

The Challenges and Opportunities in the Digitalization of Companies in a Post-COVID-19 World

—FERNANDO ALMEIDA 

University of Porto and INESC TEC, 4200-465
Porto, Portugal

Member, IEEE

—JOSÉ DUARTE SANTOS 

Polytechnic Institute of Porto and ISPGAYA,
4400-103 Vila Nova de Gaia, Portugal

Member, IEEE

—JOSÉ AUGUSTO MONTEIRO 

ISPGAYA, 4400-103 Vila Nova de Gaia,
Portugal

Member, IEEE

(Corresponding author: Fernando Almeida.)

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Abstract—COVID-19 has caused dramatic effects on the world economy, business activities, and people. But digitization is also helping many companies to adapt and overcome the current situation caused by COVID-19. The growth in the use of technology in the daily lives of people and companies to face this exceptional situation is an evidence of the digital acceleration process. This exploratory study analyzes the impact of digital transformation processes in three business areas: labor and social relations, marketing and sales, and technology. The impact of digitalization is expected to be transversal to each area and will encourage the emergence of new digital products and services based on the principle of flexibility. Additionally, new ways of working will foster the demand for new talent regardless of people's geographical location. Moreover, cybersecurity and privacy will become two key elements that will support the integrated development of the Internet of Things technology solutions, artificial intelligence, big data, and robotics.

Key words: Covid-19, digitalization, human capital, innovation, technology

I. INTRODUCTION

THE COVID-19 pandemic has been challenging companies in various sectors of activity. Many of these organizations have been forced to adopt new internal working practices and felt a strong pressure to offer products through digital channels. Companies have experienced profound changes and in a very short time implemented solutions based on digital technologies. At the same time, it has become necessary to redesign management and collaboration models to ensure that nobody within organizations is left behind and feels excluded from this digitization process. In [1], Berger states that a key factor for the success of teamwork in COVID-19 time is the inclusion of all team members in the company's major challenges. But this process has necessarily become more complex, as the flow of information that naturally flowed in the same physical space is now becoming a challenge

to reach everyone in an agile and efficient way.

Digital transformation is characterized by the fusion of advanced technologies and the integration of physical and digital systems. Innovative business models, new production processes, and the creation of knowledge-based products and services prevail [2]. Although digitization is not a new phenomenon, the challenges and opportunities that are associated are constantly changing. Before the emergence of COVID-19, the challenges posed to digital transformation were essentially focused on the fourth industrial revolution, associated with the concepts of Industry 4.0, Internet of Things (IoT), and Web 4.0 [3]–[5]. The challenges involved both the disruption of concepts and technologies, as well as the speed of this digital transformation. In the era of COVID-19, the challenges were exposed, and it is fundamental to

involve the entire organization and stakeholders in this process. Furthermore, the pace with which this change occurred was tremendous. Organizations had to do this regardless of their previous positioning and experience in digital transformation processes.

Inevitably, organizations are moving along the path of digital transformation. However, a key question is whether they are prepared for this change. Studies [6], [7] indicate that companies, even those that are most advanced in the digital transformation of their activities and workflows, are not yet fully prepared to face the challenges of the digital transformation. Digitization requires a restructuring of processes, turning the company more agile, investing in more organic structures, reinforcing standardization and automation, in order to optimize the response capacity to customers. COVID-19 has brought difficult and uncertain times and accelerated the inevitable processes of digital transformation. At this stage, it is important to start thinking about the post-COVID-19 world and, above all, to explore how we can leverage and transform these challenges into new opportunities, both in business and internal organization. In this sense, this study seeks to explore the challenges and opportunities that will be posed to organizations by the digitization of their activities considering three fundamental areas of their operation: (i) labor and social relations; (ii) marketing and sales; and (iii) technology. These areas were chosen because of the strong impact that Ban [8] and Hasanat *et al.* [9] predict on the activities of the companies arising from COVID-19. This work employs the action research method to understand the challenges posed by COVID-19 to these three key areas. This research paradigm is appropriate where great proximity to researchers is required, and the boundaries of research are not rigid.

II. LABOR AND SOCIAL RELATIONS

Social and labor relations have experienced significant transformations in the time of COVID-19. During the quarantine period, people had to adapt to a teleworking model and learn to share a reduced space with their relatives. Home residences become hybrid places where domestic tasks and office work are shared. This scenario has a large impact on people's lives, with the risk of having their income reduced or losing their jobs. According to Riley [10], 60 million Europeans are at a risk of losing their jobs or having their monthly salaries cut because of COVID-19. This overall situation represents both an economic and social drama.

