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The impact of digital strategy on company's performance: a triple bottom line approach of Italian firms.

L'impatto della strategia digitale sulle performance aziendali:

l'approccio triple bottom line delle aziende italiane

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ABSTRACT:

Digital strategy plays a crucial role in enhancing the performance of companies across various industries, and Italian firms are no exception. By adopting a triple bottom line approach, which focuses on economic, social, and environmental factors, companies can leverage digital technologies to improve their overall sustainability and competitiveness.

One of the key impacts of digital strategy on company performance is increased efficiency and productivity. By implementing digital tools and solutions, companies can streamline their operations, automate repetitive tasks, and improve communication and collaboration among employees. But on the other hand, the transition to a new form of functioning requires initial investments, and sometimes, a change in the working staff of the company and other changes, this requires additional expenses.

The purpose of the present study is to examine two aspects: the first aspect concerns the question: «*do digitalization processes of the company have a positive/negative/neutral effect on the economic growth performance of firms in Italy?* »; the second aspect concerns the question: «*do digitalization processes of the company have a positive/negative/neutral effect on the sustainability issue*?"

In *the empirical part of my work*, I analyze the data obtained from a survey of C-level managers and Top executives responsible for managing innovation, sustainability and digital transformation in Italian firms. The analysis made it possible to provide conclusions about the relationship between the digital strategy of the company and financial and non-financial performance of the company, and sustainability issue. As a result of the conducted research, it was deduced and studied that the digital strategy of the company has a positive impact on the sustainability issue, as well as on the financial and non-financial performance of the company. Also, digital strategy does have a significant indirect effect on nonfinancial/financial performance of the firm.

ABSTRACT:

La strategia digitale svolge un ruolo cruciale nel migliorare le prestazioni delle aziende in vari settori e le aziende italiane non fanno eccezione. Adottando un approccio a triplo risultato, che si concentra su fattori economici, sociali e ambientali, le aziende possono sfruttare le tecnologie digitali per migliorare la loro sostenibilità e competitività complessive.

Uno degli impatti chiave della strategia digitale sulle prestazioni aziendali è l'aumento di efficienza e produttività. Implementando strumenti e soluzioni digitali, le aziende possono semplificare le proprie operazioni, automatizzare le attività ripetitive e migliorare la comunicazione e la collaborazione tra i dipendenti. D'altra parte, il passaggio a una nuova forma di funzionamento richiede investimenti iniziali e, talvolta, un cambiamento nel personale dell'azienda e altri cambiamenti, ciò richiede spese aggiuntive.

Lo scopo del presente studio è quello di esaminare due aspetti: il primo aspetto riguarda la domanda: «*i processi di digitalizzazione dell'impresa hanno un effetto positivo/negativo/neutro sulla performance di crescita economica delle imprese in Italia?*»; il secondo aspetto riguarda la domanda: «*i processi di digitalizzazione dell'impresa hanno un effetto positivo/negativo/neutro sul tema della sostenibilità?*»

Nella parte empirica del mio lavoro, analizzo i dati ottenuti da un sondaggio tra manager di livello C e Top executive responsabili della gestione dell'innovazione, della sostenibilità e della trasformazione digitale nelle imprese italiane. L'analisi ha permesso di fornire conclusioni sulla relazione tra la strategia digitale dell'azienda e le prestazioni finanziarie e non finanziarie dell'azienda e la questione della sostenibilità. Come risultato della ricerca condotta, è stato dedotto e studiato che la strategia digitale dell'azienda ha un impatto positivo sul tema della sostenibilità, nonché sulle prestazioni finanziarie e non finanziarie dell'azienda. Inoltre, la strategia digitale ha un significativo effetto indiretto sulle prestazioni non finanziarie/finanziarie dell'impresa.

KEY WORDS: *digital strategy, digital transition, sustainable transition, digitalization processes, triple bottom line approach, digitalization , sustainability issue, firm performance, innovation, new technologies.*

CONTENTS

INTRODUCTION

In the modern world, digitalization processes have become an integral part of our daily lives. The introduction of new digital technologies affects all parts of the market: both consumers, companies, society as a whole and the environment around us. Under the influence of digitalization processes, the entire economic system as a whole is changing, and the types and ways of relationships among all participants in the system, also changes. In addition, since the process of introducing new technologies occurs exponentially, changes occur at an enormous speed.

Therefore, the topic of the impact of the implementation of various forms of digitalization is so important for study now, and therefore it is widely discussed not only in individual firms and transnational corporations, but also at the level of world government structures, for example, such as The United Nations (UN) or the European Central Bank (the ECB).

For example, the ECB last year (2023) published an extensive guide – the ECB Working Paper Series, fully devoted to the issue of "Digitalization and the economy". So, the topic I have chosen for research is widely discussed and important among all participants in the world economy.

The United Nations' ambitious 2030 Agenda for Sustainable Development hinges on the transformative power of digital technology. It envisions a future where digitalization acts as a catalyst for businesses to achieve the Sustainable Development Goals (SDGs). However, the relationship between digitalization and sustainability remains a complex and nuanced topic, with no clear consensus among researchers. While digital technologies offer immense potential for enhancing sustainability performance, their impact can be both positive and negative. On the one hand, digitalization can enable companies to optimize resource utilization, reduce waste, and improve energy efficiency through data-driven insights and automation. For instance, smart grids powered by artificial intelligence can optimize energy distribution, minimizing waste and reducing carbon emissions. Similarly, advanced manufacturing techniques like additive manufacturing (3D printing) can reduce material waste and increase product lifecycles, leading to a more sustainable

production model. Furthermore, digital technologies can empower consumers to make more sustainable choices. Online platforms and mobile applications can provide transparent information about the environmental and social impact of products and services, enabling consumers to make informed decisions based on their values. E-commerce platforms can also facilitate the adoption of sustainable consumption patterns by offering a wider selection of eco-friendly products and reducing the need for physical transportation. However, the rapid adoption of digital technologies also presents significant challenges for sustainability.

Digitalization processes are fundamentally changing the way we interact with technology and each other. Additionally, digitalization processes are reshaping industries and driving innovation.

"In the age of the Fourth Industrial Revolution, Artificial Intelligence and Digital Transformation, the effect of these significant changes on the economy's functioning is a major concern for economists and policymakers alike" (Nguyen Ngoc Tan , 2022). Moreover, the rapid pace of digitalization processes is raising questions about the impact on society and the economy. Digital technologies are reshaping labor markets and creating new opportunities for some, while leaving others behind. It is crucial for policymakers and stakeholders to address these disparities and ensure that everyone can benefit from the digital revolution.

At the moment, the topic of studying the impact of digitalization on other economic parameters and indicators is quite new, and many areas of this topic have not yet been studied. Very few papers have dealt with the topic including two aspects at once: the impact on the issue of sustainable development as a whole, as well as the impact on the economic performance of firms. However, there are many studies aimed at studying these two aspects separately.

Therefore, my research consists from two sections (a literature review section and an empirical section):

(1) from the study and synthesis of recent scientific works of two types: a) scientific works showing the connection and the impact of digitalization processes on the sustainability

issue, and b) scientific works showing the connection and the impact of digitalization processes on the economic growth performance, since at the moment there is no work considering the influence of digitalization processes on both of these parameters, and

(2) from my own analysis of qualitative data, which was obtained from a research project by the University of Pavia and the Institute for Transformative Innovation Research (ITIR).

The purpose of my research is clarifying the topic of digitalization process in modern world and answering the questions:

a. Can the digitalization process and applied digital strategies help the company overcome the problem of TBL (profit, people, and the planet)?

b. What effect do digitalization processes have on the sustainability issue?

c. Does the process of digitalization have a positive, neutral or negative effect on the financial/nonfinancial performance of companies in Italy?

Like many processes that have a significant impact on the lives of people and the planet, digitalization processes characterized by both advantages and disadvantages. In my research, I will try to figure it out and understand whether these processes have a positive or negative effect using the example of Italian firms. On the one hand, the process of digitalization is irreversible, since it facilitates many work processes and services, and if an individual company does not join the digital platform or new technologies, it risks becoming a market outsider. But, on the other hand, there is criticism and concerns about these processes, even from very influential people and economists in the world.

The risks associated with digitalization, such as cybersecurity threats and data privacy issues is important (Global Risks Report, the World Economic Forum, 2023). As more and more of our personal information becomes digitized, it is essential to safeguard against potential breaches and misuse. By understanding the implications of digitalization, we can navigate this transformative era with caution and ensure a better future for all.

So, implementing digital strategies and innovations at an enterprise is crucial in overcoming the *triple bottom line* – the social, environmental, and financial challenges faced by businesses today. Digital strategies and innovations can help improve operational efficiency and reduce costs, leading to a positive impact on the financial bottom line. By implementing technologies such as data analytics, artificial intelligence, and automation, businesses can streamline their processes, identify cost-saving opportunities, and make data-driven decisions that contribute to increased profitability.

Furthermore, digital strategies can support environmental sustainability efforts by enabling businesses to monitor and reduce their carbon footprint, optimize energy consumption, and implement eco-friendly practices. For example, digital tools can help track resource usage, manage waste more effectively, and promote sustainable sourcing and production methods.

In terms of the social bottom line, digital innovations can help businesses enhance customer engagement, improve communication with stakeholders, and foster a sense of community and collaboration. By leveraging social media, customer relationship management systems, and other digital platforms, enterprises can connect with customers in meaningful ways, strengthen relationships with employees and suppliers, and support social causes that align with their values.

Overall, implementing digital strategies and innovations is essential for enterprises to thrive in today's competitive business landscape and address the triple bottom line challenges effectively. By harnessing the power of technology, businesses can drive growth, create value, and make a positive impact on society and the environment.

1. Literature review

In my research, the literature review contains two sections:

1) The literature review begins with *theoretical framework* , which reveals the main terms and concepts used in the area of the research: such as *digitalization, digital strategy, digitalization transition sustainability issue, sustainability transition, the triple bottom line problem (TBL) approach* and others definitions on the topic under consideration;

 2) Then i provide findings from a number of studies and publications regarding the ways in which businesses' digitalization processes impact sustainable development and transitions, as well as the ways in which a company's digital strategy influences both its financial and non-financial performance.

The topic of digitalization is very relevant nowadays, since digital technologies are developing at an incredible pace. Therefore, the issue of active implementation of digitalization processes is taking more and more scientists around the world who are trying to analyze and assess the impact of this process on the economy as a whole and on local issues. Now there are many scientific works by our contemporaries on this issue, which represents different points of view. In this chapter of my study, I will consider the different author's positions on the topic of discussion. I have explored different studies and articles of authors, who specialize in the topic under consideration. In most of the studies, the authors find a positive dependence and a positive effect of digitalization on the dependent variables under consideration.

1.1 Theoretical framework

A theoretical framework in my study consists of a set of concepts, definitions, and propositions that together form a structured, comprehensive view of a such phenomenon as digitalization processes, digital transformation, digital strategy of the firm, and the terms are also related to sustainable economic development. I'll begin this section by giving a general summary of the digitalization process and outlining the various phases of its evolution, including digital transformation.

1.1.1   The main concepts and stages of the development of the digitalization and digital transformation.

Digitalization is the process of converting a business to a digital one through the use of digital technologies that modify business models and offer new chances for income and value creating (Bloomberg J., 2022). Digital technologies are an operant resource to achieve goals (Nambisan et al, 2019). Digitalization refers to the process of using digital technologies to transform business operation, processes, and models in order to adapt to the digital economy and meet the changing needs of customers and employees (Wim Hoogenraad, 2023).

 "**Digitization**' and '**digitalization**' are two conceptual terms that are closely associated and often used interchangeably in a broad range of literature" (Brennen and Kreis, 2014). Brennen and Kreiss base their definition of digitalization on *social life* – in other words, how people interact. As such interactions move away from analog technologies to digital ones, both work and leisure domains become digitalized. Digitalization leads to *a deep transformation of the business, implying the use of digital technologies to*: **optimize business processes; increase company productivity.**

One more definition by Gartner's glossary: «**Digitalization** is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities»

(Gartner's glossary). Consequently, Gartner's definition diverges significantly from academics', emphasizing shifting business models over social interactions.

The goal of digitization is to make automation possible, improve data quality, and gather and organize all that data so that we can use cutting-edge technology, such as better software. Digitalization facilitates the creation of new growth prospects. It instantly aids in attracting and keeping current and new clients. Businesses must embrace digitalization if they want to stay ahead of the competition and obtain a competitive advantage (Arushi, 2022).

The digitalization of the enterprise is essential for today and offers great opportunities both for companies and for the society at the expense of new business models, or by creating new forms. (Andriushchenko et al., 2020).

Digitalization is a process that has been evolving over the past few decades, transforming the way we live, work, and communicate. There are some key dates in development of digital technologies:

1940s: The first digital computers are developed during World War II, including the Colossus in Britain and ENIAC in the United States. These early computers paved the way for the development of digital technology.

1950s: The concept of digitization begins to gain traction, with the first digital data storage devices such as magnetic tapes and disks being developed. This enables the storing and processing of information in a digital format.

1960s: The introduction of the internet and the development of the first versions of the ARPANET set the stage for the digital revolution. This network of interconnected computers laid the foundation for the global exchange of digital information.

1970s: The invention of the microprocessor revolutionized the computing industry, making personal computers more accessible and affordable. This led to the proliferation of digital technology in homes and businesses.

1980s: The development of the World Wide Web by Tim Berners-Lee in 1989 revolutionized the way information is shared and accessed. This marked the beginning of the modern internet era.

1990s: The rise of e-commerce and digital media transformed industries such as retail, entertainment, and publishing. The dot-com bubble saw a surge in digital startups and internet-based businesses.

2000s: The widespread adoption of mobile devices such as smartphones and tablets brought digital technology into the hands of billions of people around the world. Social media platforms like Facebook and Twitter emerged as major players in the digital landscape.

2010s: The explosion of big data and cloud computing revolutionized the way businesses store, analyze, and leverage data. **Artificial intelligence and machine learning technologies began to shape the future of digitalization.**

2020s: The COVID-19 pandemic accelerated the digital transformation of industries worldwide, as businesses and individuals increasingly relied on digital tools and platforms for remote work, learning, and communication. The ability to use artificial intelligence tools for a wide range of people for freely (al applications, gpt chats).

Klaus Martin Schwab[1] mentioned on the World Economic Forum 2023, that

> "Technology is not an exogenous force over which we have no control. We are not constrained by a binary choice between accept and live with it and "reject and live without it". Instead, take dramatic technological change as an invitation to reflect about who we are and how we see the world" (Schwab K.M, the World Economic Forum, 2023)

Klaus Schwab identifies three main clusters, which are at the core of the Fourth Industrial Revolution; in physical, digital and biological spheres. The complex of physical, biological, digital and trends in innovation will obscure the line between digital and physical dimensions. This will create cyber-physical system, producing a radically new economic and social reality.

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[1] **Klaus Martin Schwab -** a German famous economist, professor of business policy, mechanical engineer, and founder of the World Economic Forum

Further I will move on to consider this issue from the perspective of various authors studying this issue.

The term "**digital transformation**" describes the deliberate application of new technology to fundamentally transform an organization so that it can adapt to and operate in the digital era (Terekhov V., 2023). It involves more than just implementing new technology; it calls for a comprehensive business strategy that is compatible with the digital age. Organizations must embrace digital transformation in the quickly changing digital landscape of today in order to stay competitive and satisfy the needs of contemporary consumers.

So, the development of digital technology has been a continuous process marked by significant breakthroughs and advancements. As we move into the future, digitalization will continue to shape the society and economy in profound ways.

The impact of a digital transformation strategy can vary across different industries. However, utilizing technology to change a business into a more valuable entity for customers and a well-organized workspace for the team is the key to a successful digital transformation strategy (Sreenidhe S.P, 2024).

Digital transformation is a comprehensive process that encompasses seven key spheres, which will be discussed below (Lucija Ivančić, 2019). These spheres include:

A. Technology/technological enhancements

B. New types of communication

C. Data-driven decision making

D. Internet of things

E. Automation of processes

F. Artificial Intelligence, or AI

G. New types of networking

Visually, this can be seen in the figure № 1

Figure № 1

There are also **three key elements of digital transformation**. Successful digital transformation efforts involve enhancing customer experience, rethinking business processes, and leveraging digital technologies to drive business value. In order to adapt and prosper in the digital age, companies must have these fundamental components. This is represented visually on the figure № 2. (Terekhov V., 2023)
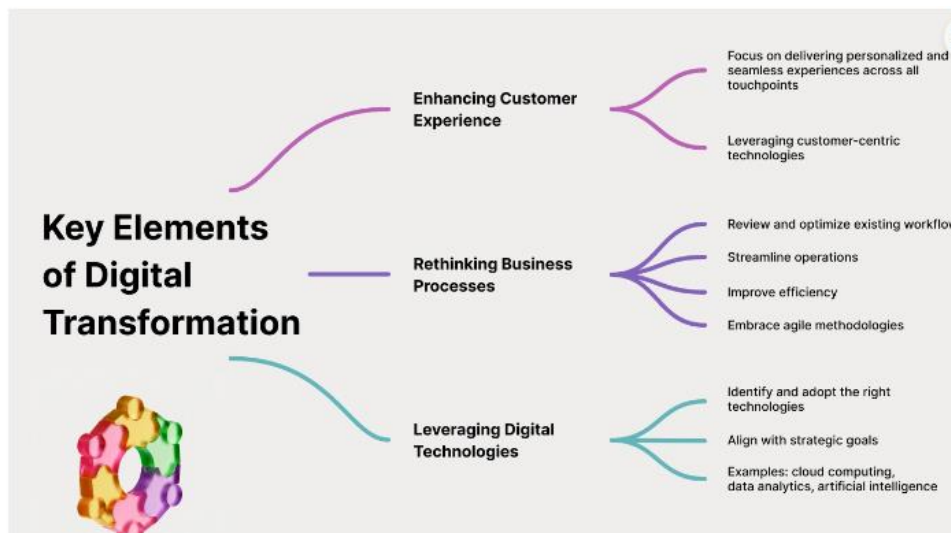
Figure № 2. Key elements of digital transformation

1. Enhancing customer experience is essential in the very competitive world of today. To create seamless and personalized experiences across all touchpoints, organizations need to concentrate on knowing the needs and preferences of their customers. To deliver quick and easy interactions, this may entail putting customer-focused technologies into place, such as chatbots, AI-powered recommendation engines, and self-service portals.

