# KEY ACTIVITIES OF DIGITAL TRANSFORMATION - COMPARATIVE ANALYSIS OF SELECTED MODELS

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**Purpose:** Systematization of knowledge in the field of defining and occurrence of key activities that make up the overall concept of digital transformation with an indication of the key stages of its implementation. In addition, the aim of the article is also to conduct a comparative analysis of selected models of digital transformation in terms of a number of criteria, such as: the degree of concentration of the model on the selected sector of the economy, the degree of concentration on digital competences, the degree of focus on management concepts, the degree of concentration on digital transformation tools, the degree of focus on the digital maturity of the organization.

**Design/methodology/approach**: The objectives of the article were achieved through an in-depth analysis of the literature on the subject in the field of models of digital transformation emphasizing the stages of its course. The article presents a comparative analysis of models selected in preliminary studies developed by consulting companies and models created as a result of research works by other scientists.

**Findings:** The authors of the article compared the existing models of digital transformation and suggested the need to develop a new model using the partial advantages of the compared models. The authors also indicated a gap in the need to implement a component emphasizing the importance of managing resistance to changes in the organization.

**Originality/value:** The originality of the article consists in drawing a conclusion in the form of a suggestion of the need to develop work in the field of modeling the digital transformation process in the context of the theory of organizational change, with particular emphasis on key competences, focus on methods and resistance to changes in an organization wishing to go through the digital transformation process.

**Keywords:** digital transformation, stages of digital transformation, digital transformation models, digital transformation tools.

**Category of the paper:** literature review.

## 1. Introduction

Digital transformation in the current literature is referred to as disruptive or incremental change process. It starts with the adoption and use of digital technologies, then evolving into an implicit holistic conversion of an organization, or deliberate in pursuing value creation. Digital transformation is a new concept frequently used by practitioners and academics, but which changes form very often depending on the context in which it is used. The term "digital transformation" is very widely used, very often wrongly, because there is no specific definition in the literature. Many authors have tried to define it and discuss its concept. In the course of preliminary literature research carried out by the authors of this publication, a need has been noticed to systematize the knowledge in the field of defining and occurring key activities that make up the overall concept of digital transformation with an indication of the key stages of its implementation, was noticed. The main aim of the article is an attempt to systematize the course of digital transformation in the form of a set of stages and related methods and tools.

The main goal of this publication is to make an attempt to systematize the available literature on the key activities of digital transformation embedded in the Industry 4.0 concept. The authors, conducting a literature review, compared a number of digital transformation models in terms of its key stages and tools used at individual stages of digital transformation.

Numerous scientific publications in the subject area indicate a phased course of the digital transformation process (Catlin et al., 2017; Bechtold et al., 2021; Schallmo et al., 2016). Some of them present models of digital transformation from the perspective of conducted scientific research, while some describe models created in the course of the work of consulting companies. This dualism suggests the need to consider the similarities and differences within the presented models. Some models postulate the need to implement various tools aimed at the development of digital competences (Brunelli et al., 2017; Pessl et al., 2017). The ambiguity of approaches to the issues of the tools used, the issue of focusing the presented models on particular market areas, and thus - the universality of digital transformation models, led to the research questions of this article:

RQ1: "Is it possible to define a universal model for the course of digital transformation taking into account its key stages and sets of tools used at each stage based on the currently available digital transformation models?".

RQ2: "Are there a distinctive set of components of digital transformation models presented by consulting companies and models developed within the scientific community?".

Answers to the above research questions will be sought through a comparative analysis of existing models, taking into account two proprietary sets of comparison criteria. The first one will be focused on the universality of the model, the second - on issues related to the theory of changes in the organization.

## 2. Materials and methods

A systematic literature review - in particular bibliometrics - was carried out for research from the last 10 years on the construction of digital transformation models. The first step was to analyse publications included in the Scopus database. However, for a comprehensive study, the analysis was deepened to include the Web from Science database.

