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Current and future state of Portuguese organizations towards digital transformation

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Abstract

In recent years, digital transformation has emerged as a phenomenon that contributes to the transition from the industrial era to an era of connected and intelligent products, causing great impact on organizations and society. This transformation is revolutionizing, not only on the way people work, but also stresses the need to find new ways of combining physical and digital innovations and interorganizational collaborations in order to foster organizations' success. The research work presented allows increasing the understanding of specific aspects of the phenomenon of digital transformation (DT). From this research it is possible to understand that the technology itself is just part of a complex puzzle, that must be solved in order for organizations to remain competitive in a digital world. It is fundamental to see if organizations in Portugal are already living the mentioned DT or if they are aware of the need to adapt to this new reality. In this context, the objective of this research is to evaluate and compare, in Portuguese organizations, the current state of digital adoption in light of their preparation in relation to the prevailing technological categories (pillars and innovation accelerators), with the future priorities of the organizations in the DT implementation.

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1. Introduction

The World is changing at an unprecedented rate, because technologies are imprinting a pace of change that is transforming society as a whole, in its different dimensions namely smart cities, transport and logistics, green energy, e-commerce, public administration, e-learning, info inclusion, health and culture. This accelerated change is also taking place in organizations and digital transformation is actively being discussed today by academics and industry professionals alike. This acceleration is based, among other factors, on a set of technologies (IoT, big data, social media, cloud computing, blockchain, augmented reality and virtual artificial intelligence and Machine Learning, among others) that are inducing organizations, according to Al-Ruithe, et al [1], *“to the next level of digital customer engagement and IT-enabled business processes and services.”* Thus, according to Berman and Bell [2] *“the challenge for companies is how fast and how far to go to the digital transformation”*. Supplemented by Bushnell and Stone [3] they show that organizations *“have to radically revolutionize themselves every few years just to stay relevant”*.

Current organizations need to be able to make changes quickly in order to adapt to changes in society's habits. For example, according to [4] we live in a platform-based economy in a World where the largest taxi company does not have a single car, or the world's largest accommodation company owns no real estate. According to the same authors, *“digital disruptors act as intermediaries by creating digital platforms that exploit existing infrastructure, products, services, and content”*; however, Baweja et al [4] showed that *“the digital disruption of existing business models is still in its early days and will continue to threaten both new businesses and established enterprises.”*

Based on the above, the concept of digital transformation appears as a systematization of all the changes necessary for organizations to follow this resolution. This concept is not new, as it was introduced in 1990 and reused in mid-2000 [5]. Digital transformation, according to [6] is a dynamic process that implies interrelations and dependencies between strategy and technologies, requiring agility and organizational commitment in all dimensions (systems, processes, structure and organizational culture) in the pursuit of the implementation of different practices in their activity. In this context, the role of technology in digital transformation, according to [7], goes beyond automation and optimization, and serves to help organizations achieve competitive differentiation, by creating additional value.

In a study by MIT Sloan / Deloitte presented in [8], the authors concluded that as the title suggests *“strategy, not technology, drives digital transformation.”* According to the study, mature digital businesses are *“focused on integrating digital technologies ... in the service of transforming how their businesses work. Less-mature digital businesses are focused on solving discrete business problems with individual digital technologies.”* Thus, according to the same authors, digital technologies offer more value when they are integrated and synthesized and supported by a culture that encourages risk taking. As conclusion of this study, it is identified that the investment in technology must be followed by an investment, mainly in the cultural and organizational transformation.

This paper aims to evaluate and compare, in Portuguese organizations, the current state of digital adoption in light of their preparation in relation to the prevailing technological categories (IoT, big data, social media, cloud computing, blockchain, augmented and virtual reality, among others) with the future priorities of organizations in the implementation of digital transformation, and for that a questionnaire entitled *“Digital Transformation in Portugal”* was held.

2. Background

Digital transformation is a topic of discussion within the strategic initiative of organizations. According to Pramanik et al. [9] the construction of digital business strategy is growing and is transversal to organizations. Both

digital and non-digital native organizations are working to incorporate and harness the full potential of technologies to keep their organizations competitive and profitable in an increasingly dynamic environment. In this section, we intend to introduce the digital transformation and organizational agility topics, the basic concepts of the presented research.

2.1. Digital Transformation

Digital transformation (DT), as mentioned previously, is nowadays a reality, not only for organizations, but for the whole society, thus becoming a topic of multidisciplinary research of the scientific community given its transversal nature, namely human resources, marketing, business processes, and innovation. Considering this framework, it can be verified that there are several definitions for the broad concept of digital transformation on literature [10].