2. Rethinking business processes is essential for an effective digital transition. To simplify processes, boost productivity, and cut expenses, organizations must evaluate and enhance their current workflows. To enable quicker iteration and adaptability, this can be accomplished by adopting agile approaches, automating manual operations, and putting workflow management tools in place.

3. Leveraging digital technologies is the digital transformation's third essential element. Businesses must choose and implement the appropriate technologies to support their strategic objectives. This can involve adopting artificial intelligence and machine learning to support intelligent automation and decision-making, deploying cloud computing solutions for scalability and flexibility, and using data analytics platforms for actionable insights.

As a result, digital processes have a strong impact on the economy. The SWOT analysis developed by Degryse (2016) shows what "digitalization" is. Degryse studied the impact of the digitalization processes on the economy. This SWOT Analysis of Digitalization (Degryse, 2016) is presented in Table № 1. In this table, one can observe the main positive and negative sides of the impact of digitalization processes on the economy, and in particular on the labor market.

Some of the key strengths of digitalization include increased efficiency, cost savings, improved customer experience, and enhanced decision-making through data analytics (Degryse, 2016). By leveraging digital technologies, organizations can streamline processes, automate repetitive tasks, and access real-time data to inform strategic decisions.

On the other hand, weaknesses of digitalization may include high upfront costs, resistance to change from employees, and potential security risks associated with storing sensitive data online. Digitalization projects may also require significant time and resources to implement and maintain, which can strain organizational resources.

Strengths	Opportunities
1. Connected world, open systems, knowledge economy	1. New jobs (computer engineers and scientists, network experts, etc.)
2. Networks, exchange, sharing and collaboration, with access based on functionality rather than ownership	2. More 'agile' work organisation; new forms of more flexible and more autonomous work
3. Integration of industries and services: intelligent factories, energy systems, mobility, transport and cities and 'optimised' governance	3. Abolition of repetitive and routine tasks
	4. Better ergonomics, help in performance of heavy or complex tasks
4. Automation, robotisation, learning machines	5. New forms of collaboration and cooperation among workers
5. Productivity, efficiency and profitability gains	6. Reshoring or onshoring (return of industries and new 'smart' factories – and jobs – to their country of origin)
6. Zero marginal cost economy	7. Possibility of new ways of distributing productivity gains (working time reduction)
7. Innovative products and services, proliferation of mobile apps to 'make life easier'	8. Possibilities of social emancipation, change of economic model geared to peer-to-peer and common goods ('post-capitalist' society)
8. New autoproduction capacities, micro factories	

Weaknesses	Threats
1. Jobless growth, jobless future	1. Massive destruction of medium-skilled jobs (computerisation)
2. Emergence of super powerful oligopolies, new world data masters	2. Intensification of 'anytime, anywhere' work; blurring of the boundary between private life and working life leading to stress and burnout
3. Concentration of power and wealth in value chains (equivalent losses for other companies, sectors and countries)	3. Loss of control by workers of their own expertise and know-how and free will (becoming the tool of a machine)
4. Frequent problems of (non)-compliance with regulatory, administrative, labour and taxation standards	4. Digital management, policing of workers, risk of mutual loss of trust between employees and management
5. Protection of personal data exposed to intrinsic risks	5. Precarisation of jobs and statuses, total dependence on 'data masters'; 'servification'
6. 'Algorithmisation' of individual behaviour, work and consumer habits, social and cultural preferences; normalisation and standardisation of the individual	6. Weakening of collective action and industrial relations
	7. Skills and training/labour demand mismatch
7. Hollowing out of the middle classes and polarisation of society between a reduced number of 'top-of-the-scale' workers and a mass of 'bottom-of-the-scale' workers	8. Exacerbation of inequality, wage stagnation
	9. 'Digital Taylorism' and emergence of a class of digital galley workers (crowd sourcing); world competition among workers for all jobs not requiring face-to-face contact
8. Under-investment and under-utilisation of digital tools for the social emancipation of low-income sections of society	10. Erosion of tax base and social insurance financing

Source: Christophe Degryse (ETUI 2016)

Table № 1

In terms of opportunities, digitalization presents a wide range of possibilities for organizations to innovate and stay competitive in a rapidly changing marketplace. By embracing digital technologies, businesses can expand their reach, improve their products and services, and gain a competitive edge in their industry.

However, there are also threats associated with digitalization, such as cybersecurity risks, data breaches, and the potential for digital disruptions to the business. Organizations must be proactive in managing these threats by implementing robust cybersecurity measures, monitoring for potential security breaches, and staying abreast of emerging technologies and trends.

Degryse's SWOT analysis framework for digitalization provides a comprehensive and systematic approach to assessing the impact of digital technologies on organizations. By carefully evaluating the strengths, weaknesses, opportunities, and threats of digitalization, organizations can make informed decisions about how to leverage technology to drive growth and success in the digital age.

In recent years, the process of creating new technologies has intensified even more. For example, a ChatGPT has entered widespread use. ChatGPT has been the latest trend of technology which generated much debate within the society as it is impactful on the life of human beings (Will Douglas Heaven, 2023). It integrated Artificial Intelligence and natural language processing technology, and have the ability to replace the work of human beings. As it works based on huge databased, ChatGPT is also knowledgeable in handling questions of different industries. The effects of ChatGPT on economic development is future discussed. ChatGPT can influence the economic as it is able to bring impacts on labor market, education, technology integration, business decision and political decision (Mengfei Wu, 2024). The impacts of ChatGPT can be argued to bring to both positive and negative impacts. The current characteristics of ChatGPT includes technical and data limitation, improve efficiency in multiple fields and bring to potential ethical and legal issues. By integrating ChatGPT into these field, it can increase the business model of ChatGPT, while also beneficial for the respective fields which brings to overall economic development of the society (Kalla Dinesh, 2023).

1.1.2   The main concepts of digital strategy.

Some scholars view digital technology as a crucial resource that accelerates digital transformation processes (Kallinikos et al., 2013; Nambisan, 2017). From this point of view, the impact of digital technology on a firm's core business during digital transformation has garnered significant attention (Hess et al., 2016; Aversa et al., 2020). A **digital strategy** is a plan that outlines how a company will use digital technologies to achieve its business objectives (Olmstead,

2022). This strategy includes defining the company's digital goals, identifying the tools and technologies needed to achieve those goals, and establishing a roadmap for implementation (Olmstead, 2022).

The digital strategy of a company may include and consist of different initiatives such as developing new digital products or services, optimizing digital marketing efforts, improving customer experiences through digital channels, and leveraging data and analytics to drive decision-making, using different digital platforms (Mitzkus, 2024). The process for creating a digital strategy is similar to other type of strategies which involve a basic process of situation analysis and performance review, strategy creation and implementation.

Though many businesses have quite different digital strategy, these fundamental elements are usually present (LoFaso, 2024):

Data analytics - Statistical methods are used by digital strategists to evaluate performance, spot trends, and pinpoint areas for expansion.

Digital advertising - Companies use advertising to advertise their goods and services online. Pay-per-click advertisements, affiliate marketing, and website display banners are examples of common digital advertising platforms.

Digital marketing - Companies use email, social media, and other digital channels to build their brand reputation and strengthen customer relationships.

Customer service - Digital technologies can increase consumer satisfaction and encourage adherence. For example, companies can provide digital loyalty programs and deploy chatbots with AI to assist with customer service.

Search engine optimization (SEO) - SEO strategies are used by digital strategists to raise a website's position in search engine results pages. Using pertinent keywords in website content and building internal links are common strategies.

Recent studies also include the following the 5 key elements for successful digital transformation including in consideration digital strategy of the firm (K. Andriushchenko et al, 2020):

1. Defining a clear business strategy before investing in digital technologies.

2. Engaging internal staff, not just external consultants.

3. Focusing on customer needs.

4. Recognizing and addressing employee concerns about changes.

5. Adopting agile, Silicon Valley-style management practices.

So in this study digitalization process presents both opportunities and challenges, appropriate policies and management practices are crucial for enterprises to successfully navigate the digital transformation.

Overall, digitalization and a well-defined digital strategy are crucial for companies to stay competitive, innovate, and adapt to the rapidly changing digital landscape. Now there are many proposals regarding the implementation of digital strategies in the organization. So, for example, Appendix № 1.1. contains the Boston Consulting Group recommendations fit within this process (Wald et al, 2019). Digital innovation is generating new sources of competitive advantage, growth, and value creation for businesses like Unilever, Starbucks, and John Deere. When combined with the appropriate digital strategy, incumbents' many advantages—resources, customer connections, and global reach, to mention a few—give them a competitive advantage over smaller rivals (Romain de Laubier et al, 2019).

1.1.3 *The main concept of sustainable development and definition of the triple bottom line approach.*

Along with digitalization process, there is another process that requires the attention of the population of the planet - issues of: climate change, increased harmful emissions, population growth; the issue of poverty and inequality of the population (Ekholm and Rockström, 2019). All

these tasks put forward and make the issue of **sustainable economic** development important for the whole world (Sivitska, 2023).

Sustainability development refers to taking decisions that "meet the needs of the present without compromising the ability of future generations to meet their own needs" (World Comission of Economic Development: Our Common Future, 1987). The SDGs were established by the UN. The SDGs focus on two of the most important issues: environmental and social sustainability.

The UN asks national governments to take action toward social and environmental sustainability when it sets the SDGs. Organizations, as opposed to governments, are crucial to the development of sustainability. They obtain, transform, and reuse natural resources. They participate in local and international communities and most significantly, they promote change through innovation (del Río Castro, G. et al, 2020). They are central actors in societal processes and mechanisms requiring sustainability development (Markus Philipp Zimmer & Jonna Järveläinen, 2022).

The emphasis on environmental sustainability gave way to a triple bottom line concept of sustainability. "The triple bottom line (TBL) is a sustainability framework that revolves around the three P's: people, planet and profit. By maximizing all three bottom lines, organizations are more likely to have a positive impact on the world while still improving financial performance" (IBM website, 2024). In the Appendix № 1.2. the interconnection of the elements of the Triple Bottom Line concept is visually presented.

According to the triple bottom line, a course of action is considered sustainable if it meets the criteria of economic, environmental, and social sustainability (Elkington, J, 2018). As a result, achieving sustainability becomes a difficult task since it requires decision-makers to take into account a variety of factors and how they interact. Similarly, organizational sustainability transformations are described as "a special case of organizational change efforts that are

multilayered, complex, and that relate to environmental, societal, governmental, organizational, regulatory, and individual factors at the same time" by Seidel et al (2014).

This concept means that business outcomes cannot be measured only by the financial bottom line. It is necessary also consider the well-being of people and the planet. This means organizations that adopt TBL frameworks are accountable to all stakeholders (Slaper and Hall, 2019).

So, the business environment is undergoing two transformations: towards digital technologies and towards sustainable development (Ezzat, 2019). In order to adapt to external pressures, businesses need to make changes to various aspects of the business. Sustainability is emerging as a need that has to be urgently addressed by policy makers, enterprises and consumers (Malhotra, Melville, Ross & Watson, 2013; Ripple et al., 2017). With growing human population, environmental and social degradation is getting more severe and our options are diminishing (Broman & Robert, 2015). Now there are many researchers studying this issue more closely.

2. *The impact of digital transformation and digitalization on sustainable transformation and financial and non-financial performance of firms*

In this section of the work, I will take into account the viewpoints of different writers in addition to specific studies that describe the effects of digital strategies on the financial and non-financial well-being of the organization, as well as the effects of firms' digital strategies on sustainable development and transformation. First, I will consider research directly related to sustainable economic development and sustainable transition in conjunction with the digital transition. Then I'll provide information from studies aimed at assessing the impact of a firm's digital strategy on its financial and non-financial performance.

1.2.1 The relation between digital transformation and the sustainable transformation

Organizations encounter two significant transformation challenges: **the pursuit of digital transformation and the achievement of sustainability transformation** (*Zimmer & Järveläinen, 2022*). Digital transformation receives significant attention in practice and research. Digital transformation is "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" *(*Vial, G, 2019). Scholars and practitioners have engaged in understanding and mastering digital transformation *(*Chanias, S. et al, 2019). Nevertheless, current research on information systems has addressed these transformations in isolation rather than examining their interconnections at the organizational level (Zimmer & Järveläinen, 2022).

However, this focus on economic sustainability overlooks the potential of digital transformation to advance the triple bottom line of sustainability, which encompasses economic, social, and environmental dimensions. (Zimmer & Järveläinen, 2022). Organizations discovered that organizations look for economic sustainability when they start their digital transformation (Barthel, P, 2021). Sustainable digital innovations can play a crucial role in facilitating both digital and sustainability transformations. (Zimmer & Järveläinen, 2022).

To achieve future-oriented, economically sustainable models of organization, they modify their internal structures and value proposition (Chanias et al, 2019). Organizations create digital transformation strategies in order to achieve this aim (Hess et al., 2016).

Strategies for digital transformation provide a roadmap from an organization's current business model to a digital one (Matt et al, 2015). Organizations build on grassroots digital innovations using these strategies (Berghaus and Back, 2017). The organizations realized digital transformation plan then consists of these realized digital breakthroughs (Elkington, 1994). As a result, an organization's intended digital transformation strategy acts as a guide, but the actual digital transformation emerges from a series of digital innovations. Indeed, Hinings et al. (2018) define digital transformation as a sequence of digital innovations that accumulates to organization-wide changes (Hinings et al, 2018).

Normally, scientific research studies digital transformation and economic sustainable development as distinct subjects. This thesis seeks to investigate how digital strategy impacts not only economic sustainable development, while also analyzing the connection between digital strategy of the firm and financial/nonfinancial performance of the firm.

Assuming that digital transformation can facilitate enterprises' convergence toward the Sustainable Development Goals, the UN 2030 Agenda has highlighted the potential of digital technology to improve sustainability performance. Despite this, the consequences of digital transformation are debatable, hence it is unclear from the literature whether digitalization and sustainability are positively correlated (Camodeca and Almici, 2021). One of the main goals of this study was to assess the hypothesis that digital strategies of the companies in Italy contributes to the achievement of Sustainable Development Goals and sustainability development.

The Agenda 2030's Sustainable Development Goals (SDGs), which were agreed upon by the United Nations in September 2015, emphasize the role of digital technology in the enhancement of sustainability (The 2030 Agenda for Sustainable Development; United Nations: Paris, France, 2015). The SDGs consist of "a plan of action for people, planet and prosperity"

formulated to "shift the world onto a sustainable and resilient path" (United Nations, Take Action for the Sustainable Development Goals, 2020); in this context, digital transformation has the potential to enable the achievement of sustainable conditions.

The relation between digitalization and sustainability, which has been recently addressed (Kiron and Unruh, 2018), sometimes raises doubts regarding the potential positive contributions of digitalization toward achieving the SDG (Seele and Lock, 2017). Though most scholars agree that **digital transformation can be an effective tool in creating sustainability** (Gouvea; Kapelianis; Kassicieh, 2018), some studies have shown that the effects of digital transformation on sustainability are unclear (Del Río.; Fernándes; Colsa, 2021).

For example, Beier et al. argued that "it remains unclear whether the digital transformation of the economy can be reconciled with the goals of sustainable development" (Beier et al., 2020). Similarly, Brenner et al. stated: "Although digitalization offers new pathways and (unseen) possibilities, its potential to achieve or impede sustainability of ecological, economic, and social human systems remains unclear" (Brenner; Hartl, 2021).

Sustainability scholars have examined the relationship between these two transformation issues (digital transformation and sustainability transformation) because they are interested in how they will merge. Four interrelationships were discovered. Researchers and practitioners conceive of digital and sustainability as:

(1) standalone challenges

(2) neutrally interrelated

(3) positively interrelated

(4) negatively interrelated (Brenner and Hartl, 2021)

To summarize the literature research on the topic under consideration, it is important to note that the interrelation between **digitalization and sustainability is unclear.**

Scholars argue for **neutral, positive and negative interrelations**. In any case, they argue for sustainability being a strategic imperative for digital transformations since organizations'

sustainability transformation is critical for sustainability development (del Río Castro et al, 2021). The specific explanation of this matter through the prism of Italian companies is a significant question and task for my research.

Markus Philipp Zimmer and Jonna Järveläinen (2020) in their research put forward the idea of the so–called the digital-sustainable co-transformation. The digital–sustainable co-transformation is a process that involves significant changes to an organization based on a sequence of sustainable digital innovations (Zimmer & Järveläinen, 2022). Building on Silvestre and Tirca's typology of innovations, authors conceptualized sustainable digital innovations as digital innovations (innovative combinations of digital business concepts and digital technological solutions that satisfy the triple bottom line of sustainability (Wiesböck and Hess, 2020). In other words, digital transformation may give organizations the foundation they need to implement sustainable digital innovations in order to achieve their transformation (Zimmer & Järveläinen , 2022). The plural of "innovations" is emphasized by the authors since a single innovation does not transform society; rather, a series of innovations does. Economic sustainability, the strategic goal of digital transformation, is subsumed by sustainability transformation as a strategic imperative. Typology of digital transformation for sustainability is shown below in the figure (see Figure № 3, based on Zimmer and Järveläinen, 2022).

