

Article

The Impact of the COVID-19 Crisis on the Digital Transformation of Organizations

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Abstract: The paper aims to analyze the digital transformation process's defining elements in the COVID-19 crisis. Starting from our main objective, which consists of a critical analysis of the defining elements of the digital transformation process in the conditions of the COVID-19 crisis, we formulate the following specific objectives: to analyze the contribution of external organizational factors to put into practice the new opportunities created by the organization's digital transformation; to evaluate the impact of digital competencies on the digital transformation of organizations; and to analyze the role of new technologies in developing digital competencies. We used the partial least squares structural equation modeling (PLS-SEM) and the bootstrapped method to evaluate the model fit, and the model was tested by SmartPLS4 software. Our research is based on information from 203 employees with authority for decision making about the digital transformation strategy in their organizations undergoing a digital transformation process. Our findings revealed that organizations, regardless of size, profile, or field of activity, are affected by changes induced by new technologies and the crisis generated by COVID-19. Therefore, formulating a digital transformation strategy must aim to minimize the risks of obsolescence and maximize the results from exploiting new digital resources. However, our results do not prove that COVID-19 crises directly and positively influence the development of digital competencies. This leads us to conclude that developing these competencies is a continuous process unaffected by disruptive factors such as crises. Instead, the development of digital competencies is influenced by new technologies. Therefore, the COVID-19 crisis directly and positively influences organizations' developing and implementing a digital transformation strategy and new technologies. The theoretical contribution of our research consists of an explanation of the role of perturber factors, such as the crisis generated by COVID-19, in developing digital competencies and improving digital transformation. The practical contributions are dedicated to managers that should have a different approach to the negative phenomena that will be considered catalytic factors of the digital transformation and disruptive factors of the organizational climate.

Keywords: digital transformation; new technologies; digital competencies; strategy



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1. Introduction

The changes produced by digital technologies in the organizational environment and the role of organizational capabilities in adapting to these transformations are analyzed in the literature [1–5]. Despite the interest in the subject, we find it challenging to identify a unitary approach to organizational capacities and how they are built. Therefore, we focused on an approach that identifies organizational capabilities as the set of skills and abilities specific to an organization, aligned and capitalized uniquely to achieve strategic objectives. Teece [6] considers that dynamic capabilities operate as an interface between the modern business environment, characterized by instability and lack of predictability, and strategic direction followed by the organization, thus allowing efficient detection and exploitation of opportunities and realistic threat assessment.

Savić [7] identified the gradual effects of introducing new technologies in the organizational environment, nuanced in digitization and digital transformation. Digitization is the transition of information from analog to digital format, contributing to its rapid dissemination beyond spatial and temporal barriers. Therefore, organizations need to focus on the digitalization process. However, many organizations have failed to notice and capitalize on significant digital changes in their industry (e.g., Kodak and Nokia), losing market dominance. These deficiencies are due to the entry into the market of disruptive actors who have managed, due to digital solutions, to remove digital barriers and respond in real time to consumers' current and constantly evolving needs.

Starting from our main objective, which consists of a critical analysis of the defining elements of the digital transformation process in the conditions of the COVID-19 crisis, we formulate the following specific objectives:

- To analyze the contribution of external organizational factors to put into practice the new opportunities created by the organization's digital transformation;
- To evaluate the impact of digital competencies on the digital transformation of organizations;
- To analyze the role of new technologies in developing digital competencies.

Winkelhake [8] considers that the main objective of triggering the digital transformation process is, for 89.6% of organizations, the need to ensure a viable future. Moreover, traditional organizations are becoming increasingly aware of the opportunities offered by digital transformation, considering it an opportunity to increase customer satisfaction and reduce costs.

The research gap covered by our research consists of the analysis of the impact of negative phenomena, such as those generated by the COVID-19 pandemic, on the success or failure of the digital transformation of organizations. Therefore, to better underline the originality of our study, we raise the following research questions:

Q1: How does digital transformation enhance organizations' opportunities created by new technologies?

Q2: Do negative phenomena influence the development of digital competencies?

