# The Impact of Organizational Culture on the Opportunities and Threats in Digital Transformation

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**Purpose:** The aim of the research is to show how the individual elements of the organizational culture - learning organization - affect the opportunities and threats related to the introduction of Industry 4.0.

**Study design/methodology/approach:** A structured questionnaire was used to survey Hungarian companies. The online questionnaire with closed and measurable scale questions were created and distributed. Questions covered following: perceived and detected threats that may hinder organizations in the digital transition process, the benefits that businesses see as an opportunity in the digital transformation, by examining the most important variables of learning organizations and the opportunities and dangers of digital transformation. As a result, survey received a positive feedback with 639 fully completing the questionnaire. Measurement was performed using IBM SPSS Statistics (Version 22.) In the first stage of the research, an Opportunities and a Threats factor were created using principal component analysis. As a result, instead of seven and twelve variables, one can be used to examine additional relationships. In the next stage of the research, we examined how each element of the organizational culture (Organizational Culture - Learning Organization) affects the factors we created, what percentage they contribute to the formation of each factor. The measurement was performed by linear regression analysis.

**Findings:** A comparison of two queries was performed, the results of which are summarized below. (A) How do certain elements of the organizational culture affect companies' the Industry 4.0 Opportunities? (B) How do certain elements of the organizational culture affect companies' Industry 4.0 Threats? In „A" case, the organizational culture factors explain 15.1% (R Square = .151) of the companies' Opportunity Factor. After the 5th modeling of the program, there are 5 Organizational Culture variables that significantly contribute to the Opportunities of companies. In „B" case, the Organizational Culture factors explain only 5.6% (R Square = .056) of the companies' Threats Factor. Following the 7th modeling of the program, there are 3 Organizational Culture variables that contribute significantly to the Threats of companies,

**Originality/value:** The five Organizational Culture variables that significantly contribute to the Opportunities of companies are: The organization proactively anticipates change, The organization is looking for innovative, new solutions, not limited by the habit, The organization also focuses on long-term impacts when making decisions, In the operation and development of the organization, the effects of the changes on other organizational units are taken into account and, The aim is to jointly develop the learning and development skills of the members of the organization, group learning. The three Organizational Culture variables that contribute significantly to the Threats of companies are: The organization is open to environmental change, The aim is to jointly develop the learning and development skills of the members of the organization, Employees can act to achieve their personal vision, ie. free self-realization.

## Introduction

Nowadays one of the biggest challenges that organisations face today is finding the proper way to shape competitive advantages including the impact of digital transformation on corporate operation and performance in the age of Industry 4.0 (Obermayer et al. 2022). In the course of organizational research, a wide range of definitions of organizational culture have been created in the diversity of cultural research conducted in the last thirty years, and the majority of these definitions are related to some common meaning, interpretation, value and norm (Hofstede et al. 1990).

Organizational culture is a concept whose role in organizational development is no longer disputed in corporate practice (Alvesson & Sveningsson, 2008). Organizational culture is a source of consistency within an organization, helping members to have an unified interpretation of the internal characteristics and external environment of the organization. According to Schein, organizational culture promotes consensus-building on what to do, why, and how, it fosters understanding and identity within the organization (Schein, 1985).

According to Peters & Waterman (2012), organizational culture is the key to corporate excellence and success. They tried to demonstrate by corporate case examples that the "common value system" or superior goals that people believe in and serve faithfully are essential to success. "The excellent companies we studied have all clearly recognized what their core purpose is and take their value systems seriously. In fact, we can't imagine if there could be an excellent company without a clear and correct set of values." (Peters & Waterman, 2012).

Furthermore, research focusing on the factors that support or hinder the digital transformation, combined with the question if they show a correlation with the current stage of the organizational culture of the companies, has not been carried out yet in Hungary. Thus, our present research is considered to fill this gap.

We conducted a survey among Hungarian companies to explore the opportunities and threats they realized during their digital turnover process. As a result of an extensive literature review, we compiled a list that included the most cited positive and negative factors of Industry 4.0.