The social and labor transformations brought about by COVID-19 have not only accelerated the processes of digital transformation but have also exacerbated the social divide between the classes [11]. Not all companies and people have the same resources to face the challenges of digital transformation. The level of the dematerialization of tasks and services depends on the specific nature of each business activity. It seems clear that smaller companies, particularly micro companies, and in sectors of activity

strongly affected by COVID-19 (e.g., restaurants and tourism) will be particularly affected. Data from the National Statistics Institute (NSI) confirm these findings and add the transport and storage sector. On the contrary, food, clothing, and footwear will be less affected. Also of note is the increase in the consumption of technological goods [12]. Figure 1 explores the data concerning tourism considering the first five months of 2020. There was a slight increase in the number of overnight stays during the first two months of the year, mainly domestic tourism in February due to the Carnival, but with a strong reduction from March onwards reaching the peak in April. May was already a month of some slight recovery considering the domestic tourism.

The fast and unplanned digitization process, forced by COVID-19, is causing a sense of inability in organizations to attract the talent needed to face the future [13]. Although, Maresova *et al.* [14] point the role industry 4.0 will play in shaping the global business environment, people and their skills will remain at the heart of economic activity. Therefore, the digital economy can only function if it is accompanied by a public and private strategy for the digitalization of education and training, both at the

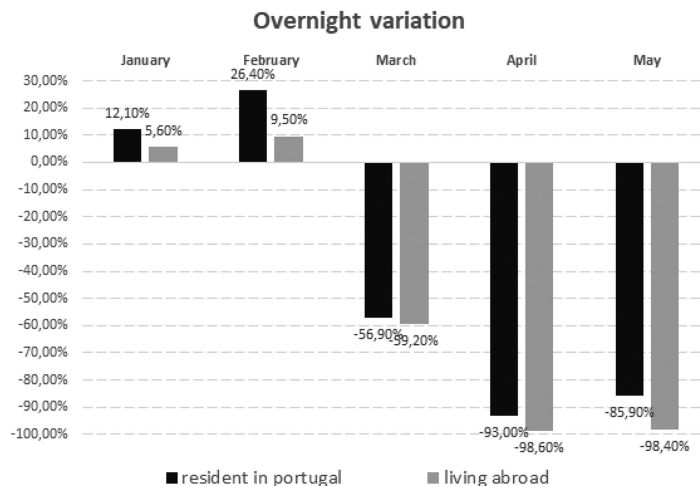


Figure 1. Variation in tourism demand (adapted from [12]).

level of transversal knowledge that the whole population will need to have in information and communication technologies, as well as in the training of highly specialized people in the fields of computer science. It is then possible to conclude that a strong commitment to digitalization does not necessarily imply a disinvestment in human resources. On the contrary, it is necessary to hire and manage the talent of the most qualified and suitable people for the new challenges of the digital economy. Accordingly, this need may lead to a change in the training offered at various levels of education, which may involve restructuring existing courses and/or increasing short courses. These courses should provide very specific skills in several areas, including technology, but without forgetting responses to social challenges, including interpersonal relationships, that workers will feel in the post-COVID-19 era. One of the potential responses is to encourage the development of vocational training in close collaboration with employers, both public and private, by stimulating the diversification and specialization of the educational offer.

It is difficult to define the qualification profile of the workforce in the post-COVID-19 era. The digital transformation of companies supports the growing importance that data science, digital marketing, and cybersecurity may assume in corporations. Allied to these dimensions, it will be necessary to apply methodological knowledge and creativity to transform data knowledge into technologically sustainable business models that combine security with economic feasibility. Unlike the industrial revolution, Saracco [15] states that in this process of digital transformation, productivity growth is disconnected from job creation and income, since it emerges fundamentally from the creation of new types of products/services and reformulation of production systems.

Finally, and with the predictable increase in teleworkers, even though adopting a hybrid model, it has contributed to the sustainable development of cities. The environmental dimension, which has significantly suffered from globalization, may benefit [16]. Not all employees will need to be living in or around cities, which will contribute to reduce car traffic and improve the quality of life of the populations. For this to happen, there must be no regional asymmetries in the digitalization process, especially in access to data networks, which may result in digital fractures between territories. Moreover, in a post-COVID-19 world, technology should serve to develop territories that are currently excluded and economically disadvantaged, contributing in this way to reduce regional asymmetries.

III. MARKETING AND SALES

The digital technologies and the change they have brought to the daily lives of businesses have created new economic opportunities. They opened new markets for new types of products and have transformed entire industries, dematerializing the products that had been commercialized [17]. At this level, Grewal *et al.* [18] report that the digitization of the economy requires the offer of highly customized products at significantly lower costs. With advances in technology and the constant presence of the Internet in the daily routine of populations, the use of digital products is becoming a valid alternative to physical products. They offer high accessibility since they can be accessed and consumed from anywhere. Examples of these products and services include apps, e-books, and on-demand streaming.

