Università
Ca'Foscari
Venezia

Master's Degree
In

Global Development and Entrepreneurship

Global Markets

Final Thesis

DIGITALIZATION OF THE ACCOUNTANCY PROFESSION AND ACCOUNTANCY PRACTICES:

AN OUTLOOK ON PROGRESS IN NORTH EAST OF ITALY

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Academic Year

2019/2020

Kazien: keep improving every day, change for better

-Cit. Giulio Ramazio-

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INTRODUCTION

The present elaborated, comes from a strong interest and curiosity about the matter treated. In my work I deal daily with the demands of accountants to become more digital and to change and improve their working approach.

In the first chapter we highlight the new skills for a digital mode, then analyzing the evolution of accountants over time, what are the factors that have influenced the spread of digital innovation and what changes must be faced.

The second chapter deals with how digital practices have changed and what new resources can be, such as artificial intelligence and blockchain.
It also addresses the issue of changing the accountant's strategy and the opportunities to redesign financial procedures.

The third chapter is instead divided into two part: in the first we analyze what is the transformation digitalization and what are the maturity models, and the second explains what digital maturity models are and analyzes the most important models found in the research conducted. This analysis will lead us to the evaluation of each of them and then decide which is the best for the research that we will then conduct. Another element of analysis in this chapter is one of the four types of organizational cultures. The decision of the model and the analysis of the latter are essential for the next chapter.

In the fourth chapter, the heart of the research, is developed the questionnaire submitted to accountants for data collection, is developed the conceptual model and explained what are the research hypotheses of this thesis. The collected data will be analyzed with the program PLS alghoritm and in this chapter the summary tables of the data will be shown.

Finally, in the last chapter, the fifth, the data analyzed will be discussed going to explain what is the scientific contribution of this research and what are the limits and challenges that can be faced in future research.

CHAPTER 1 NEW COMPETENCIES FOR A DIGITAL WORLD

1.1 An excursus on digital transformation

The technological revolution that has taken place in the last two decades due to the development of the Internet, social networks, e-commerce and appsinteracting globally and at any time, has completely transformed the modus operandi of private companies and public institutions.

A radical and disruptive change, defined the “Digital Renaissance”, a transformation of the economic, social and environmental status in which companies and state institutions struggle to increase their organizational capacity, as well as the ability to compete at the "glocal" level.

The Italian Renaissance focused on the ingenuity of man, the modern “Digital Renaissance” realizes a holistic vision, integrated between creativity, human skills, and technological instrumentation, without neglecting the interaction between digital transformation and environmental sustainability, which is an increasingly urgent issue, especially in relation to future generations.[1]

Digital innovation has a direct impact both on competitiveness and on the economic development of national infrastructures, as well as on the implementation of products and services offered by private companies.

Governments have understood that technological innovation is now a necessity for citizens.[2]As can be read in the “Tallinn Declaration on eGovernment”, “governments are changing their way of working in order to improve the delivery of public services, be more efficient and effective in their design, and achieve goals such as greater transparency, interoperability and citizen satisfaction." (Mergel et al., 2019, page 1)

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[1] DENICOLAI S., MAGNANI G., ALEGRE VIDAL J., Guest editors, *Competitive renaissance through digital transformation*, European Management Journal, Available online 22 October 2020, https://doi.org/10.1016/j.emj.2020.09.013

[2] "All the European Union Member States and EFTA countries signed the 'eGovernement Declaration' in Tallin on 6 October 2017. [...]The eGovernment Declaration follows the Malmo Declaration signed in 2009 and the launch of the eGovernment Action Plan 2016-2020 which both recognise that service-oriented, reliable and innovative government at all levels are essential to develop a dynamic, productive and European society." in *Ministerial Declaration on eGovernment - the Tallinn Declaration*, European Commission, https://ec.europa.eu/digital-single-market/en/news/ministerial-declaration-egovernment-tallinn-declaration.

What could be seen as an innovation imposed by technological changes, can become a great opportunity to modernize the bureaucratic apparatus, creating a new relationship between institutions and citizens, where local interests can acquire greater importance thanks to a direct and immediate connection, no longer forced to numerous formal steps and excessively long waiting times. (Mergel et al., 2019)

The transitional nature of technological innovation, which makes obsolete a technology in a few months of life, immediately overtaken by more advanced research, has made it difficult, at first, to define the scope and measurements suitable to understand the "new economy".

Measurements are mainly determined by reference to Information and Communication Technologies (ICT), although these categories are often confused with the digital economy: they undoubtedly are part of it, but are to be considered as additional elements.

Barefoot et al.(2018), for the measurement of goods and services part of the digital economy, refer to the parameters used by the BEA, the Bureau of Economic Analysis. They identifies three aspects: "a) digital-enabling infrastructure needed for a computer network to exist and operate; b) e-commerce, which includes digitally ordered, digitally delivered, or platform enabled transactions (B2B, B2C and peer-to-peer or P2P); and c) digital media, which refer to content that users in the digital economy create and access, including free digital media and big data."[3]

The Organization for Economic Cooperation and Development (OECD), instead, refers to 30 existing indicators or methodologies, grouped by separate areas in infrastructure, empowering society, innovation and technology adoption, jobsand growth.[4]

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[3]*Digital Economy Report 2019*, UNCTAD United Nations Conference On Trade And Development, United Nations, page 49, https://unctad.org/system/files/official-document/der2019_en.pdf.

[4] "More than 30 key existing indicators and methodologies to monitor and assess the size and penetration of the digital economy are organized in four themes according to their main purpose of measurement:

1. Infrastructure. This section covers indicators of the development of physical, service and security infrastructures underlying the digital economy. It includes access to mobile and fixed networks, the development of next generation access (NGA) networks, the dynamics of household and business uptake, secure servers infrastructure, and infrastructure for the internet of things.

2. Empowering society. This section considers indicators that portray the evolving role of the digital economy in people's life, how they access and use digital technologies, and their abilities to fully exploit their potential. It includes indicators on people's use of the internet, education, financial inclusion and interaction with government, among others.

Starting out with an interpretation of these resources, it is clear that the basis of the digital economy is primarily the information network and, first, its physical extension: the hardware needed to access and the organizational protocols and operating software; telecommunications equipment and services required for digital transmission by cable, telephone, radio or satellite; facilitiesset to the production of digital goods or services, as data centers and fiber optic cable manufacturing industries. Finally,the Internet of Things (IoT), all those devices enabled by modern technology to communicate with each other and connected to the Internet. (Barefoot et al.,2018)

This mutual influence between physical instruments, services and products gives the idea of the interoperability between the digital economy and the potential processes of economic development at the local and global level of a nation. Starting from construction of industrial sites to accommodate the headquarters of technology companies, to the implementation of infrastructure dedicated to telecommunications, such as, for example, the cabling fiber optic.

The "new economy" has a direct impact on economic policy, so that it requires not only a conceptualization for its definition but also the measurement of the effects on GDP and economic productivity. (Kotarba, 2017)

The need to survive and grow is one of the primary impulses to change. In this perspective, digital transformation offers the opportunity to make the organization more efficient thanks to digital resources, whose characteristics of immediate access to information, rapid data processing, automation, direct relationship with the customer/consumer, reducing costs in communication, allow to quickly improve a competitive approach.

Within the framework of sectoral and horizontal policies, such as, ex multis, industrial policy, commercial policy, trans-European networks, research and technological

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3. Innovation and technology adoption. This theme contains indicators that address innovation in digital technologies, new digitally-enabled business models, the role of Icts as an engine for innovation, and adoption of Icts and other emerging technologies by businesses.
4. Jobs and Growth. The metrics collected within this section explore the different ways in which digital technologies contribute to economic growth and employment creation. It includes indicators related to the labour market, employment creation, investment in Icts, value added, international trade, e-commerce, and productivity growth." in *Toolkit For Measuring The Digital Economy,* November 2018, G20 Argentina, page 5, https://www.oecd.org/g20/summits/buenos-aires/G20-Toolkit-for-measuring-digital-economy.pdf

development, education and vocational training, the Digital Agenda for Europe was conceived as one of the seven flagship initiatives of the Europe 2020 strategy.

The objectives and utilities sought through the policies of opening up to digital are multiple: as already mentioned, digital transformation is closely linked to the theme of environmental sustainability, one of the objectives pursued through increased cooperation between sectors. Again, you can get benefits from the dematerialization and systematization of documents and contents and the other end of improving health care. The creation of a digital single market, with security features and inclusiveness, is a prerequisite for the promotion of research and innovation, not only technological, but also the strengthening of specific skills.

This type of intervention operates on several levels, including the macroeconomic level, as it allows employment growth, with a consequent positive economic impact on the entire economic system. In addition, the input to digitization is supported by a public and private investment programme, which makes the structures and organizations benefiting from it more efficient and effective.

Digitization is not without problems, as it is an ongoing process that requires measurable results and transparency. That is the need to achieve a system of measurements uniform and recognized, based on clear and certain definitions.

The terms digitization, digitalization, digital transformation are often used interchangeably. Though, a careful analysis of the literature shows the diversity of the phenomena and the concepts, and their semantical differentiation.

The study by Bockshecker et al. (2018) provides a definition that includes both the social and technical aspects encompassed in the term “digital”. Based on this conceptualization, the framework consists of the socio-technical system (STS): the first aspect involves technical characteristics, hardware and technology, while the social system includes human skills and abilities. The result is a notion of digitization that relates specifically to technical aspects, while digitalization refers to the status of an organization or company, at a given time, depending on digital development and use of ICT. On the contrary, the digital transformation describes the dynamic and non-static aspect of the use of ICT innovations, considered from the technical and social point of view.

Politicians and entrepreneurs need to be aware of the importance of digitization for economic development, understanding what strategic organizational changes can be, learning about, and exploiting the link between digitization and servitization.[5]

We can also add definitions derived from the literary review by Knudsen (2020): "Digitalization is not to be confused with digitization. The latter refers to the technical process of encoding analog information into a digital format, which makes the digitized content programmable, addressable, traceable, and communicable (Hylving and Schultze, 2013; Yoo et al., 2010). As such, digitization is a less comprehensive change than digitalization. On the other hand, digital transformation entails major organizational changes driven by digital technologies and, consequently, profound alterations in strategy and the conduct of business (Bharadwaj et al., 2013; Fitzgerald and Kruschwitz, 2013). Digitalization lies somewhere between digitization and digital transformation. It involves more than a mere technical process (e.g., digitization), but it does not necessarily entail a reconfiguration of strategy or profound changes in the conduct of business (e.g., digital transformation). However, digitalization is associated with important changes related to socio-technical structures (Yoo et al., 2010). Those

[5] "By servitization, current research refers to the transition from products to services and integrated solutions (Lightfoot, Baines, & Smart, 2013). Servitization is often described as a transition, where the company moves from providing pure stand-alone products and add-on services, to maintenance contracts, operational services, and finally, to outcome- or performance-based offerings (Huikkola & Kohtamäki, 2018; Kowalkowski, Windahl, Kindström, & Gebauer, 2015; Parida, Sjödin, Wincent, & Kohtamäki, 2014b; Visnjic, Jovanovic, Neely, & Engwall, 2017). This transition has been coined as servitization, service infusion, service transition, or service transformation (Kowalkowski, Gebauer, & Oliva, 2017; Rabetino, Harmsen, Kohtamäki, & Sihvonen, 2018; Raddats, Kowalkowski, Benedittini, Burton, & Gebauer, 2019). As such, servitization is a fully-fledged transformation from product to service orientation, which often manifests in integrated solutions, including customized products, and advanced services (Windahl & Lakemond, 2010). In time, products and services are integrated by using the product lifecycle (Artto, Valtakoski & Kärki, 2015; Rabetino, Kohtamäki, Lehtonen, & Kostama, 2015). Servitization studies tend to see the Internet-of-Things, digitalization and IT capabilities inherently related to servitization - full-fledged servitization would not exist without effective data acquisition, warehousing, analytics and utilization, through a Variety of sensors, data warehouses, big data analytics and user interfaces, that enable servicing the installed base effectively, or increasing customer value by improving the usage of the product fleet being operated (Ardolino et al., 2018; Kohtamäki, Parida, et al., 2019; Martín-Peña, Díaz-Garrido, & Sánchez-López, 2018). The concept of servitization is considered to capture the digital technologies related to Iot and remote monitoring, and studies have also begun using the concept of digital servitization to underline the role of digital service technologies." in KOHTAMÄKI M., PARIDA V., PATEL P., GEBAUER H., THE *Relationship Between Digitalization And Servitization: The Role Of Servitization In Capturing The Financial Potential Of Digitalization, February* 2020, Technological Forecasting and Social Change 151:119804, DOI: 10.1016/j.techfore.2019.119804,

structures are reconfigured through the questioning of the underlying assumptions for the design and use of digital technologies (Thorseng and Grisot, 2017)."[6]

From the point of view of economic and commercial investment, as well as from the point of view of public interests and the political agenda, it is necessary to continue to search for more specific parameters in defining and measuring digital economy and the related aspects, respecting harmonized levels of standardization, to base comparisons and the consequent interventions aimed at the realization of the digital era. (Kotarba, 2017)

1.2 Evolution of Digital Accounting

The trend to continuous technological innovation is a prerequisite in the activity of professional accountants, who see the digital transformation of their work as a new opportunity.

As is evident from the report drawn up by ACCA, the Association of Chartered Certified Accountants, based on interviews with experts in finance and accounting, members of the association, 89% reaffirms the essential character of digital skills in their professional field. 68% of the participants also said they had to use their digital skills for professional purposes constantly, while no one could claim to be able to work without ever having to use them.

These data require some considerations, first the need to adhere to new business models. As already mentioned, this can be made feasible through a carefully planned transformation strategy and, as specified in Kane et al. (2015), the strategy must cover not only the structure and technology, but also the culture behind the organization.

The turning point in the modernization of the business model is in the ability to integrate business planning with technological innovations, involving the entire working

[6] KNUDSEN D. R., *Elusive boundaries, power relations, and knowledge production: A systematic review of the literature on digitalization in accounting*, International Journal of Accounting Information Systems, Volume 36, March 2020, 100441, https://www.sciencedirect.com/science/article/pii/S1467089518301350.

staff in the acquisition of new skills, is the customer, offering a very competitive product/service.[7]

As stated by Kotarba (2017), in the field of research aimed at measuring the digitization of an organization, we need to move from a goal focused only on the Internet and the related technology, to a goal centered on the customer. Even in the field of strategic innovation, it is necessary to change approach, shifting attention from the purely technological and media aspect, to the human view point focused on the customer.

In fact, the centrality of the customer is indicated as the right direction to follow for an optimal development of new skills, through faster and simpler methods and applications that contribute to a tangible digital culture within the organization. (ACCA, 2020)

These indications assume a fundamental importance if we consider that many scholars have found the inability of many structures, regardless of the size of their organization, to keep up with the times. This is because they lack adequate strategic planning.[8]

On the other hand even if it is clear that the technology sector must be developed in order to be integrated into the business model of the organization, an original vision includes all the sectors involved in an actual restructuring. We cannot limit it to the Information Technologies sector alone, but we must plan a synergistic approach between IT, the human resources sector and the development of services and products. (Berghaus, Back, 2016)

The digital quotient, identified through research commissioned by ACCA just as the awareness of this integrated vision, should be contextualized and interpreted in the light

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[7] "The power of a digital transformation strategy lies in its scope and objectives. Less digitally mature organizations tend to focus on individual technologies and have strategies that are decidedly operational in focus. Digital strategies in the most mature organizations are developed with an eye on transforming the business." in KANE G. C., PALMER D., NGUYEN PHILLIPS A., KIRON D., BUCKLEY N., *Strategy, Not Technology, Drives Digital Transformation. Becoming a Digitally Mature Enterprise*, MIT Sloan Management Review, July 14, 2015, https://deloitte.wsj.com/cfo/2015/09/30/strategy-not-technology-drives-digital-transformation/.

[8] "However, most companies only have a diffuse understanding aboutthenatureandimpactofdigitaltransformation. Consequently, theystruggle to design and implement actionable strategies successfully. This applies especially to small- and medium-sized enterprises (SME), whose ability to change is naturally limited. In 2017, many European Smes still lacked an organizational initiative for digital transformation and were referred to as non-digital. Seeking to learn from large companies, Smes are typically overwhelmed by the broad-ness of opportunities and challenges offered by digital technology. In particular, they fail to transform the implications to a suitable scale, as the priorities of large companies are too manifold to derive practical and actionable recommendation." in FISCHER M., IMGRUND F., JANIESCH C., WINKELMANN A., *Strategy archetypes for digital transformation: Defining meta objectives using business process management*, Information & Management, Volume 57, Issue 5, July 2020, 103262, https://www.sciencedirect.com/science/article/pii/S0378720618303197.

of a new and authentic leadership that can combine the principles of ethics with professional experience and new digital skills.[9]

For the business model to be effective and efficient it must be continuously in development and updating, while keeping in mind that the pillar of the profession remain technical and ethical skills, which must be combined experience, intelligence, vision, creative, emotional and, finally, digital skills. (ACCA, 2020)

Without operational agility and overcoming a rigid vision of the professional function, regardless of the context in which the organization works, the transformation strategy could prove to be unsuccessful. (Rao, 2018)

The study conducted by Tronvoll *et al.(*2020), for example, through a series of interviews with executives and managers, indicated well-defined operational choices that could be considered the basis of digital success for an enterprise: planning of a new organizational identity, dematerialization and collaborations instead of a dominant role in the market.

These considerations confirm that the digital transformation does not concern technology, but the restructuring of the entire organization, to create a business model congruent to digital evolution. In fact, although process automation is a prerequisite for digital transformation, in particular because it makes it possible to achieve greater competitiveness in terms of data acquisition and storage, as well as speed of processing, it is essential to be able to provide precise guidance in the coordination of functions within the organization.[10]

An interesting study published by the University of Agder (2019) although limited to a small number of accounting firms, highlighted that the accounting profession could present itself as the ideal candidate for digital transformation.

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[9] "In 2016, ACCA conducted a significant piece of research into the skills that accountancy and finance professionals need to develop and maintain to remain relevant. The report Professional Skills - the Future: Drivers of Change and Future Skills (ACCA 2016) introduced the concept of the professional quotients to define these necessary skill groups. [...] Among these are the skills that make up the digital quotient. The definition offered for the digital quotient is: The awareness and application of existing and emerging technologies, capabilities, practices and strategies'." in ACCA,*The digital accountant: digital skills in a transformed world*, Professional insight report, 18 March 2020,https://www.accaglobal.com/in/en/professional-insights/technology/The_Digital_Accountant.html.

[10]SHUICHIRO Y., A *Strategic Map for Digital Transformation*, Procedia Computer Science, Volume 176, 2020, Pages 1374-1381, https://www.sciencedirect.com/science/article/pii/S1877050920320470.

In fact, although at first the automation of processes had led to think that human professionalism would soon become superfluous, the versatility and creativity congenial to this role have made it central in the process of digitalization.

The authors highlight, therefore, that the educational and training path of the new generation of accountants must now take into account the learning of technology, in a shared model of development of technical and ethical skills and digital skills. In this way, it will also be possible to overcome the residual resistance to change, with the possibility of integrating advanced technologies such as artificial intelligence, robotics and big data into their professional studies.

This means investing in young people, who already have a broad understanding and familiarity of new systems and technical procedures, and assumes a fundamental importance from the point of life of creating a highly competitive staff of employees. (Duong, Fledsberg, 2019)

The statement of how crucial human capital can be in an effective strategic choice is also reiterated by "many implications from technological improvements that should be considered. Of central importance for the successful digital transformation of businesses are the human resources. The investments in staff recruitment and training areas important as the investments in IT infrastructure. Moreover, they are interdependent and related in certain ways. The knowledge and competences of employees is a very important factor for a company to cope with the challenges of Industry 4.0 in the most competitive way."[11]

Another study, focusing on the analysis of accounting activities in Finland, highlighted the difference in approach to digitization between a global enterprise and smaller local enterprises, often unable to invest in new technologies.[12] In particular, these conditions

[11] STANCHEVA-TODOROVA E., (2019) *The Knowledge and Skills Profile of Accountant 4.0*, in 11th International Conference "Digital Transformation of the Economy and Society: Shaping the Future", Prilep, North Macedonia, October 19-20, 2019, https://www.uklo.edu.mk/filemanager/HORIZONTI%202020/Serija%20A%20vol%2025/05.pdf.