Figure № 3. Typology of digital transformation for sustainability.

The typology differentiates among four types of digital transformation for sustainability.

First, digital transformation with an emphasis on organizations' economic sustainability. Second, social- digital transformation as capturing a transformation process that rests on digital innovations that emphasize the social dimensions of sustainability. Third, green- digital transformation that emphasizes digital innovations that contribute to environmental sustainability. Last, the digital–sustainable co-transformation that understands both digital transformation and sustainable transformation as one strategic imperative and introduces the triple bottom line of sustainability to digital transformation. This last type of digital transformation for sustainability strikes a balance on the triple bottom line without seeking maximization of any of the dimensions (Zimmer and Järveläinen , 2022). The authors note that such a merger of the two concepts (digital transition and sustainability transition) opens up the prospect of saving resources on both transformations through their joint implementation.

In general, the relationship between digitalization and sustainability is a controversial issue that must be investigated further in order to assess whether digital transformation can actually help firms to achieve the SDGs goals. In the Appendix № 1.3 presents the full list of SDGs – 17 goals.

In accordance with the latest work of the ECB Working Paper Series "Digitalisation and the economy" (2023) about "the digitalization processes: «There is no strong evidence of aggregate productivity gains from digital technologies so far in the euro area, possibly due to slow adoption, among other factors. The limited effects on aggregate productivity in the euro area may be also due to lags in realizing productivity gains, and offsetting effects across firms amplified by concentration in market power in the hands of "superstar" firms" (Luca Dedola (for first author) et al, 2023) Digitalization can lead to economies of scale and network effects, which benefit early innovators and create natural monopolies in the form of digital platforms. This can have an ambiguous effect on competition. Digitalization can lower the price of digital products, disproportionately benefiting richer households who spend more on these products. Digitalization can automate non-routine tasks and displace certain types of workers, potentially leading to job polarization and increased income/wealth inequality. To address these challenges, the document suggests policies such as training and re-training programs, creating "good jobs" that provide middle-class living standards, and using minimum wages to contain wage inequality. The document also notes that the euro area may be falling behind the technological frontier due to slow adoption of digital technologies, limiting the productivity gains from digitalization (Luca Dedola (for first author) et al, 2023).

In recent studies a new term appears, such as "**digital sustainability**". For example, in the research of Ilaria Guandalini (2023), who conducted a systematic review of 153 academic articles to consolidate existing research, understand the thematic connections between different studies, and identify research gaps in the emerging field of "digital sustainability". Considering the relationship between sustainability and digital transformation, it is evident that 'digital sustainability' is not a frequently used term in academic research to indicate digitalization for sustainability purposes. (Ilaria Guandalini, 2023)

It is also important to note that numerous studies exploring the strategic relationship between sustainability or digital strategies of firms with focus on restricted geographies. This is sometimes

highlighted in the title (Alakeson and Wilsdon, 2002; Beier et al., 2017; Singh et al.,2021), but in most of cases emerges from the content. For instance, Paiola et al.'s (2021) use case studies from the Italian manufacturing landscape (the same geographic segment that I am considering in my research) to explain how digital servitization impacts sustainability.

Given this analysis of the literature, I expect that the relationship between digitalization and sustainability will be positive, since this is exactly the pattern observed in most research by scientists.

Therefore, the first hypothesis that I would like to consider is:

H1: Digitalization processes has a positive effect on the sustainability issue.

Next, the second hypothesis will be formulated.

1.2.2 The impact of a firm's digital strategy on its firms financial and non-financial performance

The digitization of processes is important not just for individual businesses, but for entire industries as a means of development that offers the best chance to adapt to the fast changing global environment (Andriushchenko et al, 2020). Because of this, every individual's and every company's life is being altered by the digital transformation of industry, retail, the public sector, and other domains today (Olmstead, 2024).

The modern business environment is undergoing two major changes: a shift toward digitalization and a shift toward sustainability. Businesses must make adjustments to many parts of their operations, which may be seen in the business model, in order to respond to external forces (Vidmar, 2019). A separate role can be assigned in this process to the digital strategy that the company adopts . There is no denying that the trend of digitalization has a big impact on how successful businesses are (Tamás, 2023). Companies must adapt to a number of changes brought about by the digitization process and the adoption of new technology, including the creation of new HRM procedures and new managerial skills. (Benson et al., 2021). It needs to be considered

for study design that successful strategies for changing BM to increase sustainability performance might be very different for large enterprises and SMEs (Vidmar, 2019). Also, the digitalization process is proceeding at different speeds in different industries. The five industries most behind in digital adoption initiatives and programs were the public and government sector, healthcare, hospitality, construction, and agriculture (Goyal, 2023). Governments of different countries are allocating significant financial resources for the process of digitalization of the public sector. For example, moving on to the second area of intervention, digitalization of the public sector in Italy, the Italian National Resiliency and Recovery Plan's (NRRP) assigns €6.14 billion to sustaining the digital transition of the public sector, simplifying it for citizens and businesses and reducing time and costs (Sgueo, 2023).

Some studies have explored how firms need to adapt and upgrade their internal capabilities to succeed in their digital transformation efforts (Ferraris et al., 2019). Also, according to the findings of the recent studies, corporate digitization and digital industry innovation level have a beneficial impact on firm innovation (Li et al, 2023).

Kam Pui Liu and Weisheng Chiu (2020) propose a research model to explore the relationship between supply chain digitalization, supply chain integration and firm efficiency. In their study they made online survey of Chinese employees (N=264) working in the supply chain industry (Liu and Chiu, 2020). This research seems to me very interesting, since in my practical part I also use a survey, but of Italian companies and managers of other levels. The findings of their study reveal that both digitalization and supply chain integration have a **positive impact on performance** (Liu and Chiu, 2020). Supply chain integration partially mediates the relationship between supply chain digitalization and company's performance (Achtenhagen, 2021). Meanwhile, supply chain digitalization positively moderates the relationship between supply chain integration and company's performance (Liu and Chiu, 2020). These findings address the research gap in the extant literature and provide practical implications in ethical supply chain management. Another study (with using panel data from A-share listed companies in China between 2012 and

2019) finds that digitalization can **significantly improve firm performance**, and top management team experience is an essential complementary resource that can effectively strengthen the promotion effect of digitalization on financial performance. finds that digitalization can significantly improve firm performance, and top management team experience is an essential complementary resource that can effectively strengthen the promotion effect of digitalization on financial performance (Zeng et al, 2022).

In my research, I focus on assessing the impact of a company's digital strategy not on the innovative component of the company, but on its financial and non-financial performance of the company. To investigate this issue in my research, I used a survey (a questionnaire) of C-level managers.

Often researchers in this field use a questionnaire in their work (just as I used a questionnaire in my work). The professor Doroteja Vidmar used a questionnaire for her research (Vidmar , 2019), where questionnaire consists of three parts, where first part of the questionnaire based on TOE framework; second part of the questionnaire will be adapted from large EU Horizon 2020 project Envision (a research project on business model innovation (BMI) practices in small and medium enterprises -SMEs). Third part of the questionnaire is based upon GRI standards (Vidmar, 2019). The questionnaire and preliminary research model was tested and adapted through multiple case-studies in Slovenian enterprises. In this study, I analyzed a survey of representatives of Italian companies. I found it a very interesting approach to compile a questionnaire and conduct a survey, so the practical part of my research is also based on the results of a questionnaire of Italian companies.

Special attention in the framework of business development with the involvement of modern technologies is the sphere of FinTech (Jarvis and Han, 2021). The use of FinTech innovations to automate investment, introduce new lending platforms, personalize insurance, and changing banking services has increased last years (Gozman et al, 2018). According to Hua et al., most types of FinTech innovations generate positive value (Hua, Huang, Zheng, 2019). Cloud

computing, which can be defined as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services)" (Battleson et al., 2016).

Artificial intelligence (AI) is the theory and development of computer systems capable of performing tasks that historically required human intelligence, such as recognizing speech, making decisions, and identifying patterns. Although complex to conceptualize univocally (Asatiani et al., 2021; Berente et al., 2021). AI can be defined as the ability of machines to perform cognitive functions that mimic or exceed human cognitive skills (Coombs et al., 2020). The MNE's relational firm-specific advantages, such as local relationships and location-bound training data, can influence the creation of a local "data ecosystem" necessary for AI's effective deployment (Ciulli and Kolk, 2023). However, AI applications also face constraints, such as the dependence on data quality and quantity, the inscrutability of complex AI models leading to lack of trust, and the absence of human traits like intuitive thinking and moral reasoning (Ciulli and Kolk, 2023).

 The former refers to the application of a digital proxy, such as a blockchain token, to represent a previously amorphous unit of natural capital (George et al, 2019). Chen et al. indicate blockchain, cybersecurity, and Robo-advising are the most valuable FinTech innovation types to innovators (Chen MA et al,2019). Blockchain has been defined as "a chain of data blocks each of which is created to record a transaction" (Du et al., 2019) which "provides a distributed data structure that is replicated and shared among the members of a network" (Drummer and Neumann, 2020).

In the process of implementing business processes, it is also important who and how, which manager manages the implementation of digital processes, and this may be a separate area of study in this area (Paiola et al, 2021). Leadership competencies, especially the combination of digital and human skills, are crucial to the development and success of the digital transformation process" (Rakovic, 2024) In the absence of leadership, digital transformation will occur spontaneously in an organization, but it is necessary to monitor and manage the process itself to achieve the goal

and establish a digital organization. The authors Lazar Rakovic et all (2024) in their article identify a vaguely described process of digital transformation as the main research problem, highlighting the need for the systematization of leadership competencies necessary for effective digital transformation management. In this regard, the research objectives are to define and describe the process of digital transformation and identify the leadership competencies necessary for successful management of the digital transformation process. The existing literature within the research field is insufficiently homogeneous and inadequately integrated, resulting in insufficient knowledge about the competencies required for leaders to successfully carry out the process of digital transformation (Müller et al., 2024). Leaders must develop their individual capacities and competence to provide a better understanding of the change in dynamic environments through a strong global vision (Elidjen et al., 2019). As Müller et al. (2024) point out, the literature exists in fragments, and knowledge about the leadership competencies required for digital transformation is lacking. "The same authors emphasize that leaders must possess different competencies depending on the drivers and goals of the digital transformation". (Rakovic, 2024) The road map for digital transformation should be developed, which will guide the organization to where it wants to be in the future (Evans et al., 2021). The problem is that digital initiatives are not always strategically oriented and clearly defined (Engesmo and Panteli, 2021), or management often does not see the difference between digital transformation initiatives and smaller-scale initiatives aimed at increasing efficiency (Solberg et al., 2020). So, proper management in the firm is crucial when implementing digital processes. In today's fast-paced and ever-evolving business landscape, it is essential for organizations to adapt to the digital age in order to remain competitive and relevant.

A number of studies have noted the positive impact of digitalization processes on the company's performance and on the labor market. The articles also note the importance of monitoring the implementation of innovations in the field of digitalization and the need for competent management. After researching a significant number of articles on the topic under study, it is important to note that there are only few number of works that would address two

aspects at once: the impact on the company's management and on the issue of sustainability and the impact on the company's performance in the same time. These two topics are typically discussed independently in the articles. I see some uniqueness of my research in this.

According to the literature analysis, I expect the positive relation between digitalization and performance of the firm.

Therefore, the second hypothesis that I would like to consider is:

H 2: Digitalization processes has a positive effect on the economic growth performance (financial and nonfinancial performance) of firms in Italy.

During the computation process for the empirical section of the study, it also occurred to consider a model in which the financial and non-financial representation of businesses is the dependent variable and sustainability is the independent variable. Both the standard regression and a model using the company's digital strategy as a mediator variable were taken into consideration for this model's framework. As a result, the work also takes into account the following hypothesis:

H 3: When carrying out actions by the company aimed at sustainability issue , how will the implementation of digital strategies by the company affect the financial and non-financial performance of the company? What indirect effect will the company's digital strategies have?

2. METHODOLOGY

2.1 Introduction

To test the hypotheses formulated in the literature review section, I use quantitative research methods based on multiple regression analysis. Based on the collected data, I am conducting an analytical study using regression analysis and other methods of analysis.

In the empirical part of my work, I used two types of DATA:

1.The data which was obtained from a research *project by the University of Pavia and the Institute for Transformative Innovation Research (ITIR).* This research project was aimed to investigate current trends and future perspectives of C-level managers and Top executives responsible for managing innovation, sustainability or digital transformation, regardless of the job title of people in charge of these responsibilities. These data were obtained from a survey of responsible managers, whose responses were quantified and then evaluated.

2. The current financial data of Italian firms was collected from *database Orbis*. Orbis is the world's most powerful comparable data resource on private companies around the world. This dataset provides information about the financial performance of the company every year, for example, the turnover indicator, which was used by me in calculations. These data were downloaded from the system for analysis independently, having previously found the corresponding ID number for each surveyed Italian company.

The mission of quantitative research methods is to concretize data in a numerical version, that is, to measure a phenomenon or process - in the case of my research, the measurements relate to the effects of digitalization processes and digital strategy of Italian firms. The result of using this category of tools is a certain number, the definition of a specific trend and its nature from a scientific point of view: decrease/increase, compliance with current standards or deviation from them and the nature of deviations.

Firstly, I will describe Research Design and instruments I used in the study - Survey Instrument. Then I will explain Sample and relevant Data collection, which involves the use of several sources of information to conduct an analysis. Then I will write hypotheses to test based on the data that was collected. I will then provide several analytical analysis and describe the regression model (linear) which I applied and how the data was analyzed. In that part of the study I will Identify dependent and independent variables: I will determine which variables will be included in the regression model as dependent and independent variables. Then I will provide mediation analysis of the data. For calculation I used a statistical software package such as **SPSS** tool by IBM. Then I will present the results obtained.

A triple bottom line approach of the company requires to focus not only on the main indicators and parameters - such as profit, as was often the case in economic processes earlier, but also to take into account aspect of sustainability issue, which is closely connected with environmental and social aspects.

In my research, I raise the issue of the impact of the digitalization processes with respect to two parameters and consequences:

1.   The first hypothesis concerns how digital strategy affects the **sustainability issue**, which is now on the agenda, and more and more laws are being applied in the European Union and everywhere in the world to support SDG framework. The concern is: «Does the process of digitalization really have a positive effect on what is expected of it, or are there negative factors that affect it indirectly»? I will consider this example using the example of a country – Italy.

2. The second hypothesis that I have considered: «Does the impact of the digitalization process on the direct **economic representation of firms** in Italy is positive/neutral or negative»? I will explore financial and non-financial performance of the firm after providing of digital strategy in it.

Since, on the one hand, the processes of digitalization are recognized to lead to more efficient processes of the company, but also requires significant initial investments in carrying out the

transformation and transition of firms to a new process. Now there are many works by our contemporaries on this issue, which represents different points of view, but only few articles cover this two cases together.

On the figure № 4, it is possible to see a visualization of the dual task that has arisen for research in this Master thesis.
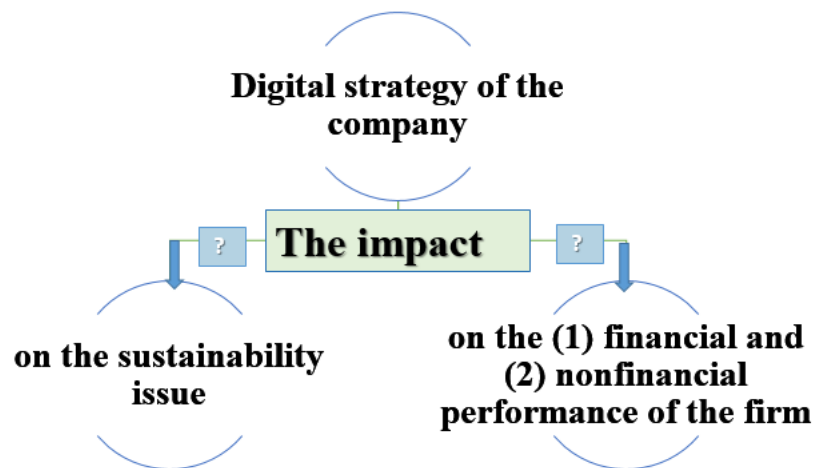

Figure № 4 The impact of digital strategy on company's performance: a TBL approach.

My research aims to elucidate the digitalization phenomenon in contemporary society, addressing the following inquiries:

- ✓ Can digitalization and its implementation strategies assist businesses in addressing the Triple Bottom Line (profit, human welfare, and environmental sustainability) challenges?;

- ✓ How do digitalization processes influence the sustainability challenge?;

- ✓ Does digitalization impact companies in Italy's financial and non-financial performance positively, neutrally, or negatively?

2.2 Research Design

Research design greatly depends on the nature of research questions. For the research questions that I raised in the previous part, it was most suitable **cross-sectional approach** of

research. A cross-sectional approach in research design is a type of study that involves collecting data from a group of individuals at a single point in time. For the main survey, a time period in summer 2023 was selected for a certain sample, then in the next part of the work, I will describe in more detail about the sample under study.

A cross-sectional approach is often used in social science research to gather information about a specific population or phenomenon at a particular moment. One of the key advantages of a cross-sectional approach is that it allows researchers to quickly gather a large amount of data about a specific population or phenomenon. This can be particularly useful when studying topics that are time-sensitive or when researchers are limited in terms of resources or time. Furthermore, cross-sectional studies are relatively easy to conduct and analyze, making them a popular choice for researchers. However, there are also limitations to using a cross-sectional approach in research design. One of the main drawbacks is that this type of study design can only provide a snapshot of a particular moment in time, making it difficult to draw conclusions about cause and effect relationships or changes over time. Additionally, cross-sectional studies are more susceptible to bias and confounding factors, which can limit the generalizability of the findings.

