# Disruptive Technologies as a Driver to Organizational Success. Organizational Culture Perspective

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## Abstract

*There is a lot of evidence in the research literature that Information Technologies can play a crucial role in achieving competitive advantage, improving decision-making, and achieving organizational success. Unfortunately, research on exploring the issues of using Disruptive Technologies (DT) is still limited, especially studies into the relationship between the use of DT and organizational success.*

*The main contribution of this study is to investigate the issue of DT's impact on organizational success, in particular identifying the benefits of using DT in organizations, as well as examining to what extent organizational culture can be a factor in enhancing organizational success.*

*The study presents the results of research on the use of Disruptive Technologies carried out in 194 organizations, especially in the areas of DT usage and the benefits that organizations achieve from adopting them, as well as the impact of organizational culture on organizational success.*

**Keywords:** disruptive technology, business intelligence, organizational success, organizational culture

## 1. Introduction

The beginning of the 21st century brought huge changes in the management domain, people's way of thinking, perception of the organization's success, and Information Technologies (IT). Modern organizations are expected to be able to anticipate the future, quickly establish cause-and-effect relationships, and propose new ways of doing things. Allocating intangible resources (information and knowledge in particular) at the center of wealth production and skillfully utilizing IT have become crucial tasks of the organization. Modern information technologies, such as Business Intelligence (BI), Cloud Computing (CC), Mobile Technologies (MT), Big Data (BD), Internet of Things (IoT), Artificial Intelligence (AI), and Blockchain, are often called Disruptive Technologies (DT) and are an area of interest for many researchers. It is believed that thanks to them, organizations can achieve organizational success. It means that they can be more innovative, achieve a competitive advantage, acquire new customers, and enter new markets as well as improve the work of individual departments, and create a comprehensive information infrastructure that ensures effective collection, filtering, integrating, analyzing of data, and conduct transformation in an organization (i.e., the introduction of new business models focused on change management, knowledge management, and customer relationship management) (Tung, 2000), (Kersten, 1999), (Laudon & Laudon, 2020), (Olszak, 2016), (Power et al., 2001), (Delen, 2014).

Although the topic of DT is an issue broadly discussed in the literature, the relationship between DT and organizational success has not been sufficiently described and documented. In other words, despite much research, there is a clear research gap regarding the impact of DT on the benefits organizations derive from their use. In particular, it was not possible to identify to what extent the organizational culture may influence DT use and the achievement of organizational success.

This study aims at identifying the impact of DT on organizational success, in particular, determining which DT are most often used in organizations and what benefits organizations derive from using DT, and at pinning down to what extent organizational culture can be a factor in enhancing organizational success. A survey query was employed to achieve the established research goal. The questionnaire consisted of 7 closed questions. The study used a 5-point Likert scale. The

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survey was conducted among 194 organizations in Poland in 2019.

The structure of the study was subordinated to the established research goal and the research method employed. At the outset, the meaning of the term "Disruptive Technologies" is explained and the most important types of DT are characterized. Further, the study focuses on the issue of organizational culture as a factor influencing organizational success. Then, the paper discusses the ideas of empirical research, which were harnessed to examine the impact of DT on organizational success and to identify the relationship between organizational culture and organizational success and DT adoption. The study ends with a summary, which includes the most important conclusions from the research and the limitations of the research method employed.

## 2. Literature background

### 2.1. Disruptive technologies

Interest in IT as a factor in socio-economic development is not a new phenomenon and has long been the subject of numerous studies. Many authors (Bahli, 2004), (Roztocki & Weistroffer, 2008), (Arney, 2008) agree that the development of organizations and entire economies depends on the level of investment in science and technology. It is believed that IT, especially today, have become a strategic tool for economic growth, determining the competitiveness of many organizations and their innovative development (Drucker, 2014), (Nonaka & Takeuchi, 1995), (Tan et al., 2005). The rapid growth of available technological solutions leads to the creation of new sets of challenges for entrepreneurs. Organizations are to put a great effort into noticing impactful technologies and preparing accordingly for the possibility of new implementations (Christensen et al., 2015). Technologies that are considered groundbreaking can become a game changer for the market even if at the moment they cannot fulfill the organization's or customer's needs. The emerging technologies that promise new possibilities are defined as Disruptive Technologies.

