.0): technologies disruption on operations and supply chain management. *International Journal of Operations & Production Management*. 39. pp. 817-828.

Kostopoulos, K. C., & Bozionelos, N. (2011). Team exploratory and exploitative learning: Psychological safety, task conflict, and team performance. Group & Organization Management, 36(3). https://doi.org/10.1177/105960111140

Kouhizadeh, M., & Sarkis, J. (2018). Blockchain practices, potentials, and perspectives in greening supply chains. Sustainability, 10(10), 3652. https://doi.org/10.3390/su10103652

Kshetri, N. (2018). 1 Blockchain's roles in meeting key supply chain management objectives. International Journal of Information Management, 39, 80-89.

Kumar, D., Samalia, H. V., & Verma, P. (2017). Exploring suitability of cloud computing for small and medium-sized enterprises in India. *Journal of Small Business and Enterprise Development*, 24(4), 814-832.

Laney D (2001) 3D data management: Controlling data volume, velocity and variety. In: Meta Group. Available at: http://blogs.gartner.com/doug-laney/files/2012/01/ad949-3D-Data-Management-Controlling-Data-VolumeVelocity-and-Variety.pdf (retrieved 18th March 2024).

Lanzini, F., Ubacht, J., & de Greeff, J. (2021). Blockchain adoption factors for SMEs in supply chain management. Journal of Supply Chain Management Science.

Lavie, D., Kang, J., & Rosenkopf, L. (2011). Balance within and across domains: The performance implications of exploration and exploitation in alliances. *Organization Science*, 22(6), 1517-1538.

Lee, O., Sambamurthy, V., Lim, K., & Wei, K. (2015). How Does IT Ambidexterity Impact Organizational Agility?. *Inf. Syst. Res.*, 26, 398-417. https://doi.org/10.1287/isre.2015.0577.

Lin, Y., & Ho, J. L. Y. (2016). Institutional pressures and environmental performance in the global automotive supply chain: The mediating role of corporate environmental ethics, culture, and governance. *Journal of Business Ethics*, 138(2), 407-421.

Lo, S. K., Xu, X., Chiam, Y. K., & Lu, Q. (2017). Evaluating Suitability of Applying Blockchain. 2017 22nd International Conference on Engineering of Complex Computer Systems (ICECCS), 158-161

Low, C. Y., Chen, Y. H., & Wu, M. C. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*, 111(7), 1006-1023.

Luo, B., Zheng, S., Ji, H., & Liang, L. (2018). Ambidextrous leadership and TMT-member ambidextrous behavior: The role of TMT behavioral integration and TMT risk propensity. *The International Journal of Human Resource Management*, 29(2), 338–359.

Lynch, J. (1983). The Role of External Validity in Theoretical Research. *Journal of Consumer Research*, 10, 109-111. https://doi.org/10.1086/208949.

Mahmood, A., Al Mamun, A., Ahmad, G. B., & Uddin, M. N. (2020). Technology adoption and diffusion in SMEs: Impact of Digital Transformation. *Journal of Technology Management & Innovation*, 15(2), 45-56.

Mahmood, T., & Mubarik, M. S. (2020). Balancing innovation and exploitation in the fourth industrial revolution: Role of intellectual capital and technology absorptive capacity. *Technological Forecasting and Social Change*, 160, 120248. https://doi.org/10.1016/j.techfore.2020.120248 .

Mammassis, C., & Kostopoulos, K. (2019). CEO goal orientations, environmental dynamism and organizational ambidexterity: The mediating role of middle managers. *European Management Journal*, 37(5), 593-603.

Maqueira-Marín, J. M., Bruque-Camara, S., & Minguela-Rata, B. (2017). Environment determinants in business adoption of Cloud Computing. *Industrial Management & Data Systems*, 117(1), 228-246.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1), 71–87.

Marian, M., & Hamburg, I. (2013). Co-operative e-learning approach based on cloud computing. In *Proceedings of the IASTED International Conference on Web-based Education* (pp. 838-843). Innsbruck, Austria, February 13-15, 2013.