In this paper, I look at non-financial indicators in a short cut, that is why I used cross-sectional approach, however, in the future this work has the prospect of continuing to look at changes in the time sample. Financial indicators of firms can be studied in comparison with previous years, which gives us the opportunity to look at the time perspective in the field of turnover changes, for example.

I provided **confirmatory research approach in this study**. "Confirmatory research is a study in which researchers hold a certain hypothesis or idea about the research questions, which includes the relations or differences between constructs" (Butler, 2014). I gathered all necessary Data for the study and then used statistical analysis techniques to test the hypothesis/questions and determine the significance of the results. In the confirmatory research I interpret the findings in the context of the research question and existing literature.

In the practical part of my work, I used **two types of DATA**:

1.The data which was obtained from a research *project by the University of Pavia and the Institute for Transformative Innovation Research (ITIR).* This research project was aimed to investigate current trends and future perspectives of C-level managers and Top executives responsible for managing innovation, sustainability or digital transformation, regardless of the job title of people in charge of these responsibilities.

2. The current financial data of Italian firms was collected from *database Orbis*. Orbis is the world's most powerful comparable data resource on private companies around the world. This dataset provides information about the financial performance of the company every year, for example, the turnover indicator, which was used by me in calculations.

2.3 Population and Sample

Target Population

The first step - to define the population that i want to study for the research. The population was defined as companies in the process of transformation, most innovative companies, there were Italian companies. The criteria - that Italian companies were with Chief Transformation Officer, CINO, CSO or CDO. The survey of **managers with the highest decision-making authority in the company regarding innovation, digital transformation, or ecological/social sustainability** was carried out. In the project research If your company does not have specific roles like these managers, the scientists took the answers from the CEO or other top-level executives who are familiar with the company's strategies. The questionnaire was adapted through multiple case-studies in Italian enterprises. A sample of managers who fit the criteria of the study was selected for the study. Further, the work could use the data of those respondents who are ready to answer the questions raised about the research topic, and get a result from them.

To conduct the study, I selected information from these data that related to the country was chosen by me to study - Italy, and the indicators I needed for analysis. The survey covered the following indicators and parameters of firms: company age, ownership type, turnover 2022, innovation performance (process innovation), sustainability-oriented innovation performance, digital strategy and digital performance of Italian firms. Each parameter category included from 5 to 9 parameters within each category. To conduct the analysis, I calculated the average parameter for each category in a certain way, which will be described below.

The survey was conducted in such a way that quantitative indicators reflecting the qualitative assessment of the respondents were obtained, which helped to make an accurate analysis of the data.

Sampling Method

The second step was - to choose a sampling method that suits this research question and data availability. Population has been identified with 2 strategies: 1) LinkedIn search and 2) Respondents from the previous waves of the survey. Data of the companies have been obtained by matching the name of the company with Orbis data set.

There are different types of sampling methods, such as random, stratified, cluster, or convenience sampling. It was more suitable for this type of research - **self-selection sampling method**. A self-selected sample is simply one in which the respondents put themselves forward for participation in a survey or similar form of research. The likelihood of bias in the sample is very high, as those who are most inclined to participate are typically individuals with a specific interest in the topic. Individuals volunteer to participate. This method can lead to a high level of bias as the sample may not be representative of the general population.

Sample Size

The third step was to calculate the sample size that is sufficient to represent your population with a certain level of confidence and precision (from 10% to 20%). The data collection period for this work was from the 14th of July 2023 until the 30th of August 2023, within which a total of N = 524 responses could be collected. After deleting companies that are not Italian and after deleting unusable responses (due to missing data) according to definition, the final dataset consisted of **N = 215** respondents (Italian companies). Initially, there were also non-Italian companies in the sample, which were excluded from it in advance. For financial indicators, the same number of respondents were selected from database Orbis, similar to those who participated in the survey, and remained in the final sample.

The fourth step was to check the characteristics of your sample and compare them with the characteristics of your population. I used data visualization (provided by SPSS tools) for creating visualizations, that helped for better understanding of the data.

Before of the analysis I also measured Cronbach's alpha coefficient for these groups of parameters. Cronbach's alpha coefficient measures the internal consistency, or reliability, of a set

of survey items. Use this statistic to help me determine whether a collection of items consistently measures the same characteristic.

2.4 Survey Instrument

Development and Design

To conduct the survey, a questionnaire was submitted, which consists of a main section containing questions related to the company's digital strategy process, sustainability issue and innovation performance, as well as additional questions, including data related to the company profile and the profile of the manager himself filling out the questions. The survey was set up in QuestionPro, which allowed respondents to choose between an English and an Italian version. The questionnaire was translated into English and translated back to Italian to ensure consistency between the two versions. Also, the survey was pretested in a pilot study to test the clarity of the questions, evaluate the length of the survey, confirm validity, and assess the variability of the constructs.

For the analysis, I used the average index of the data obtained in each category. I also used the Cronbach's Alpha coefficient for further analysis. Cronbach's alpha is a widely used indicator of the reliability of internal consistency in psychological and social research.

Structure and Content Outline

In the process of interviewing managers through the survey, additional questions were created that fit the sample. These additional questions contained several possible answers, and respondents who met the criteria participated in the study. So the survey on the additional question was **multiple-choice.**

For the main part of the survey was used the **Likert scale**. The Likert scale is a commonly used tool in social science research to measure attitudes and opinions. It consists of several statements that participants are asked to respond to on a scale, typically ranging from "strongly

agree" to "strongly disagree." In this study, a quantitative assessment from "1" to "5" was used, which allowed for a clearer analysis. This scale allowed to quantify subjective feelings and opinions in a structured way, providing valuable insights into participants' perspectives. The Likert scale can be used to assess a wide range of topics, from customer satisfaction to political beliefs, making it a versatile tool for gathering data in various fields of study. So, this approach was useful in this case.

The table № 2. shows the rating scale used in the survey.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

Table № 2. the Likert scale

Questions required for the manager's answers included the following areas:

Manager's profile:

a)   key responsibilities (The following answers have been suggested: innovation, environmental and/or social sustainability, digitalization or none of the above)

b)   personal information (The following answers have been suggested: First Name, Last Name, Job Title)

c)   age (The following answers have been suggested: Under 25, 25-35, 36-45, 46-55)

d)   Tenure (The following answers have been suggested: year)

e)   Other multiple-choice questions included data of reporting structure, budget and staff under control of the manager.

The Likert scale was used to **identify Leadership style and Job-related priorities**. Each category has from 6 to 10 questions with scale from **1** to **5**, where 1 is "**Strongly disagree**", and 5 is "**Strongly agree**". There are such questions as : «Does respondent spend time teaching and coaching?», «Does respondent treat others as individuals rather than just as a member of a group?, «Does respondent help others develop their strengths? or «Does respondent prioritize technological development?, "Does respondent prioritize Making the company more sustainable

from ecological point of view?", "Does respondent prioritize Making the company more sustainable from social standpoint (e.g. inclusion, work- life balance, etc.)"?, "Does respondent prioritize making the company more innovative" and others questions.

The next part of the survey contains data related to the company profile.

Company profile includes following questions with multiple-choice answers about:

a.   Company age

b.   Ownership type

c.   Turnover 2022

The Likert scale was used in this part of survey to identify:

a.   **Ongoing Transformation** (Digital strategy and solutions , Technological paradigms , Purpose/mission, Eco-system / network of partners / supply chain)

b.   **Innovation posture** (Does company mostly invest in radical innovation or mostly invest in incremental innovations, Does company innovate by leveraging our legacy)

c.   **Innovation performance** (product innovation) and Innovation performance (process innovation)

d.   **Sustainability** (examples of questions: " Does the company actively engage external partners to gather innovative ideas", "Does the company leverage data and digital solutions (to promote sustainability) and so on.

The survey is also based on questions regarding the following two topics: Digital strategy and Digital performance.

The part of **Digital strategy** consists of following statements:

✓   Digitalization is today at the core of our competitive advantage

✓   We generate remarkable value from data we collect

✓   We exchange strategic data with key partners and/or supplier

✓   We leverage on digital solutions to promote sustainability

✓   Digitalization pushed us to a radical transformation

The part of Digital performance consists of following statements, that in the company has improved:

✓   Cost reduction

✓   Data management (the process of acquiring, validating, storing, protecting, and processing data)

✓   Productivity and Process optimization

✓   Company agility (flexibility and quick responses)

✓   Customer satisfaction

✓   Collaboration between employees and/or departments

✓   Learning and Knowledge management

✓   Quality of work (inclusion, improving working conditions, organizational climate)

For example, Appendix № 3.1 performer the example of the questionnaire which was provided to managers.

I also found out the identification numbers of companies, which were in my selection, and gathered in the **Orbis** database, the available financial indicators of the selected companies, and ultimately, indicators of turnover and additional age of the company were selected.

2.5 Data Collection Procedure

Administration

The survey was administered on-line in **QuestionPro**, which allowed respondents to choose between an English and an Italian version.

QuestionPro is an online survey platform that allows you to create surveys and questionnaires in very convenient way, as well as allowing you to analyze and view the results, that is way this platform was chosen for gathering the data. This helps to manage risks, scale best practices, and improve digital and social presence.

To enter the **Orbis** database, I took advantage of the opportunity to use my university subscription.

Timeline

The data collection period for this work was during 1,5 months in the summer time of 2023 - from the 14/07/ 2023 until the 30/08/2023.

For financial indicators, the collection Data from Orbis database was carried out in May 2024 and then checked in June in order to get a complete picture of the data for 2023 and 2022, as well as for the previous ones (if we are talking about the company's turnover, for example)

2.6 Data Analysis

Data Preparation

In this part of my master thesis I will describe the steps taken to prepare the data for analysis, including data cleaning, handling of missing data.

First of all, the data that was uploaded to Microsoft Excel format was cleared from:

a.   companies where no answers were received to the questions asked, and therefore they cannot participate in the analysis

b.   I filtered the Data by country, since not only Italian companies participated in the sample. I chose a country for my research – Italy. So, only Italian companies remained in the sample.

Further, additional data was checked: for example, that all positions held by managers corresponded to the request.

Then I have deleted data from the database that are not necessary for the study: for example, such as the company's city, manager's data and other data.

It was also checked that there are no more companies with missing data in the base.

In order to find financial indicators for companies in the Orbis database, I found the company ID of each company in the Orbis database by company names, and then automatically uploaded data on the turnover and year of creation of the company. In order for the age line of the company to be displayed correctly, I subtracted the indicator of the year of creation of the company from 2024.

In order to obtain a parameter - a common index for each of the phenomena under consideration. I needed to find the average for each category.

At the output, I needed to have three parameters reflecting the phenomena under consideration:

1) the "DIG" indicator reflects the process of the company's digital strategy.

2) the "SUST" indicator - reflecting the sustainability issue.

3) "NONFINPERF" and "FINPERF" indicators - reflecting financial and nonfinancial performance of the firm.

Before of this process I also measured Cronbach's alpha coefficient for these groups of parameters. Cronbach's alpha coefficient measures the internal consistency, or reliability, of a set of survey items. Use this statistic to help me determine whether a collection of items consistently measures the same characteristic. Cronbach's alpha quantifies the level of agreement on a standardized 0 to 1 scale. Higher values indicate higher agreement between items. High Cronbach's alpha values indicate that response values for each participant across a set of questions are consistent. For example, when participants give a high response for one of the items, they are also likely to provide high responses for the other items. This consistency indicates the measurements are reliable and the items might measure the same characteristic.

Next, I calculated the arithmetic mean (for this I used Microsoft Excel tool) for each category of indicators, taking into account the inclusion of variables that were possible after calculating the coefficient.

It was also necessary to prepare a financial indicator, which is designated "GROWTH" and shows the percentage of turnover growth in 2022 in relation to turnover growth in 2020. The growth rate was calculated using the formula = (turnover 2022 - turnover 2020)/turnover 2020. The SPSS tool was also used to prepare this data.

Variables were also prepared for factor analysis. I explored variables, which describe "digital strategy" of firms, the sustainability, innovation performance and other variables which were described in previous part. In the table № 3 the data is presented that corresponds to each item of the variable – «digital strategy».

Name of the variable for factor analyses[2]	The corresponding question to the respondent
DIG_STR1	Digitalization is today at the core of our competitive advantage
DIG_STR2	We generate remarkable value from data we collect
DIG_STR3	We exchange strategic data with key partners and/or supplier
DIG_STR4	We leverage on digital solutions to promote sustainability
DIG_STR5	Digitalization pushed us to a radical transformation

Table № 3 The variable – «digital strategy»

In the table № 4. the data is presented that corresponds to each item of the variable – «digital strategy».

Name of the variable for factor analyses[3]	The corresponding question to the respondent
SUST_1	Improving ecological sustainability (e.g. reduction of environmental impact) is a top priority
SUST_2	We assess customers' views of green products/services through market analysis
SUST_3	Multiple departments are engaged in sustainability-related initiatives.
SUST_4	We consider sustainability as an opportunity for differentiation
SUST_5	Non-market stakeholders* are involved in design and development
SUST_6	We actively engage external partners to gather innovative ideas
SUST_7	We leverage data and digital solutions (to promote sustainability)
SUST_8	Improving social sustainability (e.g. inclusion, worklife balance, etc.) is a top priority

---

[2] The variable is built from the literature: Check: Proksch, D., Rosin, A. F., Stubner, S., & Pinkwart, A. (2024). The influence of a digital strategy on the digitalization of new ventures: The mediating effect of digital capabilities and a digital culture. Journal of small business management, 62(1), 1-29.
[3] The variable is built from the literature: Rasool, Faisal, Marco Greco, and Michele Grimaldi. "Digital supply chain performance metrics: a literature review." Measuring Business Excellence 26.1 (2022): 23-38.

SUST_9	Sustainability goals pushed us to a radical transformation

Table № 4 The variable – «Sustainability»

The variable financial performance of the firm (FINPERF) was calculated as a relative indicator of the change in the turnover of the company during the period under review (data were taken from Orbis). The variable nonfinancial performance (NONFINPERF) of the firm was calculated based on the average quantitative indicators from the survey.

Analytical Techniques

A tool for conducting analytical research - Statistical Package for the Social Sciences (SPSS)

For calculations and analytics, in my master's thesis I used a tool called Statistical Package for the Social Sciences (SPSS). SPSS is a software package used for statistical analysis. It was originally developed by IBM in 1968 and is commonly used in social, economic and scie nce research, such as psychology, sociology, and other related fields.

SPSS allows researchers to analyze and manipulate data using a wide range of statistical techniques. Some of the functions of SPSS include data preparation, descriptive statistics, inferential statistics, data visualization, and reporting. I used this statistical tool because it has a user-friendly interface, is easy to use and contains enough functions to carry out the analysis I planned.

Some functions of SPSS include:

- Data Entry and Manipulation: SPSS allows users to enter and edit data, as well as manipulate variables and cases within a dataset.

- Descriptive Statistics: SPSS can generate basic summary statistics, such as mean, median, mode, standard deviation, and range, to describe the characteristics of a dataset.

- Inferential Statistics: SPSS can perform a wide range of statistical tests, such as t -tests, ANOVA, regression analysis, chi-square tests, and factor analysis, to analyze relationships

between variables and test hypotheses. In my research, I conducted a factor analysis and also built a linear regression.

- Data Visualization: SPSS provides various tools for creating visualizations, such as bar charts, histograms, scatterplots, and boxplots, to help users better understand their data.

- Reporting: SPSS allows users to generate customizable reports and tables that can be exported to other software tools, such as Microsoft Word or Excel, for further analysis or presentation.

Overall, SPSS is a powerful tool for conducting statistical analysis and is widely used not only in academic research, business analytics, and other fields where data analysis is required.

I downloaded several additional plugins for the standard version of SPSS, which I also used in the research process.

For the analysis, I use the quantitative data described in the previous part of the work. I will provide factor analysis. Factor analysis is a statistical method used to identify patterns in data and determine the underlying structure of relationships between variables. It is often used in research to reduce the number of variables and identify the key dimensions that explain the variance in the data. The main idea of factor analysis is to identify the most important and significant factors in a set of variables that demonstrate similar characteristics. Factor analysis is aimed at reducing the dimension. In my research, I conducted a factor analysis for the DIG 'digital strategy' variable, which is presented in the analysis below.

To conduct factor analysis I used SPSS tool, and I followed these steps:

a.   I Imported data into SPSS.

b.   Go to Analyze > Dimension Reduction > Factor.

c.   In the Factor Analysis dialog box, select the variables i want to include in the analysis and move them to the Variables box.

d.   Under Extraction, I have chosen the method for extracting factors - Principal Component Method. The Principal Component Method (PCA) is a method of factor analysis that

is used to isolate the most important factors from a large number of variables. It is based on the search for linear combinations of variables that explain the largest proportion of data variability. These linear combinations are called principal components.

e.　　　Under Rotation, choose the method for rotating factors to achieve a simpler (Varimax).

f.Then run the analysis.

After running the factor analysis, SPSS provided output that includes the factor loadings (correlations between variables and factors), communalities (the amount of variance explained by each factor), and eigenvalues (indicators of the amount of variance explained by each factor). I used this output to interpret the results and determine the key factors that explain the variance in the data.

I also used SPSS tool for calculating and providing all analysis: for factor analysis, for regression analysis and graphs, for moderation and mediation analysis. For example, also for calculating **Cronbach's alpha** coefficient, I used SPSS tool. Cronbach's alpha is a widely used indicator of the reliability of internal consistency in psychological and social research. It measures the extent to which the elements of a test or questionnaire measure the same construction or concept. The Cronbach's Alpha coefficient ranges from 0 to 1, with higher values indicating greater reliability**.**

It's calculated from the following formula № 2.6.1:

$$\alpha = \frac{k}{k-1}\left[1 - \frac{\sum_{i=1}^{k} S_i^2}{S_T^2}\right], \qquad \begin{matrix} (k > 1) \\ (i > 1) \end{matrix}$$

Formula № 2.6.1 Cronbach's alpha

The number of items in the questionnaire is given by k.