The scope of defining the term "Descriptive Technologies" is very broad and has been a topic of extensive scientific debate (Li et al., 2018). It is difficult to grasp the clear research borders of the term. According to Carroad and Carroad (1982), the disruptiveness of technology is a spectrum, not a state. Nagy et al. (2016) distinguished DT by the effect that it has on customers, forcing or encouraging them to change their behavior patterns. New technology can induce new products that have different functionalities to which customers have to adjust. Foster (1986) highlighted broader capabilities of DT than existing technologies which are able to grant the customer more value (faster production process, more functionalities, and impactful cost reduction). More recent research described DT as the innovation that seeks to tap into unforeseen markets, create products to solve problems that consumers are unaware of, and ultimately change the face of the industry (Susenso, 2018). According to Alberti-Alhtaybat et al. (2019), this brings stirring of the market and creates possibilities that are unimaginable but after successful implementation, indispensable. In the opinion of Christensen (1997), prior to capturing the market, DT often plays an inferior role to well-established technologies. It occupies a niche and is accepted mainly by those organizations that are keen on innovation. The change which is brought by DT is fresh and interesting for customers and organizations, thus far it can become a commonly used technology.

Finally, according to several authors (Susenso, 2018), (Alberti-Alhtaybat et al., 2019), (Christensen 1997), DT are used to develop modern strategies and business models, create sources of competitive advantage, make fundamental transformations in organizations, and integrate and develop the entire ecosystem.

### 2.2. Most promising Disruptive Technologies

Modern studies indicate that the greatest impact on the development of the organization will belong to such technologies as (UNCTAD, 2018), (Frizzo-Barker, 2019), (Nieuwenhuis, 2018): Business Intelligence (BI), Cloud Computing (CC), Mobile Technologies (MT), Big Data (BD) Internet of Things (IoT), Artificial Intelligence (AI), and Blockchain.

Their characteristics are provided in a synthetic way below.

**2.2.1. Business Intelligence.** BI is defined as an umbrella term including different technologies used for gathering, storing, analyzing, and presenting data (Ul-Ain et al., 2010). Its main purpose is to deliver information to managerial staff, resulting in more accurate industry descriptions and better business decisions (Davenport et al., 2010). The value that can be achieved by using a well-designed BI system can be transferred into establishing cooperation, acquiring new customers, creating market opportunities, or developing new products (Olszak, 2020). Moreover, thanks to a potential boost in internal and external collaboration capabilities, this technology can provide insights and trade-offs, allowing for quick and accurate responses to

unpredictable events (Ping et al., 2018). In recent years BI redefined reporting with tools allowing for data exploration, manipulation, formatting, and visualization (Schlesinger & Rahman, 2016).

**2.2.2. Big Data.** BD technology resolves around broadening the spectrum of BI systems, analyzing "the whole environment of the organization: internal resources, customers, suppliers, users of the internet, and communities of practices" (Olszak & Mach-Król, 2018). The key factor in this process is a proper IT infrastructure (e.g., data warehouses), accurate analysis tools (e.g., OLAP, data mining software), and access to a sufficient source of data. It is worth mentioning that BD systems look for a way to extract value even from unstructured content (e.g., internet traffic, social media, videos, and voice logs). BD system allows for broader access to data, throughout many levels of management. It grants means for data collaboration and multiplies the effects of smaller-scale BI and allows for getting more significant results (Raguseo, 2018).