[12] "According to Granlund (2011), smaller firms are more reluctant to adopt modern IT because of the expenses included, along with the hidden costs, and they are sometimes engaging in ongoing development projects. Therefore, the author raises the question of whether it could be a result of inadequate resources. The query aligns with our findings, and the followers explain they do not have the resources and capacity to invest in several new systems. Further, Granlund (2011) point out that a reason might be that the employees are suspicious and fear new Technological developments." in JYLHÄ, T., SYYNIMAA, N.,*The Effects of Digitalisation on AccountingService Companies,* inJ. FILIPE, M. SMIALEK, A. BRODSKY, & S. HAMMOUDI (EDS.), ICEIS 2019: Proceedings of the 21st International Conference on Enterprise Information Systems. Volume 1 (pp. 502-508). SCITEPRESS Science and Technology Publications, doi: 10.5220/0007808605020508.

may arise because of legislation which is not very innovative and which aims to regulate, above all, local aspects, instead of favoring relationships and collaborations capable of transcending territorial boundaries. The ability to invest in new technologies and, consequently, to be productive and competitive on the market is crucial: once again, it is stressed that the adoption of increasingly innovative technologies is a decisive prerequisite for increasing productivity.

According to the Finnish study, the new technology is mainly one of the choices adopted by larger organizations in terms of expansion and increased productivity, so that they are classified as "early adopters" or "first movers" (Stancheva-Todorova, 2019). On the contrary, small entrepreneurs do not have the resources needed for structural interventions, nor do they consider it necessary to invest in new technologies, falling into the category of late or even late.

A brief reference to one of the conclusions highlighted in both the studies: the need for the role of accountant to be named in a new and different way, to reflect the new professional skills and abilities required by the modernization of the profession that plays a role of fundamental importance now far removed from the figure of the book keeper.[13]

Technological innovation influences the future of accounting management work through the transformation of management structures, professional role and identity.

Therefore, the evolution of self-understanding of one's role passes through the development of inter-operational partnerships and cooperation, "a role focused less on

[13] "The need for a new name. We observe there are many discussions at the firms regarding the Accountants' role in the future. Even though the respondents believe the Accountants are moving towards more counseling, they claim the profession defined as a consultant is not suitable. As mentioned earlier, the accountant is moving towards a new role with more IT-expertise, and therefore, some respondents recognize there is a need for a more suitable name of the accountant. One CEO (12) mentioned Regnskap Norge (a union for Norwegian authorized Accountants) should change the name of the profession to a more attractive and interesting name, which fit the changing role."in DUONG D., FLEDSBERG K., *Digitalization of the Accounting Industry : The influence of digitalization on the accountants' role and their self-understanding. An exploratory study based on 13 Norwegian accounting firms,* University of Agder 2019, https://uia.brage.unit.no/uia-xmlui/bitstream/handle/11250/2624790/Duong%2c%20Diem%20Chi%20Thi%20og%20Fledsberg%2c%20Kristine.pdf?sequence=1&isAllowed=y.

routine work and reporting tasks and more on analysis, strategy, planning and management support", as Heinzelmann argues in his analysis.[14]

In this context, the possible loss of procedural jobs in the accounting sector must also be taken into account, but this becomes a physiological replacement for the creation of new jobs requiring completely different skills. (Jylhä, Syynimaa, 2019)

Stancheva-Todorova (2019) defines this phase of digital transformation as a progression of industrial evolution. Starting from the phase of automation to move to the digitization of production and operating processes, the scholar indicates the "fourth industrial revolution" with a market approach focused on individualized services but capable of being globally competitive.

This transformation has also been identified with the term Industry 4.0. Even though there is still no agreement on the definition of phenomenon as actually revolutionary, but rather as an evolution that integrates technological models both in the field of industrial structures and solutions, both in the field of products and services mediated digitally in order to meet the renewed needs of customers and their partners.

The combination of these elements is at the base of what are called "smart factories" in which is realized the association between virtual and physical, between digital media and human abilities necessary for the productive growth, both in terms of increase in earnings and decrease in costs.

As already mentioned, the transition to this form of digital transformation passes through the human resources channel, in the double aspect of specialized employees able to bring a unique expertise and to be involved in the structuring of the company.

In this regard, it becomes a priority not only to recruit the resources best suited to the business growth tactics, but also above all to identify and train employees in skills not yet present in the company structure, through in-house vocational training programmes or through input to new methods of education for students.[15] It is to develop the

[14] HEINZELMANN R.,*Digitalizing Management Accounting*, in FELDBAUER-DURSTMUELLER B. & MAYR, S. (EDS.), Controlling - Aktuelle Entwicklungen und Herausforderungen, pp.207-226, Springer Gabler, 2019, https://www.researchgate.net/publication/333603640_Digitalizing_Management_Accounting.

[15] "... a powerful impact that the transition toward a more continuous accounting function will have is the need and necessity of a revamped accounting education system. Whether taking place in the K-12 educational setting, college or university classrooms, or continuing education environments, it appears logical to embed some of the ideas that will be necessary going forward into the accounting curriculum. The specific additions and modifications to curriculum will, of course, vary by institution and educational

Internet of Things in balance with the services offered and human capital. (Stancheva-Todorova, 2019)

All these factors influence in a decisive way the accounting profession, which now far from the archetype of the "accountant", requires the ability to know how to move efficiently through different fields and disciplines, adapting to be financial and accounting managers.

Classic accounting procedures no longer correspond to a continuous flow of data that must be read, merged and interpreted according to the increasingly specific needs of customers. (Smith, 2018)Blockchain platforms, artificial intelligence, Big Data are elements that must be the subject of research and analysis in order to develop a continuous accounting functionality able to compete with the current environmental, social and technological changes. "The very concept of a more continuous accounting function is not necessarily a new or completely innovative idea, but with current technological advances in the marketplace this concept appears to be moving increasingly toward reality. Accounting, regardless of whether the accounting professional is employed in private industry or at a public accounting firm, is still based on a periodic review and analysis of financial information. While it is clear that attest, tax, and advisory services will continue to provide opportunities for accounting professionals and form the foundation of what the profession performs, the matter by which these services are provided appear to be changing and evolving. From available market evidence it does appear that the accounting firms that will be most successful moving forward are firms that evolve and transform to keep abreast with market forces (Tysian & Drew, 2018)." (Smith, 2018)

As Bhimani and Bromwich (2009) point out, traditional management accounting techniques conflict with the problems related to the managerial evolution of the profession.

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level, but having this conversation appears a logical place to start improving the job readiness of recent Graduates entering an increasingly dynamic workplace. Drilling down, in order to have accounting professionals prepared to take advantage of emerging opportunities, accounting students must, at the very least, be made aware of them During the educational process." in SMITH S. S., *Digitization and financial reporting: how technology innovation may drive the shift toward continuous accounting, Accounting and Finance Research*, 2018, https://tarjomefa.com/wp-content/uploads/2020/03/F1728-TarjomeFa-English.pdf.

The authors make no difference with regard to the size of the company, which can be large or small, but stress that the profound transformation undergone with globalization requires greater attention to financial management and accounting management. In this regard, scholars wonder if the accounting professionals of management must give up their role, considered now limited to the needs of the company, to maintain only a role of financial control.

However, given that digitalization and globalization have also changed structures from the decision-making point of view[16], the authors seem to favour a "hybrid" solution. Accountants can be part of the decision-making process that strategically combines business objectives and actions, becoming part of the management line.

As noted in part of the management accounting literature, this method can be defined as strategic management accounting. This approach can be advantageous for management accountants, but only if they are able to deal with the continuous business, environmental and digital upheavals in a dynamic way.

In this way, by exercising a strategic and integrated role, management accountants are not likely to be excluded in favour of a management that uses accounting techniques in a non-integrated manner. (Bhimani, Bromwich, 2009)

The digital process of information must be interfaced with the accounting process, posing a series of doubts and questions concerning, in particular, the veracity of the information, its processing, storage and use, its value.

Global digitization also creates regulatory issues, as local legislation is not always able to predict all possible impacts on the use of digital data globally. As already mentioned, digital transformation can be an opportunity to improve professional standards, also from the point of view of transparency of the information process. However, the

[16] "Given the extent to which professional management accountancy bodies are embracing a more strategic posture for the field, strategic thinking in the practice of financial and cost management is an increasingly important issue. Financial managers and Accountants are encouraged to be more strategic (Nyamori et al, 2001,p.65). Strategiccontrol and cost management frameworks define approaches to strategic decisions as distinct from their implementation and from operationalising separately derived Intentions. Retaining the traditional staff instead of line role for Accountants in organisations makes it difficult for strategic thinking not to be viewed as dissociated from operational action." *in* BHIMANI A. AND BROMWICH M.,*Management accounting in a digital and global economy: the interface of strategy, technology, and cost information* in CHAPMAN C. S., COOPER D. J. AND MILLER P., (EDS.), Accounting, Organizations, and Institutions: Essays in Honour of Anthony Hopwood, Oxford University Press, Oxford, UK, 2009, pp. 85-111, http://eprints.lse.ac.uk/36853/.

managerial approach to accounting management could amplify these issues, especially in relation to organizational communication and reporting. (Arnaboldi et al., 2017)

Scholars believe that this methodology can contribute to make accounting an integral part of business decision-making and not just an automated technical tool.[17]

At the moment, there are no certainties but only insights into the future of the accounting profession, which will have to face many other challenges and changes and to adapt its role to the needs of the constantly evolving digital and global economy.

1.2.1 The factors influencing the diffusion of innovation in digitalizing accounting

Bhimani and Bromwich (2009) defined the new role of the accountant as "fluid": the transnational characteristics typical of digital operations and the alteration in the acquisition of information have changed the rigid structures within which the accounting profession moved.

This is due, as mentioned, first to the new data collection procedures, which make dynamic and changing the parameters and boundaries of the accounting profession.

Knudsen (2020) in his work refers to the systematization used by Rom and Rohde (2007) on to compare data acquisition integrated information systems (IIS) based on structured data with the digitized system, where the acquisition of unstructured data through the automatic collection of data from new sources, such as social-media platforms. These new data sources extend the ecosystem from which organizations can collect data. In itself, these developments may seem nothing more than incremental technological developments. However, the joint emergence of these technologies, which we call digitization, represents an important technological change that makes the boundaries of accounting increasingly "elusive".

Knudsen (2020), as well as Bhimani and Bromwich (2009), also highlights in his studies the interpenetration of different professional areas as a result of the digital

[17] ARNABOLDI M., BUSCO C., CUGANESAN S., *Accounting, accountability, social media and big data: revolution or hype?* , Accounting, Auditing & Accountability Journal, Volume 30 Issue 4, 2017, https://re.public.polimi.it/retrieve/handle/11311/1045698/515814/11311-1045698_Arnaboldi.PDF.

transformation process: the accounting function assumes a tactical value also compared to other sectors, like marketing or IT, and it becomes “hybrid” to survive the pressure of corporate renewal.

So one of the fundamental factors that makes digital innovation necessary is the preservation of the profession. However, the influence of new technologies and methodologies raises serious questions about the characteristics and role of the accountant in the digital age, questions that will certainly need to be further investigated and explored.

Mäkinen (2010) focuses its analysis on the diffusion of new technologies, such as electronic invoicing and e-commerce, within the accounting profession in Finland.

As we pointed out in the first paragraph, the greatest enhancement to digital transformation is the need to make the company more efficient and productive. Even in the accounting profession, efficiency is one of the fundamental reasons that motivates professionals to implement the activity with the most innovative technologies.

We have also underlined how crucial it is to establish alliances and collaborations in order to reach a wider user base and higher productivity results thanks to the reduction of costs and the inter-exchange of potential solutions.[18]

However, the basis of any cooperation project must also be harmonization and standardization work that brings together the operation of accounting studies in a unified model, in particular in relation to the optimization of internal processes and the standardization of invoicing procedures between companies.

Unfortunately, this process finds many difficulties of realization: it would be enough to standardize the model of invoice on the requirements required by law, but each company prefers a different model of invoicing according to its internal needs, making it impossible to agree on standards. In addition, the accountants have fueled these differences by creating different market segments to satisfy the discrepancies required,

[18] "Collaboration is the most frequently mentioned phenomenon. We focus on "digitally-enabled collaboration" which refers to cooperation which "expands across space, time, and organizational boundaries" (Lindberg et al., 2013). [...] In addition, the positive effects of collaboration are underlined by Avital et al. (2014) stating that "by lowering marketplace transaction costs; by facilitating { production' that is more efficient, allowing a greater level of output to be created from the same level of physical assets and labor; and by creating production and exchange opportunities that were not previously possible" are possible efficiency improvements for organizations." in BOCKSHECKER A., HACKSTEIN S., BAUMÖL U., *Systematization Of* The Term Digital Transformation And Its Phenomena From A Socio-technical Perspective. A Literature Review, 2018, http://ecis2018.eu/wp-content/uploads/2018/09/1312-doc.pdf.

also cancelling the potential positive feedback resulting from an agreement and standardization process, first of all greater transparency and scalability of the computer system depending on the amount of data. (Mäkinen, 2010)

It seems that achieving effective cooperation is also affected by the difference in the size of the company. As we have already mentioned, smaller companies do not have the means and the will to implement their own structure. In this way, they find themselves in a position of inferiority compared to large companies that instead invest in technological innovation.[19]

These assumptions prevent a possible collaboration and the creation of a harmonious and uniform environment. As the author states, "the efficiency of innovation depends on the fact that innovation is adopted by a large number of companies."

We recall that at European level, in order to overcome the obstacles of national legislation to an effective standardization of accounting rules, for several years the institutions have been trying to create the conditions for a single and effective legislation[20]. "The Europe 2020 strategy sets out a vision of a highly competitive European social market economy for the 21st century and emphasises that it is crucial to reap the full economic and social benefits of a digital society. To this end, electronic invoicing (e-invoicing) is part of the European Commission's flagship initiative A Digital Agenda for Europe which gives prominence to achieving a single digital market and calls for removal of the Regulatory and technical barriers that prevent mass adoption of e-invoicing."

It is clear that uniform regulations must form the basis of widespread and homogeneous diffusion and that to achieve this goal, networks must be set up to support and gather the experience and knowledge of the professionals involved. The results in terms of effectiveness are sensitive to the greater or lesser diffusion of an innovative technique

[19]"From the SME side the processes of sending and receiving electronic invoices can easily seem more difficult than sending and receiving invoices on paper [...] As over 90% of all Smes fall into the category of a micro company (employs under 10 people, turnover and the value of the balance sheet each under 2m€) the organization of the financial administration often consists of the owner and his bookkeeper." in MÄKINEN H., The factors *impacting the* diffusion of innovation in digitalising accounting, Helsinki School Of Economics, Department of Accounting and Finance, 2010, https://aaltodoc.aalto.fi/handle/123456789/423.

[20]*Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions, Reaping the benefits of electronic invoicing for Europe,* ABE - EBA Euro Banking association, https://www.abe-eba.eu/media/azure/production/1358/european-commission-communication-reaping-the-benefits-of-e-invoicing-for-europe.pdf

and in this sense the corporations, able to overcome territorial limits and boundaries, have a direct effect.

Furthermore, with a view to assessing the effectiveness of non-heterogeneous standardization over the long term, the establishment of unitary organizations is an optimal prerequisite for the creation of historical archives that are also useful for understanding the future.

Particularly accurate is the conclusion of ACCA's 2020 report: "As accountancy and finance professionals, in order to remain relevant, we need to embrace that digital shift, recognizing that the digital world is constantly moving forwards. The traditional digital tools, with which we have long been associated, such as spreadsheet applications, are being eclipsed by new technologies that draw on various data sources, visually represent that data and use ML to forecast trends. Our digital world is expanding in parallel to that of the organisations that we work for and with, irrespective of whether we are in-practice or in-business. We need to embrace these changes to ensure that we have the skills necessary to use these tools and embrace new business models. To learn about the new and to unlearn those areas that are no longer relevant to us. Doing that is a journey of continuous learning: one that we cannot afford to ignore."

1.2.2 Changing competencies and mindset to ensure performance

In order to be an efficient part of a globalized and digitized economy, it is necessary to develop specific skills capable of providing an appropriate response to the world of work.

Digital skills are certainly among the main skills to be considered, given that Information and Communication Technologies (ICT) are the starting point for the epochal change experienced by society and the economy in recent years.

However, as we have repeatedly pointed out, human capital within companies is of decisive importance in the innovation process.

A company can make best use of the benefits provided by technological innovation only if it invests in the knowledge and skills of its employees. As reiterated by Bygren (2016)

"employees are the primary key resource" which should be used like other key resources to support "an effective decision making structure in the company in order to provide a flexible company structure, strategies, and actions to be Able to keep up with changes."

It should be pointed out that the concept of knowledge and competence in this case must be broader than the simple digital skills needed for competitiveness in the modern world. As van Laar et al. (2017*)* explains: "21st-century skills and digital competence are both concepts that emphasize a broad spectrum of skills. Beyond skills, knowledge and attitude are viewed as essential to thrive in the knowledge society. The list of mentioned skills is extensive, but both concepts do not integrate the digital aspect. The digital aspect is often seen as a discrete skill and implying that 21st-century skills are not necessarily underpinned by ICT."

To explain the combination of key competences to participate effectively in today's competitive society, the concept of digital skill of the 21st century has been coined. This concept, while not yet sufficiently defined, includes both problem solving skills and digital skills. (CGMA, 2019)

Indeed, although digital skills are important, they alone are not sufficient to compete in a complex and differentiated environment. The technical aspect of skills must also go far beyond mere computer knowledge, as van Laar et al. (2017) reiterated, according to which, in addition to mastering ICT programmes, it is necessary to possess cognitive abilities of a higher order and the ability to encourage continuous learning of employees.[21]

Through this new interpretative lens, the financial function can also be read in a new way. Up to now, financial systematization has aimed to favor more agile organizational structures and the reduction of operating costs. However, automation now makes it possible to monitor process costs and promote efficient models, leaving the financial function free to focus on key activities such as increasing revenue and value creation, such as the possibility of taking into account the social impact of business models, for example choosing the path of sustainability.

[21]VAN LAAR E., VAN DEURSEN A., VAN DIJK J., HAAN J., (2017) *The relation between 21st-century skills and digital skills: A systematic literature review*, Computers in Human Behavior, Volume 72, July 2017, Pages 577-588, https://doi.org/10.1016/j.chb.2017.03.010.

In this sense, automation and the use of technology are a useful support, as they allow to improve the accuracy of the predictions of financial functions, as well as to significantly reduce the time of the process.

The ability to use technological innovations allows corporate staff to spend less time analyzing data and increase resources for decision-making strategy: corporate employees can enrich their skills and expertise to research of a higher value for their organization.

Finance professionals need to have the right skills to support organizations competitively: "... creating a personalized customer experience based on big data analysis or automating processes, is characterized by lower achievement rates. This indicates that the primary stages of the digital transformation process are related to creating awareness, promoting the potential offered by digital technologies, and experimenting with digital innovation. In the next stages, companies start to go about digital transformation in a more systematic and strategically planned manner, by creating measurable goals and defining roles and responsibilities in the organization."[22]

Value management by financial professionals is at the core of the work of Lawson (2019), which reports a research conducted by the IMA, Institute of Management Accountants. According to the results of this study, which seem to confirm what has already been said, the financial function is being transformed into strategic activities with higher added value, based on features such as decision-making responsibilities and strategic vision integrated into the business model.

As we have already pointed out on several occasions, a company in order to be able to compete in a globalized and digitized way must change structurally and strategically and in this perspective the accounting profession must abandon the mere processing of data to provide rather a "predictive, prescriptive and adaptive analysis". (Lawson, 2019)

Data analysis is always one of the main responsibilities of an accountant.[23]Nonetheless, thanks to the digitalization of the accounting area, financial professionals have the

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[22]BERGHAUS S., BACK A., *Stages in Digital Business Transformation: Results of an Empirical Maturity Study*, Conference Paper, Tenth Mediterranean Conference on Information Systems (MCIS), Paphos, Cyprus, 2016, https://aisel.aisnet.org/mcis2016/22/.