S_i^2 (i = 1, …, k) - the variance of each question is defined by S_i^2 (i = 1, …, k).

ST^2 - the variance of the sum of the responses of each subject j (j = 1, …, n), where n is equal to the number of individuals in the sample. The acceptable value of alpha in reliability analysis is between - 0,7 and 0,8, that indicates a good reliability. (Kline, 1999).

I calculated Cronbach's alpha in SPSS tool. To calculate Cronbach's alpha in SPSS, follow these steps:

a.   I loaded my dataset

b.   Then "Analyze" in the top menu and selected "Scale" and then "Reliability Analysis".

c.   In the Reliability Analysis dialog box, select the necessary variables I want to include in the calculation of Cronbach's alpha by moving them to the right side box labeled "Items".

d.   Run analysis

SPSS tool generated the output which includes Cronbach's alpha coefficient for the selected variables. I will perform it in the next part of the master thesis.

I use econometric methods, namely, I will build **two separate linear regression models** that will show the dependence of economic sustainable development on the influence of digitalization, as well as the dependence and correlation between the economic (financial and nonfinancial) performance of a company in Italy and the processes of digitalization.

Hypothesis:

H1: Digitalization processes has a positive effect on the sustainability issue.

H 2: Digitalization processes has a positive effect on the economic growth performance (financial and nonfinancial performance) of firms in Italy.

In this part I will use linear regression for estimation. Linear regression is a statistical method used to model the relationship between a set of independent variables and a dependent variable.

(1)   In this case, the independent variable is parameters of " **digital strategy** " and the dependent variable is "**sustainability** " in the first equation under study.

(2)   In the second equation under study the independent variable is " **digital strategy** "and the dependent variable is "**non financial and financial performance of firms** ".

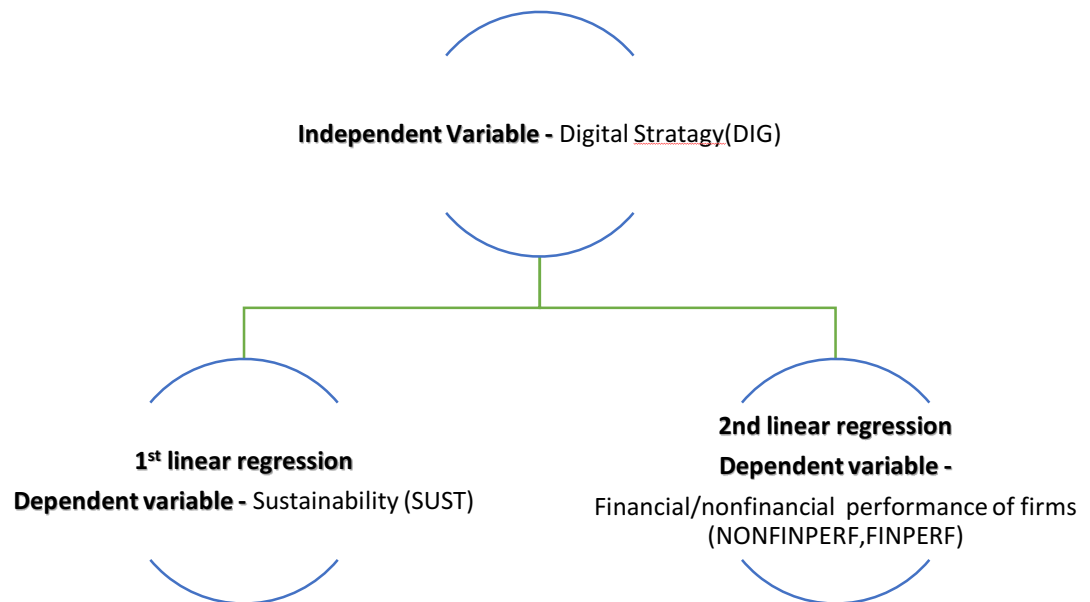Figure № 5 provides a visualized picture of the variables involved in the study.

Independent Variable - Digital Stratagy(DIG)

1st linear regression
Dependent variable - Sustainability (SUST)

2nd linear regression
Dependent variable -
Financial/nonfinancial performance of firms
(NONFINPERF,FINPERF)

Figure № 5

In the analytical part of the study, I will count a linear regression with one independent variable for two equations.

Linear regression with one independent variable, also known as simple linear regression, is a statistical method used to model the relationship between a dependent variable and one independent variable. The goal of linear regression is to find a linear equation that best predicts the value of the dependent variable based on the values of the independent variable.

For the analysis, I used the linear regression method. Linear Regression is a statistical supervised learning technique to predict the quantitative variable by forming a linear relationship with one or more independent features.

Linear Regression helps determine:

a) If an independent variable does a good job in predicting the dependent variable.

b) Which independent variable plays a significant role in predicting the dependent variable.

Assumptions of Linear Regression:

a)   The Independent variables should be linearly related to the dependent variables.

b)   Every feature in the data is Normally Distributed.

c)   There should be little or no multi-collinearity in the data.

d)   The mean of the residual is zero.

e)   A residual is the difference between the observed y-value and the predicted y-value. Having residuals closer to zero means the model is doing great.

f)   Residuals obatined should be normally distributed.

g)   Variance of the residual throughout the data should be same.This is known as homoscedasticity.

(1)   The linear regression model assumes that there is a linear relationship between the independent and dependent variables. This relationship is represented by the equation:

y = β0 + β1x + ε

Where:

Y - is the dependent variable (**Sustainability**)

X is the independent variable (**digitalization strategy of the Italian firm**)

This relationship is represented by the equation:

(1) SUST= β0 + β1*DIG_STR + ε

β0 - is the intercept term, representing the value of y when x is 0

β1 - is the slope coefficient, representing the change in y for a one-unit change in x

ε - is the error term, representing the random variability in y that is not explained by x

The goal of this linear regression model is to estimate the values of β0 and β1 that best fit the observed data. This is done by minimizing the sum of the squared differences between the observed values of y and the values predicted by the model (known as the residuals).

Once the model is estimated, it can be used to make predictions about the dependent variable based on the values of the independent variable. It can also be used to test hypotheses about the relationship between the variables and to assess the overall fit of the model to the data.

In the context of the digitalization and sustainability example, the linear regression model could be used to quantify the impact of digitalization on sustainability outcomes. For example, it could be used to estimate the change in sustainability for a one-unit increase in digitalization, or to compare the sustainability outcomes of different digitalization strategies.

(2) In the second part the linear regression model (2) assumes that there is a linear relationship between the independent and dependent variables. This relationship is represented by the same type of equation:

$y = \beta 0 + \beta 1 x + \varepsilon$

Where:

Y - is the dependent variable (**Nonfinancial (NONFIN)/Financial(FIN) performance of firms**)

X - is the independent variable (**digitalization strategy of the Italian firm**)

(2.1) NONFIN= β0 + β1*DIG + ε

(2.2) FIN= β0 + β1*DIG + ε

β0 is the intercept term, representing the value of y when x is 0

β1 is the slope coefficient, representing the change in y for a one-unit change in x

ε is the error term, representing the random variability in y that is not explained by x

To calculate the parameters of a linear model using the OLS method, the following expressions are obtained in Formula № 2.6.2.:

$$\beta_1 = \frac{\sum_{i=1}^{n}(x_i - x_{cp})(y_i - y_{cp})}{\sum_{i=1}^{n}(x_i - x_{cp})^2}$$

$$\beta_2 = y_{cp} - ax_{cp}$$

I used the SPSS tool for all analytical tasks and calculations. In the context of SPSS, conducting a simple linear regression analysis involves the following steps, which I have done:

Download the dataset in SPSS that contains the variables you want to analyze.

Use the "Analyze" menu and select "Regression" and then "Linear."

In the Linear Regression dialog box, i move the dependent variable i want to predict (SUST/NONFIN/FIN) into the "Dependent" box and the independent variable i want to use for prediction into the "Independent" box (DIG).

Then run the analysis, results of which I will perform in the next part of this master thesis.

SPSS tool displays the results of the linear regression analysis, including the regression equation, coefficients, R-squared value, and other relevant statistics. I used these results to interpret the relationship between the variables and for making predictions based on the model.

In the "Finding section" of the work, calculations and conclusions regarding linear regression will be carried out. Next, I decided to complicate the analysis somewhat, and use the second approach to analysis - using a mediator.

So, after constructing of these three linear regressions to go into deeper data analysis, I decided to implement another variable and perform a media analysis. In this analysis, the digital strategy of the company already represents a mediator, and the independent variable becomes the indicator of stability, the dependent variable is the financial and non-financial performance of the company.

The analysis was also performed using the SPSS tool. For using this analysis, I downloaded the new plugin - SPSS *Mediation Analysis with PROCESS,* developed by Andrew F. Hayes, Ph.D.

SPSS Mediation Analysis with PROCESS

PROCESS is a useful statistical tool for logistic regression path analysis modeling analysis, developed by Andrew F. Hayes, Ph.D., and available for SPSS. The PROCESS macro greatly simplifies the mediation, and moderation analysis in SPSS to just a few simple clicks, and provides a great number of regression analysis features.

Mediation analysis is a statistical technique used to examine the mechanism or process by which an independent variable influences a dependent variable through one or more mediating variables. It helps researchers understand the underlying causal relationships between variables in a given model.

I made the following steps to conduct mediation analysis using the SPSS system:

a. download dataset in SPSS with the variables of interest, including the independent variable, mediating variable, and dependent variable.

b. run regression analysis: conduct regression analysis to test the direct effect of the independent variable on the dependent variable.

c. run regression analysis for the mediator: Conduct regression analysis to test the effect of the independent variable on the mediator variable.

d. run regression analysis for the mediator and dependent variable: Conduct regression analysis to test the effect of the mediating variable on the dependent variable.

e. calculate the indirect effect: i used the PROCESS macro in SPSS to calculate the indirect effect of the independent variable on the dependent variable through the mediator variable.

f. get results

By following these steps, I could conduct mediation analysis in SPSS to understand the underlying mechanisms of relationships between variables in their research studies.

Figure № 6 provides a visualized picture of the variables involved in the mediation analysis in this study.
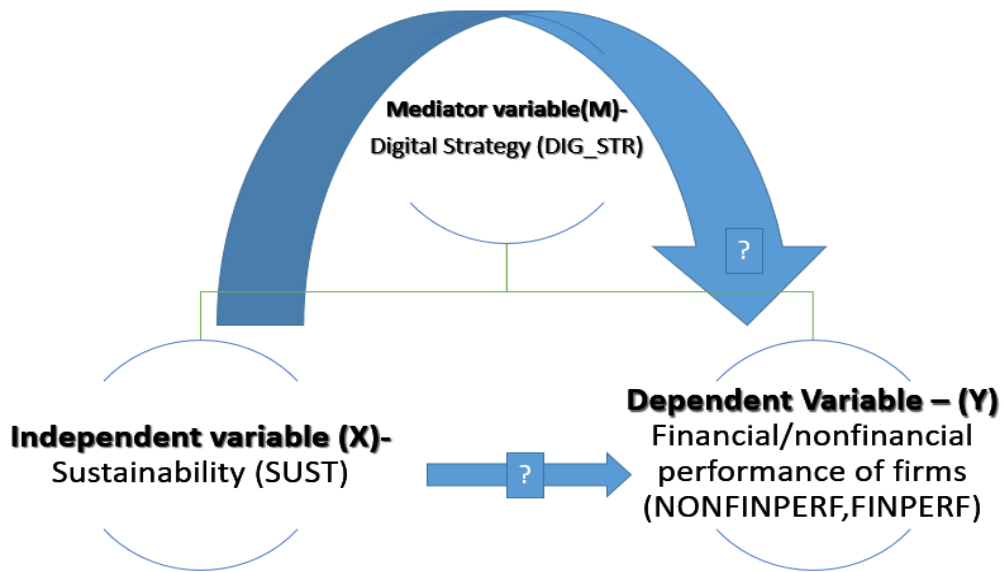
Mediation analysis

Mediator variable(M)-
Digital Strategy (DIG_STR)

?

Independent variable (X)-
Sustainability (SUST)

?

Dependent Variable – (Y)
Financial/nonfinancial
performance of firms
(NONFINPERF,FINPERF)

Figure № 6. A model with using a mediator variable - digital strategy (DIG_STR)

3.FINDINGS SECTION

3.1 Descriptive Statistics & Data Visualization

This section will present several ways to analyze the DATA which I have:

1) factor analysis;

2) Cronbach's alpha calculation,

3) simple linear regression model for 3 different cases,

4) conducting a Mediation Analysis with PROCESS.

Factor analysis

According to the "Digital strategy" (DIG_STR) indicator - As a result of the factor analysis conducted in SPSS tool, 4 tables were obtained.

In the "Extraction" column № 2 of table № 5, it is desirable that the number tends to "1". DIG_STR_3 it has the lowest indicator = 0,435 , but to decide whether to include all variables, you need to look at the indicators further.

Communalities		
	Initial	Extraction
DIG_STR_1	1.000	.695
DIG_STR_2	1.000	.664
DIG_STR_3	1.000	.435
DIG_STR_4	1.000	.615
DIG_STR_5	1.000	.573
Extraction Method: Principal Component Analysis.		

Table № 5

In the table № 6 , we can see that the component 1 has loading cumulative % is around 59,6%

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.983	59.662	59.662	2.983	59.662	59.662
2	.789	15.773	75.435			
3	.480	9.596	85.031			
4	.417	8.340	93.370			
5	.331	6.630	100.000			

Extraction Method: Principal Component Analysis.

Table № 6

The component matrix allows us to see which variables are included in the new factors – we have only component 1. All 5 indicators are included in component 1, what is visible in the component matrix in the table № 7 .

Component Matrix[a]

	Component 1
DIG_STR_1	.834
DIG_STR_2	.815
DIG_STR_4	.784
DIG_STR_5	.757
DIG_STR_3	.660

Extraction Method:
Principal Component
Analysis.

a. 1 components
extracted.

Table № 7

Coefficient - Cronbach's Alpha

I conducted Cronbach's Alpha test for two parameters - sustainability (SUST) and digital strategy (DIG_STR).

Parameter sustainability (SUST) are included 9 indicators. Results of Cronbach's Alpha are shown on the table № 8. It was valid for 204 companies.

Case Processing Summary

		N	%
Cases	Valid	204	94.9
	Excluded[a]	11	5.1
	Total	215	100.0

a. Listwise deletion based on all variables in the procedure.

Table № 8

In the table № 9 we can see that Cronbach's Alpha for SUST indicator = 0,887. According to the scale, such a coefficient is considered "good"
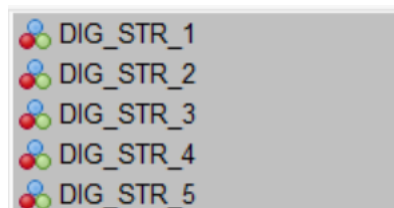
Reliability Statistics

Cronbach's Alpha	N of Items
.887	9

Table № 9

I will conduct similar analysis for the second parameter - digital strategy (DIG_STR).

Parameter digital strategy (DIG_STR) consists of 5 elements, which were described before and is possible to see in the table № 10.

DIG_STR_1
DIG_STR_2
DIG_STR_3
DIG_STR_4
DIG_STR_5

Table № 10

Results of Cronbach's Alpha are shown on the table № 11. It was valid for 201 companies.

Case Processing Summary

		N	%
Cases	Valid	201	93.5
	Excluded[a]	14	6.5
	Total	215	100.0

a. Listwise deletion based on all variables in the procedure.

Table № 11

In the table № 12 we can see that Cronbach's Alpha for DIG_STR indicator = 0,829. According to the scale, such a coefficient is considered "good". So, according Cronbach's Alpha coefficient this indicators is good.

Reliability Statistics

| Cronbach's Alpha	N of Items
.829	5

Table № 12

Linear regression models

For the parameters for linear regression, I used the arithmetic mean for all categories for the "SUST" parameter and for the "DIG_STR" parameter. I put all categories in one each parameter and run simple linear regression. The model is being built for Italian companies, according to data collected in the summer, 2023.