The following queries were run on 30 October 2022:

- WoS: TOPIC: ("digital transformation models"); Timespan: 2012-2022. Indexes: SCIEXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCREXPANDED, IC.
- Scopus: TITLE-ABS-KEY ("digital AND transformation AND model") AND (LIMIT-TO (PUBYEAR, 2022) OR (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIM-IT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012)).
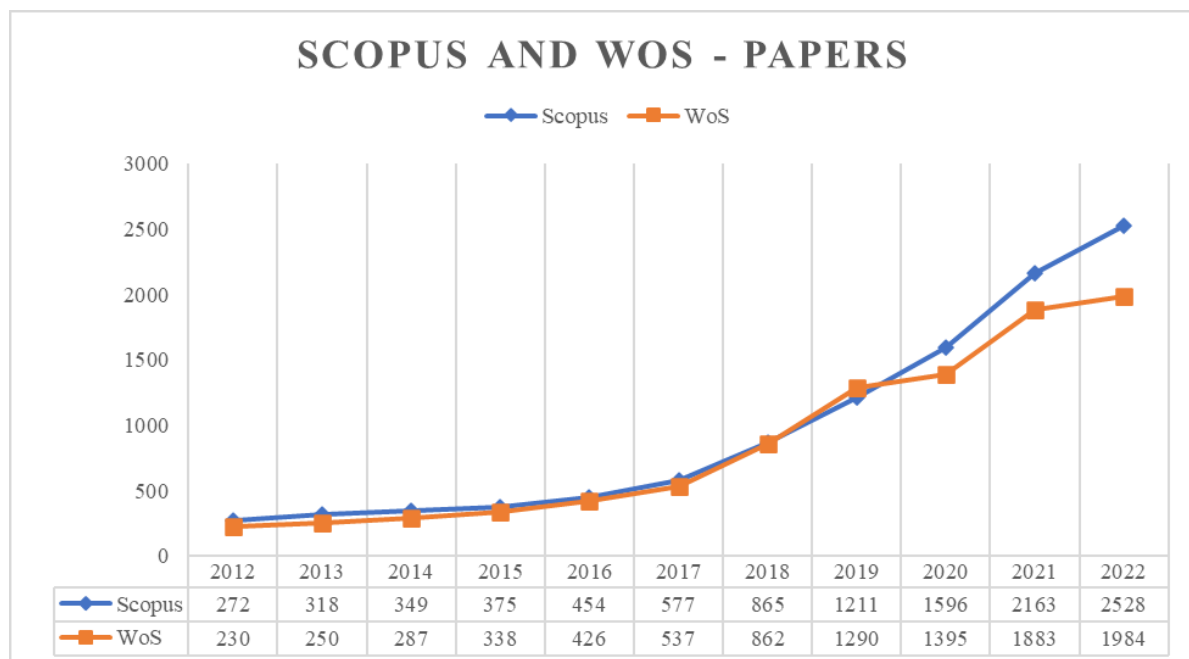


**SCOPUS AND WOS - PAPERS**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Scopus | 272 | 318 | 349 | 375 | 454 | 577 | 865 | 1211 | 1596 | 2163 | 2528 |
| WoS | 230 | 250 | 287 | 338 | 426 | 537 | 862 | 1290 | 1395 | 1883 | 1984 |

**Figure 1**. Publication of articles in each year for Scopus and WoS databases.

Source: own study

Figure 1 shows the upward trend in the number of publications on the topic under review. According to the authors, there is a lack of comprehensive comparative analyses of digital transformation models.

## 3. Defining digital transformation – literature review

Digital transformation is a new concept that has gained great popularity among practitioners and researchers over the last few years. In constant evolution, we are witnessing a real revolution introduced by enterprises and organizations. To fully understand the concept of digital transformation, we should first define and differentiate between the terms Digitization, digitalization, and digital transformation. There is some confusion in the application of these concepts in the scientific community, as most researchers in the world use these terms interchangeably, when in fact there is a significant difference between them. It is very important to distinguish between these three terms. Indeed, digitization means converting from analogue to digital information language. It is a presentation of information in any computer system. For example, we can scan a photo with a scanner to save it to a digital file (Mahrez et al., 2019).