Lucas et al. [11] defines digital transformation as “*transformation precipitated by a transformational information technology*”. This transformation involves fundamental changes in business processes, operational routines, and organizational capacity. However, DT is based on the technological pillars as well as the inducers of innovation, which forces an alignment between Information Technologies / Information Systems [12] and business.

In the study presented in [13] the authors concluded that “*executives are digitally transforming three key areas of their enterprises: customer experience, operational processes and business models*”. Gruman [14] goes further by defining DT as “*the application of digital technologies to fundamentally impact all aspects of business and society*”.

Although, as mentioned, the diversity of definitions is great there is no doubt that to ensure a successful DT, there are challenges within organizations that cannot be ignored. According to [15] the main challenges of DT are: (1) Priorities; (2) Aggregate data or customize; (3) Providing more resources to IT staff vs. more self-service analytics; (4) Storing all data vs. choosing data to store that serves a specific purpose; (5) Work performed by people vs. computing machines; (6) Security vs. accessibility; (7) Privacy of individuals vs. understanding of an individual.

As mentioned in the previous section, DT is supported on four technological pillars: mobility, cloud computing, big data, and social media. However, there are other technologies, called innovation accelerators/ that act as DT drivers [12]. However, such technologies cannot be used without careful consideration of the organization's needs and strategy [10].

2.2. Organizational agility

In the current context, organizations face daily challenges that require them to have a constant ability to embrace changes, which are often unpredictable, in several areas namely technology, social, legislative, competitiveness and globalization. Thus, to grant their place in this context, organizations must be agile and ensure their sustainability through continuous improvements. Organizational agility should, therefore, be one of the main objectives of any organization [16]. Bearing this in mind and according to Sambamurthy et al. [17] “*Firms are increasingly relying on information technologies, including process, knowledge, and communication technologies, to enhance their agility.*”

Organizational agility is defined, in the Business Dictionary, as the capability of an organization to rapidly change or adapt, in response to changes in the market. As referred, a high degree of organizational agility can help an organization to react successfully to the emergence of new competitors, the development of new industry-changing technologies or sudden shifts in overall market conditions. Specifically, Sambamurthy et al. [17] argue that agility comprises three interrelated capabilities: customer agility, partnering agility, and operational agility.

Agile organizations, unlike traditional organizations, mobilize quickly to respond to new challenges. These types of organizations are empowered to act quickly to facilitate actions, in short, they behave as living organisms [18]. Therefore, the digital technologies can help organizations quickly adapt to the changes [10].

With changing customer characteristics, a new approach is needed by organizations, with DT becoming one of the possible strategies to make that change happen.

3. State of the art

Starting mostly at 2016, we have found a significant increase of the literature on digital transformation. For the construction of the state of the art, the B-on portal (www.b-on.pt) was used, which is an Online Library of Knowledge that provides unlimited and permanent access to thousands of international scientific journals and e-books. The research was carried out between 2016-2018, with the following queries search: (i) “(Digital AND Transformation AND Portugal)”; (ii) “(DIGITAL AND TRANSFORMATION AND PORTUGAL)”; (iii) “(Digital AND Transformation AND PORTUGAL)”. The results obtained indicate a near absence of studies presenting which direction digital transformation is having in Portuguese organizations. There are only two scientific papers regarding the DT on Portuguese organizations [19, 20], the first one surveys the relationships between the enablers of digital transformation, while the second presents a benchmark of digital transformation best practices in the Tourism industry. None of the papers include a survey of the Digital Transformation in Portuguese organizations, independently of the activity area.

In order to ensure that there are already studies performed when the search query is “(Digital AND Transformation)”, a search was conducted which proved that there were already 4,250 entries, even though most of them are not directly related to the entire search query. Considering the above mentioned research, it was possible to conclude that there are no studies on Digital Transformation in Portuguese organizations, thus making it relevant and justified.

4. Research methodology

For the present study, we used the methodology of quantitative research, since it is more appropriate to determine the opinions of the respondents based on structured questionnaires.

The study was based on an online questionnaire with the title “*Digital Transformation in Portugal*”. Before being available online, the questionnaire was subjected to an evaluation of four experts in the field. After the evaluation by a group of experts the questionnaire underwent some changes. The questionnaire was online for 60 days, being directed to Portuguese companies selected by CIONET, and 77 valid responses were received. Data collected were pooled and treated by using the IBM SPSS Statistics 24.0 software and R software [21]. The statistical analyses [22] used for the data analysis were Descriptive Analysis (frequency analysis, descriptive statistics and graphical representations: boxplots and dotplot), Inferential Analysis (Spearman’s ordinal correlation, Wilcoxon Test for paired samples).