**2.2.3. Cloud Computing.** CC allows for sharing IT assets such as computing power and storage space over the internet. National Institute of Standards and Technology (Mell & Grance, 2011) defines it as "a model which permits ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction" Such IT infrastructure leads to an increase in turnover and possibilities of using IT products in "as a Service" model. This influences the means of collaboration in the organization and the way software is created, distributed, and developed because CC eliminates the need for extensive infrastructure and significantly reduces the cost of operation. (Nieuwenhuis, 2018).

**2.2.4. Mobile Technologies.** MT make the management process more dynamic. They grant access to real-time reporting on the mobile device for managerial staff, therefore, allowing for a quick and easy way to access valuable information from any place. The aspect of time is especially important for a changing industry (Pauleen, 2015). Moreover, MT grant possibilities for quick and clear collaboration among organization members, smoothening the process of management. The simplicity of mobile solutions interface (e.g., mobile wallet, mobile learning, mobile analytics) lowers the entry threshold, therefore the technology can be used by less IT skilled users (Lew et al., 2020).

**2.2.5. Artificial Intelligence.** According to Russel and Norvig (2016), AI can be delineated as "systems that mimic cognitive functions generally associated with human attributes such as learning, speech, and problem solving." Kaplan and Haenlein (2019) presented a more detailed description of AI as software with the ability to independently interpret and learn from external data to achieve specific outcomes via flexible adaptation. With the ability to overcome shortcomings of traditional software and the potential for growth and learning, AI can be used as a foundation for autonomous goods, such as vehicles, chatbots, translators, or medical robots. It can lead to significant cost reduction, elimination of errors, and possibilities for using a machine to conduct dangerous, tiresome, or high precision tasks which could be difficult for a human being to perform. Financial revenues and broader production capabilities can be achieved. Constant learning and improvement of the software result in continuous growth in the effectiveness of the solution (Russel & Norvig, 2016).

**2.2.6. Internet of Things.** IoT focuses on creating a combination of physical and digital products, thus far delivering a new product with more functionalities. Thanks to the rapid growth of computer technologies, power management, and communication, it is possible to enhance the functions of traditional products with IT services (Moktadir et al., 2018). Apart from its basic functions, the product gets connected to the internet and enables real-time monitoring, notifications, remote control, and custom adjustments. The most common areas of IoT usage are smart industry and smart housing, e.g., smart home areas, intelligent thermostats, security systems, smart energy applications, or smart transportation. Apart from individual value, granted to a user of one smart product, its impact can be observed on a much larger scale in collaboration between users of smart items. Connected to related products and/or a whole system of utilities, the device can give its benefactors valuable information about possibilities for optimization and elevating effectiveness, thus far convergence to the success of the organization (Porter & Heppelmann, 2014).

**2.2.7. Blockchain.** A blockchain is a technology allowing its users to create stable and easily retractable sets of information about actions taken. Standard blockchain is an IT infrastructure, consisting of data packages (blocks) that trace multiple performed operations. With action undertaken, the chain is expanded by another block, corresponding with the previous one. Each block contains a time stamp,

**Table 1. Key benefits from usage of selected DT.**

| DT | Key Benefits | Authors |
|---|---|---|
| Business Intelligence | Broad analytics, enhanced ways of gathering, storing, analyzing, and presenting data, more accurate business decisions. | (Schlesinger & Rahman, 2017), (Rahardja & Harahap, 2019) |
| Big Data | Extending the spectrum of data analysis, extracting value from unstructured data. | (Oussous et al.,2018), (De Mauro et al., 2017) |
| Cloud Computing | Cost reduction, new ways of developing software, increase in turnovers, software as a service possibilities. | (Schlesinger & Rahman, 2017), (DaSilva et al., 2013) |
| Mobile technologies | Real time reporting, new business model possibilities, enhancement of communication, swift access to valuable analysis and information. | (Lew et al., 2020), (Perry et al., 2019) |
| Internet of Things | Enhancing traditional products with IT services, creating systems of utilities, elevating effectiveness. | (Albishi et al., 2018), (Oriwoh et al., 2013) |
| Artificial Intelligence | Cost reduction, elimination of errors, broader production capabilities, lowering accident risks. | (Sahai & Lall, 2022), (Girasa, 2020) |
| Blockchain | Creating a safer financial environment, more precise operation. Simplifying the knowledge management process. | (Sharma & Kumar, 2020), (Nordgren et al., 2019) |