While Digitalization means the use of digital data and technology to optimize processes and automate data handling. It defines the use of a computer system for semi-automatic or full process automation. From a certain point of view, computerization is a term akin to digitization and is sometimes considered a synonym (Schwertner, 2017).

Digital transformation is a new concept frequently used by practitioners and academics, but which changes form very often depending on the context in which it is used. The term "digital transformation" is very widely used, very often wrongly, because there is no specific definition in the literature. Many authors have tried to define it and discuss its concept (Majchrzak, 2016).

The Table 1 shows various definitions of digital transformation used in the literature.

**Table 1.**
*Definitions of digital transformation used in literature*

| ID | Source | Definition |
|---|---|---|
| 1. | Henriette et al. (2016) | The digital transformation is a disruptive or incremental change process. It starts with the adoption and use of digital technologies, then evolving into an implicit holistic conversion of an organization, or deliberate in pursuing value creation. |
| 2. | Hess et al. (2016) | Digital transformation is concerned with the changes digital technologies can bring about in a company's business model, which result in changed products or organizational structures or the automation of processes. These changes can be observed in the rising demand for Internet-based media, which has led to changes in entire business models (for example, in the music industry). |
| 3. | Horlach et al. (2017) | Digital transformation as encompassing the digitization of sales and communication channels and the digitization of a firm's offerings (products and services), which replace or augment physical offerings. Furthermore, digital transformation entails tactical and strategic business moves that are triggered by data-driven insights and the launch of digital business models that allow new ways of capturing value. |
| 4. | Liere-Netheler et al. (2018) | The use of new digital technologies (social media, mobile, analytics, or embedded devices) to enable significant business improvements (such as enhancing customer experience, streamlining operations, or creating new business models). |
| 5. | Karagiannaki et al. (2017) | The use of technology to radically improve performance or reach of enterprises. |

Cont. table 1.

| | | |
|---|---|---|
| **6.** | Matt et al. (2015) | Digital transformation strategy is a blueprint that supports companies in governing the transformations that arise owing to the integration of digital technologies, as well as in their operations after a transformation. |
| **7.** | Schmarzo et al. (2017) | Digital transformation is the adoption of digital technology by an organization. Common goals for its implementation are to improve efficiency, value or innovation. |

Source: own elaboration based on Mahrez et al., 2019.

The term first appeared in 2000 (Patel, McCarthy, 2000) and focused on digitization. He is currently dealing with the phenomenon of new consumer applications that directly affect current business models and organizations.

The first definition of this term appears in the work of Fors and Stolterman (Fors, Stolterman, 2004), in which they described digital transformation as changes that digital technology entails or affects all aspects of human life.

Other researchers (Westerman et al., 2011) define digital transformation as the application of technology to increase the reach or efficiency of enterprises and the creation of new business opportunities through the use of digital data and technologies.

IBM also proposed its own definition, which says that digital transformation is a customer-centric, digital approach to all aspects of business, from business models, through customer experiences, to processes and operations. It uses artificial intelligence, automation, hybrid cloud, and other digital technologies to leverage data and drive intelligent workflows, make faster and smarter decisions, and respond in real time to market disruptions. Ultimately, it changes customer expectations and creates new business opportunities.

The change currently affects not only business processes or macro processes, but all support processes, business processes and the organization's project itself. These processes are entirely devoted to creating value.

Companies and organizations are forced to rethink their activities and the way they interact with stakeholders to adapt to new market needs or to take advantage of technological tools for productivity.

The different definitions of digital transformation can be broken down into three distinct elements (Reis et al., 2018):

- -Technological digital transformation is based on the use of new digital technologies such as social media, mobile, or analytical.
- -Organizational digital transformation requires changing organizational processes or creating new business models.
- -Social digital transformation is a phenomenon affecting all aspects of human life.