Y= SUST; X =DIG.STR

SUST= β0 + β1*DIG_STR + ε

Data visualization. Firstly, i created a scatter plot (Graph № 3.1.1) to visualize the relationship between the "SUST" parameter and for the "DIG_STR" parameter, to make sure that the relationship between the two variables seems linear. Otherwise, simple linear regression will not be a suitable technique.
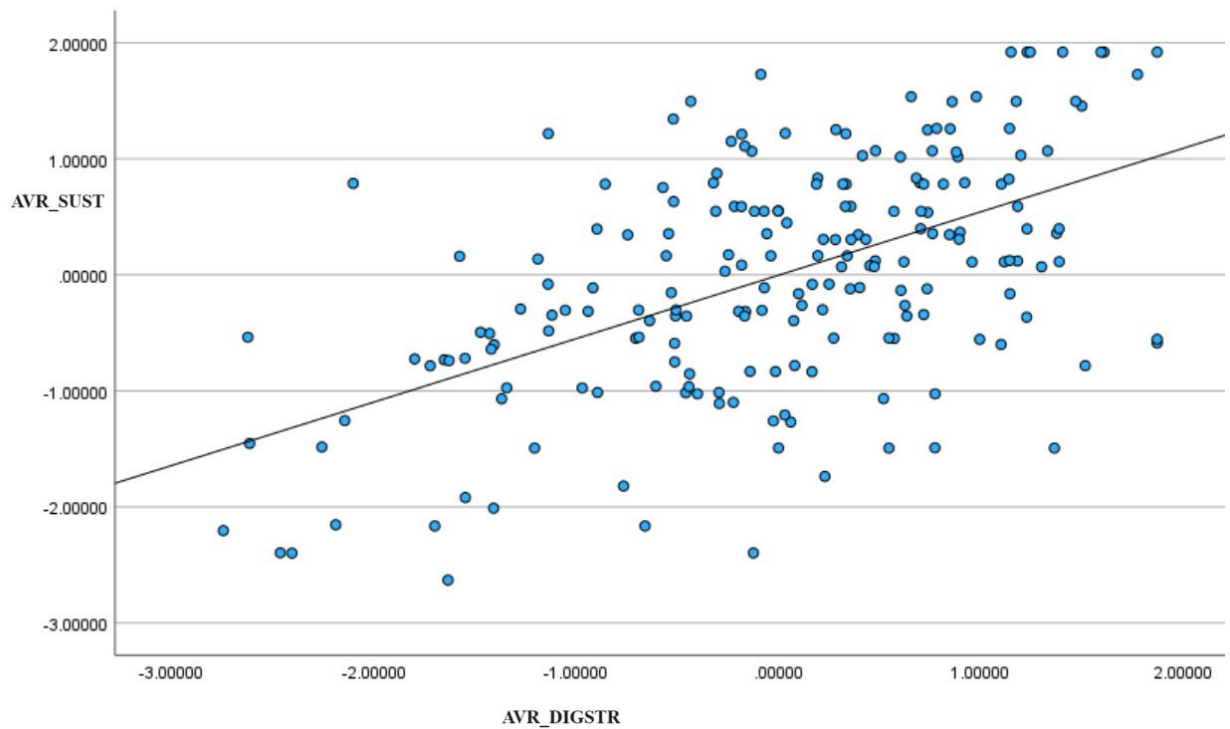
Graph № 3.1.1

It can be seen from the previous graph that there is a positive linear relationship between the two variables under consideration. I also added a trend to the chart. So, we can mean that when digital strategies are implemented more actively, they tend to have a more positive impact on the sustainability issue. Since there is a clear linear relationship between the two variables, I will proceed to fit a simple linear regression model to the dataset.

The following tables show the results of a simple linear regression. The table № 13 is "Model Summary".

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.546[a]	.298	.295	.83865324

a. Predictors: (Constant), DIG_STR

Table № 13

Interpretation of the most important numbers in this table:

R Square: This is the proportion of variance of the response variable that can be explained by the explanatory variable. In statistics, the coefficient of determination, denoted R^2 is the

proportion of the variation in the dependent variable that is predictable from the independent variable. the coefficient of determination normally ranges from 0 to 1.

In this example, R Square = 0,295. So, 29.5% of the differences in "sustainability" can be explained by the "digital strategy". Actually, R Square = 0,295 indicates that the model is not a great fit for the data, as it is only capturing a small portion of the variation. This could be due to factors such as a weak relationship between the variables, missing variables that are influencing the outcome, or the model not being properly specified. In practical terms, this means that the predictions made by the linear regression model may not be very accurate or reliable, and there may be a need to explore other models or factors that could better explain the data. The low R Square value suggests that there is still a significant amount of unexplained variability in the data that the model is not accounting for.

But in this part of the work, I suggest looking at simple linear regression as one of the methods for evaluating data, taking into account the fact that in the future it is possible to select the most suitable mathematical model, more complex.

Standard Estimation error: The standard error is the average distance by which the observed values deviate from the regression line. In this example, the observed values deviate from the regression line by an average of 0,838 units.

The table № 14 is "Coefficients". Interpretation of the most important numbers in this table:

Unstandardized B (constant): this parameter tells us the average value of the response variable when the predictor variable is zero. In this example, the average *Sustainability index* is 0,007 when the "digital strategy" is zero – no digital strategy in the firm.

Unstandardized B (DIG_STR): this parameter tells us about the average change in the response variable associated with an increase of one unit in the predictor variable. In this example, each additional point of digital strategy is associated with an increase in the sustainability issue performance by an average of 0,546.

Sig (DIG_STR): this is the p-value associated with the test statistics for DIG_STR index. In this case, since this value is less than 0.05, we can conclude that the predictor variable of the DIG_STR is statistically significant.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	Constant	.007	.059		.121	.904
	DIG_STR	.546	.059	.546	9.199	<.001

a. Dependent Variable: DIG_STR

Table № 14

Then I create a regression equation for the two indicators under consideration. In this case, the equation will be as follows:

SUST= 0,007 + 0,546*DIG_STR

We can use this equation to find an approximate sustainability performance for a Italian company based on the digital strategy it provides.

(2) Similarly, I would like to test the possibility of providing a linear regression model to look at the impact of digitalization in the firm on the performance of the firm. In this case, the company's representation will be divided into two clusters: **financial** and **non-financial**. I plan to build separate linear regressions for both indicators.

For the parameters for linear regression, I used the arithmetic mean for all categories for the "NONFINPERF" and "FINPERF" indicators and for the "DIG_STR" parameter. I put all categories in one each parameter and run simple linear regressions. The model is being built for Italian companies, according to data collected in the summer of 2023.

(a)Y= NONFINPERF; X =DIG_STR

NONFINPERF = β0 + β1*DIG_STR + ε

(b)Y= FINPERF; X =DIG_STR

FINPERF = β0 + β1*DIG_STR + ε

Data visualization. In the beginning lets see a scatter plots (Graph № 3.1.2 and Graph № 3.1.3) which visualize the relationship between the "NONFINPERF" parameter and for the "DIG_STR" parameter in the first case and he "FINPERF" parameter and for the "DIG_STR" parameter in the second case, to make sure that the relationship between this variables seems linear.
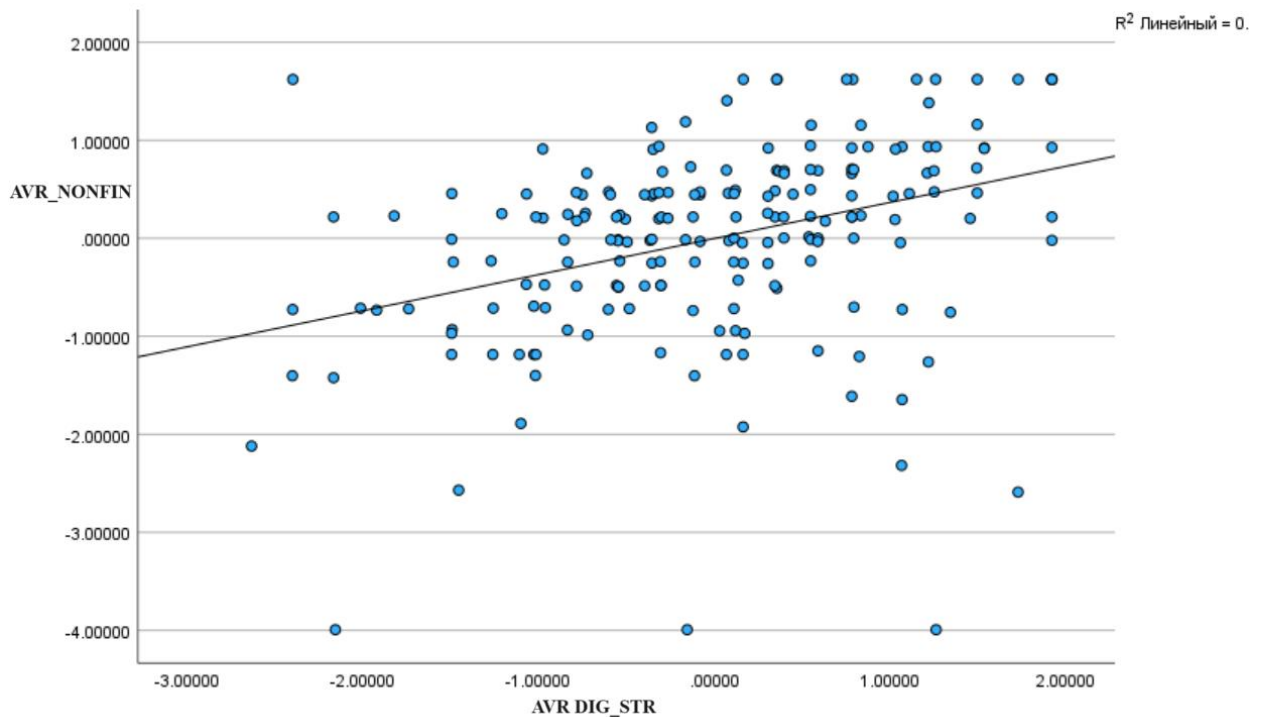
(a)Graph № 3.1.2
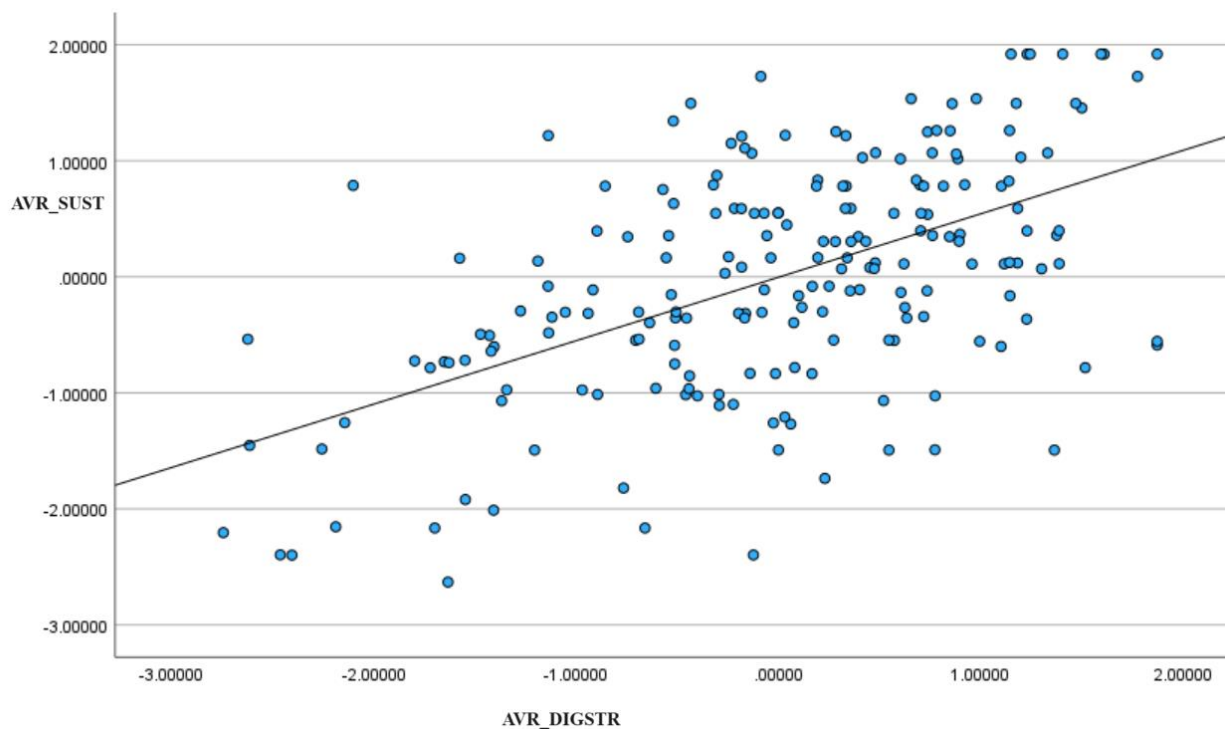
Visually, both graphs are less similar to linear regression than the graph in the first case - with the stability issue. I added liner trend that show there is a possibility of a positive linear relationship between the two variables in two cases (a,b) under consideration. So, we can accept that when digital strategies are implemented more actively, they tend to have a more positive impact on the financial and nonfinancial performance of the firm. But it is also necessary to check all parameters, that is why i will proceed to fit a simple linear regression models for this two cases (a and b).

a. The following tables show the results of a simple linear regression for NONFINPERF index. The table № 15 is "Model Summary".

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.365[a]	.133	.129	.93567763

a. Predictors: (Constant), DIG_STR

Table № 15

Interpretation of the most important numbers in this table:

In this example, R Square = 0,133. So, 13.3% of the differences in "nonfinancial performance of the firm" can be explained by the "digital strategy". Actually, R Square = 0,133 is small and indicates that the model is not a great fit for the data, as it is only capturing a small portion of the variation. It is even less then in the case with the sustainability issue. This could be due to factors such as a weak relationship between the variables, missing variables that are influencing the outcome, or the model not being properly specified. But in this part of the work, I suggest looking at simple linear regression as one of the methods for evaluating data, taking into account the fact that in the future it is possible to select the most suitable mathematical model, more complex.

Standard Estimation error: The standard error is the average distance by which the observed values deviate from the regression line. In this example, the observed values deviate from the regression line by an average of 0,935 units.

The table № 16 is "Coefficients". Interpretation of the most important numbers in this table:

Unstandardized B (constant): this parameter tells us the average value of the response variable when the predictor variable is zero. In this example, the average *NONFINPERF index* is - 0,002 when the "digital strategy" is zero – no digital strategy in the firm. So, the constant is negative.

Unstandardized B (DIG_STR): this parameter tells us about the average change in the response variable associated with an increase of one unit in the predictor variable. In this example, each additional point of digital strategy is associated with an increase in the *NONFINPERF index* by an average of 0,369, and it is positive.

Sig (DIG_STR): this is the p-value associated with the test statistics for DIG_STR index. In this case, since this value is less than 0.05, we can conclude that the predictor variable of the DIG_STR is statistically significant.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.002	.066		-.032	.975
	DIG_STR	.369	.067	.365	5.485	<.001

Table № 16

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26.336	1	26.336	30.081	<.001[b]
	Residual	171.597	196	.875		
	Total	197.932	197			

Table № 17

Then I create a regression equation for the two indicators under consideration. In this case, the equation will be as follows:

<u>NONFINPERF= -0,002 + 0,369*DIG_STR</u>

We can use this equation to find an approximate nonfinancial performance for a Italian company based on the digital strategy it provides, and we can see that the first coefficient Bo coefficient is negative, but B1 coefficient is positive.

Then I provide the similar actions for FINPERF index (b).

b. The following tables show the results of a simple linear regression for FINPERF index. The table № 18 is "Model Summary".

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.289[a]	.083	.079	.96032529

Table № 18

Interpretation of the most important numbers in this table:

In this example, R Square = 0,083. So, only 8.3% of the differences in "financial performance of the firm" can be explained by the "digital strategy". Actually, R Square = 0,083 is very small and indicates that the model is not a great fit for the data, as it is only capturing a small portion of the variation. It is even less then in the case with the previous case. In this part of the work, I suggest looking at simple linear regression as one of the methods for evaluating data, taking into account the fact that in the future it is possible to select the most suitable mathematical model, more complex, which I will provide in the next parts of the study.

Standard Estimation error: The standard error is the average distance by which the observed values deviate from the regression line. In this example, the observed values deviate from the regression line by an average of 0,96 units.

The table № 19 is "Coefficients". Interpretation of the most important numbers in this table:

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.007	.068		-.105	.917
	DIG_STR	.292	.069	.289	4.225	<.001

Table № 19

Unstandardized B (constant): this parameter tells us the average value of the response variable when the predictor variable is zero. In this example, the average *FINPERF index* is - 0,007 when the "digital strategy" is zero – no digital strategy. So, the constant is negative.

Unstandardized B (DIG_STR): this parameter tells us about the average change in the response variable associated with an increase of one unit in the predictor variable. In this example, each additional point of digital strategy is associated with an increase in the *FINPERF index* by an average of 0,292, and it is positive.

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.464	1	16.464	17.853	<.001^b
	Residual	180.756	196	.922		
	Total	197.220	197			

a. Dependent Variable: REGR factor score   1 for analysis 1
b. Predictors: (Constant), REGR factor score   1 for analysis 1

Table № 20

Sig (DIG_STR): this is the p-value associated with the test statistics for DIG_STR index. In this case, since this value is less than 0.05, we can conclude that the predictor variable of the DIG_STR is statistically significant.

Then I create a regression equation for the two indicators under consideration. In this case, the equation will be as follows:

FINPERF= -0,007 + 0,292*DIG_STR

We can use this equation to find an approximate financial performance for an Italian company based on the digital strategy it provides, and we can see that the first coefficient Bo is negative.

After constructing of these three linear regressions to go into deeper data analysis, I decided to implement another variable and perform a media analysis. The analysis was also performed using the SPSS tool. For using this analysis, I downloaded the new plugin - SPSS *Mediation Analysis with PROCESS,* developed by Andrew F. Hayes, Ph.D.