The COVID-19 pandemic has reoriented the capabilities needed to adapt to transformations induced by digital technologies by transferring them to personal and interpersonal skills. The success of digital transformation depends, essentially, on a complex set of human competencies [9]. Moreover, digital competencies must be correlated with managerial competencies, which reflects the need for managers to have, in addition to classical managerial competencies, other competencies that require an excellent strategic and functional understanding of how the digital environment works.

The paper has the following structure. First, based on the theoretical background, we formulate the hypotheses. Then, in the next section, we will present the methodology. Next, the results are detailed and followed by discussions. Finally, the paper includes detailed conclusions, limitations, and future research.

2. Literature Review and Hypotheses

The rapid and multidirectional development of digital technology presents a challenge in identifying technologies with disruptive potential for organizations. This phenomenon is reflected in several authors' approaches to innovations and how they can affect organizations [1–5,7,8].

The technological momentum is all the more impressive as technological limitations no longer present an insurmountable obstacle. Therefore, it is considered that it is only a matter of time before technological capabilities surpass human ones [10].

The crisis caused by the COVID-19 pandemic has led to a rapid and global transformation of the social and economic environment in which organizations evolve. Faraj et al. [11] observed that the phenomenon imposed by social isolation suddenly and brutally disrupted daily activities, orienting them towards a rapid digitization pro-

cess. However, in this context of crisis, not all organizations had access, in real time, to digital infrastructures.

The lack of digital competencies for some employees has led to their marginalization. The risks of digitization have been exacerbated by a lack of information technology (IT) resources and limited access to an Internet connection. Cybersecurity is another hot spot revealed by the health crisis. During the pandemic, an intensification of cyber-attacks was observed. The rapid and sometimes imperfect adoption of IT solutions, doubled by human errors, reduced digital security [12].

Flexera [13] highlighted the transformations caused by the COVID-19 pandemic in three areas: work organization, market access, and IT resource management. These transformations represent challenges and opportunities leading to a rapid diagnosis of an organization's digital maturity and formulation of digital strategies. Therefore, new competencies in leadership must be manifested which must be based on flexibility, agility, and superior communication qualities in a strongly digitalized environment [14].

The survival of organizations, especially in times of crisis, is conditioned by their ability to go through these crises, mainly when the organization of activity is severely disrupted. The relationship between supply and demand is no longer strictly coordinated by consumer needs but by digitizing offers. In this context, digital competencies have become a priority for organizations because the digitalization of organizations has become a priority for survival in an environment severely disrupted by the pandemic crisis that has put the limits of analog development to the test. Given these aspects, we formulated the following hypothesis:

H1: *Crises such as COVID-19 directly and positively influence the development of digital competencies.*

Before the crisis caused by COVID-19, organizations had the option to launch digital transformation strategies to exploit the opportunities offered by new technologies and/or protect the organization from digitization risks [15]. However, Oldekop [16] considers that the COVID-19 pandemic has accentuated the digital transformation process, making it necessary.

AppDynamics [17] conducted a study to measure the impact of the pandemic on organizations and concluded that the COVID-19 pandemic allowed both the identification of weaknesses in digital capabilities and the acceleration of digitalization due to the real-time implementation of IT initiatives that in normality would have been ignored or would have been carried out over a more extended period.

This conclusion is also confirmed by Flexera [13], who, through a study of 474 managers directly involved in IT strategy management, strengthens the priority status given to digital transformation strategies as a consequence of the pandemic generated by the COVID-19 crisis. The digital transformation strategy must be accompanied by creating an organizational culture with solid digital influences, which has as attributes agility and flexibility to prepare the organization for new normality after the pandemic crisis [18].

Thus, the following hypothesis is formulated regarding the relationship between the COVID-19 crisis and the implementation of a digital transformation strategy:

H2: *The COVID-19 crisis directly and positively influences the developing and implementing of a digital transformation strategy.*

The COVID-19 pandemic highlighted the increasingly important role played by digital technologies in maintaining competitive advantage and imposed a much more pragmatic approach to the digitization process based on creating a synergy among organization–client–new technologies.

New technologies have become ubiquitous in most areas of activity, from the stage of work organization and communication, by removing barriers of space and time [19], integrating digital strategy into the organization's overall strategy [20,21].

Digital technologies represent both resources and organizational capabilities. In times of crisis, they contribute to the functional approach of the activity, becoming an essential element of digital strategy, because it depends decisively on strategic use [22].