Source: Own elaboration

information about the previous one, and a nonce which can validate the authenticity of the block. The technology can function as a complete ledger of performed transactions, therefore, granting its users full knowledge of performed actions (Nofer et al., 2017). It is a very desired functionality in many sectors, e.g., banking, logistics, and retail. The amount of transactions and transactional information is overwhelming in nowadays industries and a way to run a trustworthy ledger, which is hard to sabotage, appealing to many organizations. The usage of blockchain can translate to a safer financial environment, more precise operation, and easier knowledge management. The research shows that Blockchain is an effective technology to overcome collaboration and trust issues among business partners, thus far leading to beneficial effects (Rejeb et al., 2021).

### 2.3. Organizational culture

The organizational culture can be defined as a system of shared values and defined appropriate attitudes and behaviors for organizational members (Price, 2007). Organizational culture helps organizations take risk, set high performance standards, establish positive attitude towards failure and individual growth (Tushman & Nadler, 1986). Culture is crucial in such areas as readiness for changes, flexibility, employing motivation or setting a strategical approach. The mentioned values can create an inspiring environment, stimulating its participants to look for raising effectiveness and innovation. Moreover, organizational culture should be judged not only in the scope of an innovation driver but also as a factor of organizational success. According to Mărăcine (2012), culture is a key element that determines goals of the company and whether it is possible to achieve them. This corresponds with dealing with external challenges and the attitude to internal incidents. However, Wilkins and Ouchi (1983) pointed out that these relations are not straightforward. Wrong organizational culture can have a negative impact on organization's success or be irrelevant to performance. It is important to identify limiting insights and proper application of the culture to organizational culture.

## 3. Research method

This study aimed at identifying the impact of DT on organizational success, in particular, at determining which DT are most often used in organizations and what benefits for the organization result from the DT use, as well as at establishing to what extent organizational culture can be a factor enhancing organizational success (Fig. 1).


**Figure 1. Relation between DT usage, organizational culture and success.**
Source: Own elaboration

A survey query was employed to achieve the established research goal. The questionnaire consisted of 7 closed questions. The study used a 5-point Likert scale.
Questions were as follows:
Q1. What disruptive technologies are being used in your organization?
Q2. What are the areas in which your organization uses disruptive technologies?
Q3. Are disruptive technologies a strategic tool for the development of your organization?
Q4. What do you associate the term "success" of the organization with?
Q5. In your opinion, is there a relationship between the use of disruptive technologies and the company's success?
Q6. What benefits/values the organization receives using disruptive technologies?
Q7. How would you describe the culture of your organization?

Due to the fact that most of the answers were represented by nominal variables, the logit models were applied. These *t* models were used to examine a relationship between two items from the questionnaire, given the set of *k* controls is represented by the characteristics of the companies in the sample. They took the following form:

$$P(y_j = 1) = \frac{\exp\left(\beta_0 + \beta_1 x_j + \sum_{i=1}^{k} \gamma_i c_{ij} + \xi_j\right)}{1 + \exp\left(\beta_0 + \beta_1 x_j + \sum_{i=1}^{k} \gamma_i c_{ij} + \xi_j\right)},$$

where:

$P(y_j = 1)$ – probability that respondent $j$ gives a positive answer to outcome item $y$,

$x_j$ – an answer to independent item $x$ given by respondent $j$,

$c_{ij}$ – an $i$-th characteristics of a company represented by respondent $j$, $i = 1, 2, \ldots, k$,

$\beta_0, \beta_1, \gamma_i$ – estimated coefficients,

$\xi_j$ – error term.