SPSS Mediation Analysis with PROCESS

A study investigated nonfinancial and financial performance of the firm among a sample of N = 215 Italian companies. That is, the relation from the sustainability (SUST) agenda provided by the firm onto nonfinancial (NONFINPERF) and financial (FINPERF) performance of the firm is thought to be mediated by "digital strategy" (DIG_STR), is visualized below – figure № 7, in comparison with simple linear regression model approach in the case when SUST – is independent variable.
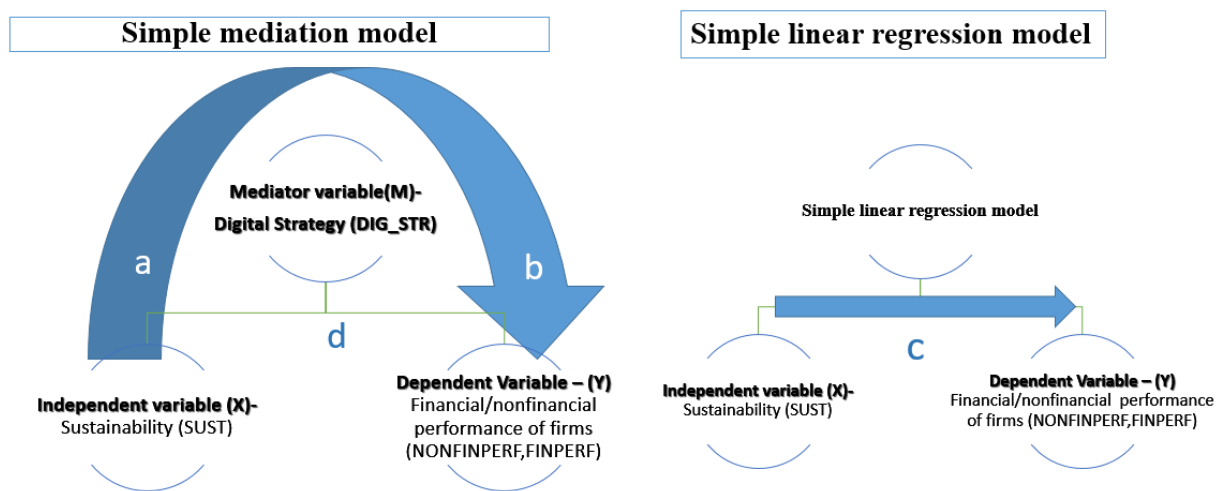
Figure № 7

Besides this indirect effect through DIG_STR, SUST could also directly affect NONFINPER/FINPERF indexes of the firm.

Now, what would happen if this model were correct and we'd (erroneously) leave fatigue out of it? Well, in this case the direct and indirect effects would be added up into a total effect. if all these hypotheses are correct, we should see the following in our data:

a. assuming sufficient sample size, paths a and b (on the Figure №_) should both be significant;

b. path d (direct effect) should be different from c (total effect)

Before the analysis I provided quick data checks. Let's first see if our data look plausible in the first place. As a quick check, let's inspect the histograms of all variables involved. We'll do so from the SPSS syntax. On the Figure № 8 there are the histograms for four parameters: SUST, DIG_STR, NONFINPERF, FINPERF.
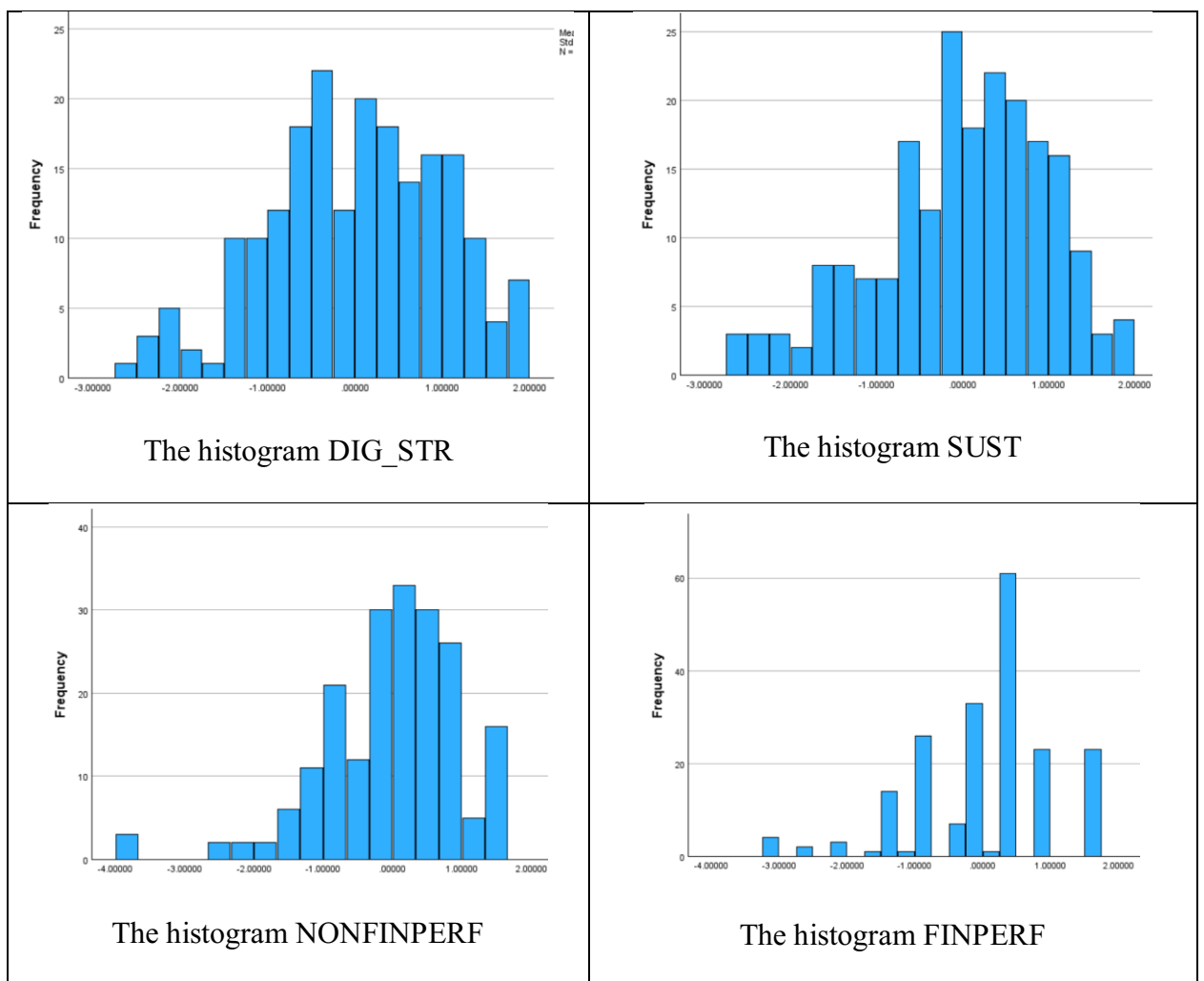

The histogram DIG_STR

The histogram SUST

The histogram NONFINPERF

The histogram FINPERF

Figure № 8

I think these values still look pretty plausible and I don't expect them to have a major impact on our analyses. Although disputable, I'll leave them in the data on this stage of analysis.

Then provide mediation analysis in SPSS tool.

Mediation model:

Y – NONFINPERF

X-SUST

M- DIG_STR

Sample size: 215

First look at path - a: this is the effect from X (SUST) onto M (DIG_STR). I found it in the output if we look for OUTCOME VARIABLE DIG_STR as shown below on the Table № 21

```
Model Summary
     R     R-sq     MSE      F       df1       df2       p
   .5298   .2807   .7108   76.4774  1.0000  196.0000   .0000

Model
           coeff    se      t       p      LLCI     ULCI
constant  -.0043  .0599  -.0715   .9431   -.1225   .1139
SUST       .5356  .0613   8.7451  .0000    .4149   .6564

Standardized coefficients
          coeff
SUST     .5298
```

Table № 21

For path a, $b = 0.53$, $p > 0.05$: on average, so this is no statistically significant.

```
OUTCOME VARIABLE:
 N_FIN_P

Model Summary
     R     R-sq     MSE      F       df1       df2       p
   .3648   .1331   .8800   14.9649  2.0000  195.0000   .0000

Model
           coeff    se      t       p      LLCI     ULCI
constant  -.0020  .0667  -.0304   .9758   -.1335   .1295
SUST      -.0036  .0804  -.0452   .9640   -.1621   .1548
DIG_STR    .3707  .0795   4.6637  .0000    .2139   .5274

Standardized coefficients
          coeff
SUST     -.0036
DIG_STR   .3666
```

Table № 22

Path d= - 0036; Path b = 0,3707. P-values <0.05 are the usual level of statistical significance.

It is interpreted as "obtaining a statically significant result" in this case.

Paths b and d are found in a single table. It's the one for which OUTCOME VARIABLE is

Y(NONFIN) and includes b-coefficients for both X(SUST) and M (DIG_STR)

```
************************* TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
N_FIN_P

Model Summary
      R     R-sq    MSE     F       df1      df2      p
    .1907   .0364   .9731   7.3963  1.0000   196.0000  .0071

Model
           coeff    se      t       p      LLCI    ULCI
constant  -.0036   .0701   -.0515   .9590  -.1419   .1347
SUST       .1949   .0717   2.7196   .0071   .0536   .3362

Standardized coefficients
           coeff
SUST       .1907
```

Table № 23

In the table № 24, when "total effect" P-values <0,05 , that it is mean that the usual level of

statistical significance. But with "direct effect", P-values >0,05 , that it is mean that it is not

significant. The conclusion in this scenario would be that while the overall combined impact of

the variables being studied is statistically significant, the direct influence of one specific variable

on another is not statistically significant. This suggests that there may be other indirect pathways

or underlying factors at play that are contributing to the significant overall effect observed. And in

our case it is – DIG_STR (digital strategy)

```
************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
   Effect    se      t       p      LLCI    ULCI    c_cs
   .1949    .0717   2.7196   .0071   .0536   .3362   .1907

Direct effect of X on Y
   Effect    se      t       p      LLCI    ULCI    c'_cs
  -.0036    .0804   -.0452   .9640  -.1621   .1548  -.0036

Indirect effect(s) of X on Y:
           Effect   BootSE   BootLLCI  BootULCI
DIG_STR    .1985    .0489    .1079     .2990

Completely standardized indirect effect(s) of X on Y:
           Effect   BootSE   BootLLCI  BootULCI
DIG_STR    .1942    .0490    .1033     .2942

************************* ANALYSIS NOTES AND ERRORS ********************
```

Table № 24

Then I will provide second part of the mediation analysis in SPSS tool – for second parameter - "financial performance" (FIN_PERF) of the firm.

Mediation model:

Y – FINPERF

X-SUST

M- DIG_STR

Sample size: 215

First look at path **a** in this case: this is the effect from X (SUST) onto M (DIG_STR). I found it in the output if we look for OUTCOME VARIABLE DIG_STR as shown below on the Table № 25

```
OUTCOME VARIABLE:
DIG_STR

Model Summary
      R      R-sq     MSE       F       df1      df2        p
    .5268    .2775    .7251   81.8289  1.0000  213.0000    .0000

Model
          coeff     se       t        p      LLCI     ULCI
constant  -.0052   .0581   -.0890    .9292   -.1196   .1093
SUST       .5315   .0588   9.0459    .0000    .4157   .6473

Standardized coefficients
          coeff
SUST      .5268
```

Table № 25

For path a, $b = 0.53$, $p > 0.05$: on average, so this is no statistically significant. The situation it the same as in the first case – with NONFINPERF.

```
OUTCOME VARIABLE:
FIN_PERF

Model Summary
      R    R-sq     MSE      F     df1      df2       p
   .2810   .0789    .9056   9.0841  2.0000  212.0000    .0002

Model
          coeff    se      t       p     LLCI    ULCI
constant  -.0029  .0649  -.0446   .9644  -.1308   .1250
SUST      -.0328  .0773  -.4245   .6716  -.1851   .1195
DIG_STR    .2932  .0766  3.8286   .0002   .1422   .4441

Standardized coefficients
          coeff
SUST     -.0329
DIG_STR   .2969
```

<p align="center">Table № 26</p>

Path d= - 0328; Path b = 0,2969, $p > 0.05$: on average, so this is no statistically significant.

Paths b and d are found in a single table. It's the one for which OUTCOME VARIABLE is Y (FINPERF) and includes b-coefficients for both X(SUST) and M (DIG_STR)

```
************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
   Effect    se      t       p      LLCI     ULCI    c_cs
    .1230   .0677  1.8162   .0707   -.0105   .2565   .1235

Direct effect of X on Y
   Effect    se      t       p      LLCI     ULCI    c'_cs
   -.0328   .0773  -.4245   .6716   -.1851   .1195   -.0329

Indirect effect(s) of X on Y:
           Effect   BootSE  BootLLCI  BootULCI
DIG_STR    .1558   .0452   .0708     .2488

Completely standardized indirect effect(s) of X on Y:
           Effect   BootSE  BootLLCI  BootULCI
DIG_STR    .1564   .0452   .0707     .2507
```

<p align="center">Table № 27</p>

In the table № 27, when "total effect" and "direct effect" have P-values >0,05 , that it is mean that it is not significant. The conclusion in this scenario would be that while the overall combined impact of the variables being studied is statistically not significant, the direct influence of one specific variable on another is not statistically significant too. **The indirect effect is**

significant because the Lower Level Confidence Interval and the Upper Level Confidence Interval are both positive indicating that the bootstrapping analysis reveals that the coefficient never assume the value of 0.

3.2 Results of the analysis

In the previous part of the Master thesis, I carried out calculations of the that Cronbach's Alpha coefficient before carrying out the main calculations, and for both parameters (SUST and DIG_STR) Cronbach's Alpha coefficient is considered "good". When Cronbach's Alpha coefficient is considered "good", it typically means that the measure used in a study or assessment is internally consistent and reliable. A high Cronbach's Alpha coefficient indicates that the items or questions in the measure are measuring the same underlying construct or concept consistently. This means that the measure is likely to produce consistent and dependable results, and can be trusted to accurately assess the variable of interest.

Next, simple linear regression models were built: one of which estimated the dependence:

1) Parameter SUST (sustainability) as dependent variable, and parameter DIG_STR (digital strategy) as independent variable (x).

2) Parameter NONFINPERF/ FINPERF (nonfinancial/financial performance of the firm) and parameter DIG_STR (digital strategy) as independent variable (x). In this case were constructed two different linear regressions for each parameter: NONFINPERF/ FINPERF

Almost all models show low R Square parameter. When R Square is low in a simple linear regression, it means that the independent variable(s) in the model are not explaining much of the variance in the dependent variable. In other words, the model does not accurately predict or account for the variability in the dependent variable based on the independent variable(s). This could be due to various factors such as the model not being correctly specified, the relationship between the variables not being linear, or there being other factors not accounted for in the model. A low R Square value indicates that the model may not be a good fit for the data and may need to be revised or improved. But at the initial stage, I decided to look at the coefficients obtained in linear regressions models anyway.

As a result, for the parameter SUST, we obtained the equation: **SUST= 0,007 + 0,546*DIG_STR,** where we can observe a positive relationship between the variable digital strategy and the company's component sustainability performance, as a dependent variable. Thus, the higher the DIG_STR score, the higher the SUST score.

For the parameter NONFINPERF, we obtained the equation: **NONFINPERF= -0,002 + 0,369*DIG_STR,** where we can observe a relationship between the variable digital strategy, as an independent variable, and the company's component nonfinancial/financial performance of the firm, as a dependent variable. We can see that the first coefficient Bo coefficient is negative, but B1 coefficient is positive. So, the slope of the line of trend is positive.

For the parameter FINPERF, we obtained the equation: **FINPERF= -0,007 + 0,292*DIG_STR,** where we can observe a relationship between the variable digital strategy, as an independent variable, and the company's component - financial performance of the firm, as a dependent variable. We can see that the first coefficient Bo coefficient is negative, but B1 coefficient is positive. So, the slope of the line of trend is positive, the same with case of NONFINPERF.

It should be borne in mind that in this case, a simple linear regression is considered, which does not take into account the amount of initial investment in the transition to more digitalized processes in the company. These additions can serve as an idea for the development of the following, more complex data estimation models.

In mediation analysis, a mediator variable is one that helps explain the relationship between an independent variable and a dependent variable. Sometimes, when a mediator is added to a model, it can change the overall significance of the relationship between the independent and dependent variables.

With mediation analysis with PROCESS I explored indirect effect of SUST index affect NONFINPER/FINPERF indexes through DIG_STR, SUST. Some of the models in this part of

analysis turned out to be insignificant, but an interesting point is that when i added the DIG_STR indicator (digital strategy) to the system as a mediator, the model becomes significant. This could happen if the mediator variable is playing a crucial role in explaining the relationship between Sustainability and economic performance of firm. In this case, self-esteem might be the "missing link" that was not taken into account initially. By including it in the analysis, I able to show that digital strategy does have a significant indirect effect on nonfinancial/financial performance of the firm. Overall, this situation highlights the importance of considering potential mediators in mediation analysis, as they can change the significance of the relationships between variables and provide a more comprehensive understanding of the underlying mechanisms at play.

4.CONCLUSIONS AND DISCUSSIONS

4.1 Summary of Key Findings

At the stage of choosing a topic for my master's thesis, I tried to find a topic that is now the most important, relevant and valuable - which would have a strong impact on the development of society and support the goal of achieving ESG issue. In my opinion, the development of digital technologies, their application and changes in the work of a company will have a significant impact on the work of not only individual companies, but also a strong influence on the work of the entire economic world system. Now we can already see these influences in the modern world.

Based on the study completed, it was determined and examined that the company's digital strategy positively affects both the sustainability issue and the company's financial and non-financial performance. Additionally, there is a noticeable indirect impact of digital strategy on the company's financial and nonfinancial performance.

The ability to timely apply and implement a new digital strategy for a specific company is the basis for successful and profitable development at the present time. Now we can observe how all participants in economic relations: both state institutions and private companies (large transnational companies and small enterprises) are trying to act in a timely manner and introduce new information platforms and technologies, and also new digital strategies. These processes have two different sides:

On the one hand, new technologies make it possible to save resources, switch to qualitatively new ways of processing information, new ways of creating a product, new ways of conducting communications, which significantly saves energy and resources.

On the other hand, the transition to a qualitatively new level of technology brings with it negative consequences, as well as costs at the implementation stage. To move to a new level of digital equipment, a company needs extensive investments at the initial stage. Also, if we are

talking about the human factor - the use of personnel, then often a change in the technological system of a company requires a change in employees (sometimes this is the replacement of employees with technology / robotics, which leads to a number of layoffs), somewhere it is necessary to improve the skills of employees and change the approach to work, all these changes also require investment and resources.