Bharadwaj [23] considers that new technologies increase the organization's efficiency by providing information and integrating digital solutions into the organization's overall strategy in crisis conditions. Moreover, before the pandemic crisis, it was challenging to establish a clear relationship between investment in technology and the performance of an organization [24]. However, due to the crisis, this relationship became obvious.

Considering all arguments presented above, we formulated the following hypothesis:

H3: *Crises such as COVID-19 directly and positively influence the implementation of new technologies in organizations.*

The exponential development of new technologies and the irreversible changes they generate in society and the business environment are perceived as disruptive for organizations [8]. Therefore, there is a change in communication habits and information, as well as in the competitive environment and relations between shareholders.

Technological progress has penetrated both personal and professional life, redefining the structure of professions and the way they have executed [25] in terms of decision making and leadership [26] and the perspective of the labor market, more and more, by the relationship between the demand and supply of digital competencies.

The elaboration and implementation of a digital transformation strategy are conditioned by the transformation of the organization's environment [15]. Therefore, the set of digital competencies in an organization makes the digital transformation strategy aimed at reducing the divergences between the organization and its environment, which leads us to formulate the following hypothesis:

H4: *The development of digital competencies directly and positively influences the implementation of a digital transformation strategy.*

Digital competencies are constantly evolving and have particularities depending on the type of employees. Thus, Prensky [27] distinguished between digital natives and digital immigrants, differentiating individuals born in a world characterized by the ubiquity of new technologies from those who learned to use these technologies at some point in adulthood. The continuous evolution of digital competencies is also argued by Lovelock [28], which expects an increase of up to 75% in 2025 of digital natives in the active population, compared to the 50% increase expected for 2018. In conclusion, how we integrate new technologies into the professional context depends on digital competencies.

Almaiah et al. [29,30], starting from the importance of digital technologies in increasing digital competencies, concluded that using new technologies depends considerably on user satisfaction.

Junior et al. [31] identified the competencies needed to develop new technologies: agility, reactivity, the ability to manage multiple digital channels simultaneously, and the ability to manipulate and view data. The synergy between IT systems and human competencies is also highlighted by the research conducted by Frankiewicz and Chamorro-Premuzic [9], which emphasized the role of human resources in developing digital resources needed to adapt the organization to changes in the external environment, especially in a crisis.

Therefore, we formulated the hypothesis below:

H5: *New technologies directly and positively influence the development of digital competencies.*

Berghaus and Back [32] consider that organizations must constantly evolve and adapt to changes in consumer demands and structural transformations generated by a competitive business environment. Therefore, new technologies play an essential role in promoting the organization's digital transformation. As a result, von Leipzig et al. [33] considered that digital transformation is triggered by the dominant trends of the organization's sector

evolution and in identifying risks that may arise from the competition. Furthermore, the factors that trigger the digital transformation process can be internal or external, related to the need of organizations to adapt to changes generated by new technologies in their environment [34]. Therefore, one of the objectives of digital transformation is to enhance the new opportunities created by new technologies and protect the organization from the risks of using new technologies [15,35].

Digital transformations are conditioned by the implementation of the organization's strategy, with an emphasis on the digital strategy, because it is considered that there is a synergy between the two strategies. Moreover, the technological component is a benchmark for evaluating an organization's digital maturity. However, on the other hand, the success of the digitalization process is conditioned by the degree of the interweaving of new technologies with the organization's strategic objectives [36].

Analyzing the theoretical approaches, we formulate the following hypothesis:

H6: *New technologies directly and positively influence the implementation of digital transformation strategy.*

With regard to these hypotheses, we propose the following conceptual model (Figure 1).