The survey was conducted among 194 organizations in Poland in 2019. About half of the surveyed organizations in the sample operate in the service sector. Less frequent are companies from production, trade, and mixed sectors. About 60% employ between 50 and 249 employees. The remaining 40% are large organizations with an employment level exceeding 250 employees. The size of the organizations in terms of turnover is highly diversified – approximately equal fractions of companies report the turnover that belongs to 0-2, 2-10, 10-50, and more. The majority of the sample consists of domestic firms, whereas only 17% are exclusively foreign ones. Over 70% of the organizations have been operating for more than 10 years on the market and only 3% are newly-established organizations.

## 4. Findings and discussion

The conducted research showed that the most frequently used DT in organizations include: Data Warehousing (53.6%), Big Data (52.1%), Business Intelligence (51.0%), and Mobile Technologies 46.9%. Technologies such as IoT (24.7%), Cloud Computing (21.8%), Artificial Intelligence (12.4%), and Blockchain (6.7%) are used less frequently (Fig 2).

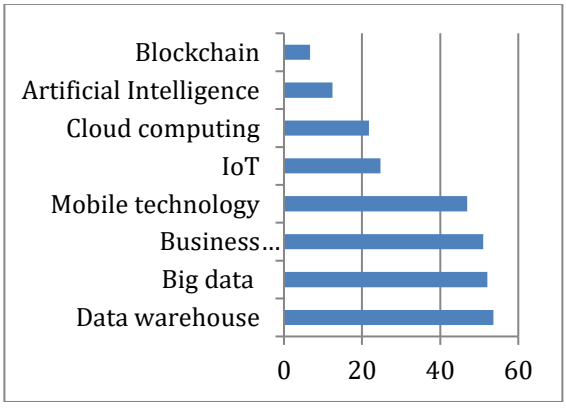


**Figure 2. Most used Disruptive Technologies.**
Source: Own elaboration.

Over 71% of the surveyed organizations stated that the technologies used are the strategic tools for them in management and allow them to achieve a competitive advantage. All organizations that use BI and BD technologies recognized them as key tools in their search for competitive advantage. For the most common DT areas used included: logistics and supply chain (59.88%), marketing (53.1%), finance and banking (50.5%), advanced services (40.2%), trade (31.4%),

research and development (29.4%), HR (25.3%) and production (18,6%). Results are presented in Fig 3.


**Figure 3. Most common DT usage areas.**
Source: Own elaboration

When asked about the link between the technologies used and the company's success, the respondents emphasized that it is strong or very strong (over 75% of the surveyed organizations). About 24% of the organizations indicated that it is weak or rather weak. The majority of the organizations (71.1%) associated success with an increase in revenues, although 53.1% of organizations also identified it with a competitive position and leadership in the industry, 49.0% with social capital and good relationship with surrounding organizations, 43.8% with an increase of customer satisfaction, 35% with growth of intellectual capital, 33.5% with innovative goods and services, 23.2% with new business models, and 16% with intensive internet and social media activity (Fig 4).

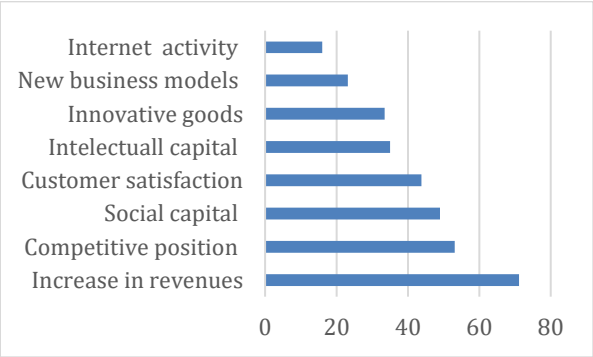


**Figure 4. Areas associated with the term success.**
Source: Own elaboration.

The most frequently mentioned benefits of using DT technology in surveyed organizations included: improved customer relationship management (52.6%), improved supply chain management (45.4%), improved communication and collaboration (42.3%), and internal optimization of business processes (40.7%). Results are presented in Fig 5.