## *Literature Review*

## Digital Maturity

The concept of maturity was first coined by Phillip Crosby in 1979 as a "complete, perfect or finished state pot" (Tarhan et al. 2016). According to Simpson & Weiner (1989), the term "maturity" generally means "complete, perfect, or finished state," while Bititci et al. (2015), "the ability to respond appropriately to the environment through leadership practices". If this is the case, Schumacher et al. (2016) approach is acceptable, according to which the expansion of maturity also represents some progress in the development of a system. There are various structural approaches and frameworks in the literature to illustrate this process.

Mittal el al. (Mittal et al., 2018) draws attention to that we have to distinguish among maturity models, roadmaps and frameworks. Greissbauer et al. explains that a roadmap for digital transformation has to start by evaluating the existing digital level of maturity, in order to get information's about the strengths you can already build on (Geissbauer et al., 2016). Based on this knowledge the organisation can define the appropriate systems/processes and maturity models, need to integrate into future solutions (Machado et al., 2019). Mettler defined maturity models as continuous improvement tools, that help to reach a more sophisticated maturity level following the defined step-by-step process (Mettler, 2011).

Kane et al. (2017) suggest that digital maturity is a systematic path for an organization to undergo digital transformation, while Chanias and Hess say that digital maturity reflects the state of an organization's digital transformation process (Chanias & Hess, 2016). The authors explain that digital maturity describes what a company has already achieved during the transformation and how it is systematically preparing to adapt to an increasingly digital environment in order to remain competitive.

According to Kane (2019), digital maturity goes beyond the use of new technologies. The company aligns the workforce, culture, structure, and tasks by taking advantage of the opportunities provided by the technology infrastructure inside and outside the organization. It is about continuous adaptation, where the ability to respond appropriately to change is also important, in which digital skills can help. Maturity as a quality feature is constantly changing over time, so managers need to be aware of the working methods associated with digital trends so that the organization fits in well with the given environment and has the right adaptability (Kane et al., 2017).

To be digitally "mature", a company must overcome a number of obstacles, including the highest possible customer service with the highest product quality and optimal cost-effectiveness. The biggest obstacles are the lack of strategy and competing priorities. The lack of a digital strategy is typically the biggest barrier for early-stage companies (Kane et al., 2015).

The digital maturity describes what a company has already achieved in implementing digital transformation. On this way there are a number of barriers that businesses can face; among others the organisational culture and the human factors are quoted more and more repeatedly. Scientific literature mention the lack of capabilities to change, the lack of motivation and the missing digital skills and workforce (Tijan et al. 2021).

After reviewing the above literary definitions, we can conclude that the most important thing from the point of view of our investigation is that organization, culture and technology are almost without exception a common factor in digital maturity. The listed factors appear in all models, regardless of company size. Table 1 summarizes the factors. Based on these, higher digital maturity requires a full commitment from the company to make a lasting investment in people, skills, technology and cultural change.

**Table 1: The most important factors in digital maturity**

| Literature resources | The factors examined |
|---|---|
| **Blatz et al. (2018)** | strategy and leadership, corporate culture and organization, IT infrastructure, data maturity, process and operation, product |
| **Deloitte (2018)** | customer, strategy, technology, operation, organization and culture |
| **Gill – VanBoskirk (2016)** | culture, technology, organization, insights |
| **McKinsey (2016)** | strategy, culture, organization, ability |
| **Mittal – Romero – Wuest (2018)** | finance, people, strategy, process, product |
| **North et al. (2019)** | growth, strategy, mindset, resources |
| **Pirola et al. (2019)** | strategy, people, processes, technology, integration |
| **PwC (2016)** | processes and infrastructure, digital sales, customer engagement, people and culture |
| **SAP (2017)** | digital transformation management, organization, culture, skill management, learning experience, capacity absorption, learning measure |

Source: Blatz et al., 2018, Deloitte, 2018, Gill & VanBoskirk, 2016, McKinsey, 2016, Mittal et al., 2018, North et al., 2019, Pirola et al., 2019, PwC, 2016, SAP, 2017.

## Digital Transformation

Digital transformation is understood as the struggle of companies with the challenges of the fourth industrial revolution (Industry 4.0) (Saldanha, 2019), which is embodied in the business use of contemporary information technologies (Gerbert et al., 2015), and which ultimately leads to the fusion of technological and business processes results in (Kusiak, 2017).