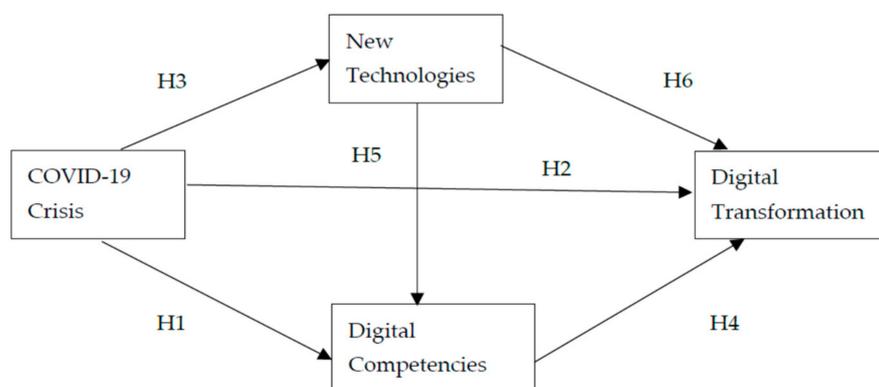


Figure 1. The conceptual model. Source: Authors.

3. Methodology

3.1. Study Instrument

The conceptual model of scientific research was developed based on a questionnaire structured in five sections. The first section is dedicated to respondents, and the organization provides information on the following variables: the number of employees, the organization's profile, gender, and age of respondents. The second section deals with the COVID-19 crisis. The third section is dedicated to digital competencies (DC). The fourth section deals with new technologies (NT). The fifth section is committed to digital transformation (DT). The variables and their items are detailed in Table 1.

The first question of the questionnaire was the following: Is a digital transformation process underway in your organization? If the answer is YES, the respondent continues to fill out the questionnaire; if the answer is NO, the questionnaire is closed.

To evaluate the different items of the questionnaire, a five-point Likert scale from 1 (to a very small extent) to 5 (to a very large extent) was used.

The questionnaire was distributed online to professionals from organizations involved in digital transformation.

Our research is based on information provided by employees with authority for decision making about the digital transformation strategy in their company. All respondents were working in organizations undergoing a digital transformation process.

Table 1. The structure of sample.

| Variables | | Frequency | Percent | Cumulative Percent |
|----------------------|-------------------|-----------|---------|--------------------|
| Number of employees | 1–9 | 24 | 11.8 | 11.8 |
| | 10–49 | 57 | 28.1 | 39.9 |
| | 50–249 | 76 | 37.4 | 77.3 |
| | 250–499 | 18 | 8.9 | 86.2 |
| | over 500 | 28 | 13.8 | 100.0 |
| | Total | 203 | 100.0 | - |
| Organization Profile | Mainly B2B | 128 | 63.1 | 63.1 |
| | Mainly B2C | 25 | 12.3 | 75.4 |
| | Both B2B and B2C | 50 | 24.6 | 100.0 |
| | Total | 203 | 100.0 | - |
| Gender | Female | 112 | 55.2 | 55.2 |
| | Male | 91 | 44.8 | 100.0 |
| | Total | 203 | 100.0 | - |
| Age | 20–30 years old | 32 | 15.8 | 15.8 |
| | 31–40 years old | 92 | 45.3 | 61.1 |
| | 41–50 years old | 45 | 22.2 | 83.3 |
| | 51–60 years old | 27 | 13.3 | 96.6 |
| | over 60 years old | 7 | 3.4 | 100.0 |
| | Total | 203 | 100.0 | - |

Source: Authors.

3.2. The Sample

Data were collected via a survey administered online, and information about the survey was sent by email to organizations from the automobile industry. From an initial respondent of approximately 300 potential respondents, 245 questionnaires were completed, and only 203 questionnaires were validated.

The structure of the sample is presented in the table below (Table 1).

As is presented in the above table, the distribution of representatives of the different types of organizations needs to be balanced. This challenge is the result of the online administration of the questionnaire.

4. Results

We used the SEM-PLS model [37] and the bootstrapped method to evaluate the model fit [38]. Thus, our model was tested by SmartPLS4 software [39].

Table 2 presents the reliability values (loadings) that must be greater than 0.70 [37] and the collinearity statistic (VIF) that must be below the threshold of 5 [40].

We analyzed the data from the above table. We observe that the loadings range from 0.702 to 0.895 (above 0.700), and the variance inflation factors (VIFs) range from 1.312 to 2.586, proving that multicollinearity is not an issue for our model.

Table 3 presents the reliability and validity of the latent variables.