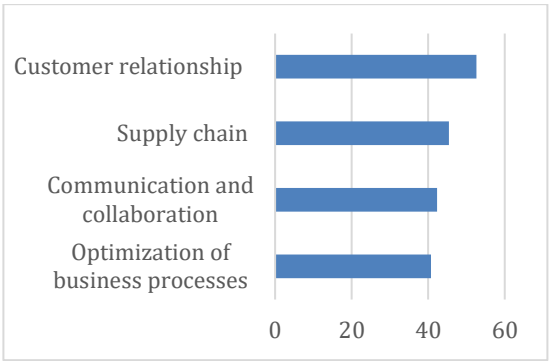


**Figure 5. Areas of DT usage benefits.**
Source: Own elaboration.

Interesting results were achieved by analyzing the correlations between organizational success and organizational culture and DT usage. The most significant results are presented in Table 2 and Table 3. The tables contain the odds ratios for the pairs of items. The ratios show to what extent the chance of selecting a certain answer is affected by organizational culture characteristics selected by the respondents.

Responders' answers showed the correlation between organizational culture and achieving success. The organizations that are looking forward to implementing innovative products or services push for the organizational culture not afraid of the change. Better market position is correlated with implementing significant attention to professional data analysis, analytical skills, and the use of various IT tools as well as being open to new and honest ideas from the stakeholders. Organizations open to ideas from employees tend to create innovative products or services and improve the quality of well-being of various social groups. Finally, organizations that support teamwork and sharing ideas more often achieved high activity in the digital world, the internet, and social media. Moreover, the study shows some examples of reverse correlations. Culture open to ideas of customers tends to support new business models but is less likely to aim at increasing turnovers and high social capital. Organizations that are open to ideas of internet users less often identify success as increase in customer satisfaction and high social capital as those without that trait. Organizations that follow and respond to the needs of the external environment are less likely to aim at

creating innovative products or services. More often they seek to achieve high social capital.

**Table 2. Correlation between organizational culture and organizational success.**

| Organizational culture | Organizational success | Correlation |
|---|---|---|
| Not afraid of a change | Innovative products and services | **3.14** |
| Analytical skills and competences Devoted to using data analysis, analytics skills and various IT tools. | High (leadership) market position | **2.82** |
| Open to ideas from stakeholders | High (leadership) market position | **2.78** |
| Open to ideas from employees | Innovative products or services | **2.44** |
| | Improving the quality of life of citizens or various social groups | **2.65** |
| Supporting teamwork and sharing ideas | High activity in digital world, internet, social media | **2.22** |
| Open to ideas of customers | New business models | **2.05** |
| | Increase in turnover | **0.45** |
| | High social capital and excellent external relationships | **0.39** |
| Open to ideas of internet users | Increase in customers' satisfaction | **0.29** |
| | High social capital and excellent external relationships | **0.20** |
| Following and responding to the needs of the external environment | Innovative products and services | **0.48** |
| | High social capital and excellent external relationships | **2.24** |

Source: Own elaboration

**Table 3. Correlation between organizational culture and benefits from DT.**

| Organizational culture characteristic | Benefits from DT usage | Correlation level |
|---|---|---|
| Not afraid of a change | Improving customer relationship management, increasing sales, and increasing customer satisfaction | **2.31** |
| | Improving communication and collaboration | **2.58** |
| Devoted to using data analysis, analytics skills and various IT tools | HR improvement | **2.78** |
| Open to ideas from employees | Optimization of internal business processes | **3.17** |
| | HR improvement | **3.62** |
| Supporting of teamwork and sharing ideas | Optimization of internal business processes | **3.61** |
| | Improving production management | **2.63** |
| | HR improvement | **3.85** |
| Open to ideas of customers | New business models – e-commerce | **2.59** |
| | HR improvement | **3.23** |
| Open to ideas of internet users | New business models – e-commerce | **2.31** |

| | | |
|---|---|---|
| Following and responding to the needs of the external environment | Optimization of internal business processes | **3.02** |
| Motivating to learn and improve employees' skills | Improving production management | **4.29** |