[23] "In the digitally transformed world, data is key. The ability to use data to understand the business environment in real time, to add value to customers, is key. Those organisations that survive and thrive will be those who have addressed the disruptive forces, understood how the changes affect their business model and addressed their customers' changing behaviours." in ACCA, Professional insight report, 18

opportunity to use their predictive skills to implement the decision-making and strategic process: "... the accounting and management information systems which are dedicated to support manager's decision-making using accounting data as primary information sources. Some papers consider how new technologies could reshape the accounting and management information systems, enhancing their information potentialities and their ability to support decision-making processes, while other research studies show how managerial information needs affect and reshape the adoption of information technologies asking for more digitalisation."[24]

As a result of the transformation of their role, the accountants must pay greater attention to certain qualities and characteristics which assume a fundamental importance both in terms of internal organization and external relations, with commercial partners or with customers.

First, the practice of ethical behaviour must be pursued throughout the company, both with regard to the activities of employees, particularly in the acquisition of data, and with regard to the privacy of customers.

In this sense, the accountants of management can assert the strong ethical imprint related to their profession. A feature increasingly important in the movement towards the transformation of the profession, which in managing strategic design will have to solve numerous ethical issues that go beyond the compilation and reporting of information.

In this framework still in progress and fragmented, have a great reference value the skills of management managers identified in their Management Accounting Competency Framework by the IMA.[25]

March 2020, The digital accountant: digital skills in a transformed world, https://www.accaglobal.com/in/en/professional-insights/technology/The_Digital_Accountant.html.

[24] MANCINI D., LAMBOGLIA R., CASTELLANO N., CORSI K., *Trends of Digital Innovation Applied to Accounting Information and Management Control Systems,* in CORSI K., CASTELLANO N., LAMBOGLIA R., MANCINI D. (EDS), Reshaping Accounting and Management Control Systems, (pp.1-19) Springer, 10,2017, 1007/978-3-319-49538-5_1.

[25] "The Future Role of Management Accounting. The evolving role of management Accountants in a changing world. This research area focuses on the role of Accountants as business partners and the transformational role of technology within accounting." in *IMA Management Accounting Competency Framework*, Institute of Management Accountants, Inc., 2020, https://www.imanet.org/insights-and-trends/the-future-of-management-accounting/ima-management-accounting-competency-framework?ssopc=1.

Essential skills can be grouped into six critical areas: Strategy, Planning & Performance, Reporting & Control, Technology & Analytics, Business Acumen & Operations, Leadership, Professional Ethics & Values

For the first sector, divided into strategic cost management and cost accounting, this includes all those analytical and predictive activities, including budget preparation and innovation management. The activities envisioned in this area reflect the transformation of the role of the managing accounting officer and the integration of the accounting process in the elaboration, control, validation and implementation of strategic planning.

In relation to the second area, of reporting and control, the automation of accounting processes makes management accountants responsible for assessing their authenticity and security, in compliance with legal accounting obligations.

The third sector is the one that has the biggest innovations compared to past skills, as it refers to the most advanced technologies: management accountants must verify the impact of Big Data in data extraction for structured and unstructured data. The skills needed to manage the technology are combined with planning skills, in a holistic representation that includes the acquisition and processing of data and their presentation.

As has repeatedly been pointed out, the digital transformation does not[26] involve only one of the business sectors, therefore the definitions of the competences pertaining to the fourth sector have been widened in function of the transformation of the companies and the accounting management. The company acumen includes understanding the operations of an organization, a critical competence for accounting management, and project management skills, necessary to contribute to the multiple functions with respect to partnerships and stakeholders following the change of business models.

Leadership confirms the crucial skills for management accountants in this domain: collaboration, communication, conflict management are just some of the skills of an effective guide, both within the financial function and throughout the organization.

[26] "These factors are a defined strategy for digital transformation, an appropriate management and involvement of employees, products or services according to the changing needs of customers, employees with the right competencies and task and role models, a digitization-friendly corporate culture, suitable internal work processes ("operations"), digital governance structures for controlling transformation and suitable technologies for the products/services or operations. *[*...]" inSANDKUHL K., SHILOV N., SMIRNOV A., *Facilitating Digital Transformation by Multi-Aspect Ontologies: Approach and Application Steps*, IFAC-PapersOnLine, Volume 52, Issue 13, 2019, Pages 1609-1614, https://www.sciencedirect.com/science/article/pii/S2405896319314119.

Finally, the field of ethics and professional values in relation to accounting management. It combines the ability to respect the ethical principles of the profession and the ability to recognize ethical conflicts and to resolve them properly. In addition, it includes the ability to implement the strategic planning of the organization in full compliance with the law and any obligation arising from the exercise of business activity.

Imposing and following ethical practices is crucial in limiting potential negative consequences for organisations, and underlines the key role of management accountants in new business forms.

1.3 An European analysis of digital competence

European industry could effectively contribute to the development of technological innovation, rather than simply suffering the effects of the Internet of Things, big data, robotics, blockchain technologies and artificial intelligence. The digital transformation of enterprises has enormous growth potential for Europe. However, as reported by Afonasova et al. (2019), 47% of the EU population does not have adequate digital skills, despite predicting that in the coming years 90% of jobs will require a high level of digital skills.[27]

As already mentioned, through the Digital Agenda, EU Member States have developed a strategy for reforming the digital single market. However, there still seems to be a confused vision about the policies to be implemented in order to start a course of "new economy" in Europe. (Bauer M., Erixon F., 2016)

Indeed, European industry and policy seem to be under the pressure of digital innovation from the United States and China, so much so that they think of regulations that are restrictive of foreign companies and their actions on European soil, although

[27] "As elaborated, our study revisits and operationalizes the term digitalization in terms of both the macro, infrastructural level and the micro, individual level. For macro-level digitalization, we focused on the development of Icts, digital scaffolding of media, and the adoption of digital infrastructures as sociotechnical phenomena in society; for micro-level digitalization, we examined individuals' shift of media use from legacy to digital media. Based on this operational clarification, we found that the development of digital infrastructures does not necessarily entail a Corresponding Created in individuals' use of digital media and of the Internet."CHAO SU C., LIU J., AND ZHOU B., *Two Levels of Digitalization and Internet Use Across Europe, China, and the U.S.*, International Journal of Communication 14 (2020), 5838-5859 1932-8036/20200005, https://ijoc.org/index.php/ijoc/article/view/14556/3278

they comply with the laws and regulations in force in the European market. The doubt is that European politicians are using competition law, such as the lack of copyright reform, for political and economic purposes to combat competition from foreign companies.

The digital single market should have the effect of reducing digital barriers in Europe, however, despite the opening-up declarations of the European digital economy, European authorities seem to be more keen on new regulation with a stratification effect than in the already rigidly regulated non-digital single market.

In fact, a much more accurate analysis should be made of the reasons why the European digital economy has not developed efficiently, such as the regulatory heterogeneity in traditional non-digital sectors affecting digital and non-digital enterprises. Instead of acknowledging the situation, European authorities seem to hope for a positive development of digital technologies and the digitization of non-digital business models when the legislative limits in e-commerce, privacy and copyright policies are removed.

At the moment, therefore, there does not seem to be a coherent and defined digitization action in Europe. Even the Digital Economy and Society Index (DESI) composite index, an annual analysis and benchmarking tool that includes European digital performance indicators (broadband access, commercial and private activities in the use of various digital services) and indicates the progress of Member States in economic and social digital evolution, does not provide clear and consistent results on the real impact of digital transformation on economic growth.

DESI includes a large number of indicators that provide an accurate view of digitization, but this complexity prevents us from finding the primary aspects on which public and private investment must be targeted to generate effective economic growth.

The importance of identifying primary projects aimed at the development of a local/transnational economy is evident, for example, for the Baltic States, which can count on a limited investment and must choose according to the greater effectiveness. (Karnitis et al., 2017)

The debate on the potential and opportunities of the digital economy in Central and Eastern Europe (EEC) is the basis of the Mckinsey report.[28]

The report focuses on the progress of the digitization process in ten countries, Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia, known as "Digital Challengers", compared to the group of highly digitized countries, "Digital Frontrunners" means Belgium, Denmark, Estonia, Finland, Ireland, Luxembourg, the Netherlands, Norway and Sweden.

Assuming that there is no predetermined path to achieving optimal digitization, it is possible, according to the 2019 report, identify sectors that can influence the development of the new economy thanks to the Mckinsey Global Institute index based on indicators such as expenditure on computers, software and telecommunications equipment, and the stock of ICT assets.[29]

Based on the results obtained, it is possible to create a map of the industrial sectors that, through digitization, are able to influence national productivity. As confirmed by Karnitis et al. (2017) "The selection of digitalization aspects with the most significant impact on the economic growth should be evaluated as the major benefit of the study; any economy would use these results for the sustainable planning and assessment of investments and activities in various aspects of digitalization. All observations of the model's analysis strongly relate to the Baltic States, which currently are not among the leading EU economies yet; the model clearly shows the digital weaknesses, the prevention of which would make the most effective contribution to the GDP growth."

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[28] NOVAK J., PURTA M., MARCINIAK T., IGNATOWICZ K., ROZENBAUM K., YEARWOOD K., THE *rise of Digital Challengers: How digitization can become the next growth engine for Central and Eastern Europe,* Digital/Mckinsey, Mckinsey & Company, 2018, https://digitalchallengers.mckinsey.com/.

[29] "MGI(Mckinsey Global Institute)'s Industry Digitization Index represents the first major attempt to measure the progress of digitization within various sectors. It combines dozens of indicators to show where and how companies are building digital assets, expanding digital usage, and creating a more digital workforce. The results show that along with the technology sector itself, media, financial services, and professional services are surging ahead of the rest of the economy. By contrast, sectors such as government, health care, education, local services, hospitality, basic goods manufacturing, and construction are lagging. This groupincludes some of the Biggest sectors in terms of GDP(Gross Domestic Product) contribution and employment, creating a significant drag on overall productivity." in MCKINSEY GLOBAL INSTITUTE, *The US economy: An agenda for inclusive growth, Briefing paper*, Mckinsey&company, 2016, https://www.mckinsey.com/~/media/Mckinsey/Featured%20Insights/Employment%20and%20Growth/Can%20the%20US%20economy%20return%20to%20dynamic%20and%20inclusive%20growth/MGI-US-Economic-Agenda-Briefing-paper-November-2016.pdf.

As for the analysis of the nations belonging to the central-eastern region of Europe, the report distinguishes three different groups of industries according to the different digitization rates achieved.

The “leading digital” industries, with a high digitization rate, include the ICT and financial-insurance sectors. The industries belonging to the group of “digital followers” are basically manufacturing and wholesale/retail. The “digital novice” industries include sectors such as the arts, entertainment, and agriculture as well as medium and large public sectors such as health care.

As we have already mentioned in previous chapters, digitalization influences business models, making them more flexible and resilient to market demands and creating new growth opportunities. Digitalization can change the rules of the market and create advantages or disadvantages depending on the entrepreneurial attitude you take.

The authors point out that, in the first instance, the new models mark the transition from the physical assets of traditional industry to intangible assets and digital networks, which do not require a heavy initial investment and can produce high short-term profits. These changes can also affect the product or service offered by the company, making it completely different as in the case of the music streaming service.

The disruptive effect of digital transformation occurs not only in the private sector but also in the public sector, where, thanks to the Internet of Things, it is possible to operate according to new standards and greater transparency and the use of data flows available to public institutions can become a source of predictive analysis.

The interconnection between public and private outlined in the first paragraph of this chapter drives policy makers to support the digital transformation of the private and public sectors through programmes aimed at achieving greater interaction between companies and public administration.

Action must not be directed solely at the internal market, but must be of a cross-border nature in order to achieve the maximum result. Strengthening digital collaboration within common programs can become a strong point for Digital Challengers countries. The involvement of more than one country becomes a factor in strengthening the interest of the European Union or the European Economic Area in relation to common needs and interests and a precondition for seeking immediate solutions and investments

in the context of implementation on the Digital Single Market and the Digital Agenda for Europe.

An example in this sense is the strategies and investments decided worldwide to develop artificial intelligence (AI). Although the United States and China maintain a record in this area, the Old Continent could be part of the fight effectively if a number of small countries pooled their knowledge and resources.

In this sense, in April 2018, 25 countries signed the European Declaration on Artificial Intelligence Cooperation, declaring "a strong will to join forces and engage in a European approach to deal therewith. By teaming up, the opportunities of AI for Europe can be fully ensured, while the challenges can be dealt with collectively."[30]

The new digital solutions allow companies an online presence and a direct contact with their targeted customers, constituting one of the most important assets for productivity. It is not just about building a website, but proactively participating in virtual exchange and branding skills.

Thanks to technology for companies, especially smaller ones, it is no longer impossible to create a market out of the country. Digitalization allows small businesses or "micro-multinationals" to be present globally without investing large sums, through their own website or e-commerce markets to connect with customers and suppliers around the world.

The majority of EC companies engaged in online sales use their own website or application, while e-commerce markets are in general more useful to SMEs than to large companies.

Also from this point of view the difference in size between small and medium-sized companies and large competitors, as well as the percentage difference between markets belonging to Digital Challenger and Frontrunners. Especially for small and medium-sized companies, the gap between the two groups is clear, with only one out of seven SMEs in the EEC region selling their products or services online in 2017, compared to one out of five SMEs in the Digital Frontrunner markets.

[30] EU Member States sign up to cooperate on Artificial Intelligence, https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence

CHAPTER 2 BUILDING THE DIGITAL PRACTICE

2.1 The digital economy and its challenges to accounting

The technological revolution has an increasingly strong impact on the corporate structure, strategic management and employees of the entire industrial sector.

As reported in the Pwc survey in digitalisation of financial statement audits of 2018, "70% of decision-makers expect the degree of automation to be between 10 and 40% by 2022; 18% use AI even though Artificial Intelligence is still at the early stages of development; 8% of the surveyed companies are making use of blockchain technology; 13% of the companies already use software robots and 22% intend to do this."[31]

Automation, Robotics and Artificial Intelligence cause a radical change first towards employees and their tasks: the work is intended to be increasingly specialized. Even in the accounting field, as we explained in the previous chapter, the versatility required by the new tasks makes the accountant not the simple manager of accounts, a task already subject to automation, but an analyst capable of handling anomalies and singularities of the accounting process.

As a result, the introduction of new technology reduces the number of employees only to the level of the simplest operations, requiring instead more employees in a different and more specialized role. (Jylhä, Syynimaa, 2019)

Technological innovation has a potential influence not only on the labour market and on the transformation of the roles of employees, but also in the context of commercial and competitive relations between old local actors and new global actors, which, thanks to digitisation, may operate in markets that are physically distant from their premises.

Another aspect that stimulates companies to a greater awareness of the role of modern technology in the industrial field is the expectation of the customer. The competitiveness of companies is not limited to the productivity and excellence of the service, but as we saw in the previous chapter must put at the center of its decision-making and strategic

[31]Digitalisation in finance and accounting. And what it means for financial statement audits, Pwc Germany, 2018, https://www.pwc.de/en/digitalisation-in-finance-and-accounting.html.

evolution, the customer and his needs also regarding the use of new technological advances.

The need to implement a tactical approach, in a different and innovative way to customers, is primarily reflected in the cost/price that you can request for your services: only the offer of a product/service with modern and agile features compared to the past allows to be competitive and to avoid that prices drop dramatically as has been noted in recent years. (Jylhä, Syynimaa, 2019)

Technological renewal is now unavoidable and all organisations wishing to remain competitive have already entered or are being pushed into the digitisation phase. The next phase, marked by the use of Artificial Intelligence and robotics, seems to take place at a slower pace and under different conditions, as already several organizations use robotics, but Artificial Intelligence seems a futuristic tool to be employed in an organizational structure.

Brynjolfsson and Mcafee (2014) in their book "The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies" coined the term Second Machine Age, synonymous with the new technological revolution based on advances in robotics and artificial intelligence, applied in all industrial, computer and social contexts. The Second Age of Machines is the result of the digital integration of computers, computer interconnection networks, new processes and technological products, on which the new business models such as e-books, streaming music or e-mobility are based. According to the authors, this massive development of digital technologies highlights the enormous social implications and above all the impact on the future of existing jobs, potentially leading to an increase in unemployment and greater inequality. (Spencer, 2017)

However, the future vision of digital technologies is positive, as they will eliminate forms of mechanical work and fatigue, leaving opportunity for forms of creative work free from physical limits. The new technology will make the organizations more productive, but this step requires adequate reforms to ensure the forms of work and workers in the second era of machinery.

In the accounting sector, studies and organisations must invest in new technology to reduce costs, increase productivity, and face current and future competition. (Jylhä, Syynimaa, 2019)

The digital economy is the result of the qualitative transformation of economic and social processes following the technological revolution of the last twenty years. Accounting methodology and practice are also influenced by modern information collection, conservation, processing and management technologies. The transformation conditions the accounting information system, which is, in chronological and systematic order, at the base of the entire economic entity.

Both from the point of view of practice and from the theoretical point of view, the digital revolution offers the opportunity to "expand and modernize the content of accounting science under new conditions". (Spilnyk, Paluh, 2019)

We have already pointed out that the renewal of the accounting sector is inevitable and urgent, because the profession risks being absorbed by computerization of the economy and accounting risks falling apart in favour of multifunctional IT programmes.

The greatest risk is the loss of the accounting function's value for information to the stakeholders, in relation to the technological contributions that are required by customers as necessary to improve the accounting management process, but above all to improve the management of internal information considered essential.

Therefore, the digital economy determines the orientation and characteristics of the accounting evolution, affects the theoretical development through the renewal of the methodology, the determination of the criteria for recognition and definition of operations, the integration, identification and systematisation of accounting policies.

But it also has a strong impact on the improvement of accounting practice, through the transition from theoretical knowledge to the development of procedural recommendations, the practical implementation of which will contribute to the effectiveness of technological renewal integrated into decision-making management.

Therefore, the technological and informative changes of the "now economy" stimulate the search for new objectives and the organization of accounting methods flexible or alternative to the traditional, able to bring back to the center of the economic and financial system the accounting profession. (Spilnyk, Paluh, 2019)

"In years to come, experts predict, many companies will use information technology to become a "real-time enterprise"-an organization that is Able to react instantaneously to changes in its business. And as firms wire themselves up and connect to their business

partners, they make the entire economy more and more real-time, slowly butSurely creating not so much a 'new' but a 'now' economy." The Economist, February 1, 2002."

In fact, the countless collapses that have devastated the financial market in recent years, the inability of neoclassical economic theory to explain the continuous ups and downs of the system, the failure of traditional accounting methodology to interpret data and predict crises has led to a profound rethinking of the principles and methodologies underlying the financial system.

Despite attempts to make procedural innovations, Vasarhelyi and Alles (2008) point out that "the fundamentals of accounting-and accounting research-remain as they were a decade earlier. External accounting reports are presented quarterly, accounting standards are introduced in a reactive mode and are meant for purely manual application, with no Directly formulated Provision for tagging or automated referral; auditing firms in general still retain billing practices developed for a highly manual audit process and mainstream accounting research looks backward on the impact on financial markets of disclosures already made Rather than looking forward to how technologies that are already in widespread use elsewhere in business can be used to transform accounting practice. In short, while businesses are moving on to the ¿now' economy, accounting remains in a traditional' mode." While commercial and industrial practice have increased the pace of production and service, accounting practice fails to speed up its processes.