In addition, transformational changes are necessary to implement the digital transformation that is related to strategy, organizational culture and leadership. The impact of digital transformation in any organization can be broken down into three different levels: changing business models, transforming customer experiences, and transforming business processes (Mahrez et al., 2019).

## 4. Key activities of digital transformation in the context of its phased course

In the literature being the subject to this review, 14 models have been identified focusing on the key digital transformation activities that make up its phased course. Four of them are the result of the work of consulting companies, and twelve were created as part of scientific studies. Table 2 indicates the stages of the digital transformation process accentuated in particular models of digital transformation.

**Table 2.**
*Phased course of digital transformation process according to models*

| Model ID | Model (Author) | Stages of digital transformation process |
|---|---|---|
| 1. | McKinsey (Catlin et al., 2017) | 1. Defining the value<br>1.1 Secure senior management commitment<br>1.2. Set clear, ambitious targets<br>1.3. Secure investment<br>2. Launch and acceleration<br>2.1 Start with lighthouse projects<br>2.2 Appoint a high-caliber launch team<br>2.3 Organize to promote new, agile ways of working<br>2.4 Nurture a digital culture<br>3. Scaling up<br>3.1 Sequence initiatives for quick returns<br>3.2 Build capabilities<br>3.3. Adopt a new operating model |
| 2. | Six-step journey towards I4.0 - Capgemini (Bechtold et al., 2021) | 1) Conduct a digital maturity assessment<br>2) Identify opportunities and threats in I4.0 enviromnent<br>3) Define I4.0 vision and strategy<br>4) Prioritize the transformation domains<br>5) Derive the roadmap towards I4.0<br>6) Implement and sustain the change |
| 3. | Schallmo et al., 2016 | 1. Digital Reality<br>2. Digital Ambition<br>3. Digital Potential<br>4. Digital Fit<br>5. Digital Implementation |
| 4. | Baslyman, 2022 | The transformation comprises two main phases:<br>1. Exploitation (is concerned with exploring digital technologies and selecting the ones that would help achieve the strategic goals of a corporation) and<br>2. Integration. (is concerned with the actual implementation and adoption of those digital solutions into the running of the business of the corporation |
| 5. | Szopa, Cyplik, 2020 | 1. The assessment of the current level of digitization of the enterprise as well as<br>2. The proposal of its digital transformation |

Cont. table 2

| | | |
|---|---|---|
| 6. | Parviainen et al., 2017 | 1. The first step is to analyze the potential impact of digitalization for the company and decide on the position that the company wants or needs to take in the change.<br>2. The second step is to review the current state of the company with respect to the desired position and the impact of digitalization, as well as to identify the gap between the current situation and the wanted future.<br>3. The third step defines the approach that needs to be taken to close the gap from the organization's current state to the desired position and defines the concrete actions needed to reach the desired position.<br>4. The fourth step is about implementing and validating the actions and returning to previous steps if needed. The model is used iteratively to gradually build the solution and fine-tune digitalization goals and plans, if needed |
| 7. | I 4.0 roadmap (Issa et al., 2017) | 1) task-force set-up<br>2) digitalization assessment<br>3) focus definition<br>4) use-case idea generation<br>5) use-case impact estimation<br>6) use-case selection |
| 8. | Agile change management model (Le Grand et al., 2019) | 3 phases:<br>1) define<br>a) the context<br>b) the actors involved<br>2) experiment<br>a)the workshop cycle<br>b) the control cycle<br>3) anchor<br>a) transformation dashboard<br>b) business-change assessment grids |
| 9. | Conceptual model to guide firms to systematically develop action plans for digitalization (Ng et al., 2019) | 5 stages<br>1) the assessment of the current digital capabilities<br>2) the design of the digital business model<br>3) the assessment of the current digital capabilities<br>4) the identification of future digital capabilities<br>5) the development of the action plan |
| 10. | Customer-focused actions to undertake a digital transformation journey (Shah et al., 2019) | 1) broaden the definition of digital transformation<br>2) discover how in love customers really are<br>3) build momentum from the top<br>4) teach the power of digital<br>5) encourage digital accountability<br>6) commit to never being satisfied<br>7) invest beyond the here-and-now |
| 11. | Integral 2.0 - the key challenges faced during a Digital transformation initiative (Kearney, 2020) | 1) being digital<br>a) success definition<br>b) digital domain structure<br>c) digital upskilling<br>2) doing digital<br>a) innovation engine<br>b) execution engine<br>c) scaling engine |
| 12. | Blueprint for Digital Success (Reinhard et al., 2016) | Six steps:<br>1) map out I4.0 strategy<br>2) create initial pilot projects<br>3) define the capabilities needed<br>4) become a virtuoso in data analytics<br>5) transform into a digital enterprise<br>6) actively plan an ecosystem approach |