Mathew, P. S., Pillai, A. S., & Palade, V. (2018). Applications of IoT in healthcare. In A. Sangaiah, A. Thangavelu, & V. Meenakshi Sundaram (Eds.), *Cognitive Computing for Big Data Systems Over IoT*. Springer, Cham. https://doi.org/10.1007/978-3-319-70688-7_11

Mcdonald, N., Schoenebeck, S., & Forte, A. (2019). Reliability and Inter-rater Reliability in Qualitative Research. *Proceedings of the ACM on Human-Computer Interaction*, 3, 1 - 23. https://doi.org/10.1145/3359174.

McIntosh, M. J., & Morse, J. (2015). Situating and constructing diversity in semi-structured interviews. *Global Qualitative Nursing Research, 2*(1), 1-12. https://doi.org/10.1177/2333393615597674

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing. National Institute of Standards and Technology, 145(6), 1-3. https://doi.org/10.6028/NIST.SP.800-145

Mengistu, A. T., & Panizzolo, R. (2021). Indicators and framework for measuring industrial sustainability in Italian footwear small and medium enterprises. *Sustainability, 13*(10), 5472. https://doi.org/10.3390/su13105472

Mikalef, P., & Gupta, M. (2021). Artificial intelligence capability: Conceptualization, measurement calibration, and empirical study on its impact on organizational Creativity and firm performance. *Information & Management*, 58(3), 1–20. https://doi.org/10.1016/j.im.2021. 103434

Moro-Visconti, R., Cruz Rambaud, S., & López Pascual, J. (2023). Artificial intelligence-driven scalability and its impact on the sustainability and valuation of traditional firms. *Humanities and Social Sciences Communications*, 10(795), 1-12. https://doi.org/10.1057/s41599-023-02214-8

Nwachukwu, C., & Vu, H. M. (2020). Strategic flexibility, strategic leadership and business sustainability nexus. *International Journal of Business and Management*, 15(1), 99-112.

O'Reilly, C. & Tushman, M. (2013). Organizational ambidexterity: Past, present, and future. *Academy of Management Perspectives* 27(4) 324-338. https://www.jstor.org/stable/43822033

O'Reilly, C. A., & Tushman, M. L. (2004). The ambidextrous organization. *Harvard Business Review,* 82(4), 74-81.

O'Reilly, C. A., III, & Tushman, M. L. (2004). The ambidextrous organization. *Harvard Business Review*, April 2004. https://doi.org/10.19030/jabr.v32i6.9889

Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information Management*, 51(5), 497-510.

Ooi, K.-B., Lee, V.-H., Tan, G. W.-H., Hew, T.-S., & Hew, J.-J. (2018). Cloud computing in manufacturing: The next industrial revolution in Malaysia? *Expert Systems With Applications*, 93, 376-394.

Organisation for Economic Co-operation and Development. (2019). *Latin America and the Caribbean 2019: Policies for competitive SMEs in the Pacific Alliance and participating South American countries.* https://doi.org/10.1787/d9e1e5f0-en

Organisation for Economic Co-operation and Development. (2019). OECD SME and entrepreneurship outlook 2019. https://doi.org/10.1787/34907e9c-en

Papachroni, A., Heracleous, L., & Paroutis, S. (2014). Organizational ambidexterity through the lens of paradox theory: Building a novel research agenda. The *Journal of Applied Behavioral Science*, 1-23. https://doi.org/10.1177/0021886314553101

Pappas, I. O., Mikalef, P., Giannakos, M. N., Krogstie, J., & Lekakos, G. (2018). Big data and business analytics ecosystems: paving the way towards digital transformation and sustainable societies. *Information Systems and e-Business Management*, 16(3), 479-491. https://doi.org/10.1007/s10257-018-0377-z

Parra, D. T., Talero-Sarmiento, L. H., Ortiz, J. D., & Guerrero, C. D. (2021). Technology readiness for IoT adoption in Colombian SMEs. In Proceedings of the 16th Iberian Conference on Information Systems and Technologies (CISTI) (pp. 1-10). Chaves, Portugal.