The COVID-19 pandemic had a significant impact on the growth of online commerce, mainly driven by trade closure and mobility restrictions. This movement may have a wider

scope and coverage. Klünder *et al.* [19] advocate that the dematerialization of processes will contribute to substantially reduce some fixed costs for companies. In parallel, the younger generations will adopt their own routines of consumption of products and services in the digital society.

The flexibility of the new digital products and services is a determining factor for their adoption [20]. In this sense, providing consumers with solutions or models that are flexible to their needs, leads to a faster purchase decision. There are several models of contracting for each business, but it is expected that in the future the consumer will give preference to those models in which they have the autonomy to choose and contract their service or product, without the need for physical and time-consuming intermediation. Simplification is a key path to a better customer experience and integration is equally crucial, both to simplify the relationship with the customer and to use data intelligently.

The introduction of new technologies in organizational processes not only helps to build customer loyalty but also helps to reach new audiences in the international market [21]. Digitization enables organizations to establish their operations anywhere in the world, especially through faster communication and shared services. In parallel, business communication with public services will also migrate strongly to digital platforms in both national and local government.

R&D processes will also change. In the industrial and technological sectors, the development of innovation is a key factor for the development of new competitive advantages [22]. In a global context of competitiveness, Brown *et al.* [23] argue that open innovation and collaborative innovation have been producing potential visible results of added value for the economy. These

models are based on the sharing of investments, skills, and risks. Companies can only perceive the added value of these innovation models with a strong focus on collaborative technologies that enable the creation and sharing of knowledge in a collaborative way among the different economic actors.

The supply chain management in the perspective of incoming goods, but especially in the output to continue sales, suffered a great deal of pressure during the confinement, and will possibly be even greater to ensure the success of companies that are investing in e-commerce [24]. The most pressing need is for the integration and automation between the various players (salesperson and distributor), specifically on platforms that enable the salesperson to obtain the best price, and the distribution of their product can lead to the emergence of new business models.

In turn, the payment systems business model, which for some micro companies has been a barrier to the development of new business, will tend to have an expansion in turnover. This may provide the emergence of new players and, consequently, greater bargaining power for companies that decide to move toward new marketing channels, particularly on social networks. With this, companies seek to diversify their sales outlets and consequently reduce risks in the face of another possible future closure of their physical sales outlets.

IV. TECHNOLOGY

Digital transformation processes depend on the workforce and the means at their disposal. Technology plays a key role in the digital transition. There is panoply of emerging technologies that have already contributed to the digital transformation of many companies

and industries, but in a post-COVID-19 world will assume greater relevance.

The IoT can be seen as the network of physical objects that contains technologies and software that enables them to communicate and interact intelligently internally or with their external environment over the Internet [25]. IoT can have applications in various domains from personal, business, and industrial. According to Maple [26], IoT has the potential to disrupt the realities of companies and lead to significant operational improvements, offering new types of services to customers and high-quality products. The availability of data and information, through the monitoring and measurement of all activity, allows with IoT to completely transform the vision and perception of the activity, bringing numerous competitive advantages and a more detailed and real knowledge of the business. This information will be fundamental to overcome the challenges and difficulties posed to companies by the proliferation of COVID-19.

As a result of the advances of IoT and the increase in the volume of data available to companies, there is a need to find new processes to analyze the high volume of heterogeneous information that will necessarily arise. Big Data is the term that can be used to refer to this extremely broad set of data, which, therefore, needs special tools to store, extract, organize, and transform the data into information that can be analyzed widely and in a short time [27]. The ability to capture large volumes of data and analyze it correctly and effectively has evolved many times in recent years due to the development of more sophisticated algorithms and the continuous improvement of power and computational storage. However, in a post-COVID-19 world, significant growth in the volume of data on the Internet is expected and the use of

big data knowledge and techniques will be essential for business survival. A change in the big data paradigm is expected as an element of creating a competitive advantage for a new paradigm in which big data is determinant for the survival of firms in an increasingly wider set of industries. At this level, an exponential growth in the use of big data is expected to forecast sales of products or services, to predict customer behavior, to analyze consumer trajectory in physical and virtual spaces, and to identify computational security risks.

Robotics is another area that is expected to grow significantly. Robots will be increasingly used not only to replace human work but also to interact with humans [28]. Indeed, robots are already being used to solve complex tasks, but their usefulness and applicability will necessarily evolve. Robots are expected to be progressively more autonomous, flexible, and cooperative. As a result, robots will be able to interact with others as well as work alongside humans and safely learn from them. Industry 4.0 offers a high potential for growth not only in the dimension of robotics, but also in the digital interconnection between the means of production, the supply chain, and the distribution channels.