Cont. table 2.

| | | |
|---|---|---|
| **13.** | Guidelines to help manufacturers develop their digital transformation initiatives - BCG (Brunelli et al., 2017) | Steps:<br>1) understand the value of making the change<br>2) assess the current state of systems and operations<br>3) define a roadmap and vision<br>4) improve existing processes<br>5) expand capabilities along the value chain |
| **14.** | A model to make companies analyse their individual maturity levels (Pessl et al., 2017) | 1) a kick-off workshop<br>2) ascertaining the company's status and existing I4.0 competences<br>3) a target state for each function definition<br>4) derivation of concrete measures to determine the differences between the current stage and target maturity level<br>5) balanced scorecard creation |

Source: own elaboration.

## Comparative analysis of selected models

In order to conduct a comparative analysis of digital transformation models, four of those listed in Table 2 were selected. Two of them come from studies prepared by leading management consulting companies, while the other two - from scientific studies presented in scientific journals.

The following comparative analysis of digital transformation models was conducted taking into account two sets of criteria. The first set of criteria (Table 3) focuses on the versality of models and consists of the following:

- the degree of concentration of the model on the selected sector of the economy,
- the degree of concentration on digital competences,
- the degree of focus on management concepts,
- the degree of concentration on digital transformation tools,
- the degree of focus on the digital maturity of the organization.

As part of the second set of criteria, the following elements resulting from the theory of change management from the organization were taken into account:

- emphasizing the role of leadership in digital transformation,
- determining the significance of digital transformation,
- creating and communicating a digital transformation strategy,
- focus on resistance to changes,
- analysis of opportunities and threats arising from the environment of the organization,
- focus on creating a roadmap of digital transformation,
- -indication of the competences and skills of participants in digital transformation.

The comparison of selected models with the use of criteria given above is presented in Tables 3 and 4.

**Table 3.**
*Comparison of digital transformation models - first set of criteria*

| Criteria/model | BCG (Brunelli et al., 2017) | Capgemini (Bechtold et al., 2021) | Schallmo et al., 2016 | Pessl et al., 2017 |
|---|---|---|---|---|
| **Focus on the sector** | No | No | No | No |
| **Focus on digital competences** | Yes | Yes | Yes | Yes |
| **Focus on management concepts** | Yes (Change management, Lean management) | Yes (Lifecycle management, Shared resources management, Knowledge management) | Yes (Innovation management, Change management) | Yes (Change management, Knowledge management, Process management) |
| **Focus on tools** | Yes | Yes | Yes | Yes |
| **Focus on digital maturity** | Yes | Yes | No | Yes |

Source: own elaboration.

**Table 4.**
*Comparison of digital transformation models – second set of criteria*

| Criteria/model | BCG (Brunelli et al., 2017) | Capgemini (Bechtold et al., 2021) | Schallmo et al., 2016 | Pessl et al., 2017 |
|---|---|---|---|---|
| **Emphasizing the role of leadership** | Yes | Yes | No | No |
| **Determining the significance of transformation** | No | No | No | Yes |
| **Strategy creation and communication** | Yes | Yes | Yes | Yes |
| **Focus on resistance to change** | No | No | No | No |
| **Analysis of opportunities and threats from the environment** | Yes | Yes | Yes | Yes |
| **Assessment of digital maturity** | Yes | Yes | Yes | Yes |
| **Development of the digital transformation roadmap** | Yes | Yes | Yes | Yes |
| **Indication of digital competences and skills of participants in the organization** | No | No | Yes | No |

Source: own elaboration.