Partanen, J., Chetty, S. K., & Rajala, A. (2020). Business model experimentation in SMEs: A contingency perspective. *Industrial Marketing Management*, 88, 187-196.

Paul, G. B., & Marieke, R. D. P. A. (Eds.). (2020). *Artificial intelligence : Reflections in philosophy, theology, and the social sciences*. BRILL.

Peters, G. W., & Panayi, E. (2016). Understanding modern banking ledgers through blockchain technologies: Future of transaction processing and smart contracts on the internet of money. In Banking beyond banks and money (pp. 239-278). Springer, Cham.

Poncholi, H. (2012). Mobile device for health care monitoring system using wireless body sensor network. *International Journal of Electronics, Communication, and*

Computer Engineering, 3(4). ISSN (Online): 2249-071X. ISSN (Print): 2278-4209.

Prieto-Pastor, I., & Martin-Perez, V. (2014). Does HRM generate ambidextrous employees for ambidextrous learning? The moderating role of management support. *The International Journal of Human Resource Management*, 589-615. https://doi.org/10.1080/09585192.2014.938682

Qin, X., Shi, Y., Lyu, K., & Mo, Y. (2020). Using a TAM-TOE model to explore factors of Building Information Modelling (BIM) adoption in the construction industry. *Journal of Civil Engineering and Management*, 26(3), 463–468. https://doi.org/10.3846/jcem.2020.12176

Rahi, S., Ghani, M. A., & Ngah, A. H. (2019). Integration of unified theory of acceptance and use of technology in internet banking adoption setting: Evidence from Pakistan. *Technology in Society*, 58.

Raisch, S., & Birkinshaw, J. (2008). Organizational ambidexterity: Antecedents, outcomes, and moderators. *Journal of Management*, 34(3), 375-409.

Reinhardt, K. (2023). *Business Research Methods*. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4488860

Rialti, R., Marzi, G., Caputo, A., & Mayah, K. (2020). Achieving strategic flexibility in the era of big data: The importance of knowledge management and ambidexterity. *Management Decision*, 1585-1600, 58(8). https://doi.org/10.1108/MD-09-2019-1237

Rialti, R., Marzi, G., Silic, M., & Ciappei, C. (2018). Ambidextrous organization and agility in big data era: The role of business process management systems. Business *Process Management Journal*, 1091-1109, 24(5). https://doi.org/10.1108/BPMJ-07-2017-0210

Rojas-Córdova, C., Williamson, A., Pertuze, J., Calvo, G. (2023). Why one strategy does not fit all: a systematic review on exploration–exploitation in different organizational archetypes. *Review of Managerial Science* 17(7) 2251-2295. DOI: 10.1007/s11846-022-00577-x

Roy, A., Zalzala, A., & Kumar, A. (2016). Disruption of Things: A model to facilitate adoption of IoT-based innovations by the urban poor. *Procedia Engineering*, 159, 199-209. https://doi.org/10.1016/j.proeng.2016.08.159

Rubio, D., Berg-Weger, M., Tebb, S., Lee, E., & Rauch, S. (2003). Objectifying Content Validity: Conducting a Content Validity Study in Social Work Research. *Social Work Research*, 27, 94-104. https://doi.org/10.1093/SWR/27.2.94.

Saleem, H., Li, Y., Ali, Z., Mehreen, A., & Mansoor, M. S. (2020). An empirical investigation on how big data analytics influence China SMEs performance: Do product and process innovation matter? Asia Pacific Business Review, 26(5), 537-562. https://doi.org/10.1080/13602381.2020.1759300

Saratchandra, M., Shrestha, A., & Murray, P. (2022). Building knowledge ambidexterity using cloud computing: Longitudinal case studies of SMEs experiences. *International Journal of Information Management* 67. https://doi.org/10.1016/j.ijinfomgt.2022.102551

Sarker, I. H. (2021). Machine learning: Algorithms, real-world applications and research directions. *SN Computer Science*, 2(160). https://doi.org/10.1007/s42979-021-00592-x