For example, accounting that failed to fully exploit the integrated features offered by the ERP system, The European Parliament's Committee on the Environment, Public Health and Consumer Protection has been working on a number of points.[32]

The researchers therefore point out that the digital and industrial renewal is progressing much faster than the adjustment of accounting procedures, which should instead benefit from the possibility of comparing their own research with the experience

[32] "ERP is the acronym for enterprise resource planning. ERP could be described as a database software package that supports all of a business's processes and operations including manufacturing, marketing, financial, human resources, and so on. In other words, the goal of ERP is to have one integrated system for the entire company. The integration of all of a company's information from all departments, processes, operations, etc. requires that an ERP system be very sophisticated. This in turn requires a company to commit considerable resources for planning, training, and implementing an ERP system. Two of the suppliers or vendors of major ERP systems are SAP and Oracle." in What is ERP? , Accounting Coach, https://www.accountingcoach.com/blog/what-is-erp.

acquired in other fields, projecting the established principles of accounting practice into new models integrated into technology.

The "now economy" demands the adaptation of the role of accounting to the changes"in real time": after having identified the deficiencies of the traditional accounting model, The solution is based on the way managers use the new technology for quick and effective decision-making. To this, it is necessary to understand what automated decisions are, to understand the different levels of decision-making aimed at providing information, to understand the timing of information, the relevance of information to the user, understand which parties are interested in information, such as customers and suppliers, workers, banks, partners of the organization. (Vasarhelyi, Alles, 2008)

The authors in their work continue to highlight the obsolescence of the content, format and information structures of the traditional balance sheet, income statement and cash flow statement, that produce a vision strictly confined to cost/benefit reading, a vision so limited in the measurement and reporting business that it does not take into account the really relevant data compared to traditional archival data. The data must be opportune and reliable to ensure the competitiveness that potentially results from the innovation of the company's technological set-up. Therefore, companies that want to keep up with real-time are opting for highly dynamic, customised mechanised processes that can adapt to the speed of corporate decision-making strategies. (Vasarhelyi, Alles, 2008)

Despite the many changes due to technological development, accounting remains the underlying language of every business model and the accounting consultant remains one of the most reliable referents in a company. (Pepe, 2011)

At the beginning of accounting activity, financial information was closely linked to paper and to the human capacity to compose, analyse and conserve with method and detail. With the advent of computers and accounting software, the accounting profession changes completely physiognomy. The revolution begins with the spreadsheet, which eliminates the boring part of the work and guarantees a minimum margin of error. Subsequently, the transfer of business to the digital network allows the accounting company to coordinate internal management activities with the communication needs of customers. In fact, new technologies favor the creation of "a bidirectional communication: they amplify the pre-existing unidirectional communication system and

generate a corporate dialogue, through active and real-time interactions between the entity and its stakeholders (collaboration) and through an Impliciticit set of mutually beneficial outcomes (engagement)." (Mancini et al., 2017)

For this purpose, both internal networks, such as the Intranet, can be used to communicate with employees through mail, internal documents and research tools, as well as external networks, as an Extranet dedicated to the access of customers to a part of documents and files. In any case, the use of new technologies allows the accounting firm to rationalize functions and reduce operating costs. (Pepe, 2011)

Again, to achieve greater efficiency, software and interfaces have been developed to preserve and organize all documents and then be processed on the basis of an algorithm able to analyse the data and interpret the financial statements of customers effectively.

Thus, cloud computing, the on-line service to permanently store data and use business applications remotely, also offers the possibility to store and access all the data needed for the financial analysis of the customer. However, this technology raises several security issues, since as far as service providers guarantee the protection of sensitive data, cyber attacks that can violate them cannot be excluded. (Pepe, 2011)

As Heinzelmann (2019) observes "Cloud-based solutions are of benefit to organizations working in virtual environments. For Smes, they can be a cost-effectiveness option, although they are not widely Employed in this context. For multi-national enterprises (Mnes), meanwhile, they can offer integration, standardization and real-time data accessibility. Likewise, cloud-based solutions allow for improvements in planning and control via enhanced forecasting and benchmarking functionalities, and better access to accounting information to track business performance. They also offer better data sharing capacities compared to ERP systems. Overall, cloud solutions provide a host of benefits that may improve management accounting and control systems and practices. However, empirical evidence of their utility in a real-life setting remains limited."

For these reasons, the use of technology forces companies to seek professional accountants specialized in the technological area.

An accountant must control the rules, principles and regulations of the accounting profession, but nowadays he must also have an integrated vision of technologies with

accounting systems in order to make accounting practice more efficient and the company more productive.

Synchronous technological preparation is necessary especially in relation to the use of particularly complex computer tools but able to provide effective improvement inputs. We mentioned the complexity of enterprise resource planning systems (ERP) which provides an accurate holistic representation of the corporate organization as a whole. Also the system of Supply Chain Management (SCM) provides useful tactical indications, in this case to use in the within of the relationships with suppliers.

The description of these technologies shows that the accounting profession cannot be disconnected from the coordination of strategic resources and the aims of the organization. Indeed, as the authors point out, "continuous business assessment entails the continuous monitoring of business and the assessment of the effect of a "significant variance" on the current conditions of business. Continuous business assessment links continuous monitoring to environmental conditions and to consequent management actions."[33]

In this perspective, new figures are born in the specialized areas of accounting and finance, such as, for example, the forensic accountant, that thanks to its technical skills in accounting is able to investigate and produce evidence in the context of civil judgments or against financial irregularities such as fraud, money laundering, insurance compensation.[34] Unfortunately, most of these offences are perpetrated through computer systems and require technological expertise essential to their discovery and analysis.

Therefore, future generations of accountants are faced with a twofold aspect of the technological revolution within their profession: on the one hand, computerised systems and automation have undermined the traditional role of accountants, forcing professionals in the sector to face a employment crisis and the rethinking of their specialist skills. On the other hand, the deployment of complex but highly effective IT

[33] VASARHELYI M. A., ALLES M. G., The "now" economy and the traditional accounting reporting model: Opportunities and challenges for AIS research, International Journal of Accounting Information Systems 9, 2008, pp. 227-239, http://raw.rutgers.edu/Miklosvasarhelyi/Resume%20Articles/MAJOR%20REFEREED%20ARTICLES/M46.%20the%20now%20economy.pdf.

[34] https://www.accaglobal.com/gb/en/qualifications/why-acca/competency-framework/job-profiles/governance-risk-and-control/forensic-accountant.html.

tools and tools has allowed the professional accountant to seize new job opportunities, making it an integral and indispensable part of the decision-making process of corporate organizations.

The potential of accounting technology has also provided the opportunity for new forms of professionalism, but has also radically transformed accounting management management with respect to accountability and internal/external reporting.[35]

2. 2 Artificial Intelligence, software robots, blockchain and the risk of cyber security

"The organization of data using internet-based technologies (cloud, big data and analytics, blockchain and AI) is the most recent development in the ever-changing accounting landscape." (Heinzelmann, 2019)

Companies must plan objectives based on the examination of conditions and the implementation of reliable predictions. Therefore, expertise in data analysis is central to the success of strategic business planning.

With digitization and the explosion of social media communication, the amount of data has increased exponentially. The first definition given by Gartner (2001) in its "3V" model, in fact emphasizes this characteristic: "Big Data is high Volume, high Velocity, and/or high Variety information assets that require new forms of processing to enable enhanced decision-making, insight discovery and process optimization." (Mancini et al., 2017; ACCA, IMA, 2013)

Professionals in the sector have defined the term more precisely, not only emphasizing the breadth of data but also the variety of tools through which they are acquired. ACCA defines Big data as "the vast amount of data continually collected through devices and technologies such as credit cards and customer loyalty cards, the internet and social

[35] "In the last two decades, there was a growing emphasis on the corporate disclosure: in private sector, this is linked to the attempt of improving companies' governance after some scandals and During the crisis [25]; in public sector, this is linked to the continuing pressure to provide informationon managers' activities and outcomes produced."in MANCINI D., LAMBOGLIA R., CASTELLANO N., CORSI K.,*Trends of Digital Innovation Applied to Accounting Information and Management Control* Systems, in Corsi K., Castellano N., Lamboglia R., Mancini D. (Eds), Reshaping Accounting and Management Control Systems, Springer, 2017, pp.1-19, 10,1007/978-3-319-49538-5_1.

media and, increasingly, Wifi sensors and electronic tags. Much of this data is unstructured - data that does not conform to a specific, pre-defined data model."[36]

However, according to Arnaboldi et al. (2018), these features are not particularly relevant in explaining the impact of Big Data on accounting, as they are elements that accountants routinely manage from before the digital revolution. For accounting managers manage a large volume of data is not a novelty, working in multinationals or corporations of companies. Speed is an inherent characteristic of the accounting profession, as the accounting manager must always update their financial knowledge in real time. The Variety is another characteristic of accounting systems, deriving from the use of scorecards and balanced dashboards, where there are financial and non-financial indicators from different sources.

For this reason, analyzing big data in relation to social media connections could offer a new and different perspective of the features relevant to accounting. According to this interpretation, for accounting management the relevant features are externality, as the Big data come from sources - cookies, mobile phones, loyalty cards, Internet of Things - external to the company, therefore collected for purposes other than accounting and without a control of the professional accountant, generating problems of privacy violation and data ownership rights. Second important characteristic is abductivity, that is the tendency of big data to influence the decision-making process in a different way than the data collected for accounting purposes only: it passes from a deductive approach to an inductive one. The sought-after and assembled data are much more 'fluid' than traditional data and require rules and structures that can channel them for accounting purposes.

Finally, inexhaustibility, that is the real consistency of the representativeness contained in the Big data. The enormous amount of public data could lead to think that they are representative of the entire population, but does not take into account all the variables and limitations underlying its purchase. Therefore, Arnaboldi et al., 2018 emphasize the innovation of procedures and rules in the interaction between big data and accounting management.

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[36] *Big data: its power and Perils,* Report for ACCA and IMA by The Futures Company, 2013, https://www.accaglobal.com/vn/en/technical-activities/technical-resources-search/2013/december/big-data-its-power-and-perils.html.

Even other researchers have pointed out that the peculiar attributes of big data, especially the huge bulk and their unstructured nature require a number of adjustments in different areas. In particular, as we have already mentioned, the acquisition and storage of data poses considerable problems in terms of their quality and veracity, as well as in terms of their ownership. Secondly, processing and interpretation require specific professional skills that need to be acquired and updated by the accounting professionals. (Stancheva Todorova, 2018).

Big data potentially offer countless advantages in terms of predicting and reducing the risks of the business, but according to other authors, as reported by Heinzelmann (2019), "it may be argued that the greater availability of data neither automatically enhances insight into operational processes and customer preferences, nor does it support decision making." Therefore, the only real option for big data is to create the special skills and abilities needed to organize and make useful data for Accountants management in order to better decision making strategy.

Indeed, professional accounting bodies such as ACCA and the Chartered Global Management Accountants (CGMA) have already introduced knowledge of the new information technologies and computer programs of the latest generation in their professional qualification.[37]

As we will see in the next paragraph, the tenor of technological innovation also implies the need to change the planning of accounting courses, in order to adapt accounting education to the current needs of the labour market and to the expectations of employers. (Stancheva-Todorova, 2019).

The increasing value of the data within the strategic organization of the companies makes the Big data a real company asset. This new view of the dates is confirmed by recent studies, from which it emerges that already many companies, especially the larger ones, have inserted data as an asset on their balance sheets. However, as reported by professional associations, both the valuation of intangible assets such as data assets,

[37]For example, ACCA Certificate in Digital Innovation for Finance (Certdif) develop technology skills based on key insight from ACCA's report, The digital accountant - digital skills in a transformed world, focused on emerging technologies, future disruptors and digital transformation, https://www.accaglobal.com/gb/en/qualifications/glance/certdif/overview.html; CGMA Digital Mindset Pack (2019-20) helps to gain skills in Automation, Blockchain, Data analytics, Human intelligence, Cybersecurity, see https://www.cgma.org/learn/courses/cgma-digital-mindset-pack.html.

both the measurement of the actual value of data is a task of high difficulty. (ACCA, IMA, 2013)

The integration of financial data and not through accounting information systems, software and platforms for data calculation, has a strategic potential in business decision-making. Activities and information increased through the digitization of information within the organization - "customer-based information, operational data, industrial information generated through operations and financial results" - constitute an increasingly important intellectual property in relation to the vicissitudes of the accounting and financial market.

The effective use of digital goods and the analysis of both quantitative and qualitative information seems to be the ideal premise for achieving positive results in the market and the implementation of new products and services.

Intangible assets and intellectual property have a real financial value, as accounting and financial managers can generate higher potential profits, taking into account the increased ability to identify and communicate, to both internal and external stakeholder groups, the specific intangible assets within the company.

The development of inter-operability between intellectual property and the organisation's commercial purposes can guide the decision-making process, but, above all, the analysis of additional data, information from information, as well as ensuring a clearer vision of objectives and results, it can become a source of new revenue opportunities, for example by anticipating the identification of customer trends or needs and the reduction of possible errors. (Smith, 2018)

To this, accounting professionals are becoming increasingly important, as they possess high-level analytical skills that can be applied to the analysis of financial and non-financial data, thanks to the specific skills in computer and technological culture.[38]

[38] "Accountants and finance professionals must find ways not only to measure big data as an organisational asset but also to use it as a measure of organizational performance. The trend towards integrated reporting (IR) and the inclusion of non-financial =capitals' in company reports and accounts makes adopting this approach all the more urgent. It will increasinglybe necessary to combine to combine 'hard' financial data with 'softer' and non-financial datasets to provide the bigger picture of performance."in*Big data: its power and Perils*, Report for ACCA and IMA by The Futures Company, 2013, https://www.accaglobal.com/vn/en/technical-activities/technical-resources-search/2013/december/big-data-its-power-and-perils.html.

The contribution of the accounting sector could pass, in a few years, from a functionality at the service of companies to a sector integrated qualitatively in the decision-making process.

The financial compartment can be enhanced by the new skills developed in function of big data, in order to assess organizational performance and risks, both organizational and investment. (ACCA, IMA, 2013)

In recent years, financial management processes have been an ideal field of application of automation, as they involve, for the most part, repetitive and mechanical tasks involving a high volume of data.

Automation comes from the application of Robotic Process Automation (RPA), a series of software installed on devices able to technically imitate the routine and systematized human activity quickly, accurately and profitably.

Automation is the first step towards Machine Learning and Artificial Intelligence. Within the RPA, Sarah Burnett, Vice President of Everest Group Research, identifies four different classification groups. The assisted RPA, one of the easiest solutions to adopt, as these are programs for the use of employees, able to improve their productivity. Unassisted RPA comes from the centralization of processes in single server and does not require the use by individual employees, as it autonomously processes entire business processes, even complex, increasing the possibilities of scalability. Autonomous RPA is an evolution of unassisted RPA, as it acts in an integrated way with the decision-making process through the inclusion of prioritization rules. Cognitive RPA uses artificial intelligence technology, so it can also process unstructured data. (Burnett et al., 2018)

Currently, RPA and AI are not yet considered in a joint view, as RPA applications belong mainly to the first three categories. (Burnett et al., 2018) In the future, it will provide competitive advantage, while it will improve cost efficiency, help financial management the evolution of the environment and can be used to concentrate professional resources on promoting the creation of added value.

Several authors point out that the evolution of RPA will allow ever greater integration with AI functions and products, especially in relation to the automation of unstructured data. The progression of the functionalities of RPA will allow a complex elaboration also based on the insertion of financial rules: as already evidenced, the shift of human

resources from purely technical tasks to highly qualified tasks capable of building the added value of the company. Small businesses could benefit most from this development, able to become highly competitive compared to large companies thanks to the ability to organize resources in a more productive and exploit human creativity free from the burdens of mechanical tasks.

The final phase of automation, the cognitive phase will be particularly significant because, applied to the most diverse processes of financial management, will be the starting point for creating new and more effective operating models. (Viljakainen, Lehikoinen, 2020)

It is useful to note that, according to some authors, robotics is not only a technological innovation, but also a social and cultural issue. Policy makers have an interest in keeping technological innovations open and not in the hands of a few, in order to create a competitive market but in which resources are distributed evenly. It is now clear that the spread of technology also affects social, work, health, insurance and safety fields, posing ethical and legal questions and doubts that need to be addressed by politicians and legislators with rapid and appropriate responses: "The challenges of robotics and AI revolution require scientific discussion from theviewpoint of management, leadership and organisations - that means it is time to discuss the meaning of these challenges seriously also in terms of existing traditions of management and safety sciences, bearing in mind their importance already today.Digitalisation, robotics, AI, Iot and big data are most definitely key factors affecting Societal development in the future." (Kaivo-oja et al., 2017)

Artificial Intelligence is the next step in technological innovation towards 'machine learning and natural language processing', through training protocols that use probabilistic and statistical models to increase the ability of machines to learn.(Heinzelmann, 2018)

Smith (2018) defines AI as "either a suite of programs or individual program that can replicate certain facets of human behavior and engagement in some situations."

In the accounting field, the control and forecasting capabilities of the machines, supported by the evaluation of the data to be processed by the accountants, constitute a prospect of performance improvement. (Heinzelmann, 2018)

The AI is able to provide accuracy, security and speed in the processing of accounting data, thanks to the ability to disaggregate even the most complex commercial transactions in accounting terms to be cataloged in the accounting records.

Based on machine learning algorithms, which in practice have to transform into if-then rules and decision trees, AI can provide useful guidance to the operating budget and forecast revenue, improve budgeting processes and strategic management, offer a safe forecast on possible fraud and scams. (Stancheva-Todorova, 2018)

The new skills required of accountants to benefit from better and cheaper data, in-depth analysis and commercial predictions are specific to machine learning techniques. The role of accountants is fundamental in the control, validation, evaluation of the quality of the data used. Computer learning is based on the recognition and application of data-based patterns or existing models, from which algorithms are derived to compensate for inherent distortions and other limitations of AI applications. Therefore, the application of accounting standards must be done critically and based on strategic and functional leadership skills, coaching and mentorship, and a strong ethical sense. (Stancheva-Todorova, 2018)

In recent times, there has been a lot of talk about Blockchain technology, whose definition lends itself to different significances.

Blockchian technology, which has its maximum implementation in the bitcoin ecosystem, is in the early stages of development in the financial markets.

JP Morgan (2019) describes Blockchain technology as creating immutable records of transactions accessible to all network participants. A Blockchain database consists of a number of blocks 'chained' together through a reference in each block to the previous block; each block records one or more operations. New blocks are added to the existing chain through a consensus mechanism in which members - peer to peer - of the Blockchain network confirm transactions as valid.

The use of a network of users, each of which stores its own copy of the data, is also called Distributed Ledger Technology (DLT),[39]therefore the terms DLT and Blockchain are

[39] "Distributed Ledger technology (DLT), of which the blockchain technology is the best known example, has attracted significant interest from the financial industry and academia. DLT gained notoriety by being used for the trading of crypto currencies, such as Bitcoins, which are issued and validated by the system users Rather than by a central authority. Since the deployment of virtual currencies, the financial industry has been investigating whether this technology can be applied to securities markets in order to create a

often used as equivalents, even if DLT is considered as a broader term and inclusive of the term Blockchain. (Lewis et al., 2019)

Pwc (2018) highlights the constant expansion of the database in a potentially infinite chain, but above all underlines the functional aspect to the information symmetry as all participants, companies, stakeholders, third parties, possess the same information.[40]

Blockchain systems ensure that all contracting parties have the same exact records. In addition, they possess a number of distinctive properties that make them 'resilient' because they operate in a decentralized manner, using distributed open source protocols. They have integrity features, as they do not need third-party imprimatur, and transparency, as everyone can screen and control any changes. They form a highly trusted environment, as transactions are immutable, cannot be reversed or re-sequenced.

As a result, the impact that Blockchains can have on the audits of financial statements is evident, of which they would become an integral part and point of origin.

Despite many challenging aspects, the authors of the report note that Blockchain does not have the diffusion you might expect. According to data published in 2018, 8% of companies surveyed by PwC uses this technology to ensure data integrity, process transactions and sign contracts.[41]

This is probably due to the failure to resolve some issues, in particular the need to prevent any manipulation by administrators. These considerations once again make the role of accounting managers central, which must be assisted in the control by external

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more efficient market, compared to the usage of ledgers based on classical double-entry bookkeeping." in PRIEM R.,*Distributed Ledger technology for securities clearing and settlement: benefits, risks, and Regulatory implications*, Financial Innovation 6, No. 11, 2020, https://link.springer.com/article/10.1186/s40854-019-0169-6#citeas.