Digital transformation is attractive because it enables the integration and expansion of production processes both within and across organizations, but it is also a great challenge (Nevo & Wade, 2010). A very small percentage of companies succeed (Issa et al., 2018)

The success of the digital transformation depends heavily on digital maturity (Deloitte, 2018). When we talk about digital transformation, the emphasis is not necessarily on digital transformation, but on transformation, in which the human factor plays an important role (Westerman, 2017).

According to Jones et al (2021) "digital transformation is less about adding technology to the production line and more about changing all aspects of the business from processes to culture starting with the pervasive mindsets held by individuals and as a collective organization, and that because of this, new strategic initiatives are needed to accomplish such transformations."

It is also important to examine the opportunities and threats of digital transformation in the literature.

On the side of possibilities, Tijan et al. (2021) and Mahmood et al (2019) are the most relevant to us. Tijan identified three important areas in the maritime sector that are emerging as drivers: organizational, technological and external environmental factors, more specifically: new and innovative technologies, changes in customer behavior and customer expectations; the position of competitors. And based on Mahmood's research, the scope can be further expanded: with the concepts of value creation, operational efficiency, customer relationship, commitment, and competitive advantage. Mahmood et al. it also identified the following success factors for the digital transformation of organizations: effective strategy, strategic alignment, strategy for the role of people, development of knowledge management strategies, commitment of senior management, appropriate organizational culture, multifunctional collaboration, IT infrastructure and change management.

On the side of threats, Tijan et al. (2021) was one of the authors who explored the most important barriers to digital transformation. There are plenty of barriers to list, but the three most important groups (as far as opportunities) are barriers related to the organization, technology, and external environment. More specifically, lack of cultural integration, lack of vision and strategy, lack of motivation, digital skills and workforce. In addition, new technologies are costly, may face cyber security issues, and may lack the appropriate regulatory and legal environment. Similar barriers to digital transformation appear in the list of Tritaphti and Gupta (2019), supplemented by unreliability of data, lack of benchmarks, low level of technology maturity, high initial level of investment, inadequate infrastructure, resistance to change. (Tritaphti, Gupta, 2019).

The questions in our questionnaire regarding the opportunities and threats of industry 4.0 for organizations were therefore formulated after studying the above literature.

## Organizational culture

Among the definitions of organizational culture, it is worth examining the most cited ones. Handy (1993) stated very simply that organizational culture: "means deeply embedded beliefs and convictions in the organization." According to Denison D. R. (1996), culture is responsible for the deep structure of the organization, which is rooted in the values, beliefs and assumptions

of organizational members. Schein's (1990) definition: "the patterns of basic assumptions that an organization has learned while solving its external and internal problems and that have proven themselves to be accepted, valid and workable for similar problems. This definition is also worth considering, because it is here that the dynamic approach to culture appears for the first time."

Organizations strive to build a culture that is unique to them and gives the organization its uniqueness. Uniqueness is caused by the interaction of environmental and organizational characteristics, social influences and traditions. A common feature of this infinite variety of organizational culture, according to Deal & Kennedy (1982), is that members of the organization accept, value, act on, and commit to it.

The development of organizational culture is a slow and long process. Its effect develops only slowly, it takes time for the development of common values, norms, management habits and behavior. The effect of a strong culture, on the other hand, is long-lasting. Culture is actually the self-regulatory system of an organization. At first, the members of the organization only adapt to the norms, then accept them, later identify; eventually, organizational values are embedded in their personalities. (Schein, 1985).

There are many barriers to the adoption and integration of new technologies at the organizational level. Johnson (2010) highlights the importance of perceived organizational-level risks, such as hidden errors that do not come to the surface during system tests, as well as financial risks. These reduce trust in the adoption of new technology at the organizational level, which can be compounded by limited knowledge of the benefits of the system, as well as the lack of preparation of the organization (e.g.: difficulties in implementing new technologies, lack of industry standards, etc.). Fitzgerald et al. (2014) reached similar conclusions in their study examining the organizational introduction of digital technologies. They also emphasize the importance of organizational commitment and vision in successful technology introduction.