Sauer, P. C., Orzes, G., & Davi, L. (2021). Toward SME 4.0: The impact of Industry 4.0 technologies on SMEs' business models. In D. T. Matt, V. Modrák, & H. Zsifkovits (Eds.), *Implementing Industry 4.0 in SMEs* (pp. 231-247). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-70516-9_10

Schmidt, C. G., & Wagner, S. M. (2019). Blockchain and supply chain relations: A transaction cost theory perspective. *Journal of Purchasing and Supply Management*, 25(4), 100552. https://doi.org/10.1016/j.pursup.2019.100552

Scuotto, V., Santoro, G., Bresciani, S. & Del Giudice, M. (2017). Shifting intra- and inter-organizational innovation processes towards digital business: An empirical analysis of SMEs. Creativity and Innovation Management 26(3) 247-255. https://doi.org/10.1111/caim.12221

Sharma, S. K., et al. (2018). Mobile applications in government services (mG-App) from user's perspectives: A predictive modelling approach. *Government Information Quarterly*, 35(4), 557-568.

Shetty, J. P., & Panda, R. (2021). An overview of cloud computing in SMEs. *Journal of Global Entrepreneurship Research*, 11, 175-188. https://doi.org/10.1007/s40497-021-00273-2

Shlomo, Y., Tarba, Justin, J., P., Jansen, Tom, J., M., Mom, Sebastian, R., Thomas & C. Lawton (2020). A microfoundational perspective of organizational ambidexterity: Critical review and research directions, *Long Range Planning*, Volume 53, Issue 6

Simek, D., & Sperka, R. (2019). How robot/human orchestration can help in an HR department: A case study from a pilot implementation. *Organizacija*, 52(3), 204-217.

Simsek, Z., Heavey, C., Veiga, J. F., & Souder, D. (2009). A typology for aligning organizational ambidexterity's conceptualizations, antecedents, and outcomes. *Journal of Management Studies*, 46(5), 864-894.

Smith, W. K., Binns, A., & Tushman, M. L. (2017). Complex business models: Managing strategic paradoxes simultaneously. *Long Range Planning*, 50(1), 67-79.

Soon, J. N. P., Mahmood, A. K., Yin, C. P., Wan, W. S., Yuen, P. K., & Heng, L. E. (2014). IaaS cloud optimization during economic turbulence for Malaysia small and medium enterprises. *International Journal of Business Information Systems*, 16(2), 196.

Soto-Acosta, P., Cegarra-Navarro, J. G., & Cillo, V. (2018). Technological innovation, sustainability, and business performance in industrial sectors: A systematic literature review. *Journal of Business Research*, 89, 209-215.

Spatar, D., et al. (2019). Adoption factors of electronic health record systems. *Technology in Society*, 58.

Suoniemi, S., Meyer-Waarden, L., Munzel, A., Zablah, A. R., & Straub, D. (2020). Big data and firm performance: The roles of market-directed capabilities and business strategy. Information & Management, 57(7), 103365. https://doi.org/10.1016/j.im.2020.103365

Tassey, G. (2008). The Roles and Economic Impacts of Technology Infrastructure, Version 3. *National Institute of Standards and Technology*. Retrieved from https://www.nist.gov/system/files/documents/2017/05/09/Measurement_Infrastr_Roles_Impacts_v3.pdf

Taylor, A., & Helfat, C. E. (2009). Organizational linkages for surviving technological change: Complementary assets, middle management, and ambidexterity. *Organization Science*, 20(4), 718-739.

Trieu, H. D. X., Nguyen, P. V., Nguyen, T. T. M., Vu, H. T. M., & Tran, K. T. (2023). Information technology capabilities and organizational ambidexterity facilitating organizational resilience and firm performance of SMEs. *Asia Pacific Management Review*, 28(544-555). https://doi.org/10.1016/j.apmrv.2023.03.004

Trieu, H., Nguyen, P., Nguyen, T., Vu, H., & Tran, K. (2023). Information technology capabilities and organizational ambidexterity facilitating organizational resilience and firm performance of SMEs. Asia Pacific Management Review 28(4) 544-555. DOI: 10.1016/j.apmrv.2023.03.004

Trieu, H., Nguyen, P., Tran, K., Vrontis, D., & Ahmed, Z. (2023). Organisational resilience, ambidexterity and performance: the roles of information technology competencies, digital transformation policies and paradoxical leadership. International Journal of Organizational Analysis. https://doi.org/10.1108/IJOA-05-2023-3750

Trieu, V. H., Huynh, Q. L., & Nguyen, T. T. (2023). Paradoxical leadership and IT capabilities in SMEs: Evidence from the manufacturing industry. *Information Systems Management*, 40(1), 65-77.