[40] "In simple terms, the technology handles blocks-uniquely identified, linked transaction records-in a chain. A blockchain is a continuously growing, distributed, shared Ledger of such blocks, which are sealed cryptographically with a digital fingerprint generated by a hashing function. Each block is "Chained" to the previous one by referring to its hash value. The computers, or nodes, that connect to the blockchain verify that a transaction is valid for the rules of the governing logic-namely, the smart contract. The defining characteristic of many blockchain platforms is the confirmation process by which new records are added to the Ledger." in TRELEAVEN P., BROWN R.G., YANG D., *Blockchain Technology in Finance*, Computer, (9), 2017, pp. 14-17, https://www.researchgate.net/publication/327382563_Blockchain_Finance_Questions_Regulators_Ask.

[41]*Digitalisation in finance and accounting. And what it means for financial statement audits*, Price Waterhouse and Cooper, Pwc, 2018, https://www.pwc.de/en/digitalisation-in-finance-and-accounting.html.

auditors. But, above all, the solution of technological issues requires the development of a real IT finance architecture, in a shared and standardized context that applies the same criteria and the same structural definitions. (PwC, 2018)

The interaction between digital technology and operational activities of the company introduces the theme of cyber-security: the use of innovative but often still poorly tested technologies increases the risk of cyber breaches and resulting in loss and dispersion of customer and employee data, as well as confidential information received from business partners. Risks grow with the increasing use of connected devices, mobile, and back-office technologies.

In addition, threats of cyber attacks, if not adequately contained or averted, may also cause potential damage to the reputation of the organization.

Again, accounting and financial managers have a crucial role to play: controlling information, managing data protection and security, constantly updating corporate privacy procedures, understand what vulnerable accesses can be, estimate the impact of a potential IT attack and the negative repercussions they may have, not only on the financial capital but also on the company's reputation. Brand reputation is now an essential component of the value of the company and is an intangible and strategic asset linked to performance objectives and risk. Therefore, the financial sector is responsible for identifying objectives, assessing and mitigating risks in the elaboration, analysis and storage of huge sets of sensitive data, as well as the targeted management of resources to pursue these purposes. (Pwc, 2015)

Cyber-crime encompasses an increasing number of potential crimes. In addition to the theft of digital information, the digital transformation of companies facilitates crimes such as industrial espionage, sabotage by competitors, terrorist attacks on infrastructure. Therefore, specific skills are required for the prevention and detection of cyber threats, which should find their highest application in the framework of a strengthened and qualified internal audit. (Stancheva-Todorova, 2018)

The new digital age involves the clash and encounter of the optimistic and pessimistic current about the value and benefits of an increasingly pervasive technology. (Brynjolfsson et al., 2017)

Optimists view artificial intelligence and machine learning as real elements that are able to contribute effectively to development and growth, not only productive, but also social and cultural. The pessimists point out that industrial growth, initially driven by the digitalization of business systems, has in reality suffered a setback. In addition, several authors argue that the increased wealth produced is not evenly distributed, indeed, creating dissonance between the skills required and the skills of workers led to a decline in income if not to the loss of work. As we have already mentioned, the technological revolution has a strong influence not only in the industrial and productive sector, but is a focal theme in social policies. The repercussions of the 'now economy' on society, health, well-being, work, digital divide, education generate uncertainty and concern, which the governments must remedy.

The representation just proposed could make the two scenarios appear in contrast with each other, but a careful analysis reveals that correlated and symptomatic of a single phenomenon able to explain and understand them together, ‘an economy in transition’. (Brynjolfsson et al., 2017)

As the authors of the 'modern productivity paradox' study explain, investment in AI requires large sums of money and a lot of time to implement, and this can, at least initially, depress productivity when measured statically and traditionally.

In addition, we must focus on all those complementary innovations that in addition to the development of AI are able to increase the impact, not only in the areas of human capital and skills, but also in new business processes and models.

We have repeatedly pointed out that as a result of the great production changes made possible by the digital age, countless structural and decision-making organisational aspects of companies have changed.

However, the advent of artificial intelligence also forces an additional change: to estimate the real value of the intangible assets owned by the enterprise and the consequent utility needs a structural reworking of the conception of the organisations in order to adapt them to the new elements and the current economic measuring instruments; as GDP and productivity, must be updated according to the new intangible assets created by the implementation of AI. (Brynjolfsson et al., 2017)

2.3 The strategic transformation of accounting into a learned profession

As we have already mentioned, the theme of the digital transformation of commercial and organizational models is inextricably linked to the modernization of the educational systems at the base of the curricular profiles necessary for the growth of the 'now economy'.

"Due to the increasing impact of Industry 4.0 drivers, one of the most important issue when Discussing the interdisciplinary skills and competences required from Accountants in "the factory of the future" context, is the identification of the missing knowledge and abilities that should be Acquired or developed from the profession. To manage with the missing expertise, accounting education and professional training should be adapted and continuously linked to the changing labour market requirements and employers' demands for qualified human resources."[42]

Novak et al. (2018) pointed out that the low score in the Global Entrepreneurship Index reached by the so-called Digital Challengers countries is due to the lack of an entrepreneurial culture.[43]

This consideration has led the political representatives of the area concerned to focus on integration programmes between entrepreneurship and formal education. These projects include, for example, 'the development of startup camps or events in which students meet representatives of startups, incubators and accelerators and can participate in workshops on entrepreneurship in different sectors'.

At the same time, it is possible to create environments suitable for the development of digital challenges for entrepreneurs: a cutting-edge example is "regulatory sandbox", allows entrepreneurs to experiment with technological solutions such as blockchain in real market conditions. (Novak et al., 2018)

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[42] STANCHEVA-TODOROVA E., *Are accounting educators ready to embrace the challenges of industry 4.0, Industry 4.0*, Vol. 4 (2019), Issue 6, pp. 309-312, https://stumejournals.com/journals/i4/2019/6/309.

[43] See Chapter 1, NOVAK J., PURTA M., MARCINIAK T., IGNATOWICZ K., ROZENBAUM K., YEARWOOD K., *The rise of Digital Challengers: How digitization can become the next growth engine for Central and Eastern Europe,* Digital/Mckinsey, Mckinsey & Company, 2018, https://digitalchallengers.mckinsey.com/.

Autor et al. (2003) propose a study on the actual link between technological investment and in-progress education.

The digitalisation and structural transformation of enterprises has profoundly changed professional skills in terms of work tasks. As already mentioned, the skills of the 21st century in occupations and tasks include a very broad spectrum of knowledge that is not limited to digital competence alone. Rather, it is a matter of focusing on highly educated workers able to move easily within the organizational structure in response to the continuous changes in work needs.

Pincus et al. (2017) produced a specific study on the radical change in accounting programs in the US educational context.

The automation of accounting and financial processes, the growing gap in professional skills between traditional jobs and the new profiles required, the new technological prerequisites in the field of academic research and publishing, the new technological tools dedicated to education have not yet produced the radical change that one would expect in the field of teaching, neither in content, nor in pedagogical methodology. A necessary change if you want to understand and implement future financial models.

Although the American Institute of Certified Public Accountants (2015) certifies an increase in the recruitment and remuneration of accounting graduates, there is a shortage of excellent accounting educators in the academic field, continuing to maintain the wide skills gap between traditional workers and new professionals resulting from the shortcomings of the higher education sector.

As noted by experts in Pwc (2015) accounting professionals must prepare for the change of skills, however it is not yet clear, as stated by Harteis (2018) whether this change implies a shift towards higher skills or, on the contrary, towards less specialized skills depending on the work carried out by machines. The author leans for a solution in both directions, depending on the operating sector of the professional accountant.

Nowadays, the tradition of the accounting profession faces the challenge of technological changes, relying on new employees with skills adapted to technological, structural,

social and cultural innovations, and by initiating retraining processes for existing employees.[44]

Off shoring and automation have so far included working areas marked by mechanical and repetitive tasks, but the exponential growth of computerization and Artificial Intelligence will allow to perform increasingly complex tasks according to criteria of economy and efficiency. For example, accounting implementation processes through Robotic Process Automation, from accounts payable to book closures, lead to cost savings and productivity gains.

Academic researchers and those responsible for higher education, sometimes in collaboration with business leaders, have embarked on a path of mentoring higher education to the changing needs of the digital age. Universities use online courses and 'hybrids' learning spaces on campus, as well as propelling for competing study programs and lifelong learning models with ‘different credential structures’ (nano degrees, micro certificates, digital badges). (Pincus et al., 2017)

Academic publishing has undergone a profound transformation due to the digitalization of libraries and magazines and the possibility of freely accessing them, research tends to be increasingly interdisciplinary and inter-operative with business research.

However, technological innovation does not yet play a decisive role in teaching and learning, at best taking on the role of a supplement to traditional teaching. As the authors point out through the words of Bill Gates (2013), even today we are amazed "to see how little technology has changed the way we teach our students. My children are more or less as educated as my father was, almost untouched by innovation."

Faced with the pressing financial and technological forces for change, higher education institutions at widely different conditions of the 21st century.

[44] "From an educational perspective, the individual level of workers and employees is of particular relevance, since the effects of digitalization have direct influence on work tasks and processes. As soon work processes change, they require workers to adapt and to learn. Some work processes will change, some become obsolete, and some new will be established. Depending on the quality of such changes, a need for workplace learning, for further education or for a modified preparation for work through vocational education and training arises." In HARTEIS C., *Machines, Change and Work: An Educational View on the Digitalization of Work*, Chapter 1 in HARTEIS C. EDITOR, The Impact of Digitalization in the Workplace. An Educational View, Professional and Practice-based Learning 21, Springer International Publishing, 2018, http://196.189.45.87/bitstream/123456789/9765/1/37.pdf.pdf#page=47.

Higher education curricula need to be guided by economic and productive factors, whereby specific skills need to be acquired for skilled work and their professional skills need to be continuously updated.

The change in accounting education must become systemic, so it must be based on a combined practical-academic approach, able to produce integrated and constantly adapted learning models.

However, also the new on campus degree programs, the addition of new topics, the creation of intensive summer programs, the promotion of internships, the presentation of examples of implementation and counselling constitute an improvement of the traditional accounting curriculum rather than a strategic change in the structure of faculties. (Pincus et al., 2017)

The accounting faculty is strategically placed in relation to the future of education responding to the real work needs of "the forth industrial revolution". In particular, they can also guide the evolution of financial models through interdisciplinary research projects involving professionals in academic research. As highlighted in "*Are accounting educators ready to embrace the challenges of industry 4.0", "*Theknowledge and skills profile of the future accountant is a real challenge for the accounting educators as they have to prepare Raduates for the new requirements of the labour market. Accounting programmes should become interdisciplinary with teaching content delivered from different departments. Accounting academics have to develop plenty of Diversified skills and abilities in students and to take the lead in this academic cooperation." (Stancheva-Todorova, 2019)

Higher education can become the ideal driver of change by responding adaptively even to the increasingly urgent demand from international bodies not only for constantly updating technological training, but also of an interdisciplinary professional/academic learning which also includes subjects such as statistics or ethics, able to respond quickly to emerging issues related to the use of new technologies and which have repercussions and ramifications in different areas and teachings.

2.4 An opportunity to redesign financial procedures

"The key attributes of this new finance function are speed, agility and foresight. What's needed is a clear vision and leadership from the CFO-a strategy for the digital age Rather than a digital strategy. There also needs to be a willingness within the wider finance team to embrace change as an opportunity Rather than as a threat. The front-runners are already reaping the dividends. Their priorities for relevance and success aren't just following trends, but ensuring their thinking is original and farsighted enough to lead them."[45]

Emerging technologies increase the agility of financial and accounting procedures, finally overcoming the ostracism towards Information Technology to effectively exploit technological tools in a manner applied to existing business models, but with a view to a wider reconsideration of transformation processes.

The financial team can reinvent the future of its procedures. For the financial and accounting transformation it is essential to recognise the operational and procedural improvements, internal factors and external trends that make it a strategic imperative. Competitive dynamics resulting from financial and accounting functions, externally, insufficient control or ineffective management - controls or compliance, management of the cost of capital or strengthening of merger integration processes - Internally, they are the supporting elements for the redesign of the basic processes and the operating model. Moreover, it is essential that researchers and operational experts conceptualize the key objectives and desired results in the "next" perspective. Prediction of the future state is defined state should be free from current state systems, processes and people.

Starting from the current situation in a multi-dimensional documentation, but of different depth depending on the function pursued: for example, if the objective is not to repeat errors, understand in detail the current state processes in all their facets and inefficiencies is necessary, thus also affecting time and costs. In any case, the establishment of a high-level list of potential benefits - qualitative and quantitative, helps to assess the options impartially.

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[45] *Leading from the front: Redesigning finance for the digital age. Making sense of the changing role of finance in the digital economy*, Price Waterhouse Cooper, Pwc, 2015, https://www.pwc.com/gr/en/publications/leading-from-the-front-redesigning-finance-for-the-digital-age.pdf.

The target operating model involves a project of future business functions, based on high-level estimates and various assumptions, such as a real decision-making process marked by uncertainties.[46]

Financial leaders can identify future performance-driven schedules by not rejecting the idea of applying automation and smart technology to financial and accounting procedures, as an opportunity to reassess current practices and achieve more effective results for the organisation in terms of increased operational efficiency and administrative benefits, achieving added value by: "...research reveals that the focus of the finance function in a digital world is shifting from being one based on cost to one based on organisational value. Finance will no longer be evaluated purely on how costly it is to run, but on the added value finance brings to the organisation and the wider community. For management accounting practitioners, this shift represents the prospect of a rewarding career in finance, in which they add real value to organisations."[47]

Value is not only cost-based, only an internal function, but reflects an outward aspect: increasing cost efficiency and thus maintaining competitiveness and meeting shareholder commitments. Moreover, the restructuring of the financial function in an innovative sense allows companies to see their performance not only in a strategic perspective, but also in relation to the individual phases that follow each other from time to time. This allows better decision-making plans for better performance for the company, current and future customers, business partnerships.

The financial and accounting functions interface with the new technology to manage the business efficiently, interacting at all levels of the business model, depending on the different sectors, sales, marketing, logistics.

To take full advantage of intelligent automation, what is needed is a change of mindset that "...also includes accepting that this is not a purely technological proposal, and that AI cannot simply be fixed on current processes. Like human intelligence, it is a combination of knowledge, senses and experience, and realizing its potential involves

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[46] Accounting and Finance Transformation Roadmap, Ciopages.com, 2020, https://www.ciopages.com/finance-transformation-roadmap/.

[47] CHARTERED GLOBAL MANAGEMENT ACCOUNTANT (CGMA), *Re-inventing finance for a digital world*, 2019,https://www.cgma.org/resources/reports/re-inventing-finance-for-a-digital-world.html.

thinking not only of the digital elements, but also of the corporate infrastructure within which they operate. Properly implemented, [...] should be intrinsic to the way the enterprise works." (Capgemini, 2018)

CHAPTER 3 DIGITAL MATURITY MODELS

3.1 Theoretical Framework

3.1.1 Digital transformation

A fundamental change in the organization, which significantly modifies organizational strategy, structure and distribution of power, can be defined as transformation (Berghaus & Back, 2016; Theicher, 2019).

According to Vial the definition of Digital Transformation (DT) 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".[48]

To be able to structure this definition, a deep analysis of the available DT definitions was made and 4 properties were identified:

- Target entity, for example the unit of analysis involved by digital transformation
- Scope, for examplethe measure of changes that occur within the properties of the target entity
- Means, for example the technologies used in creating the change inside the target entity
- Expected outcome, the outcome of digital transformation

This definition does not involved only organization, but includes "broader individual, organizational and social contexts"(Vial, 2019), and it does not guarantee but acknowledges that the result of the DT is improvement.

Digital transformation influences several aspects of companies:

(1)processes, with the introduction of new technologies and automations in operations;(2)organization, where new services change the way existing ones are offered; (3)business domain, where DT impact the value chain and roles in the company

[48]Vial, G. (2019), Understanding digital transformation and a research agenda,https://doi.org/10.1016/j.jsis.2019.01.003

ecosystem; (4)Society level, where DT can change the type of work (Sehlin, Truedsson, & Cronemyr, 2019).

3.1.2 Maturity models

The term "maturity model" was introduced in 1970 and was quickly developed academic and in practical field, in several areas of interest (Lahrmann et al. 2011; Felch et al. 2019). The word “maturity” identifies“the state of being complete, perfect or ready” (Lahrmann et al. 2011).

Maturity models (MM) in addition to provide further prespectives, traces the distinctive paths of how organizations face their transformation(Berghaus &Back, 2016)and they are often used by companies in order to improve the level of maturity and to recognize and measure performance(Simon, Schoeman & Sohal, 2010; Santos & Martinho, 2019).

Thus, we can indicate three fundamental functions of the maturity model:

- Documenting the *status quo*, due to different level of maturity
- Giving guidance on the development path
- Comparing capabilities between organizations and business unit

(Felch et al. 2019)

We can also identify three main reasons for using MM: the first is a descriptive purpose, it can be used for as-is assessments; the second is a prescriptive purpose, it describeshow to identify desiredfuture maturity levels and it provides guidance on how toimplement improvement measures; finally comparative purpose for internal or externalbenchmarking (Szelagowski & Berniak-Wozny, 2019, pp. 221).

According to Simon, Schoeman and Sohal (2010) the levels of a maturity model should be five, in general, and should indicate the different processes that a company must adopt; according toSzelagowski and Berniak-Wozny (2019) the number of levels can

vary between four and seven stressing “The outline of the stages of maturation paths include thecharacteristics of each stage and the logical relationship between them”[49].

3.2 Digital Maturity Models

Due to the different terminology, digital maturity models are more difficult to develop and implement than general ones (Williams *et al*.2019; Aslanova *et al*. 2020).

Digital maturity can be considered as the basis of digital transformation, because it is a process that aims at implementing and integrating the organisation, human and other resources within the digital process (Aslanova *et al*. 2020).

Digital maturity defines how an organisation prepares to adopt continuous change (G.C., Kane 2017).

Both consulting firms and academics developed some models of digital maturity.Through a research conducted by Teicher (2019), we can identify 22 digital maturity models and classify them as follows:

- 12 models developed by academics, including 5 generic approach and 7 in a sector-specific approach
- 10 models developed by consultants, including 8 generic approach and 2 in a sector-specific approach

Some of these models will be excluded as they are developed for a particular sector (manufacturing).

Secondly, from an initial analysis of the articles it emerged that some do not take into account the fundamental element of culture.

In the cultural dimension, within the digital maturity model, elements such as “customer centrality”, “collaboration” and“agility and flexibility” are considered (Buvat *et al.* 2017). According to Buvat*et al*. (2017) in the digital culture of a company you can analyze the

[49]Szelagowski, M. & Berniak-Wozny, J. (2019). The adaption of business process management maturity models to the context of the knowledge economy. Business Process Management Journal, 26(1), pp. 212-238, https://www.emerald.com/insight/content/doi/10.1108/BPMJ-11-2018-0328/full/html

ability to create new work models, to reinvent methods for more open communication and to increase tolerance to risk and failure.

Isaev, Korovkina and Tabakova (2018)explain that in order to provide great customer service, the company should adopt and implement digital technologies.

For this reason the culture element is considered a fundamental element, so it was considered appropriate to exclude models that did not consider this dimension.

The maturity models below have been summarised for relevance to this study, as they relate to process performance improvement and digitalization.

3.2.1 Deloitte Digital Maturity Model –2017

The Deloitte Digital Maturity Model (DMM) was developed by a consulting firms in collaboration with TMForum.

This model identify four levels of maturity: leaders, followers, average and laggards.

These levels were created by analysing, through a questionnaire of 65 questions, five different dimensions:(1) **strategy:** that investigates how through strategy, the company manages to transform and gain competitive advantage using new digital initiatives; (2) **operations:**guiding strategy management through the evolution of processes using digital technologies, also improving the effectiveness and efficiency of the business; (3) **organization and culture:** supporting governance and talent processes through the definition and development of an organisational culture, (4)**customer:** use consumer preferred communication channels to create a relationship between the customer and the company as a digital partnerand; (5)**technology**: use digital strategy to satisfy customers by creating, protecting, storing and exchangingdata.