Comparing selected models, it can be concluded that some of them strongly focus on a few selected aspects of digital transformation, while others present a broader perspective, taking into account a wide range of change management issues. By using strong elements of individual models being the subject of comparative analysis, one may attempt to develop a concept for building a new model using elements of existing models and suggesting the need to expand elements insufficiently developed within the compared models.

**The concept of building a new model using elements of the existing models**

The proposed, extensive model of digital transformation could fragmentarily use the advantages of the models presented in Tables 3 and 4. Table 5 presents a list of the components of digital transformation models taken into account in the context of the theory of change management in an organization, along with an indication of models strongly emphasizing these components.

**Table 5**.
*Digital transformation model components accentuated in existing models*

| Model component | Models accentuating key components |
|---|---|
| Emphasizing the role of leadership | BCG (Brunelli et al., 2017), Capgemini (Bechtold et al., 2021) |
| Determining the significance of transformation | Pessl et al., 2017 |
| Strategy creation and communication | BCG (Brunelli et al., 2017), Capgemini (Bechtold et al., 2021), Schallmo et al., 2016, Pessl et al., 2017 |
| Focus on resistance to change | None - the need to develop recommendations |
| Analysis of opportunities and threats from the environment | BCG (Brunelli et al., 2017), Capgemini (Bechtold et al., 2021), Schallmo et al., 2016, Pessl et al., 2017 |
| Assessment of digital maturity | BCG (Brunelli et al., 2017), Capgemini (Bechtold et al., 2021), Schallmo et al., 2016, Pessl et al., 2017 |
| Development of the digital transformation roadmap | BCG (Brunelli et al., 2017), Capgemini (Bechtold et al., 2021), Schallmo et al., 2016, Pessl et al., 2017 |
| Indication of digital competences and skills of participants in the organization | Schallmo et al., 2016 |

Source: own elaboration.

An attempt to build a hybrid model, taking into account the strengths of the models compared in this article, would require:

a) The use of the consulting companies model (BCG, Capgemini) for the component of emphasizing the role of leadership in the digital transformation process.

b) The use of the scientific model presented by Pessl for the component of determining the importance of digital transformation for the organization.

c) The use of elements of all models in creating and communicating strategies for carrying out digital transformation.

d) The development of comprehensive model assumptions and recommendations on issues related to combating resistance to change.

e) The use of elements of all models in the scope of conducting the analysis of opportunities and threats arising from the organization's environment.

f) The use of elements of all models in assessing the digital maturity of an organization willing to enter the digital transformation process.

g) The use of elements of all models in creating a roadmap of the digital transformation process.

h) The use of the scientific model presented by Schallmo in the scope of indicating the competences and digital skills of the participants of the organization.


## 5. Conclusion


Concluding the content of this article, digital transformation is an area in which the academic literature is most interested, but still requires a more in depth definition of the concept, a better understanding of the requirements, but also a strategic orientation in a long term perspective. To provide a better characterization for both research and practice, and therefore, to structure the field of digital transformation, the authors systematized the definitions of the digital transformation process appearing in the literature on the subject. Then, they presented 14 models of digital transformation emphasizing the phased character of its course, in order to select 4 of them in the next stage of work for a comparative analysis. For the purpose of conducting a comparative analysis of the existing models, 2 sets of comparison criteria were composed. The first one was to indicate the degree of universality of the compared models, while the second one took into account the elements resulting from the theory of changes in the organization. The proposed, extensive model of digital transformation could fragmentarily use the advantages of the models presented in Tables 3 (Comparison of digital transformation models - first set of criteria) and 4 (Comparison of digital transformation models – second set of criteria). Table 5 autors presents a list of the components of digital transformation models taken into account in the context of the theory of change management in an organization, along with an indication of models strongly emphasizing these components.

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