Our research questions regarding the topic are as follows: A. How do certain elements of the organizational culture affect the companies' Industry 4.0. opportunities? B. How do certain elements of organizational culture affect companies' Industry 4.0 threats?

We believe that, in general, the above approaches are a good illustration of the complexity and essential elements of organizational culture. For this reason, we hypothesize that some elements of learning organizations have an impact on the opportunities and threats inherent in the digital transformation of companies.

*Methods*

The empirical study examined the impact of organizational culture on the opportunities and threats of digital transformation. Based on the literature review, a list of obstacles, opportunities and elements of organizational culture related to digital transformation was compiled, and a quantitative survey was applied among Hungarian enterprises.

We used a structured questionnaire to survey Hungarian companies. The service and the educational sector were excluded from the analysis, because neither of them has up-to-date financial data. If we narrow the sample further, we can look for medium-sized, large, and giant production companies that have presumably already addressed the issue of Industry 4.0. The companies we examined belong to the sectors listed below:

- Agriculture, forestry, and fishing,
- Mining and quarrying,
- Manufacturing,

- Electricity, gas, steam, and air conditioning supply,

- Water supply; sewerage, waste management and remediation activities,

- Construction,

- Wholesale and retail trade; repair of motor vehicles and motorcycles,

- Transportation and storage,

- Real estate activities,

- Professional, scientific, and technical activities,

- Public administration and defence; compulsory social security.

The basic population was given by a list received from the Orbis database, which consisted of a total of 54.291 companies. Since our questionnaire was prepared and distributed online, we excluded businesses whose electronic contact information was not included in the database. The survey lasted from 11th March, 2021 till the end of April 2021, resulting in a total of 639 fully and 2350 partially completed responses. We did not process the partial answers, as they did not contribute relevantly to the focus.

In the questionnaire, we used fundamentally closed, measurable scale questions, which were covered

- perceived and detected threats that may hinder organizations in the digital transition process

- the benefits that businesses see as an opportunity in the digital transformation

- by examining the most important variables of learning organizations and the opportunities and dangers of digital transformation.

In our research, we opted for a 4-point scale, because the even-numbered scales have no neutral point, force the respondent to commit to a certain position (Brown, 2000). Measurement are performed using IBM SPSS Statistics (Version 22.)

In the case of the opportunities of the digital transformation ("A" case), companies had to mark the most characteristic of them out of 4 possible answers (1 - not at all typical - 4 - completely typical), which are the following: decision support based on digital data, digital tracking of raw materials and products, automated material handling, supply chain integration and transparency, fleet Industry 4.0 Compatibility (Digital Data Service), use of cloud-based solutions, production automation, apply augmented reality solutions, M2M - Communication between machines, application of artificial intelligence, automated debugging and forecasting (eg. maintenance scheduling). real-time inventory management (automated entries).

In the case of the threats of the digital transformation ("B" case), the above 4 possible answers were given, but in this question and the companies had to respond to the following 7 factors: ad hoc leadership without strategy, lack of digital skills of the workforce, labor law and employment issues, distrust of technology, distrust of employees, data security (data protection of electronic documents), cyber security (protection of the technical infrastructure of the information system).

First of all, we created an "Opportunities" and a "Threats" factor using principal component analysis. As a result, instead of seven and twelve variables, we can use one to examine further correlations.

As a statistical control, we also analysed how much the new aggregated variables retained from the information content of the original variables. When creating the factors, a minimum

aggregate level of variance should be achieved, which is 50% according to Székelyi and Barna (2004). Based on the results, it can be clearly seen that the total explained variance is 55.35% for Threats, and 58.97% for Opportunities. Thus, in both cases, it exceeds that minimum level.

*Results*

In the next stage of the research, we examined how each element of the organizational culture (Organizational Culture - Learning Organization) affects the factors we created, what percentage they contribute to the formation of each factor. The measurement was performed by linear regression analysis. During the measurement we were able to clearly determine which of the explanatory and which is the explained variable, so we did not perform correlation but regression analysis.