In order to assess digital maturity, each of the five dimensions was divided into sub-dimensions, leading to a total of 179 individual criteria.

The model also helps to determineopportunities for future progress and which areas need more attention through the analysis of three stages:

- Image: where the current level of maturity is determined and opportunities and future vision are identified

- Deliver: where the most critical areas are assessed and on which to focus
- Run: where progress is assessed and measured.

All the results obtained from the surveys are developed internally, neither the questionnaire nor the score criteria to determine the maturity level are available.

3.2.2 Forrester's General Maturity Model (2016)

Forrester's General Maturity Model (2016) is a pubblic maturity models that was developed for help organization to identify their digital maturity.

In this model takes into account four dimensions:

- Culture: how the company and the employee deal with use of technology and digital innovation
- Technology: how the company actual use and adopt the emerging technology
- Insights: how a company measure success and inform strategy by using customer and business data
- Organization: how much a company supports strategy, governance and digital execution

In order to identify the level of digital maturity companies must complete a questionnaire of 28 questions, which involve the various dimensions mentioned above, indicating a value between 0 and 3:

- 0 company completely disagrees with the statement
- 1 company somewhat disagrees with the statement
- 2 company somewhat agrees with the statement
- 3 company completely agrees with the statement

Depending on the score achieved, companies may be in one of the following levels of maturity:

- Skeptics (0-33): companies that are at the beginning of their digitisation process, have difficulty in approaching new technologies as they have limited knowledge and experience in innovation.

- Adopters (34-52): companies that invest in digital knowledge and infrastructure, also give more import to the consumer than production/services.
- Collaborators (53-71): collaborate internally and externally to enable digital development and innovation.Use their digital skills to gain competitive advantages.
- Differentiators (72-84): has integrated the digital and physical worlds, have a strong competitive advantage in the market and have achieved a solid revenue growth

3.2.3 Digital Maturity Model Universität St. Gallen

According to the DMM develop by Berghaus & Back (2016) the model should have nine components: (1) custumer experience, (2) collaboration, (3) transformation management, (4) culture and experise, (5) production innovation, (6) strategy, (7) information technology, (8) organization, (9) digitalization process.

Each of them is divided in sub-components for a total of 60 items that are presented to the companies through an online-questionnaire (available only in the given search period), where participants had to indicate a value from 0- do not degree to 4 – fully agree (Likert-scale).

Then the data was analysis by applying the Rasch-algorithmto determine a metric for each component, and a combination of two scores has been used to identify maturity levels.

The maturity level in this DMM are five: (1) promote & support; (2) Create & Build; (3) Commit to transform; (4) User-centered & elaborated processes; and (5) Data-driven enterprise.

3.2.4 Digitalization in accounting KPMG

The model developed by KMPG research with Dr. Shellon and Dr. Hess (2017), was created to determine the status quo, responsibilities and obstacles of digitisation and the digital evolution of accounting.

The model is developed by combining the analysis of two factors, digital solution in accounting and management of digitalisation, making it possible to classify maturity levels by analysing a model with two non-linear dimensions.According to (Reman et al. 2017) a linear relationship among levels does not hold true, although most of the models developed consider a linear relationship between digitisation and organisation.

The first factor have three elements that are taken into account to analyse the status quo:

- Digital solution:where the following eleven elements are fundamental to partially determine the level of digital maturity:
    1. *Paperless accounting*: consider all paper and digitized documents
    2. *Interfaces to (external) systems*: External documents (banks, AdE) that can be accepted via an interface directly in the accounting system.
    3. *Management of data quality*: check quality and accuracy of data
    4. *Process automation*: implement digital knowledge to automate processes
    5. *Uniformity of systems*: uniform the basic systems in accounting
    6. *Integrated consolidation system*: consolidation process to obtain direct access to company data
    7. *Real-time reporting*: apply innovative technologies for rapid analyses and reporting.
    8. *Creation of transparency*: systems enabling analysis of end-to-end processes, such as purchases and sales.
    9. *Big data analyses*: analysis of large quantities of data from various source systems.
    10. *Tools for visualization*:use software to prepare data analysis results, with varying degrees of detail for the respective target audience.
    11. *Cloud computing*: employ cloud solutions

- Influence of digitisation on accounting: this section which investigates what influence digitalization has had in the company, will not be included in the calculation of the level of maturity as they are general questions
- Obstacles to digitisation: also this section will not be included in the calculation of the level of maturity, but are questions of a general nature, where you want to investigate what are the difficulties presented for digitization.

The second factor start with two general question (who is responsible for digitization in the company and how the budget for digital projects has evolved) and then is focus on seven element:

1. Strategy: a planned digitisation strategy is followed
2. New technologies: research new technologies to improve processes.
3. Digital skills: The company systematically supports skills for its employees, which will be necessary in a digital future.
4. Change: all management staff encourage the availability and individual responsibility of the employee, in order to speed up the digital transformation.
5. Management: The digitalisation in accounting is managed on the basis of defined roles, responsibilities, and decision-making processes.
6. Resources:The top management level provides adequate resources for digital change.
7. Cooperation with the IT department: the IT department meets the needs of the accounting department.

The questions in section 1 (digital solution) and in section 2 (management of digitalisation) must be evaluated with a scale ranging from 1 (“does not apply at all”) to 5(“completely applies”).

The maximum possible score for the axis “digital solutions”is 55 and the minimum score is 11 and the companies that reach a score between 11 and 28 are placed in the lower cluster, mind if they reach a score between 29 and 55 are placed in the upper cluster. Instead the axis “management of digitalisation” have a maximum score of 35 and a minimum score of 7 where the companies with a score between 35 and 25 are placed in the upper cluster, with they have a score between 18 and 7 are in lower cluster.

Companies with a score between the defined point ranges are described as the middle range.

3.2.5 Digital Maturity Model for Management Consultant Firms

In the master thesis conducted by Guerrera, B. M.; Snöberg, A. and Tetzlaff, L. (2020) some existing maturity models are analyzed and compared to each other, coming to the conclusion that to date there is no specific model for consulting companies or in general for those who offer knowledge-based services.

The authors developed a model based on research carried out finding five fundamental dimensions divided into three sub-dimensions (for a total of 15 sub-dimensions):

- Culture: analyze the tendency of the study to use digital technologies and digital innovations. This dimension is divided into “use of digital technology”, “continuous improvement” and “techonology motivations”
- Strategy: analyses how the firm supports and governs its digitalstrategy divided, through the following elements: “Digital strategy”, “Communicating strategy” and “Influence on service offering”
- Organization & Operations: analyses both external elements such as governance and partnership withdigital technologyproviders, and internal elements such as employee training. The sub-dimensions are: “Integration and Alliances with technology providers”, “Digital Governance” and “Digital Training”
- Technology: divided into “Technology Type”, “Capabilities of the firm” and “Integration within processes”analyse the actual use of digital technologies.
- Insights: analyze throught the three sub-dimensions - “Measuring consultant performance”, “Incorporating feedback and lessons learned” and “Measuring digitalization’s impact” - how to measure success and inform the strategy using both business data and customer data

Each question according to its importance can have a weight between 1 and 4, for each of them you will have to give a value between the following:1 - Completely Disagree, 2 – Somewhat Disagree, 3- Somewhat Agree, and 4 - Completely Agree.

In order to calculate the score obtained for each dimension, first multiply the weight of the question with the value of the answer given, secondly add the result of each question.

At the end we can add the results obtained in the individual dimensions to find the overall digital maturity level.

This methodology allows to find both the general level but also to analyze which dimension is more inclined/critical for digitization

The digital maturity levels identified are four (Leader, Adopter, Beginner, Researcher) and for each of them there is a description by dimension.

3.2.6 Gurbaxani & Dunkle 2019

In September 2019, V. Gurbaxani, and D. Dunkle, published in Mis Quaterly Executive the article: Gearing Up For Successful Digital Transformation.

In this 6 dimensions are analyzed:

- Strategic vision: It evaluates whether a digital vision exists, if there is a strategy to realize this vision and it analyzes if the executive team has the knowledge and the ability to realize the digital strategy.
- Culture of innovation: The vision of the company's culture and failure is evaluated. It also seeks to identify the presence of incentive practices for innovation.
- Know-how and intellectual property (IP) assets: tries to understand if the company has the intellectual knowledge to adopt the strategic vision and evaluates the business approach to the use of software for the different areas of interest such as: increase the operations performance, understand the consumer, increase its interaction with the outside.
- Digital capabilities:analyzes the availability and presence of strategic and technical skills to support digital transformation.
- Strategic alignment:determine the company's risk desire, assessing whether it is willing to risk the existing revenue streams for a possible and uncertain future gain. It also measure whether the company has the funds and is willing to invest them in digital transformation.

- Technology assets:this section tries to understand the extent to which new digital technologies such as the use of big data, cloud computing and internet/wireless communication are adopted by the company.

In the questionnaire distributed, the various companies were able to indicate, for each size, how they felt in relation to their competitors using one of the following options: slightly or significantly behind, on par, slightly or signicantly ahead.

To identify the various ranges between the levels of maturity they took into account the median score of each category, in this way it is possible to identify which are the strongest and most weak categories, thus taking specific measures to improve a certain dimension.

3.3 Choice of digital maturity model

In this section we briefly summarize the models above and explain the reason that led to choose one model rather than another.

- Deloitte (2017): In this case the model wants to analyze the level of maturity and also the three phases of a company (image, deliver, run). In this model we can find five dimensions and among these there are the most important ones such as culture, technology and organization. However, as specified by the magazine itself, the model was developed to analyze the banking services sector, for this reason it was not considered suitable for the research of this thesis.
- Forrester (2016): This model is used in many researches as it analyzes the main dimensions of digital maturity: culture, organization, technology and insights.
  The main feature of this questionnaire is its generic nature, suitable for analyzing the digital maturity of all types of companies.
- Berghaus & Back (2016): the research was conducted on industries such as IT & telecommunication industry, in retail / wholesale, in transportation / logistics, in the machine industry, and in the consumer goods industry.
  Moreover analyzing the literature that involved the research itself we can observe that the model is not suitable for providing a complete evaluation of the

digital maturity model and the results do not expose a specific numerical value to identify the level of maturity reached (Aslanoca, I.V., Kulichkina, A.I. , 2020)

- Kpmg (2017):this model does not explicitly take into account dimensions such as technology, culture and strategy, but considers two factors and with the specific questions for each of them we can identify the dimensions.

  The model is generic, it is not linear as it combines the results of the two factors to measure digital maturity.

  However, in order to answer the research question,we wanted to exclude this model as it is too generic and does not allow for an accurate analysis of the various dimensions.
- Master thesis digital maturity model (2020):the model was developed after conducting a thorough literature review and comparing several models of digital maturity.

  In order to identify the dimensions and levels of digital maturity, the authors compared the dimensions considered in other maturity models and based on scientific articles (Gill & VanBoskirk, 2016; Williams et al. 2019; Isaev et al. 2018; Simon et al. 2010; and Szelagowski & Berniak-Wozny, 2019).
- Gurbaxani & Dunkle (2019): The research aims to identify the general framework of a company within a specific sector, comparing it with other companies within the same area of expertise.

  Analyzes important elements such as culture and also the use of different digital technologies.

The first objective of this thesis research is to analyze the level of maturity of accountants, and after a careful literature review and analysis of the various questionnaires mentioned above, in order to be able to analyze the level of digital maturity of the accountants it was considered more appropriate the questionnaire proposed by Forrester.

In the following paragraphs we will talk about the organizational culture and performance, this is because two other objectives of thesis research is to analyze if there is a positive relationship between the level of maturity and the performance of the company, and if the element, explained in the following paragraphs, of the hierarchy of

culture organization can negatively influence the positive relationship between level of maturity and performance.

3.4 Organizational Culture

According to Slater & Olson (2010) the organization must have a culture of support as it is considered as a competitive advantage and allows you to execute your business strategy more efficiently or effectively. Managers' choices must reflect two dimensions: external orientation vs internal orientation and the need for flexibility vs control.

According to Cameron, Freeman (1991) and Dwyer *et al.* (2003) we can therefore find four types of culture of the organization:

- Clan: It has an internal vision and need for flexibility in fact the dominant attributes are cohesion, participation in decision-making, teamwork and the sense of family. The organization is based on employee loyalty, interpersonal cohesion and tradition. The strategic emphasis is on human resource development, commitment and morale;
- Hierarchy: this type has an internal vision but need to control processes in this way formal policies and rules are closely followed, in fact the dominant attributes are order, rules, uniformity and efficiency. Employees are motivated by awards for achievement and safety. In this type the leader has a style of coordinator, organizer and administrator;
- Market: unlike the Clan, this type of culture has an internal vision and formal governance, is based on achieving goals and competitiveness. The strategy emphasizes the achievement of market share and motivates employees through competition;
- AdHocracy: this kind of culture is the opposite of the hierarchy as it combines external orientation and informal governance. The dominant attributes are creativity, dynamism and adaptability, employees are motivated by the growth of innovation and flexibility. The strategy focuses on the development of new markets and the acquisition of new resources

Each type of culture has a different impact on the performance of the company, for example Deshpande et al. (1993), have taken over an order Market>Adhocracy>Clan>Hierarchy.

Also in other research such as Joseph and Kibera (2019) it is found that the clan type does not have a significant positive impact on performance while the market culture type instead has a very positive impact.

In this thesis research one of the objectives is to analyze whether the presumed positive relationship between digital maturity and performance can be negatively influenced by the presentation of a hierarchical organizational culture.

Following a careful analysis of the literature, to analyze the presence of a hierarchical culture it was considered more appropriate to use the culture scale developed by by Campbell and Freeman (1991).

CHAPTER 4 DIGITAL MATURITY, HIERARCHY CULTURE AND PERFORMANCE: EXPECTATION AND EVIDENCE

After the analysis carried out in the previous chapters to give a complete picture of digitalization, maturity model and culture organization, the objective of this second part of the paper is to explain what are the hypotheses of this research, analyze the sample, analyze the data collected through the questionnaire submitted to submitted to the accountants of North-East Italy through the PLS program and go to interpret the data found by the analysis.

4.1 Research model

According to different author like Dwyer*et al*. (2001), Slater*et al*. (2010) and Insensee *et al*. (2020) the type of hierarchical culture has a negative effect on company performance but having the accountants a purely internal vision of their organization, with this research we want to analyze if also in this case this type of culture has a negative impact on the performance:

H1:HCO(Hierarchy Culture Organizational) have a negative relationship with Performance

To analyse whether or not the accountant presented the hierarchy culture organizational, the four questions in the questionnaire developed by Cameron and Quinn (1999) were used, see Appendix A.

As we analyzed in the previous chapter, digitization is made up of different dimensions and each of them formalizes the level of digitization of the company. Almost all of the research analyzes a single element of digitization and how this relates to company performance (Dwyer et al., 2001; Slater et al., 2010). In this research we want to first check the level of digitization of the accountants of North-East Italy, and then we want to analyze if the various dimensions of digitization significantly influence performance, so the hypotheses formulated are:

H2: Technology have a positive relationship with Performance

H3:Insights have a positive relationship with Performance

H4:Organization have a positive relationship with Performance

H5:Culture have a positive relationship with Performance

Questions can be found in Appendix C.

To analyze how the variables of digitization and the variable hierarchy organizational culture impact on market performance, was created the conceptual model reported to Fig.1. The same model was used in the program PLS.

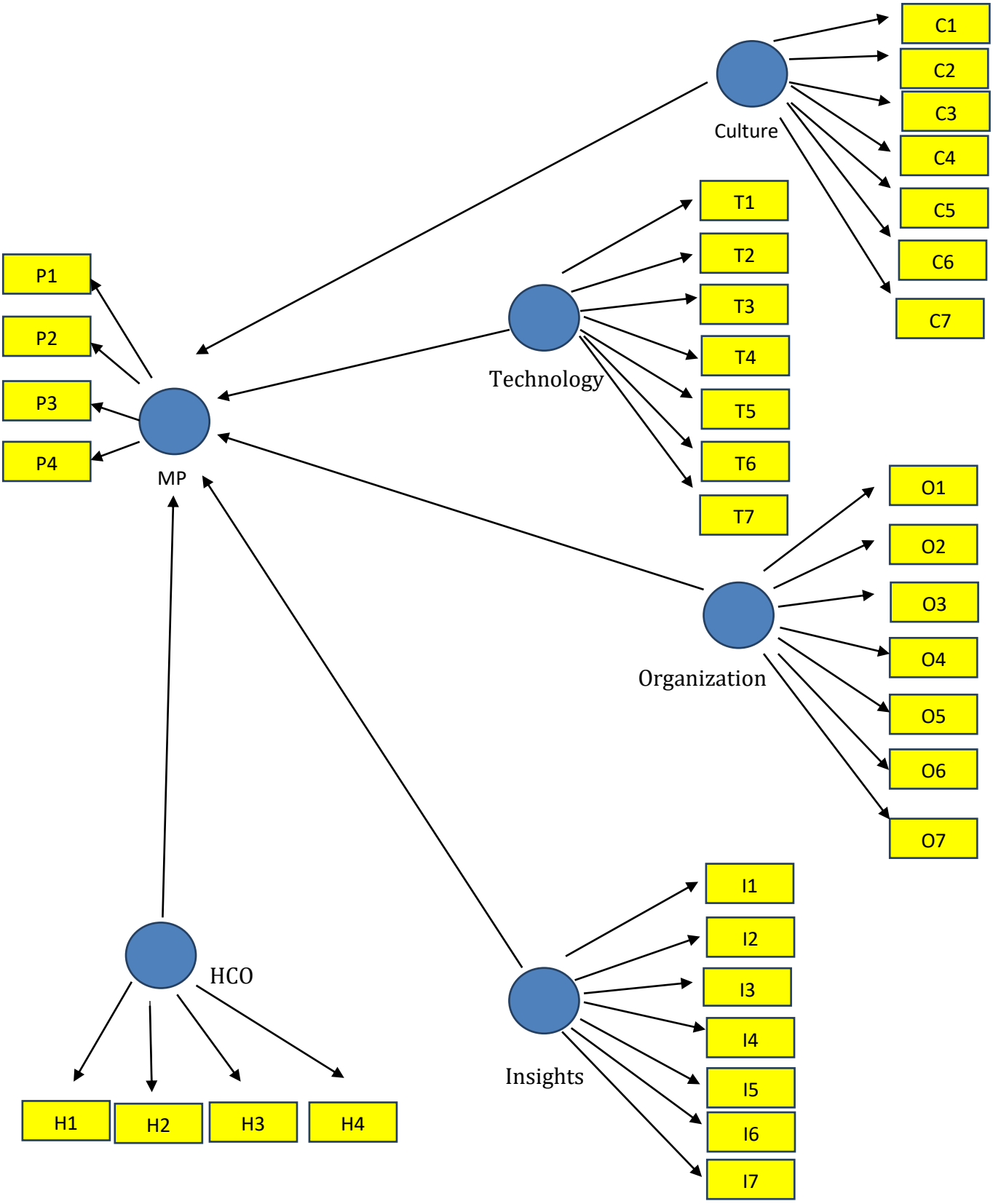

Fig.1 Conceptual Model

4.2 Sample analysis

The research information was collected through the administration of a questionnaire to each participant.

Due to the qualitative nature of the survey, it was decided to create and submit the questionnaire through an online link.

Each firm was first contacted by telephone in order to identify the person or persons competent on the subject, then proceeded with a first telephone conversation with the indicated person who has been given a short description about the research and the purpose, once ascertained the availability to participate, the questionnaire was sent by email along with a more precise explanation the work and manner in which it is to be completed.

It was decided to ask closed questions providing mutually exclusive answers to which to assign a score on the basis of a Likert scale of agreement/disagreement, in particular 1 = Entirely disagree; 2 = Mostly disagree; 3 = Somewhat disagree; 4 = Neither agree nor disagree; 5 = Somewhat agree; 6 =Mostly agree; 7= Entirely agree.