The questionnaire consists of 3 Sections which include: “*Organization characterization*” (Section 1, with four questions), “*Current organization characterization regarding Digital Transformation*” (Section 2, with nine questions), and “*Organization's future in relation to Digital Transformation*” (Section 3, with three questions).

For Section 1, question A2 (“*What role do you play in the organization?*”), and A4 (“*What is the general feeling of your organization when it comes to technological disruption?*”), the respondents could only choose one of eight available options, and one of the four available options, respectively. Due to General Data Protection Regulation (GDPR), questions A1 and A3 could not be treated. Section 2, questions B1 (“*The organization has explored how Digital Transformation impacts suppliers, distributors and other partners*”), B2 (“*The organization's leadership has considered the costs, savings and return on investment associated with Digital Transformation*”) and B3 (“*The organization has, a plan, or strategy, to implement Digital Transformation*”) use a five-point Likert scale ranging: “*Strongly disagrees*” (1) to “*Strongly Agree*” (5). For questions B4 (“*What is the most important goal of the Digital Transformation strategy in your organization?*”), B5 (“*Who leads the Digital Transformation initiative in your organization?*”), B6 (“*What are the main factors that currently help your organization implement Digital Transformation?*”) and B7 (“*What are the biggest obstacles that prevent your organization from implementing Digital Transformation?*”), the respondents could choose more than one option. For the remaining questions, B8 (“*Evaluate the state of the organization's current digital adoption for the following technology categories*”) and B9 (“*Classify the various departments of the organization based on their ability to adapt to technological change*”) the respondents must classify ten technologies and nine departments within a specific scale. For question B8, the respondents must classify within the following scale ranging: (1) “*Nothing prepared*”, (2) “*Unprepared*”, (3) “*Prepared*”, (4) “*Fully prepared*”, and (N/A) “*Not applicable*”. Regarding the last question (B9), the respondents

must classify nine departments within the following scale ranging: (1) “Not agile”, (2) “Not very agile”, (3) “Agile”, (4) “Extremely agile”, and (N/A) “Not applicable”. Section 3, question C1 (“Given the accelerated rhythm of technological change, how does the organization’s ability to adapt in the next 3 years?”) use a five-point Likert scale ranging: “Unable” (1) to “Very capable” (5). For question C2 (“Evaluate (next 12-18 months) the priorities in the implementation of DT in the organization, for the following technology categories”) the respondents must classify ten technologies within the following scale ranging: “No priority” (1), “Low priority” (2), “Strong priority” (3), “Total priority” (4) and (N/A) “Not applicable”. Finally, question C3 (“According to studies carried out, the organizations that are investing in DT, have made more than 10% of their revenues and expect a return between 2 and 5 years. Is this a reasonable investment for your organization?”) use a five-point Likert scale ranging: “Strongly disagrees” (1) to “Strongly Agree” (5).

5. Analysis and discussion of results

In relation to the role the respondents play in the organization (Question A2), 27,3% are Senior executive, 27,3% Senior Manager, 15,6% CIO followed by Manager, CEO and General manager.

The general feeling about organization technological disruption (Question A4) reveals that 61% of the respondents think, that it “Provides new opportunities to improve business”, being of little relevance the other options (“Helps in the conquest of new markets” – 18,2%; “Eventually the organization will adapt” – 14,3% and “Represents a threat to the survival of the organization” – 6,5%). Questions A1 – “email” and A3 – “Sector of activity” of Section 1 could not be treated due to General Data Protection Regulation (GDPR).

Regarding to questions (B1) and (B2) from Section 2, it was found that: 68.9% of respondents agree / strongly agree that their organization has explored how DT impacts suppliers, distributors and other partners; 62.4% of respondents agree / strongly agree that their organization's leadership considers the costs, savings, and return on investment associated with implementing DT. It is important to observe that, a considerable percentage of organizations (20.8%) have a neutral opinion on this issue.

Question (B3) allows us to conclude that 63.7% of respondent organizations state that they agree / strongly agree that the organization has a plan or strategy, to implement DT. It is also important to mention the high percentage of organizations (19.5%) that showed no opinion.

The most important goal of the DT strategy in organization (B4) was “Reach and engage with customers more effectively” (39%), followed by “Modernize legacy IT systems and processes and reduce costs” (29,9%) and “Improve business visibility and increase income” (19,5%).

Concerning who leads the DT initiative in the organization (B5), there is massive leadership from the “Senior executive” team and the “CEO’s”.