Analyzing Table 3, we observe that Cronbach's Alpha (CA) values range from 0.749 to 0.874, which is above 0.7 [41], the Dijkstra–Henseler [38] statistics (ρ_A) values are between 0.755 and 0.889, the composite reliability (CR) values range from 0.841 to 0.901, which is above the threshold of 0.6, and the average variance extraction (AVE) ranges between 0.566 and 0.665, which is greater than 0.5 [42].

Table 4 presents the Fornell–Larcker criterion [43] to establish discriminant validity.

Table 5 contains the heterotrait–monotrait ratio of correlations (HTMT).

All HTMT values range from 0.189 to 0.570, below the threshold of 0.85 [44]. Our research evaluates the structural model by calculating the R Square indicator, which has values from 0.078 to 0.286 (moderate to sound). Table 6 presents a model FIT Summary.

Table 2. Variables, loadings, and collinearity Statistics (VIF).

| Variables/Items | Loading Values | VIF Values |
|---|----------------|------------|
| C: COVID-19 crisis: The effects of the COVID-19 crisis include: | | |
| C1: Identify gaps in the organization's digital capabilities | 0.735 | 1.584 |
| C2: Confirm the importance of the organization's digital capabilities | 0.895 | 2.370 |
| C3: Development of digital products and solutions and digital sales channels | 0.742 | 1.718 |
| C4: Accelerate the digital transformation process | 0.877 | 2.396 |
| DC: Digital Competencies: Consider that in your organization, employees: | | |
| DC1: Share the goals of the digital strategy and agree to change the way they work to meet them | 0.848 | 2.384 |
| DC2: Can use analytical, cloud, or social media technologies to carry out their activity | 0.780 | 1.761 |
| DC3: Organizes in teams, naturally and fluidly, according to objectives | 0.835 | 2.388 |
| CD4: Considers customer satisfaction a priority | 0.807 | 1.766 |
| CD5: Enjoy freedom in carrying out missions | 0.744 | 1.750 |
| NT: New Technologies | | |
| NT1: To what extent do you agree with the statement: Do new technologies potentially transform the field of activity in which your organization operates? | 0.753 | 1.598 |
| NT11: Artificial intelligence | 0.716 | 1.610 |
| NT12: The Internet of Things | 0.727 | 1.713 |
| NT13: Cloud Computing | 0.778 | 2.044 |
| NT14: Big Data | 0.797 | 2.056 |
| NT15: 3D printing | 0.749 | 2.586 |
| NT16: Virtual reality | 0.745 | 2.531 |
| DT: Digital Transformation | | |
| DT1: Do you consider that your organization has initiated a digital transformation strategy to adapt to the effects of new technologies? | 0.741 | 1.312 |
| DT2: To what extent do you agree with the statement that digital transformation promotes sustainable development? | 0.754 | 1.500 |
| DT3: To what extent do you agree with the statement: Does the digital strategy support the vision and mission of the organization? | 0.812 | 1.684 |
| DT4: Do you think the organization will become more agile due to the digital transformation initiative? | 0.707 | 1.437 |

Source: Authors. Data processed with SmartPLS4.

Table 3. Construct reliability and validity.

| | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE) |
|------------------------|------------------|-------|-----------------------|----------------------------------|
| COVID-19 Crisis | 0.835 | 0.891 | 0.887 | 0.665 |
| Digital Competencies | 0.863 | 0.870 | 0.901 | 0.646 |
| Digital Transformation | 0.749 | 0.755 | 0.841 | 0.569 |
| New Technologies | 0.874 | 0.889 | 0.901 | 0.566 |

Source: Data processed with SmartPLS4.

Table 4. Fornell–Larcker Criterion.

| | COVID-19 Crisis | Digital Competencies | Digital Transformation | New Technologies |
|------------------------|-----------------|----------------------|------------------------|------------------|
| COVID-19 Crisis | 0.816 | - | - | - |
| Digital Competencies | 0.152 | 0.804 | - | - |
| Digital Transformation | 0.343 | 0.399 | 0.755 | - |
| New Technologies | 0.279 | 0.183 | 0.490 | 0.753 |

Source: Data processed with SmartPLS4.