Within the framework of the organizational culture, the companies had to mark the most characteristic of them out of 4 response options for nine factors / variables (1 - not characteristic at all - 4 - completely characteristic), which variables are the following: the organization is open to environmental change, the organization proactively anticipates change, the organization is innovative, looking for new solutions, not limited by habit, the organization also focuses on long-term impacts when making decisions, the effects of changes on other organizational units are taken into account in the operation and development of the organization, the aim is to jointly develop the learning and development skills of the members of the organization, group learning, it is important for the organization to integrate individual, employee visions into the organizational vision, employees are aware of how their work contributes to the achievement of organizational goals, employees can act in order to achieve their personal vision, is free self-realization.

In regression models, the behavior of a dependent variable is explained by independent variables that are themselves high measurement levels. Before starting the analysis, we need to consider 3 aspects (Achen, 1982).

The first is that the null hypothesis states that there is no relationship between the variables. We accept that if the significance is between 0.05 and 1, respectively. will be rejected if below 0.05. The second step is that the explained variable (i.e., in our case, the Opportunities, and the Threats factor) must have a normal distribution, which is measured by the Kolmogorov-Smirnov test. If the significance of the Kolmogorov-Smirnov test is above 0.05, the variables are normally distributed. The third step is to test for homogeneity, where the Levene test value should be above 0.05 so that we can decide whether homoskedasticity is met. If the data are plotted on a scatter plot and are more densely than average around a line, the data can be said to be homoskedastic. If the figure differs from this, then we are talking about the phenomenon of heteroskedasticity, the variances in this case are not the same.

A comparison of two queries was performed, the results of which are summarized below. The two studies were as follows:

A.      How do certain elements of the organizational culture affect companies' the Industry 4.0 Opportunities?

B.      How do certain elements of the organizational culture affect companies' Industry 4.0 Threats?

The following was observed during the study:

The number of items in the sample is high (Descriptive Statistics, N = 639). The null hypothesis is rejected in both cases, because the significance level is 0, so there is a relationship between the variables. The second step was overturned in all three cases, since the significance of the Kolmogorov-Smirnov test is also 0, so the explained variables are not normally distributed, but

the study can be performed independently. The situation is similar with the homogeneity test, because in the case of several explanatory factors, on the one hand, it would be many to compare the variables one by one, and on the other hand, it is almost impossible not to have a correlation between them.

In the query, we used the "Backward" method, in which all independent variables are included in the model in the first step, and then, based on the "fall worm" principle, the independent variable producing the weakest partial explanation is removed from the model first. The discarding of the "bad" independent variables continues until each of the variables in the model has a partial explanation that is significant.

In „A" case, the organizational culture factors explain 15.1% (R Square = .151) of the companies' Opportunity Factor (Table 2). After the 5th modeling of the program, there are 5 Organizational Culture variables that significantly contribute to the Opportunities of companies, namely:

- The organization proactively anticipates change,

- The organization is looking for innovative, new solutions, not limited by the habit,

- The organization also focuses on long-term impacts when making decisions,

- In the operation and development of the organization, the effects of the changes on other organizational units are taken into account and

- The aim is to jointly develop the learning and development skills of the members of the organization, group learning.

The above variables, i.e., each element of the organizational culture, contribute -14.5, 14.1, -10.7, 12.9, and 16.1 percent, respectively, to the definition of Opportunities. The "B" value (Unstandardized Coefficients) shows the slope of the regression value and as we can see "the organization proactively anticipates change" and "the organization also focuses on long-term effects when making decisions" and there is a negative / inverse relationship between the Opportunities.

Table 2: Explanatory power of Study model "A"

| Model | R | R Square |
|---|---|---|
| 1 | ,396[a] | ,157 |
| 2 | ,396[b] | ,157 |
| 3 | ,395[c] | ,156 |
| 4 | ,392[d] | ,154 |
| 5 | ,389[e] | ,151 |

Source: own research, 2021

In „B" case, the Organizational Culture factors explain only 5.6% (R Square = .056) of the companies' Threats Factor (Table 3). Following the 7th modeling of the program, there are 3 Organizational Culture variables that contribute significantly to the Threats of companies, namely:

- The organization is open to environmental change,

- The aim is to jointly develop the learning and development skills of the members of the organization, to

- Employees can act to achieve their personal vision, ie free self-realization.