When questioned regarding the main factors that help on the implementation of DT (question B6), the “Leadership Vision” factor pointed out by 64.9% of the organizations, stands out significantly. It can also highlight the “Culture of the organization” (48.1%) the “Support of the organization's managers” (42.9%) and the “Technological partners” (40.3%) as relevant factors. It should also be mentioned as a surprising factor, the low results (27.3%) obtained on the “collaborators with knowledge”.

The most pointed obstacles that prevent organizations from implementing DT are, the “Culture of the organization”, and “Inadequate budgets with the values” with approximately equal percentages (42.9% and 40.3%, respectively).

It was found that the leadership and culture of the organization are the most important factors for the implementation of DT in these organizations, therefore, it makes perfect sense that the inadequate budget is a relevant obstacle.

The percentage of organizations that indicate that one of the biggest obstacles is “Managers resistance”, “Employees do not have the necessary skills” and “Confused leadership on what to do” is similar (between 20% and 30%), percentages that, in our opinion, are worrying. Among the various options to choose from “Few technological partners” was the least chosen (6.5%).

In order to evaluate the future of the organization in relation to DT, given the accelerated pace of technological change, we began by investigating the organization's adaptability in the next 3 years (Question C1). With the

obtained results, we conclude that the majority (66.2%) of the organizations are capable or very capable of accomplishing the proper adaptation, even though 27.3% do not consider themselves neither very, nor less capable.

Given the fact presented in question C3, in which organizations investing in DT make more than 10% of their revenues available and expect a return between 2 and 5 years, we find that the respondents of the organizations are almost evenly distributed on the opinions (I disagree / I strongly disagree, do not agree or disagree and agree / fully agree), i.e. there does not seem to be a preponderant opinion.

Finally, in order to evaluate the main objective of this study, we started by comparing the importance of technological categories, both now and in the future (Questions B8 and C2). In this study, the most discriminatory descriptive measure in the comparison of categories in current and future was the mean, that is, the average grade assigned to each technological category (this measure is adequate given the low / moderate dispersion of the data). Figure 1 shows the evolution of the results obtained for the 10 categories in current and future.

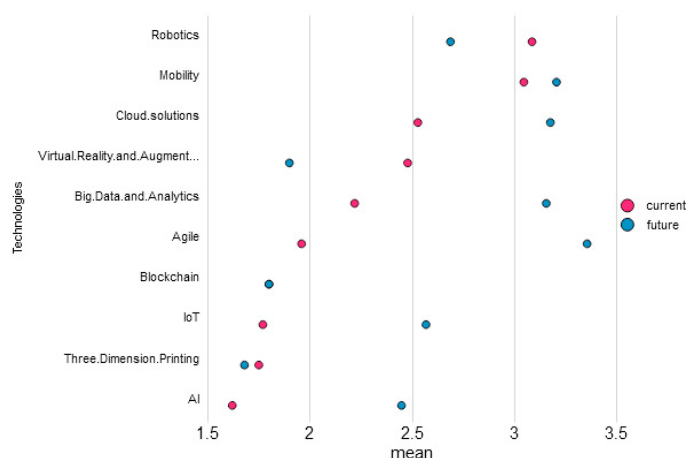


Fig. 1. State of adoption (current) / priority in implementation (future).

In Figure 1, we find that with the exception of the technological categories (Robotics, Virtual Reality / Augmented Reality (VR / AR) and 3D printing), there is a significant increase in organizations regarding the degree of priority / importance in implementation, with respect to the current status of the other categories. Among the categories in which the increase occurred, the following increases are of particular relevance: 71.4% for Agile Collaboration Tools (Agile), 45.2% for IoT Technology / Sensors and 42.3% for Big Data & Analytics. In a more detailed analysis, we can conclude that the categories (Agile, Big Data & Analytics and Cloud) that were evaluated by the organization about current digital adoption and marked as poorly / moderately prepared, are those that have the highest priority in the future implementation of DT in the organization. It should also be pointed out that there is only one category among the ten categories, whose evaluation by the organization in its current adoption and future implementation is preponderant (average above 3), which is Mobility. Finally, it should be noted that regarding Blockchain, the evaluation of organizations in the current adoption and priority of future implementation is identical.

In order to confirm the above conclusions and since the organizations evaluated the digital adoption capacity and the priority in the implementation of the DT (future), we compared the same organizations before (preparation for the digital adoption) and (priority in the implementation of DT) for the same technological categories, which justifies the use of tests for paired samples. Therefore, in order to check whether there are significant differences in organizational assessments (measures on an ordinal scale), before and after, for each of the technological categories, we used non-parametric Wilcoxon tests (Table 1).