It should also be noted that new technologies and digital strategies of a company affect the entire economic system, as well as the environment. And precisely the challenge that now faces the population of our planet is to improve the situation related to the state of the environment. It is this issue that has received much attention from major international organizations, such as the UN or the European Central Bank, the government of major states, and therefore a plan has been developed to achieve goals in the field of economic sustainable development, which was presented in my work as part of the literature review.

When choosing this topic for research, I was interested in how much the company's digital strategies influence two factors. The first factor is precisely related to economically sustainable growth , and the extent to which digital processes can reduce pollution, emissions of harmful substances, improve the situation and become closer to achieving set goals. So, how can digital strategies in the company support/or otherwise destroy the way of firms to the sustainability issue and approach. On the other hand, I wanted to look at how firms' strategies directly influence the performance of the company (financial and non-financial). In this context, I explored two factors: breaking down the data into financial and non-financial indicators.

4.2 Interpretation of Results

The purpose of my study was in exploring two aspects:

(1) How digital strategies (in positive/negative/neutral way) can support or hinder a company's path to sustainability, as well as

(2) How these strategies directly impact the company's financial and non-financial indicators.

(3) What indirect effect does the company's digital strategy have on its financial and non-financial performance?

During the research (on the example of Italian companies) I found out that the implementation of company's digital strategy has a positive impact on firm's performance and overall sustainability. I got a positive dependence in the study by examining the collected data and building a linear regression.

Also, the analysis conducted with the mediator - the digital strategy of the company showed that there is an indirect effect of the digital strategy of the company, and the model becomes significant if the Sustainability (SUST) is an independent variable in the model, and the mediator variable - the digital strategy of the firm appears.

By leveraging technology to streamline processes, enhance customer experiences, and improve decision-making, it is possible to see a notable increase in efficiency, and customer satisfaction metrics. Digital initiatives have also helped us to reduce costs, minimize waste, and operate more sustainably, contributing to the long-term success and viability of our organization. The ability to implement new digital strategies is crucial for a company's successful and profitable development. However, the transition to new technologies also brings negative consequences and initial costs. While new technologies can help save resources and switch to more efficient ways of processing information and production, they also require investments in infrastructure and changes to the workforce.

4.3 Comparison with Existing Literature

Before starting my own research, I studied a vast amount of information, articles by famous and modern authors who study the topic of digitalization processes, the firm's digital strategies, the topic of sustainable economic growth, and the impact of the firm's digital strategy on the firm's economic performance. It was interesting to note for myself in the process of studying the literature that in some few articles we find simultaneously studying the issue of the impact of digitalization processes on the sustainability , and on the economic performance of the company in the same study.

The most part of authors in the studies discuss the impact of digitalization on productivity, employment, and inequality in firms. It highlights that while 70% of enterprises involved in digitalization achieved their goals, 70% of digital transformation initiatives fail to reach their stated goals (K. Andriushchenko et al, 2020)

Some studies found no strong evidence of aggregate productivity gains from digital technologies in the euro area, possibly due to slow adoption and offsetting effects across firms, some studies underlines positive effect of digital strategies of the firm in the firm performance and the sustainability agenda. This fact was confirmed in my research.

The studies from literature review also discusses the relationship between digital transformation and sustainability, noting that businesses need to make changes to various aspects of their operations to adapt to the dual transformations towards digital technologies and sustainable development.

It is important to note that when conducting a mediation analysis, it was also revealed in my study that digital strategies have an impact when considering the relationship between the policy pursued within the framework of the sustainability issue and its impact on the performance of the company. So, i studied the material extensively and presented the main findings in a literature

review, the first part of my master's thesis. In the second part, I conducted an analytical analysis of the data that was collected, received, and analyzed.

4.4 Implications of the Study

The research I conducted was aimed at looking at and analyzing whether the company's digital strategy really affects the company's performance, I also explored the question of the impact on economic sustainable growth. And it was revealed that there is a significant impact. This research can serve as proof of the need to introduce new innovative and digital strategies in the company.

In today's rapidly changing business environment, the importance of implementing new digital strategies in companies cannot be overstated. As technology continues to advance at a breakneck pace, companies that fail to keep up with the latest trends risk falling behind their competitors and missing out on valuable opportunities for growth and success.

One of the key reasons why it is crucial for companies to embrace digital strategies is that they can significantly improve the overall efficiency and productivity of the organization. By leveraging digital tools and technologies, companies can streamline their operations, automate repetitive tasks, and enhance communication and collaboration among employees. This in turn can help companies to reduce costs, increase revenues, and operate more effectively in today's competitive marketplace.

Furthermore, implementing new digital strategies can also help companies to achieve the Sustainable Development Goals (SDGs). These goals encompass a wide range of social, environmental, and economic challenges that the world is facing, including poverty, inequality, climate change, and environmental degradation. By harnessing the power of digital technologies, companies can play a significant role in addressing these global challenges and driving positive change in society.

For example, digital tools can help companies to reduce their carbon footprint by enabling remote working, reducing the need for travel, and improving energy efficiency in their operations.

They can also help companies to promote social inclusion and diversity by providing opportunities for underrepresented groups to access employment and training programs. Additionally, digital strategies can enable companies to contribute to the goals of sustainable consumption and production by optimizing their supply chains, reducing waste, and promoting responsible consumption practices.

Implementing new digital strategies is essential for companies to remain competitive, drive innovation, and achieve their business objectives. By leveraging digital technologies, companies can improve their performance, enhance their impact on society, and contribute to the achievement of the Sustainable Development Goals. It is therefore imperative for companies to embrace digital transformation and leverage the power of technology to drive positive change in their operations and in the world at large.

To conduct the analysis, more than 500 firms were surveyed using a specially developed questionnaire, which is described in detail in the second part of my master's thesis, which allowed us to gain an understanding of how company managers responsible for digital strategies, innovation and the sustainability issue in the company assess the impact of digitalization processes. After preparing the data, due to the total number of respondents, there were remote companies that did not have answers on any items, or were not Italian companies. Based on the results, a sample of 215 respondents was compiled.

Next, I analyzed the data using a special analytical tool SPSS by IBM. For this work, I made the simplest models: I built three linear simple regressions. The construction of linear regression made it possible to look at the impact of digital strategy on the indicator of sustainable economic development of a company, as well as on the financial and non-financial indicators of a company in Italy. This model is not ideal; all points reflecting this situation are described in the chapter on analytics. I believe that in continuation of this work, i can consider more complex mathematical models - not linear ones, which could describe the selected data. From the constructed linear regressions, it is possible to see that in all three linear regressions we have a positive B1-

coefficient, which indicates a positive slope of the line - trend. If we are talking about a linear dependence of the data considered, then we still have a positive dependence. This suggests that the company's active digital strategy leads to an increase in indicators of economic sustainable development, as well as an increase in the financial and non-financial indicators of the company. I also carried out a more complex analysis called mediation analysis. In this case, I looked at how a company's sustainable development policy can influence its financial and non-financial performance; in this model, we have Mediator - Digital strategy. During the research process, an interesting point was noticed that with the direct impact of the indicator of sustainable economic development on the economic performance of the company (financial and non-financial), we have an insignificant model, while, with the mediator - the Digital strategy of the company, we have a significant model that in once again mean the importance of carrying out and implementing a Digital strategy for a company, on the example of Italian companies.

4.5 *Limitations*

This study has some limitations and opportunities for future research. One of the limitations of the model is the sample size, the study was carried out only on the example of Italian firms. Italy is a prominent representative of a developed economy with its own specifics and peculiarities. Therefore, we cannot extrapolate the results of this study to all countries in the world, especially to emerging markets. This limitation may serve as a challenge to conduct a more extensive study, using the example of a larger number of countries or regions.

The next aspect of the limitations concerns the fact that some of the constructed models showed insignificant coefficients, or had a small R squared indicator. This mean that the data may not be a good fit exactly for a linear regression model, and another type of regression model may be more appropriate (e.g. a polynomial regression model). The sample size may be too small to detect a statistically significant relationship between the independent and dependent variables, leading to insignificant coefficients and a small R-squared. This limitation is also a point for growth and the possibility of finding a more suitable mathematical model for evaluating data.

4.6 Recommendations for Future Research

Based on the limitations and findings, I can suggest that for future research it is useful and interesting to expand the sample and the number of respondents, and geographically.

If we look at the expansion of the study within one country (Italy), then it might be interesting to increase the number of respondents, and look at the indicators depending on the region of the country. For example, it is possible to look at the impact of the implementation of digital strategies in the south and north of Italy, since these two parts of Italy have differences in the economic structure. It may also be interesting to deepen the survey of managers, and see specifically which tools and technologies have been successfully implemented, in order to extrapolate this successful experience to other organizations.

Increasing the data in the sample will help both increase mathematical accuracy and select a more successful model describing the nature of the data.

Also, one of the ways to deepen the research is to consider the data over a time period, for example, six months, since rapid changes are taking place in this area. Using time series of data, it is possible to draw conclusions about the speed and intensity of the impact of processes.

If we are talking about an idea for future research with an expansion of the research area: then this study could be applied and studied in different types of economies in order to draw conclusions about the processes of digitalization of firms in developed and developing economies. Here you can ask similar questions, whether the influence is positive or not. And in which type of countries the impact is more intense and significant. Firms in developed economies typically have more resources and access to technology, which allows them to be more advanced and sophisticated in their use of digital strategies. They tend to invest more in digital marketing, e-commerce, and data analytics, as they have the financial means to do so. Developed economies also tend to have a higher level of internet penetration and a more tech-savvy population, which

allows firms to reach a larger audience online. This enables them to target specific demographics more effectively and personalize their marketing messages.

On the other hand, firms in developing economies may face challenges such as limited internet access, infrastructure issues, and a lack of skilled digital talent. As a result, their digital strategies may be more basic and less sophisticated compared to those in developed economies.

So, it would be interesting to study the impact of digital strategies in more extensive samples.

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Appendix № 1.1. **The Boston Consulting Group recommendations fit within digitalization process. The Five Rules of Digital Strategy.**
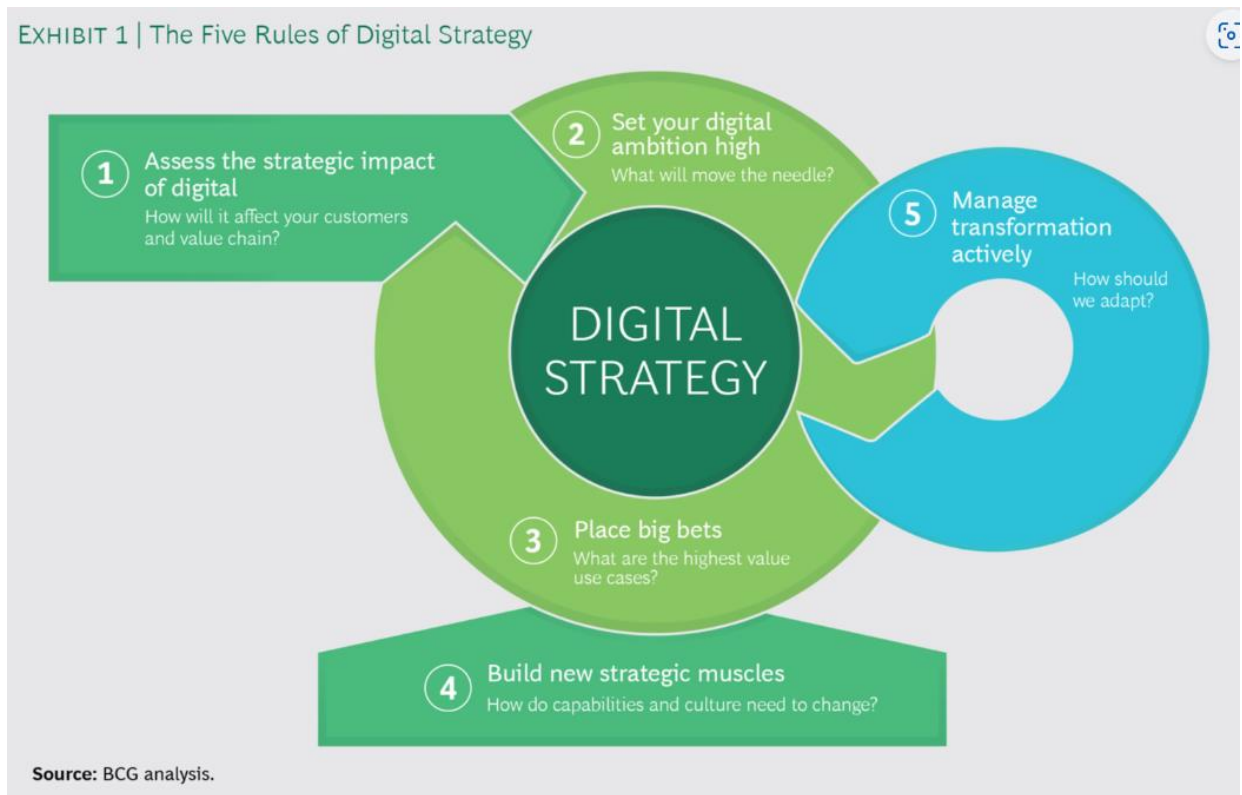
Appendix № 1.2**. The interconnection of the elements of the Triple Bottom Line concept**

Appendix № 1.3. **The list of THE 17 SDGs**

Source: https://sdgs.un.org/

Appendix № 3.1 The example of the questionnaire for Managers.

Sustainability

	1	2	3	4	5
Improving ecological sustainability (e.g. reduction of environmental impact) is a top priority	❏	❏	❏	❏	❏
We assess customers' views of green products/services through market analysis	❏	❏	❏	❏	❏
Multiple departments are engaged in sustainability-related initiatives.	❏	❏	❏	❏	❏
We consider sustainability as an opportunity for differentiation	❏	❏	❏	❏	❏
Non-market stakeholders* are involved in design and development	❏	❏	❏	❏	❏
We actively engage external partners to gather innovative ideas	❏	❏	❏	❏	❏
We leverage data and digital solutions (to promote sustainability)	❏	❏	❏	❏	❏
Improving social sustainability (e.g. inclusion, worklife balance, etc.) is a top priority	❏	❏	❏	❏	❏
Sustainability goals pushed us to a radical transformation	❏	❏	❏	❏	❏

Digital performance

Rasool, Faisal, Marco Greco, and Michele Grimaldi. "Digital supply chain performance metrics: a literature review." *Measuring Business Excellence* 26.1 (2022): 23-38.

In the last 3 years, the investment in digital solutions (Cloud services, AI, Digital platforms, the Internet of Things, Robotics, Virtual reality, Blockchain, Digital twins and other digital services) in your company has improved:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Cost reduction	❏	❏	❏	❏	❏
Data management (the process of acquiring, validating, storing, protecting, and processing data)	❏	❏	❏	❏	❏
Productivity and Process optimization	❏	❏	❏	❏	❏
Company agility (flexibility and quick responses)	❏	❏	❏	❏	❏
Customer satisfaction	❏	❏	❏	❏	❏
Collaboration between employees and/or departments	❏	❏	❏	❏	❏
Learning and Knowledge management	❏	❏	❏	❏	❏
Quality of work (inclusion, improving working conditions, organisational climate)	❏	❏	❏	❏	❏

Digital strategy

Proksch, D., Rosin, A. F., Stubner, S., & Pinkwart, A. (2024). The influence of a digital strategy on the digitalization of new ventures: The mediating effect of digital capabilities and a digital culture. Journal of small business management, 62(1), 1-29.

How much do you agree with the following statements in the context of your company?

	1	2	3	4	5
Digitalization is today at the core of our competitive advantage	❏	❏	❏	❏	❏
We generate remarkable value from data we collect	❏	❏	❏	❏	❏
We exchange strategic data with key partners and/or supplier	❏	❏	❏	❏	❏
We leverage on digital solutions to promote sustainability	❏	❏	❏	❏	❏
Digitalization pushed us to a radical transformation	❏	❏	❏	❏	❏

Leadership style

The measure of transformational leadership was an adaptation of Stock et al.'s (2017) construct, which is based on the multifactor leadership questionnaire (MLQ) by B. Bass and Avolio (1995).

How much do you agree with the following statements about how you lead your team:

	1	2	3	4	5
I seek differing perspectives when solving problems	❏	❏	❏	❏	❏
I get others to look at problems from many different angles	❏	❏	❏	❏	❏
I spend time teaching and coaching	❏	❏	❏	❏	❏
I treat others as individuals rather than just as a member of a group	❏	❏	❏	❏	❏
I help others develop their strengths	❏	❏	❏	❏	❏
I am an inspiration to other people	❏	❏	❏	❏	❏
I make other people enthusiastic about assignments	❏	❏	❏	❏	❏

Job-related priorities

Questions from previous questionnaires to ensure comparability with previous years.

How much do you prioritize the following activities while performing your job?

	1	2	3	4	5
Technological development	❏	❏	❏	❏	❏
Definition of strategies / business models	❏	❏	❏	❏	❏
Supporting other functions / people within my organization	❏	❏	❏	❏	❏
Development of collaborations with third parties	❏	❏	❏	❏	❏
Scouting of startups / tech / trends	❏	❏	❏	❏	❏
Development of corporate culture	❏	❏	❏	❏	❏
Coordination of activities /projects across departments	❏	❏	❏	❏	❏
Making the company more innovative	❏	❏	❏	❏	❏
Making the company more sustainable from ecological point of view	❏	❏	❏	❏	❏
Making the company more sustainable from social standpoint (e.g. inclusion, worklife balance, etc.)	❏	❏	❏	❏	❏
Promoting digital transformation	❏	❏	❏	❏	❏