The analysis of the questionnaires obtained was carried out anonymously through the program PLS: what research is about getting a global, not a particular vision.

63 accountants were contacted and 41 questionnaires were received, two of which were not taken into account as the reply in the control questions was found to be incorrect, The figures below therefore refer to a total of 39 correctly completed questionnaires.

In order to verify the level of digital maturity of the accountants, the measurement scale adopted by Forrester was readjusted with a 7-point scale, the proportion was used to identify each minimum and maximum value between the various levels, obtaining the ranges below:

Level of Maturity	*Score range*
Skeptics	28-54
Adopters	55-102
Collaborators	103-154
Differentiators	155-196

Tab.1 Score range of maturity level

From the data collected we note that no accountant is at the initial stage of digitalization defined Skeptics, that is, the stage where the company does not favor the digital and therefore cannot meet the technology requirements, social media, digital training and managing a customer's digital experience;

23% of accountants are in the Adopters phase, the phase where the company is willing to invest limited resources for digitisation, companies often don't have the internal resources to deal with a digital marketing and therefore rely on external companies;

64% of accountants are in the third phase defined Collaborators where companies give priority to the overall experience of customers compared to the performance of each channel, are distinguished for having a strong coordination and continuous communication between the company and marketing;

and the 13% of accountants is in the last phase called Differentiators characterized to create individual teams with shared goals that co-create tactics and strategy by unifying the business and the company.

The average level of education within the accountants was found to be the diploma with 51% followed immediately after by the bachelor's degree and the master's degree (respectively 28% and 21%), the highest level of education -The Master- is not present in any accountant (0%).

By combining the two elements, Digital Maturity and Education Level, it can be noted that accountants who have a higher level of education (Master's degree) are those who also have the highest level of Digital Maturity, while those who are in the intermediate level are those who have a diploma or a bachelor's degree, only three accountants who have the master's degree have turned out to be included in the Collaborations category.

Through a control variable, company seniority, we can note that there may be a relationship between the seniority of the accountant and the level of digital maturity acquired, this is because all accountants who fall into the highest level of digitization

also fall into the lower level of seniority, also for these we can also note, through the control variable size, that almost all (4/5) have a small size (5 employees);

The majority of accountants in the Collaborators level are medium-sized (6-15 employees) and are of average seniority (11-15 years);

Those who fall into the lowest category of digitalisation, Adopters, are the large-size accountants (16-30 employees) and have higher seniority (>15 years).

4.3 Validity and reliability

As first thing after having realized theouter model, also called Measurement models, that describes the relationship between items and variables (called latent variable).

In the program PLS to be able to proceed you must click on the top right on the item "Calculate">PLS Algorithm, as parameters for the calculation have been set:

-Weighting scheme: path

-Maximum Iterations:300

-Stop Criterion (7)

Then in the program once performed the calculation in the lower left we have the item Quality Criteria where we find the item "Construct Reliability and Validity" in this section we can analyze Cronbach's Alpha and Composite Reliability both useful to assess the reliability of the model.

The value of Cronbach's Alpha to be acceptable must be between 0.60 and 0.70, but if the value is between 0.7 and 0.9 are more than satisfactory.

Instead the Composite Reliability by convention should have a value higher than 0.7

In the chart we find also the rho_A useful also for verifying the reliability of the model, but for convention it usually places more attention to the values brought back in the above mentioned elements.

Another useful element in this chart is the AVE (Average Variance Extracted), it serves to measure the validity of the model and the accuracy of the variables, for convention the value must be greater than 0,5.

	Cronbach's Alpha	*rho_A*	*Composite Reliability*	*AVE*
Culture	0.8706	0.7111	0.8504	0.4654
HCO	0.9223	0.9333	0.9450	0.8114
Insights	0.8984	0.9372	0.9045	0.5809
Market Performance	0.9214	0.9261	0.9445	0.8098
Organization	0.8404	0.2892	0.1552	0.1955
Technology	0.8788	0.8743	0.8935	0.5554

Tab.2 Construct Reliability and Validity

Other section that we find after the calculation is the Discriminant Validity, useful to verify how much the single items are suitable to describe the own variable and consequently not suitable to describe the others, the more unsuitable they are to describe the other variables, the better the model created, so the higher the discriminant validity, the more valid the items for the single variable are.

Discriminant Validity consists of three methods:

- Fornell-Larcker: the values of the diagonal are the square root of the AVE and these values and the values below the diagonal are interesting for the analysis because for column the values below the diagonal must be lower than the value in the diagonal because they indicate the correlation between one variable latent and the other, so it must be lower than the value itself.

-Heterotrait-Monotrait Ratio (HTMT): by convention the values should be less than 0,85 to have discriminant validity. There's a tolerance range of 0.89.

-Cross Loading: usually it is used if in the first two methods some variable has not met the requirements, it can verify every single item and the value it assumes regarding the own variable of reference and the other variable.

This is to assess whether the value does not discriminate validity may depend on one or more variables that do not best describe only the reference variable.

	Culture	*HCO*	*Insights*	*Market Performance*	*Organization*	*Technology*
Culture	**0.6822**	0.0000	0.0000	0.0000	0.0000	0.0000
HCO	-0.2099	**0.9008**	0.0000	0.0000	0.0000	0.0000
Insights	0.6110	-0.0576	**0.7622**	0.0000	0.0000	0.0000
Market Performance	0.2562	-0.8508	0.2060	**0.8999**	0.0000	0.0000
Organization	0.2567	-0.4527	0.4289	0.6019	**0.4422**	0.0000
Technology	0.3996	0.3703	0.4340	-0.2470	-0.0958	**0.7452**

Tab.3 Discriminant Validity – Fornell-Larcker

	Culture	*HCO*	*Insights*	*Market Performance*	*Organization*	*Technology*
Culture	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HCO	0.1966	0.0000	0.0000	0.0000	0.0000	0.0000
Insights	0.8761	0.1400	0.0000	0.0000	0.0000	0.0000
Market Performance	0.1976	0.9142	0.2050	0.0000	0.0000	0.0000
Organization	0.8966	0.3213	0.8197	0.3786	0.0000	0.0000
Technology	0.6794	0.3365	0.5955	0.2350	0.8008	0.0000

Tab.4 Discriminant Validity - Heterotrait-Monotrait Ratio

	Culture	*HCO*	*Insights*	*Market Performance*	*Organization*	*Technology*
C1	**0,8933**	-0,2072	0,5676	0,2466	0,3480	0,3322
C2	**0,7402**	0,0668	0,5971	0,0269	0,2937	0,4871
C3	**0,7857**	-0,1244	0,5177	0,1972	-0,0127	0,3508
C4	**0,6687**	-0,0220	0,4854	0,0327	0,2448	0,3640
C5	**0,5245**	0,0950	0,3957	-0,0116	0,3509	0,2821
C6	**0,6897**	-0,0105	0,5232	0,0367	0,0855	0,4553
C7	**0,3104**	0,1844	0,5445	-0,0622	-0,1405	0,3689
H1	-0,0690	**0,9162**	0,0626	-0,8302	-0,4232	0,4126
H2	-0,3267	**0,8967**	-0,0936	-0,7234	-0,3434	0,2907
H3	-0,0718	**0,8486**	-0,0841	-0,6483	-0,3450	0,2572
H4	-0,2818	**0,9391**	-0,1049	-0,8399	-0,5010	0,3549
I1	0,5544	-0,0786	**0,8597**	0,1953	0,2566	0,4002
I2	0,5928	0,0373	**0,6211**	0,0095	0,1285	0,2147
I3	0,5365	0,0607	**0,6963**	0,0340	0,4762	0,4822
I4	0,4986	0,0064	**0,5980**	0,0133	0,1875	0,3630
I5	0,4511	-0,0523	**0,8654**	0,2167	0,4665	0,3479
I6	0,5209	0,0431	**0,7105**	-0,0074	0,1968	0,5748
I7	0,5724	-0,0378	**0,9194**	0,1420	0,3706	0,3686
O1	0,2358	0,5236	0,3048	-0,3025	**-0,3358**	0,4739
O2	0,5077	-0,1079	0,6806	0,3196	**0,5351**	0,3673
O3	0,6158	-0,0785	0,4942	0,2040	**0,5036**	0,3469
O4	0,3951	-0,1231	0,5691	0,4016	**0,7779**	0,2528
O5	0,5268	0,2927	0,3339	-0,2194	**-0,2958**	0,5769
O6	0,3742	0,1880	0,2918	-0,1478	**-0,1522**	0,5952
O7	0,4319	0,0573	0,4661	-0,0124	**-0,0160**	0,4952
P1	0,1585	-0,8025	-0,0129	**0,8964**	0,4510	-0,3479
P2	0,2597	-0,7242	0,3042	**0,8813**	0,5358	-0,0744
P3	0,0483	-0,6984	0,1785	**0,8768**	0,5496	-0,1997
P4	0,4260	-0,8301	0,2657	**0,9435**	0,6244	-0,2600
T1	0,3000	0,4100	0,3554	-0,2280	-0,2324	**0,8554**
T2	0,4140	0,3132	0,3131	-0,2469	-0,0860	**0,8383**
T3	0,1228	0,1574	0,2218	-0,0937	-0,0382	**0,5635**
T4	0,3721	0,1943	0,4460	-0,1424	0,1126	**0,7846**
T5	0,4031	0,0054	0,3185	0,0683	0,0681	**0,4361**
T6	0,3123	0,3068	0,3962	-0,1741	0,0500	**0,8116**
T7	0,5031	0,1854	0,3899	-0,1288	-0,1350	**0,8193**

Tab.5 Discriminant Validity - Cross Loading

4.4 Bootstrapping Procedure

The last thing we analyze with the PLS program is the Structural Model(called inner model) that describes the relationship between the variables present in the model.

In order to analyze the inner model, bootstrapping is used, a procedure that randomly extracts bootstrap samples from the original sample, each time an observation is extracted from the original sample before the next random extraction, the observation taken is reinserted, in this mode, all observations are always present before the next extraction.

As you can read in the section Interpretation data, the bootstrapping analyzed in this research does not contain some items for the variables Culture and Organization, this because they were found to be not significant.

In PLS at the top right Calculate > Bootstrapping, using the following parameters:

-Subsample: 5000

-Complete Bootstrapping

-Confidence Interval Method: Bias-Corrected an Accelerated (BCa) Bootstrap

-Test Type: two Tailed

-Significance Level: 0.05

with this calculation we are shown the elements like:

-Original sample (Beta values): weight of the impact the independent variable has on the dependent variable, by convention it should be greater than 0.2

-T-Statistics (t-values): significance index, representthe link between variables, by convention it should be greater than 1,96

-P -Values: should take a value <0.05 to be meaningful and accept the assumption

	Beta Values	*Sample Mean*	*Standard Deviation*	*T- values*	*P-values*
Culture → Performance	-0.108	-0.074	0.127	0.851	0.395
HCO → Performance	-0.812	-0.781	0.086	9.397	0.000
Insights → Performance	0.025	-0.046	0.166	0.152	0.879
Organization → Performance	0.341	0.356	0.155	2.200	0.028
Technology → Performance	0.034	0.025	0.109	0.314	0.754

Tab. 6 Bootstrapping

	t *Values*	p *Values*	*95% Confidence Intervals*	*Acceptance/Refusal (significance* p*<0.05)*
H1: HCO have a negative relationship with Performance	9.397	0.000	[-1.001 ; -0.673]	Yes
H2: Technology have a positive relationship with Performance	0.314	0.754	[-0.278 ; 0.158]	No
H3: Insights have a positive relationship with Performance	0.152	0.879	[-0.279 ; 0.340]	No
H4: Organization have a positive relationship with Performance	2.200	0.028	[-0.002 ; 0.627]	Yes
H5: Culture have a positive relationship with Performance	0.851	0.395	[-0.353 ; 0.130]	No

Tab.7 Significance testing results of the total effects

4.5 Data analysis

The first table to be checked is Tab.2 where we can analyze the measurement model values such as Cronbach's Alpha, Composite Reliability and Average Variance Extracted.

While for Cronbach's Alpha we find all values higher than 0.7 and therefore acceptable, for Composite Reliability we find almost all values higher than 0.7 except for the variable Organization which reports a value equal to 0.1552 and for AVE, which should have a value greater than 0.5, we find both the variable Culture with 0.4654 and the variable Organization with 0.1955.

For the variables HCO, Insights, Market Performance and Technology we can note that all the items have a value greater than 0.5 therefore they are significant, for example H2: 0.897, H3: 0.849, I1:0.860, I2:0.621, I5: 0.865, P1: 0.896, P4: 0.944, T2: 0.838, T6: 0.812, T7: 0.819.

For the variable Culture we find all the voices with values over 0,5 except for the voices C7 (0,310) and for the variable Organization instead we have four negative items:

O1 (-0.336), O5 (-0.296), O6 (-0.152), O7(-0.016).

The second thing to check is the discriminate validity with the three methods available: Fornell-Larcker method where all the values of the columns for the various variables - Culture, HCO, Insights, Organization, Market Performance and Technology - are lower than the value of the variable with itself, therefore the correlation between a Variable Latent and the other is not greater than the value with itself.

HTMT method, where instead the expected value would have to be inferior to the 0.85, we find for the column Culture and the rows of the variable Insights and Organization a value just over, respective 0.8761 and 0.8966 but inside the tolerant range, while for the column HCO and the row of the Market Performance we find a value equal to 0.9142 therefore superior to the conventional value and the tolerance range.

In Cross Loading method we can note the items C7 in the Culture column takes a value of 0.3104 while in the Insights column takes a value of 0.5445 and in the Technology column takes the value of 0.3689, values higher than the reference variable.

Also items O1, O5, O6 and O7 also have much lower values in the Organization reference column than in the other columns. As a consequence of this it was considered appropriate to proceed with the analysis of the data by removing these items not significant.

Carried out this operation we can switch to the analysis the bootstrapping procedure where as we can see in Tab. 6 the beta is greater than 0.2 only for the HCO and Organization variables, -0.812 and 0.341 respectively.

The t-Values is greater than 1.96 only for the HCO and Organization variables, 9.397 and 2.200 respectively.

The p-Values is less than 0.05 only for the HCO and Organization variables, 0.000 and 0.028 respectively.

Consequently, the hypotheses are:

H1: HCO have a negative relationship with Performance is Accepted

H2: Technology have a positive relationship with Performance is Refusal

H3: Insights have a positive relationship with Performance is Refusal

H4: Organization have a positive relationship with Performance is Accepted

H5: Culture have a positive relationship with Performance is Refusal

CHAPTER 5 DISCUSSION , LIMIT AND CHALLEGES

5.1 Discussion

The objectives of this study are two: the first is to analyze the sample and understand how much the studies in North-East Italy are digitized and the second is to understand how the dimensions that are used to determine the digital maturity influence the market performance. This study also includes an element external to the dimensions of maturity or the hierarchy culture organization, because as many studies report (Pratt et al., 1992; Chow et al., 2002) the accountants have a purely hierarchical orientation, so you want to analyze if this element has a negative effect on performance as it happens in companies (Dwyer et al. 2001, Agbejule 2011).

According to the literary research addressed, no study has analyzed how the various elements of digital maturity could actually influence corporate performance, this could be a contribution of the research addressed.

In the first part of this research we recognized that almost all accountants are on average digitized and that the most digitized accountants are those who have a lower seniority and a higher level of education. According to research published by the University of Agder (2019) the accounting profession could present itself as the ideal candidate for digital transformation, Duong and Fledsberg (2019) state that investing in young people, who are already familiar with new systems and technologies, would have an important impact in creating highly qualified and competitive team.

The results of this research show that even for accountants the presence of a hierarchical organizational culture has negative effects on performance and we can also note how the cultural dimension of fundamental maturity, in agreement with Buvat et.al (2017) necessary for analyze the ability to create new work models, to reinvent methods for more open communication and to increase tolerance to risk and failure , doesn’t have a positive effect on performance, it assumes a negative beta.

Nowadays it is argued that the professional figure of the accountant is digitally less developed than the other realities. Having analyzed in this research the HCO element, characteristic of this profession, it could be argued that a contribution of this research is

to have confirmed, although in a limited manner, that one of the reasons why accountants are digitally less advanced is precisely their hierarchical structure.

In addition, we noted that the dimension of the organization, which includes elements such as the strategy, has a positive effect on performance, in fact the digital transformation concern the restructuring of the entire organization, to create a business model congruent to digital evolution (Shuichiro, 2020).

The technology dimension has a non-significant effect, in contrast to research that claims it has a positive effect example Khin et al. (2019). According to Kotarba (2017) and Berghaus, Back (2016) to measuring the digitization of an organization, we need to move from a goal focused only on the Internet and the related technology, to a goal centered on the customer. We cannot limit it to the Information Technologies sector alone, but we must plan a synergistic approach between IT, the human resources sector and the development of services and products. So it is likely that the technology dimension used to measure the level of digitization of accountants may not be as significant on performance as the technology of manufacturing companies may be.

These conclusions for accountants may be important because they might consider changing their organizational structure by moving towards a less internally oriented and formal but more informal and externally oriented form. As seen in the previous chapters there are three other types of organizational cultures all with a higher impact than the hierarchy (Cameron, Freeman, 1991;Dwyer *et al.* 2003).

With the change of the organizational culture, accountants could also change the culture that is at the basis of the company, this to orient employees towards a more collaborative process and work in teams, which has more benefits than individual work and for watertight sectors.

Another element that the accountants could take into consideration is certainly the possibility of increasing the specialized staff, hiring younger people and/ or people who already have technological predispositions and that is versatile.

5.2 Limit and Challenges for future research

A first limitation of this research is the amount of samples analyzed, in fact 39 samples have been analyzed, this is because during the collection of data some accountants have not shown interest in the research or were too busy with the fiscal deadlines of the period, it should also be considered that the accountants may not have put the right attention to all questions but only to some of them

Future research could increase the number of samples to be analyzed and extend the research throughout the national territory instead of carrying out the verification only in North-East Italy.

In this research it was decided to pay attention and analyze only the hierarchy culture organization type, however as we have seen before there are other types of organizational culture (Cameron, Freeman, 1991;Dwyer *et al.* 2003).

This could be both a research limit and a challenge for future research, a limit as only one type of organizational culture has been analyzed and we do not have the possibility of comparison with other methodologies, a challenge as other research may decide to analyse the presence and impact on the performance of all organizational culture.

In addition, another challenge for future research would be to insert a moderating variable that could verify what positive or negative impact the organizational culture would have on the dimensions of digitalization.

Finally, another possible limit of the sample could be the type of accountants chosen for the analysis, in fact they were chosen accountants who performed only active accounting practices, while future research could also include those who follow the HR domain.

REFERENCES

ACCA, *Technology trends: their impact on the global accountancy profession*, 2013, https://www.accaglobal.com/content/dam/acca/global/PDF-technical/futures/pol-af-ttti.pdf.

Agbejule A., (2011) *Organizational culture and performance, the role of management accounting system*, Journal of Applied Accounting, Vol. 12, No. 1, pp. 74-89, 31 May 2011, https://doi.org/10.1108/09675421111130621

Al-Htaybat K. et al., (2018) *Educating digital natives for the future: accounting educators' evaluation of the accounting curriculum, Accounting Education*, Volume 27, Issue 4, 2018.

Antonelli V., D'Alessio R., (2014) *Accounting history as a local discipline: The case of the Italian-speaking literature* (1869–2008), Accounting Historians Journal, 2014, meridian.allenpress.com

Aslanova I.V., Kulichkina A.I., (2020) Proceedings of the 2nd International Scientific and Practical Conference "Modern Management Trends and the Digital Economy: form Regional Development to Global Economic Growth", Atlantis Press, 5 May 2020, https://doi.org/10.2991/aebmr.k.200502.073

Autor D. H., Levy F., & Murnane R. J., (2003) *The skill content of recent technological change: An empirical exploration*. The Quarterly Journal of Economics,118 (4), 1279–1333.