Table 5. Heterotrait–monotrait ratio of correlations (HTMT).

| | COVID-19 Crisis | Digital Competencies | Digital Transformation | New Technologies |
|------------------------|-----------------|----------------------|------------------------|------------------|
| COVID-19 Crisis | - | - | - | - |
| Digital Competencies | 0.189 | - | - | - |
| Digital Transformation | 0.432 | 0.472 | - | - |
| New Technologies | 0.291 | 0.221 | 0.570 | - |

Source: Data processed with SmartPLS4.

Table 6. Model fit summary.

| | Saturated Model | Estimated Model |
|------------|-----------------|-----------------|
| SRMR | 0.073 | 0.073 |
| d_ULS | 1.464 | 1.464 |
| d_G | 0.534 | 0.529 |
| Chi-Square | 587.534 | 587.534 |
| NFI | 0.920 | 0.920 |

Source: Authors. Data processed with SmartPLS4.

The model is significant because the standardized root mean square residual (SRMR) is below 0.8, and the NFI (normed fit index) is above 0.9.

5. Discussion

Implementing a digital transformation strategy is complex and time-consuming, driven by disruptive factors such as the COVID-19 crisis.

5.1. The Impact of the COVID-19 Crisis on the Digitalization of Organizations

COVID-19 crisis has had a profound impact on the digitalization of organizations, as evidenced by the positive and significant correlations recorded between all items of this variable. The strongest correlation is established between C4 and C2—a correlation of 0.725. These lead us to the conclusion that the crisis period caused by the COVID-19 pandemic strengthened the digital capabilities of organizations (C2) and allowed the development of new digital products and solutions (C3), resulting in the acceleration of the digital transformation process (C4). Difficult switching in a world where analog contact has been kept to a minimum has allowed the identification of gaps in the digital capabilities of organizations (C1) and confirmation of their importance (C2), as evidenced by the correlation with a value of 0.538. Identifying gaps in digital capabilities has been a contributing factor in accelerating digital transformation (0.470).

5.2. The Development of Digital Competencies

Analyzing the correlations between the items of the variable that refer to the nature of digital competencies needed for digital transformation, we observe that all items have positive correlations. The strongest correlation is sharing digital strategy objectives to the point of accepting the change of work to fulfill them and working in the team to achieve the goals—a correlation of 0.684. It is interesting to note that respondents revealed the need for self-management and teamwork as essential digital skills. Indeed, one of the transformations in the organization of work brought about by digital transformation lies in the development of skills designed to use analytical, cloud, or social media technologies to carry out their work, thus contributing to the achievement of the objectives of the digital strategy—a correlation of 0.587. To organize in teams and achieve digitization objectives, employees must benefit from the freedom to execute missions—a correlation of 0.610. Sharing the goals of the digital strategy and the willingness to change how we work (CD1) is positively correlated with prioritizing customer satisfaction (CD4). The correlation of 0.599 confirms that customer orientation is essential for accepting the changes produced

by digital transformation. The priority given to customer satisfaction must be correlated with digital competencies, leading us to conclude that they are an essential element for the sound management of customer relations in a digital environment [45].

5.3. The Impact of New Technologies on the Digitalization of Organizations

The new technologies have positive correlations, the strongest correlation of 0.748 being observed between the variables 3D Printing (NT15) and Virtual Reality (NT16). These results demonstrate a significant link between this type of technology that places the user at the center of creating the consumer experience, turning him into an actor who actively participates in value creation. Another significant correlation of 0.628 is that between Cloud Computing (NT13) and Big Data (NT14), identified by respondents among the technologies with the highest disruptive potential on organizations. Although Big Data can exist without Cloud Computing, the two in the organization are very likely. Cloud Computing is the most flexible form of storage, inexpensive, and easy to manage data characterized by volume, diversity, and instability. The combination of the two technologies allows for increasing the value of the data, which can reduce their operating costs. The strongest of the correlations of 0.519 demonstrates that an effective digital strategy supports the vision and mission of the organization. As a result, the organization will become more agile due to the digital transformation initiative.

5.4. The Contributions of Implementing a Digital Transformation Strategy in Organizations

Implementing a digital transformation strategy can promote sustainable development, given that it is already integral to the organization's mission. Indeed, as sustainability becomes a permanent concern, digitalization can make an essential contribution to sustainable development policies by creating partnerships that enable a global approach to the impact of an organization on the environment in which it evolves—a correlation of 0.509. Moreover, a digital transformation strategy, whose role is to adapt the organization to the changes produced by new technologies, acts in synergy with the vision and mission of the organization, thus, contributing to its fulfillment—a correlation of 0.418.