As digital technology penetrates the economy and society, its vulnerabilities also increase. It is imperative to protect cyberspace from incidents, malicious activity, and misuse. However, cybersecurity incidents, whether intentional or accidental, are increasing at an alarming rate and can disrupt both business operations and essential services (e.g., water, electricity, health). According to Martins [29], the problems related to cybersecurity and that cause fear in the adoption of new digital technologies by organizations can be organized in three major groups: (i) lack of awareness and

knowledge on the subject; (ii) existence of complex scenarios where old technologies cohabit with emerging technologies; and (iii) lack of time and resources to invest in cybersecurity. In a post-COVID-19 world, it is expected that there will be significant changes in the perception of companies about cybersecurity. From one perspective, knowledge on the subject will necessarily increase, but from a different perspective, we will have a growing heterogeneity of equipment connected to the network that will increase these risks. Many of these risks can only be mitigated with significant efforts in the training of people, as a large part of cybersecurity risks are related to negligent human behavior. Consumers will be much more involved and concerned about cybersecurity risks and will demand technologically innovative solutions that do not jeopardize the security of their personal data. Privacy by design as envisioned by van Rest [30] will be a key standard in the process of developing technological solutions.

V. CONCLUSION

The repercussions and pace of technological disruption in organizations are increasing and have been accelerated by COVID-19. Companies need to be prepared for this challenge, and to this end, they need to foster a culture of innovation that involves the company's employees in this process. In fact, COVID-19 has accelerated the processes of digital transformation not only in companies but also in

individuals and public entities. The enormous challenge for managers is to get involved in this change, while trying to keep the business running, facing a different and uncertain future. Furthermore, it is relevant to highlight that the three key aspects related to labor/society, market/sales, and technology are strongly interconnected. Digitization of companies will increase the importance given to the digital channels of marketing and sales of companies. It will also foster teleworking and consumption of technological products as more people will interact using hybrid communication mechanisms accessible from anywhere, and not exclusively in the physical environment of companies and their homes.

The performed study helped to explore the impact of digitization on labor and social relations, marketing and sales, and technology dimensions. The effects of digitization are being felt across all these areas. The success of a company's digital transformation processes will depend heavily on the adoption of the community, namely its employees, suppliers, partners, and customers. Among the encountered challenges is the adoption of telework and a distance working model that enables high interactivity and cooperation, in which the talent overcomes the geographical location of these people. The growth of e-commerce is another challenge, since associated with it emerges a whole

value chain that must be properly integrated to provide a differentiated shopping experience for the customer. The flexibility of digital products and services will also be a determining factor for its adoption. On the technological side, the growth of IoT-supported systems, artificial intelligence, big data, and robotics emerge. Furthermore, cybersecurity and privacy will also be seen as key elements in the adoption of new technological solutions.

This study mainly offers practical contributions by exploring an emerging theme with high interest from businesses and citizens. This study can be an important asset for companies to prepare for the challenges posed by the post-COVID-19 world and could also be a relevant study for policymakers in establishing business support measures. This study also has several limitations. First, at the time of this study, COVID-19 is still far from being mitigated, and only very recently some countries have restrictions on business activity, and the movement of people began to be lifted. For many companies, the short-term impacts of COVID-19 may turn their business activity unviable. As future work, it would be relevant to explore this work with an empirical study with the business sector to gather feedback from companies on their future plans for digitization. Furthermore, it would also be desirable to segment this study and apply it to various contexts, such as specific countries and sectors of business activity.

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Fernando Almeida (Member, IEEE) received the M.Sc. degree in innovation and entrepreneurship and the Ph.D. degree in computer science engineering from the Faculty of Engineering, University of Porto (FEUP), Porto, Portugal. He is currently a Professor and Researcher with the University of Porto and INESC TEC. He is a Founder Member of IAOP and is involved in the development of the US TAG group for ISO 56000 (Innovation Management). His current research areas include innovation policies, entrepreneurship, and software engineering.

José Duarte Santos (Member, IEEE) received the B.Sc. degree in business sciences, the M.Sc. degree in marketing, and the Ph.D. degree in management from the University of Vigo, Vigo, Spain. He is currently a Professor with the Instituto Superior Politécnico Gaya (ISPGAYA), Vila Nova de Gaia, Portugal and the Instituto Superior de Contabilidade e Administração do Porto (ISCAP), Matosinhos, Portugal. He is also a Researcher with the Centre for Organisational and Social Studies of Polytechnic of Porto (CEOS.PP), Porto, Portugal. His current research areas include social media marketing, social customer relationship management, and social selling.

José Augusto Monteiro (Member, IEEE) received the M.Sc. degree in information management from the University of Porto, Porto, Portugal. He is currently working toward the Ph.D. degree on web science and technology with Universidade Aberta, Lisbon, Portugal. He is currently a Professor with Instituto Superior Politécnico Gaya (ISPGAYA), Vila Nova de Gaia, Portugal. He is a Microsoft Certified Professional (MCP) and has a Certificate of Pedagogical Aptitude (CAP) from IEFP. His current research areas include e-government solutions, web accessibility, and web interfaces.