Berghaus S., Back A., (2016) "*Stages in Digital Business Transformation: Results of an Empirical Maturity Study*", MCIS 2016 Proceedings, 26 Oct. 2016,https://aisel.aisnet.org/mcis2016/22

Bhimani A. and Bromwich M. (2009) "*Management accounting in a digital and global economy: the interface of strategy, technology, and cost information*" In Chapman, Chris S., Cooper, David J. and Miller, Peter, (eds.) Accounting, Organizations, and Institutions: Essays in Honour of Anthony Hopwood, Oxford University Press, Oxford, UK, pp. 85-111. ISBN 9780199546350, version available at: http://eprints.lse.ac.uk/36853/

Bhimani A. & Willcocks L., (2014) *Digitisation, 'Big Data' and the transformation of accounting information*, Accounting and Business Research, 44:4, 469-490, DOI: 10.1080/00014788.2014.910051, http://dx.doi.org/10.1080/00014788.2014.910051

Brynjolfsson E., Rock D., & Syverson C., (2019) *Artificial intelligence and the modern productivity paradox: A clash of expectations and statistics*, in A. Agrawal, J. Gans, & A. Goldfarb (Eds.), The economics of artificial intelligence: An Agenda (pp. 23–57), University of Chicago Press, 2019, https://www.nber.org/system/files/working_papers/w24001/w24001.pdf.

Burnett S., Aggarwal M., Modi A. &Bhadola S.,(2018)*Defining Enterprise RPA, New Research by Everest Group*, 2018, https://www.fusionsol.com/wp-content/uploads/sites/22/2019/07/Everest-Group-UiPath-Defining-Enterprise-RPA.pdf.

Buvat J., Crummernel C., Kar K., (2017) *The digital culture challenge: closing the employee leadership gap*, Capgemini Digital Transformation Institute Survey. Paris: Capgemini Digital Transformation Institute

Cameron S.Kim, Freeman J.Sarah, (1991) *Cultural congruence, strength and type: relationships to effectiveness*, JAI Press Inc., Available online 1991, http://webuser.bus.umich.edu/cameronk/PDFs/Organizational%20Culture/Cultural%20Congruence.pdf

Chartered Global Management Accountant (CGMA), (2019) "*Re-inventing finance for a digital world*", https://www.cgma.org/resources/reports/re-inventing-finance-for-a-digital-world.html

Chi Thi Duong D., Fledsberg K., (2019) "*Digitalization of the Accounting Industry*", University of Agder, Faculty of Business and Law, Department of Economics and Finance, 2019

Cobbin P., Dean G., Esslemont C., Ferguson P., Keneley M., Potter B., West B., (2013) *"Enhancing the Accessibility of Accounting and Business Archives: The Role of Technology in Informing Research in Accounting and Business*", ABACUS, Volume 49, Issue 3, September 2013, 396-422, https://doi.org/10.1111/abac.12009.

Deshpandé R., Farley U.J., Webster E.F., (1993) *Corporate Culture, Customer orientation and innovativeness in Japanese Firms: A quadrad analysis*, Sage Journals, Jan. 1993, https://doi.org/10.1177/002224299305700102

Digitalisation in finance and accounting. And what it means for financial statement audits, Price Waterhouse Cooper, PwC, 2018, https://www.pwc.de/en/digitalisation-in-finance-and-accounting.html

Dwyer S., Richard O.C., Chadwick K.,(2003)*Gender diversity in management and firm performance: the influence of growthorientation and organizational culture*, Dec. 2003, 10.1016/S0148-2963(01)00329-0

European Commission, "*Digital Transformation Scoreboard 2018. EU businesses go digital: Opportunities, outcomes and uptake*", https://ec.europa.eu/growth/tools-databases/dem/monitor/sites/default/files/Digital%20Transformation%20Scoreboard%202018_0.pdf

Felch V., Asdecker B., Sucky E., (2019) Maturity Models in the Age of Industry 4.0 – Do the Available Models Correspond to the Needs of Business Practice?, Hawaii International Conference on System Sciences, Jan. 2019, 10.24251/HICSS.2019.620

Fowler C. J., Keeper T.,(2016) "*Twenty years of Accounting History, 1996–2015: Evidence of the changing faces of accounting history research*", Accounting History, Vol 21, Issue 4, 2016, https://doi.org/10.1177/1032373216657842.

Gill M., VanBoskirk S.,(2016)*The Digital Maturity Model 4.0 –Benchmarks: Digital Business Transformation Playbook*, Forrester, Available online 22 January 2016, https://forrester.nitro-digital.com/pdf/Forrester-s%20Digital%20Maturity%20Model%204.0.pdf

Guerrera B.M., Snoberg A., Tetzlaff L., (2020*) Digital Matuirty Model for Management Cunsultant Firms: Digital Technologies within a standardized management consulting process and performance improvements*, Diva, June 2020, http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1439010&dswid=2110

Gupta M., George J.F.,(2016)*Toward the development of a big data analytics capability*, Elsevier, Vol. 53, Issue 8, Dic 2016, pp. 1049-1064, https://doi.org/10.1016/j.im.2016.07.004

Gurbaxani V., Dunkle D., (2019) *Gearing up for successful digital transformation*, Mis Quarterly Executive, , Vol. 18, Issue 3, Articole 6, Aug. 2019, https://aisel.aisnet.org/misqe/vol18/iss3/6

Heritage B., Pollock C., Roberts L.D.,(2014)*Validation of the Organizational Culture AssessmentInstrument*,Plosone, 25 March 2014, 10.1371/journal.pone.0092879.

HARTEIS C., *Machines, Change and Work: An Educational View on the Digitalization of Work*, Chapter 1 in HARTEIS C. EDITOR,The Impact of Digitalization in the Workplace. An Educational View, Professional and Practice-based Learning 21, Springer International Publishing, 2018, http://196.189.45.87/bitstream/123456789/9765/1/37.pdf.pdf#page=47.

Heinzelmann R., *Digitalizing Management Accounting, in book: Feldbauer-Durstmueller, B. &Mayr, S. (Eds.), Controlling* – AktuelleEntwicklungen und Herausforderungen, Springer Gabler, 2019, pp. 207-226, https://www.researchgate.net/publication/333603640_Digitalizing_Management_Accounting.

Isaev E., Korovkina N., Tabakova M., (2018) Evaluation of the readiness of a company's IT department for digital business transformation, June 2018, 10.17323/1998-0663.2018.2.55.64

Isensee C.,Teuteberg F., Griese K.M., Topi C.,(2020)*The relationship between organizational culture, sustainability, and digitalization in SMEs: A systematic review,* Elsevier, Vol. 275, 1 Dic 2020, https://doi.org/10.1016/j.jclepro.2020.122944

Joseph O.O, Kibera F., (2019) *Organizational Culture and Performance: Evidence from Microfinance Institutions in Kenya*, Sage Open, March 8 2019, https://doi.org/10.1177/2158244019835934

Jylhä, T., & Syynimaa, N. (2019) *The Effects of Digitalisation on Accounting Service Companies*. In J. Filipe, M. Smialek, A. Brodsky, & S. Hammoudi (Eds.), ICEIS 2019 : Proceedings of the 21st International Conference on Enterprise Information Systems. Volume 1 (pp. 502-508). SCITEPRESS Science And Technology Publications. doi:10.5220/0007808605020508

KAIVO-OJA J., ROTH S., WESTERLUND L., *Futures of robotics. Human work in digital transformation*, International Journal of Technology Management, 73, 2017, pp. 176-205, https://www.researchgate.net/publication/292392264_Futures_of_Robotics_Human_Work_in_Digital_Transformation.

Kane G.C, Kiron D., Palmer D., Phillips A.N., Buckley N. (2015), *Strategy, not Technology, Drives Digital Transformation: Becoming a digitally mature enterprise*, Deloitte University Press,2015, https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/technology-media-telecommunications/deloitte-cn-tmt-strategy-not-technology-drive-digital-transformation-en-150930.pdf

Kane G.C, Kiron D., Palmer D., Phillips A.N., Buckley N., (2017) Achieving Digital Maturity, MITSloan Management Review – Deloitte University Press, July 2017, https://www2.deloitte.com/content/dam/Deloitte/za/Documents/technology/za_DUP_Achieving-digital-maturity.pdf

Khin S., T. CF Ho, (2019) Digital technology, digital capability organizational performance: A mediating role of digital innovation, International Journal of Innovation Science, Vol. 11, No. 2, pp. 177-195, https://doi.org/10.1108/IJIS-08-2018-0083

Kreher M., Sellhorn T.,Hess T., (2017) *Digitalisation In Accounting study of the status Quo in German Companies*, KPMG, 2017, https://assets.kpmg/content/dam/kpmg/de/pdf/Themen/2017/digitalisation-in-accounting-en-2017-KPMG.pdf

Laara E., Van Deursen A. J.A.M., Van Dijk J. A.G.M., Haan J., (2017) *The relation between 21st-century skills and digital skills: A systematic literature review*, Computers in Human Behavior, Volume 72, July 2017, Pages 577-588, https://doi.org/10.1016/j.chb.2017.03.010.

Leading from the front: Redesigning finance for the digital age. Making sense of the changing role of finance in the digital economy, Price Waterhouse Cooper, PwC, 2015, https://www.pwc.com/gr/en/publications/leading-from-the-front-redesigning-finance-for-the-digital-age.pdf.

Lahrmann G, Max F., Winter R., Wortmann F., (2011) Business Intelligence Matuirty: Development and Evaluation of a Theoretical Model, System Sciences (HICSS), Feb. 2011, 10.1109/HICSS.2011.90

Leisching A., Wolfl S., Ivens B., (2016) When Does Digital Business Strategy Matter to Market Performance?, AIS eLibrary, 21 Nov. 2016, https://aisel.aisnet.org/icis2016/ISStrategy/Presentations/13/

Lewis R., Mcpartland J., Ranjan R., Blockchain *and Financial Market Innovation*, J.P. Morgan Center for Commodities at the University of Colorado Denver Business School, 2019, http://www.jpmcc-gcard.com/wp-content/uploads/2019/03/GCARD-Summer-2019-Chicago-Fed.pdf.

Mancini, Daniela & Lamboglia, Rita & Castellano, Nicola & Corsi, Katia. (2017) "*Trends of Digital Innovation Applied to Accounting Information and Management Control Systems*", in *Reshaping Accounting and Management Control Systems,* (pp.1-19) Springer, Eds: Corsi K., Castellano N., Lamboglia R., Mancini D. 10.1007/978-3-319-49538-5_1.

Mäkinen H., (2010) *The factors impacting the diffusion of innovation in digitalising accounting,* Helsinki School Of Economics, Department of Accounting and Finance

Nal N., (2019) *Digitalisation of Public Sectors in Europe An Outlook on eGovernment Progress and Welfare Regime Type*, Faculty of Law, Economics and Governance Theses, Utrecht University, https://dspace.library.uu.nl/handle/1874/388690

Pavlykivska O., Marushchak L., (2019) *Functional Imperatives and Dominant Ideas Of Digital Accounting System Development*, in Nataliia Marynenko, Pradeep Kumar, Iryna Kramar, edd., Business Risk in Changing Dynamics of Global Village 2. Monograph, Publishing House of University of Applied Sciences in Nysa 2019.

PEPE A. A., *The Evolution of Technology for the Accounting Profession*, CPA Practice Advisor, Apr 19th, 2011, https://www.cpapracticeadvisor.com/home/article/10263076/the-evolution-of-technology-for-the-accounting-profession.

Pincus, Karen & Stout, David & Sorensen, James & Stocks, Kevin & Lawson, Raef. (2017) "*Forces for change in higher education and implications for the accounting academy*", Journal of Accounting Education, 10.1016/j.jaccedu.2017.06.001.

Pratt J., Beaulieu P., *Organizational culture in public accounting: Size, technology, rank, and functional area*, Elsevier, 1992, https://doi.org/10.1016/0361-3682(92)90018-N

Reimagining Finance and Accounting, A point of view by Carole Murphy Head of Business Transformation Services, Capgemini's Business Services, Capgemini, 2018, https://www.capgemini.com/wp-content/uploads/2018/04/fpia_pov_final.pdf.

Santos R.C., Martinho J.L., (2019) An Industry 4.0 maturity model proposal, Journal of Manufacturing Technology Management, Dec. 2019, 10.1108/JMTM-09-2018-0284

Sehlin D., Truedsson M., Cronemyr P., (2019) *A conceptual cooperative model designed for processes, digitalization and innovation*, International Journal of Quality and Service Science, Dec. 2019, 10.1108/IJQSS-02-2019-0028

Shuichiro Y., A *Strategic Map for Digital Transformation*, Procedia Computer Science, Volume 176, 2020, Pages 1374-1381, https://www.sciencedirect.com/science/article/pii/S1877050920320470.

Simon A., Schoeman P., Sohal A., (2010), *Prioritised best practices in a ratifiedconsultingservicesmaturity model for ERP consulting*, Journal of Enterprise Information Management, Vol. 23 No. 1, pp. 100-124 https://doi.org/10.1108/17410391011008923

Slater S.F., Olson E.M., Finnegan C., (2010)*Business strategy, marketing organization culture, and performance*, https://link.springer.com/article/10.1007/s11002-010-9122-1

Smith S. S*., Digitization and financial reporting: how technology innovation may drive the shift toward continuous accounting*, Accounting and Finance Research, 2018, tarjomefa.com

SPENCER D., *Work in and beyond the Second Machine Age: the politics of production and digital technologies*, Work, Employment and Society, 31 (1), 2017, pp. 142-152, https://doi.org/10.1177/0950017016645716.

SPILNYK I.V., PALUH M.S., *Developing Accounting System: The Challenges Of Digitalization*, Institutional Repository of Vadym Hetman Kyiv National Economic University, 2019, https://ir.kneu.edu.ua/bitstream/handle/2018/31423/ZE_2019_33.pdf?sequence=1.

Stancheva-Todorova E., (2018) *How artificial intelligence is challenging accounting profession, Journal of International Scientific Publications*" Economy & Business 12, 126-141

Stancheva-Todorova E., (2019) The Knowledge and Skills Profile of Accountant 4.0, in: 11th International Conference "*Digital Transformation of the Economy and Society: Shaping the Future*", Prilep, North Macedonia, October 19-20, 2019.

STANCHEVA-TODOROVA E., *Are accounting educators ready to embrace the challenges of industry 4.0, Industry 4.0*, Vol. 4 (2019), Issue 6, pp. 309-312, https://stumejournals.com/journals/i4/2019/6/309.

Szelagowski M., Berniak-Wozny J., (2019) *The adaption of business process management maturity models to the context of the knowledge economy*, Business Process Management Journal, 26(1), pp. 212-238, https://www.emerald.com/insight/content/doi/10.1108/BPMJ-11-2018-0328/full/html

Teichert Roman, (2019) *Digital Transformation Maturity: A Systematic Review of Literature*. Acta UniversitatisAgriculturae et SilviculturaeMendelianaeBrunensis, 67(6): 1673–1687, https://acta.mendelu.cz/media/pdf/actaun_2019067061673.pdf

The rise of Digital Challengers: How digitization can become the next growth engine for Central and Eastern Europe, Digital/McKinsey, 2018 McKinsey & Company

VASARHELYI M. A., ALLES M. G., *The "now" economy and the traditional accounting reporting model: Opportunities and challenges for AIS research*, International Journal of Accounting Information Systems 9, 2008, pp. 227-239, http://raw.rutgers.edu/MiklosVasarhelyi/Resume%20Articles/MAJOR%20REFEREED%20ARTICLES/M46.%20the%20now%20economy.pdf.

Vial G., (2019) *Understanding digital transformation and a research agenda*, Elsevier, Vol. 28, Issue 2, June 2019, pp. 118-144, https://doi.org/10.1016/j.jsis.2019.01.003

Viljakainen A., Lehikoinen E., *Robotic Process Automation in Financial Management*, Mini Project, LUT University, Industrial Engineering and Management, 2020,https://www.researchgate.net/profile/Essi_Lehikoinen/publication/346033040_Robotic_Process_Automation_in_Financial_Management/links/5fb77f1fa6fdcc6cc64f6848/Robotic-Process-Automation-in-Financial-Management.pdf.

Warren J. D., Jr; Moffitt K. C.; Byrnes P., (2015) "*HowBig Data Will Change Accounting*", Accounting Horizons 29 (2): 397–407, https://doi.org/10.2308/acch-51069.

Williams C.A., Schallmo D., Lang K., Boardman L. (2019) Digital Maturity Models for Small and Medium-sized Enterprises: A systematic Literature Review, International Society for Professional Innovation Management, June 2019, https://www.researchgate.net/publication/334108295_Digital_Maturity_Models_for_Small_and_Medium-sized_Enterprises_A_Systematic_Literature_Review

APPENDIX

APPENDIX A

Constructs Hierarchy Organizational Culture and his Items		
Constructs	Items	Source
Hierarchy Organizational Culture	H1 The head of institution is a generally considered to be a coordinator, an organizer or and administrator	Cameron S.Kim, Freeman J.Sarah, Cultural congruence, strength and type: relationships to effectiveness, JAI Press Inc., Available online 1991, http://webuser.bus.umich.edu/cameronk/PDFs/Organizational%20Culture/Cultural%20Congruence.pdf
	H2 Istitution emphasizes permanence and stability. Efficient, smooth operations are important.	
	H3 The glue that holds institution together is formal rules and policies. Maintaining a smooth-running institution is important there	
	H4 Istitution is a very formalized and structured place. Bureaucratic procedures generally govern what people do	

APPENDIX B

Constructs Market Performance and his Items		
Constructs	Items	Source
Market Performance	P1 Respect to the past 3 years we have introduced new products or services into the market faster than our competitors	Gupta M., George F. J., Toward the development of a big data analytics capability, Elsevier, Available online 2016, http://dx.doi.org/10.1016/j.im.2016.07.004
	P2 Respect to the past 3 years our success rate of new product or services has been higher than our competitors	
	P3 Respect to the past 3 years our market share has exceeded that of our competitors	
	P4 Respect to the past 3 years we have entered new markets more quickly than our competitors	

APPENDIX C

Constructs of Digital Maturity and their Iterms		
Constructs	Items	Source
Culture	C1 We have the right leaders to execute on our digital strategy day-to-day	Gill M., VanBoskirk S., The Digital Maturity Model 4.0 – Benchmarks: Digital Business TransformationPlaybook, Forrester, Available online 22 January 2016, https://forrester.nitro-digital.com/pdf/Forrester-s%20Digital%20Maturity%20Model%204.0.pdf
	C2 We believe that our competitive strategy depends on digital	
	C3 We take measured risks in order to enable innovation	
	C4 We clearly communicate our digital vision both internally and externally	
	C5 We prioritize over all customer experience over the performance of any individual channel	
	C6 We invest in targeted digital education and training a tall levels of our organization	
	C7 Our board and our C-level executives back our digital strategy	
Technology	T1 Our technology budget is fluild to allow for shifting priorities	
	T2 Our marketing and technology resources work together to co-create our digital technology road map	
	T3 We have a flexible, iterative, and collaborative approach to technology development	
	T4 We measure our technology teams by business out comes not just system up-time	
	T5 We leverage modern architectures (APIs, cloud, etc.) to promote speed and flexibility	
	T6 We use customer experience assets, like personas and journey maps, to steer our technology design	
	T7 We use digital tools to promote employee innovation, collaboration, and mobility	
Organization	O1 Our vendor partners deliver value that enhances our digital competencies	
	O2 Our organization model encourages cross-functional collaboration	
	O3 The staff supporting our critical digital functions are best in class	
	O4 Our organization structure prioritizes customer journeys over functional silos	
	O5 We dedicate appropriate resources to digital strategy, governance, and execution	
	O6 We have digital skills embedded through out our organization	
	O7 We have dened and repeatable processes for managing digital programs	
Insights	I1 Customer insight actively steers our digital strategy	
	I2 We use customer-centric metrics like Net Promoter Score or lifetime value to measure success	
	I3 We have clear and quantiable goals for measuring the success of our digital strategy	
	I4 Customer insights inform digital design and development	
	I5 We have clear and quantiable goals for measuring the success of our digital strategy	
	I6 Every employee understand show her performances ties to corporate digital goals	
	I7 We feed lessons learned from digital programs back into our strategy	