To measure the level of significance in hypothesis testing, we analyzed the significance of the relationship between variables (Table 7) using *t*-test analysis and *p*-values from path coefficients.

Table 7. Path Coefficients—Mean, STDEV, *t*-values, *p*-values.

| Hypotheses | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | <i>t</i> Statistics (O/STDEV) | <i>p</i> Values | Decision |
|---------------|---------------------|-----------------|----------------------------|---------------------------------|-----------------|--------------|
| C -> DC = H1 | 0.111 | 0.117 | 0.0888 | 1.263 | 0.207 | Not Accepted |
| C -> DT = H2 | 0.190 | 0.186 | 0.064 | 2.975 | 0.003 | Accepted |
| C -> NT = H3 | 0.279 | 0.282 | 0.070 | 4.009 | 0.000 | Accepted |
| DC -> DT = H4 | 0.293 | 0.299 | 0.058 | 5.013 | 0.000 | Accepted |
| NT -> DC = H5 | 0.156 | 0.160 | 0.068 | 2.288 | 0.022 | Accepted |
| NT -> DT = H6 | 0.382 | 0.382 | 0.053 | 7.157 | 0.000 | Accepted |

Source: Authors. Data processed with SmartPLS4.

We notice that, for all hypotheses, the values of *t*-test analysis are not higher than 2.4, and the *p*-values are within normal limits (less than 0.05 [41]), leading to the validation of five of six hypotheses.

Figure 2 shows bootstrapping results, reflecting the significance of the relationship between constructs.

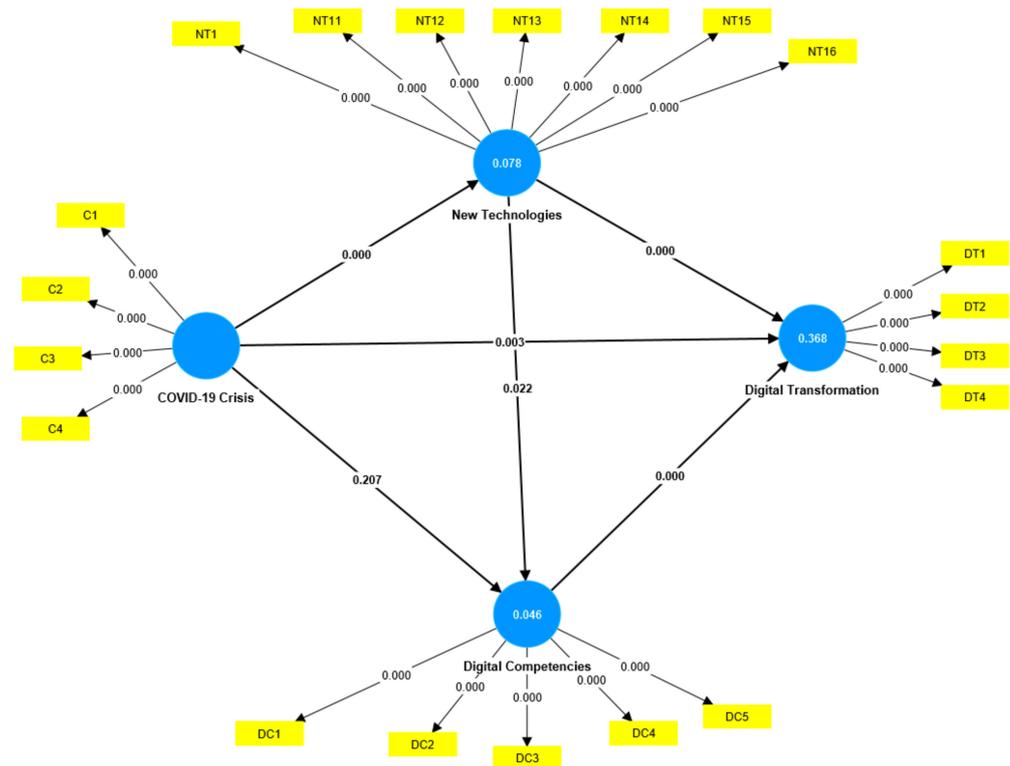


Figure 2. SmartPLS bootstrapping results. Source: Data processed with SmartPLS4.