The above variables, i.e. the individual elements of the organizational culture, are -13.2, 14.9, and 16.7 percent to the definition of Threats. The value of "B" shows the slope of the regression

value and as we can see "the organization is open to environmental changes" and there is a negative / inverse relationship between the Threats.

**Table 3: Explanatory power of Study model "B"**

| Model | R | R Square |
|---|---|---|
| 1 | ,255[a] | ,065 |
| 2 | ,255[b] | ,065 |
| 3 | ,252[c] | ,063 |
| 4 | ,249[d] | ,062 |
| 5 | ,246[e] | ,060 |
| 6 | ,241[f] | ,058 |
| 7 | ,236[g] | ,056 |

Source: own research, 2021

In summary, Figure 1 shows that some of the variables in organizational culture affect the 2 factors we created. Perhaps most interesting is the fact that "group learning", which ultimately helps to develop and interpret common aspects between employees and the company, can also be used to develop and interpret common hazards. This also contributes to the Opportunities factor. So, we managed to establish a connection between some elements of the organizational culture and the opportunities and threats of the industry 4.0 of the organizations, but this connection is quite low.

**Figure 1: The effect of organizational culture variables on the factor of opportunities and threats**
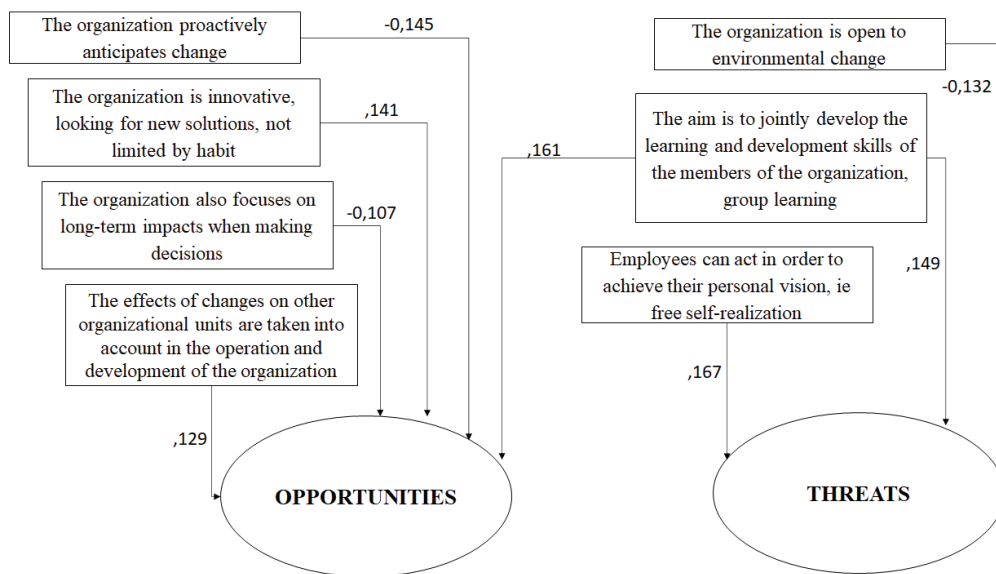


Source: own research, 2021

## Conclusion

Our empirical study examined the impact of organizational culture on the opportunities and threats of digital transformation. Based on the literature review, we compiled a list of obstacles, opportunities and elements of the organizational culture related to the digital transformation, and we used a quantitative survey among Hungarian Companies.

As can be seen, almost all elements of organizational culture contribute to some factor (opportunity / threat). The opportunity factor is explained by five variables of the elements of the organizational culture, three of which are positive and two are negative. The two negative relationships (the organization proactively anticipates change and focuses on the long-term effects of the organization's decisions) mean that responding companies know that these two

aspects would be an option for them during the digital transformation, however, their organization is not currently works according to.

The threats factor is explained by three variables of the elements of the organizational culture, two of which are positive and one is negative (the organization is open to environmental changes). According to company executives, being open to changes in the external environment poses a high risk to your company. It should be emphasized that the goal is to jointly develop the learning and development skills of the members of the organization, group learning appears on both sides, so according to the filling companies, this aspect is both an opportunity and a threat to be introduced and applied.

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