Source: Own elaboration

Conducted research showed that organizations that are not afraid of change are more likely to improve customer relationship management, increase sales, increase customer satisfaction and improve communication and collaboration through DT usage. Similarly, organizations that are devoted to using data analysis, analytics skills, and various IT tools benefit in HR. A culture open to ideas from employees provides optimization of internal business processes and HR improvement. Organizations that support teamwork and sharing of ideas, gain advantages in optimizing internal business processes, improving production management, and HR. Openness to the ideas of customers leads to new business models and HR improvement. Organizations open to ideas of internet users tend to use DT technology to create new business models, e.g., e-commerce. Following and responding to the needs of the external environment, the organization grants optimization of internal business processes. The highest level of correlation between benefits of DT usage and organizational culture was identified between motivation to learn and improvement in production management.

## 5. Conclusion

Although DT have recently become an interesting area of scientific discourse, there is still a lack of comprehensive research devoted to the problem of DT-driven organizational success. This study attempted to investigate the link between DT usage and organizational success as well the impact of organizational culture on this success. To achieve this goal, research with a help of a survey query was designed and conducted. 194 organizations were asked about the most used kinds of DT, benefits from DT usage as well as the relationship between DT usage and organizational success and organizational culture.

This study shows that such technologies as Business Intelligence, Big Data, Mobile Technologies, and Data Warehousing can play a strategic role in achieving organizational success. They contribute to several benefits, especially in supply chain management, customer services, marketing, and HR. This study reflects the correlation between organizational culture and achieving success. For example, the organizations that are looking forward to implementing innovative products or services push for an organizational culture not afraid of change. Better market position is correlated with implementing significant attention to professional data analysis, analytical skills, and the use of various IT tools as well as being open to new and honest ideas from the stakeholders. Moreover, organizations open to ideas from employees tend to create innovative products or services and improve the quality of well-being of various social groups. The survey illustrates that organizations that support teamwork and sharing ideas more often achieved high activity in the digital world, the internet, and social media.

Our research extends the relevant literature. First, it contributes to the emerging studies on DT by investigating the issue of DT usage to support organizational success. Second, it demonstrates how organizational culture can impact DT usage and organizational success. Third, it highlights the correlation between organizational culture, organizational success, and benefits gained from DT usage.

The obtained findings and outcomes of this study should be useful for any managers and organizations willing to use DT to support organizational success.

The conducted research, both the literature and own empirical research, confirms our conviction that we need to conduct further work on learning about the mechanisms of extracting organizational success from DT. Recognition of such mechanisms in various corporations and employee groups seems particularly important.

Authors are aware of limitation of presented research. First, the research was conducted among 194 Polish organizations. To formulate more global, universal conclusion it would also be advisable to conduct empirical research on a larger sample (number) of organizations and comparative analyzes, e.g., due to the different organizational culture, size of the organization and relationships with the environment. Moreover, data on organizational success and its association with organizational culture and DT were gathered through self-reporting of managerial staff. This way of data collection might be subjected to distortion and inaccuracies because managers tend to present their organizations as more advanced than they really are. Futher, pointed out associations between organization success, organizational culture, and DT usage are only

of a correlated nature. The cause-and-effect conclusion should not be driven from them.

The conducted research, both the literature review and our own empirical research, confirm our conviction that we need to conduct further work on learning about the mechanisms of extracting organizational success from the use of BI as well as to explore the role of organizational culture in gaining value from BI.

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