Tushman, M. L., & O'Reilly, C. A. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review*, 38(4), 8-30.

Tushman, M. L., Smith, W. K., & Binns, A. (2010). The ambidextrous CEO. *Harvard Business Review*, 88(6), 74-80.

Unioncamere. (2023). *Rapporto Regionale PMI 2023*. Retrieved from https://www.unioncamere.gov.it/rapporto-regionale-pmi-2023

Wasim, M., Ahmed, S., Kalsoom, T., Khan, M. S., & Rafi-Ul-Shan, P. M. (2024). Market orientation and SME performance: Moderating role of IoT and mediating role of creativity. *Journal of Small Business Management*, 62(2), 938-965. https://doi.org/10.1080/00472778.2022.2100897

Watson, H. J., & Wixom, B. H. (2007). The current state of business intelligence. *Computer*, 40, 96–99.

Weston, C., Gandell, T., Beauchamp, J., McAlpine, L., Wiseman, C., & Beauchamp, C. (2001). Analyzing Interview Data: The Development and Evolution of a Coding System. *Qualitative Sociology*, 24, 381-400. https://doi.org/10.1023/A:1010690908200.

Wong, L. W., Leong, L. Y., Hew, J. J., Tan, G., & Ooi, K. (2020). Time to seize the digital evolution: Adoption of blockchain in operations and supply chain management among Malaysian SMEs. International Journal of Information Management, 52, 101997.

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

Zhang, J., Edgar, F., Geare, A. & O'Kane, C. (2016). The interactive effects of entrepreneurial orientation and capability-based HRM on firm performance: The mediating role of innovation ambidexterity. *Industrial Marketing Management* 59 131-143. https://doi.org/10.1016/j.indmarman.2016.02.018

Zhang, Q., Cheng, L., & Boutaba, R. (2010). Cloud computing: State-of-the-art and research challenges. *Journal of Internet Services and Applications*, 1(1), 7-18. https://doi.org/10.1007/s13174-010-0007-6

Zhu, K., Kraemer, K. L., Gurbaxani, V., & Xu, S. X. (2006). Migration to open-standard interorganizational systems: Network effects, switching costs, and path dependency. *MIS Quarterly: Management Information Systems*. https://doi.org/10.2307/25148771

Zhu, K., Kraemer, K., & Xu, S. (2003). Electronic business adoption by European firms: A cross-country assessment of the facilitators and inhibitors. European

Journal of Information Systems, 12(4), 251–268. https://doi.org/10.1057/palgrave.ejis.3000475

Appendices

Appendix 1. Semi-structured interview questions

1. Digital Technologies
    a. Business Needs of adopting new digital technologies:
    b. How companies chose new digital technologies
    c. Steps company does for developing digital technologies?
    d. Role of internal stakeholders
    e. Role of external stakeholders
    f. How digital technologies changed daily operations

2. Organizational Ambidexterity
    a. Examples of innovations enhancement of using technology
    b. Specific examples of projects in which they balanced innovation and improvement of existing processes
    c. Use of KPI?
    d. Primary challenge of balancing exploration and innovation
    e. How they address those challenges

3. Future Moves
    a. How do you see digital technologies in your sector in 3/5 years
    b. What specific dynamic capabilities are essential for sustaining Organizational Ambidexterity in the future?
    c. Workforce preparation for the future?
    d. What are your strategic priorities for ensuring Organizational Ambidexterity?
    e. How do you align your resources and capabilities with these strategic priorities?
    f. Advice for Other SMEs: o Based on your experience