Regarding triggering a digital transformation strategy, our results align with the research of Dudézert [15], Burlea-Schiopoiu [46], and Ducrey and Vivier [47]. They identify new technologies' disruptive potential and their role in reconfiguring the organizational environment. For these authors, organizations' response lies in formulating a digital transformation strategy, which aims to protect the organization from disruptive competitors and allow it to create and exploit new sources of value.

Teece et al. [48] consider that organizational capacities and digital competencies different from those required by a stable and predictable environment are needed in an unstable ecosystem. Therefore, the authors advance dynamic capabilities to detect the change, capture valuable sources, and transform the organization to align it to meet strategic objectives.

The research of Singh and Hess [49] confirms the importance of management for digital transformation. Our study's results agree with Alos-Simo et al. [50], which consider digital transformation implementation a top-down process requiring a committee or dedicated person to ensure centralized management.

5.5. The Theoretical and Practical Contributions of the Research

The theoretical contribution of our research consists of an explanation of the role of perturbator factors, such as the crisis generated by COVID-19, in developing digital competencies and improving digital transformation.

Previous studies on digital transformation do not analyze the crises as a factor positively influencing the development of digital competencies. For example, Majchrzak and Shepherd [51] discussed the COVID-19 pandemic only in terms of a negative phenomenon without deeply analyzing the potential of crisis to accelerate digital transformation in organizations. Therefore, digitalization researchers can use our study as a departure point for analyzing the particularities of digital transformation in different critical situations generated by internal and/or external factors.

The practical contribution is two folds. First, to ensure the survival of their organizations, managers must be aware that they must ensure the access of all employees to new technologies and provide them with training to use them as efficiently as possible [52].

Second, managers must develop, implement, and continuously adapt the digital transformation strategy, taking the phenomena that could negatively influence the organization's performance as a benchmark. Therefore, the negative phenomena must be considered catalytic factors of digital transformation and disruptive factors of the organizational climate.

6. Conclusions

Our research has explored the triggering and implementation phases of the digital transformation strategy, which has allowed us to identify disruptive technologies as triggers for the need to transform organizations. For example, the pandemic crisis has favored the rapid development and implementation of new technologies designed to respond in real time to users' expectations by removing barriers, especially space ones [53].

Another conclusion of our study is that all organizations are affected by changes induced by new technologies, even at different levels. In response, they formulate a digital transformation strategy involving the organization as a whole. Moreover, the COVID-19 crisis does not directly and positively influence the development of digital competencies, which strengthens our conclusion that the development of these competencies is an ongoing process that affects the competitive advantage of any organization. On the other hand, the COVID-19 crisis directly and positively influences the development and implementation of a digital transformation strategy and the process of implementing new technologies in organizations [54–56].

The COVID-19 crisis has amplified fragility or competitive advantage built on digital solutions, revealing their importance to organizations. Although the effects of this crisis are long-lasting in transforming consumer habits or the competitive landscape, more is needed to act independently on digital transformation or capabilities, which must be part of a global organizational strategy. In this sense, digital transformation is a global and complex process that strongly affects the mission and vision of the organization, and our conclusions agree with Almeida et al. [57].

The limits of our research consist of the fact that it focused on private organizations. However, this phenomenon, especially in the conditions of the pandemic crisis, is also found in public or non-profit organizations. Future research will focus on the comparative analysis of digital transformation in public and private sectors to highlight the particularities of this process at different levels.

Digital transformation was analyzed in a crisis context, and this is another limitation of our research. Therefore, future research will explore digital transformation under normal conditions.

Our future research will analyze the relationship between digital transformation and the enhancement of creativity in organizations. Furthermore, we will study the degree of managers' knowledge related to potential offers by new technology in the framework of the explosive development of artificial intelligence. As a result, we will find the answer to the following question:

Is the human factor still a key resource for the organization in the context of the large-scale implementation of artificial intelligence and the development of the Metaverse?

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