Table 1. Results of Wilcoxon Test.

Technological categories	p-values
Mobility	0,522
Cloud solutions	0,000

Big Data & Analytics	0,000
IoT Technology / Sensors	0,000
3D Printing	0,503
Virtual Reality / Augmented Reality	0,000
Robotics / Automation	0,001
Agile Collaboration Tools	0,000
AI	0,000
Blockchain	1,000

The results of Table 1, for which the p -values are above 0.5, confirm the previous exploratory analysis, that is, there are no significant differences in the organizations' evaluations, before and after, regarding Mobility, 3D Printing and Blockchain.

However, a significant reduction in the score of the evaluation of the organizations at the current moment for the future moment in the categories Robotics (p -value = 0.001) and VR / AR (p -value = 0,000). As for the other technological categories (Cloud, Big Data & Analytics, Agile, IoT and AI) there is a significant increase in the score of the evaluation of organizations between the current moment and the future (p -values = 0.000).

Figure 2 illustrates the distribution of the evaluation scores (current and future).

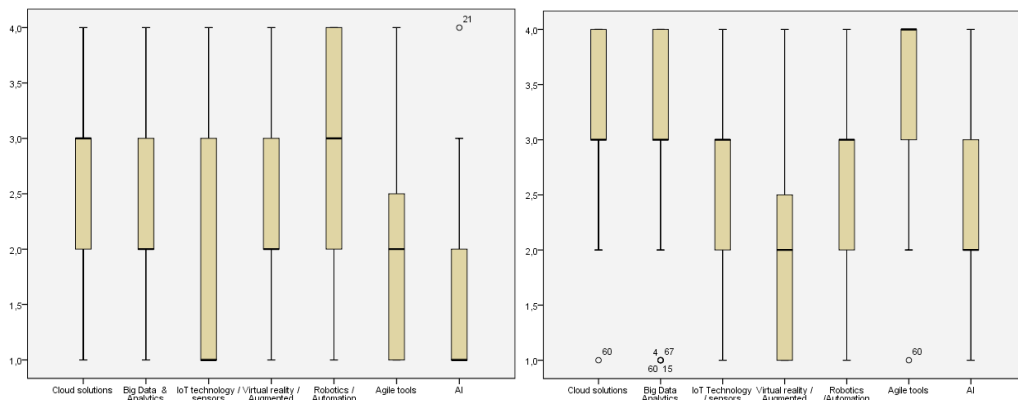


Fig. 2. State of adoption (current) / priority in implementation (future).

6. Conclusions and Future Work

Digital Transformation is becoming, more and more, an expression of the everyday live due to its relevance for the life of organizations. As a consequence of not observing and integrating their implications, it has led large organizations with a consolidated market, presence to disappear. This reluctance to change is an intrinsic factor of the human being, and it is not recognized at the deepest level of the change that organizations have to make for DT, because technology adoption is not enough, it has to be deeper, it has to be organizational. In order to understand the perception of Portuguese organizations regarding the adoption of DT, a questionnaire was created.

The results presented in Section 5 show that, at this time and based on the data collected, DT in Portugal is still in an immature state. The general feeling about organization technological disruption (Question A4) reveals that 61% of the respondents think that it “*Provides new opportunities to improve business*”. However, there are a significantly high percentage of responses to organizational awareness that is necessary for this adoption: 14.3% of respondents say that eventually their organization will adapt. Regarding question B2 (“*The organization's leadership has considered the costs, savings and return on investment associated with Digital Transformation*”) 20,8% of organizations have neutral opinions on this issue and regarding question B3 (“*The organization has, a plan, or strategy, to implement Digital Transformation*”), 19.5% of the organizations have no opinion and, on the other hand, on the point of view of the technological adoption by technological inductors / accelerators which is presented at very low adoption values (B8) [23].

Despite the current situation, most organizations can be considered as capable or very capable of making the necessary adjustments (question C1). Comparing the results obtained with the degrees attributed to the various

technological categories, at present and in the future (questions B8 and C2), it is concluded that, except for Robotics, Virtual Reality / Augmented Reality and 3D printing, there is a significant increase by organizations regarding the degree of priority / importance in the future implementation of the current status of the other categories. Agile Collaboration Tools (Agile), with an increase of 71.4%, IoT Technology / Sensors with an increase of 45.2% and Big Data & Analytics with an increase of 42.3%.

The future work, this study will be extended to a broader audience, by comparing and evaluating the status of Iberian Peninsula organizations with respect to DT.

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