# DIGITAL TRANSFORMATION: A COGNITIVE STUDY FOR ORGANIZATIONS TO SHAPE THEIR JOURNEYS

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| ARTICLE INFO | ABSTRACT |
|---|---|
| | **Purpose:** The purpose of this study is to reveal novelties of digital transformation with a holistic approach based on expert experience, that may help digital business leaders to shape their digital transformation journeys.<br><br>**Theoretical framework:** With the acceleration of technological advancements, the complexity of digital transformation is increasing and it leads to novel impacts. As expected, this raises the difficulty of developing a final methodology. Therefore, there is still more research required to explore these novelties.<br><br>**Design/methodology/approach:** As a basis, existing maturity models and frameworks were inspected. Then, C-Level managers were interviewed to explore the novelties. Axial and selective coding was used to interpret the interview data.<br>**Findings:** Findings showed that digital transformation is not only about digital technologies but also the transformation of business models and cultural change. In addition, technologies like 5th-generation networks (5G), quantum computing, and blockchain may affect these models more in the future. Organizations may have to consider law regulations, hiring, management support, and customer experience more, to do a successful digital transformation.<br><br>**Research, Practical & Social implications:** Future research is recommended to bring more practitioner experience to the theory and highlight the cultural effects of digital transformation for organizations.<br><br>**Originality/value:** The results show that the complex nature of digital transformation both requires and causes the number of publications to grow exponentially. Also, this can help business leaders to make use of the results to improve their digital transformation strategies. |

## TRANSFORMAÇÃO DIGITAL: UM ESTUDO COGNITIVO PARA AS ORGANIZAÇÕES MOLDAR SUAS JORNADAS

**RESUMO**
**Objetivo:** O objetivo deste estudo é revelar novidades da transformação digital com uma abordagem holística baseada na experiência de especialistas, que podem ajudar os líderes de negócios digitais a moldar suas jornadas de transformação digital.
**Referencial teórico:** Com a aceleração dos avanços tecnológicos, a complexidade da transformação digital aumenta e leva a novos impactos. Como esperado, isso aumenta a dificuldade de desenvolver uma metodologia final. Portanto, ainda há mais pesquisas necessárias para explorar essas novidades.

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**Desenho/metodologia/abordagem:** Como base, modelos de maturidade e frameworks existentes foram inspecionados. Em seguida, os gerentes C-Level foram entrevistados para explorar as novidades. Codificação axial e seletiva foi usada para interpretar os dados da entrevista.
**Resultados:** Os resultados mostraram que a transformação digital não é apenas sobre tecnologias digitais, mas também a transformação de modelos de negócios e mudança cultural. Além disso, tecnologias como redes de 5ª geração (5G), computação quântica e blockchain podem afetar mais esses modelos no futuro. As organizações podem ter que considerar mais os regulamentos legais, contratação, suporte de gerenciamento e experiência do cliente para fazer uma transformação digital bem-sucedida.
**Pesquisa, implicações práticas e sociais:** pesquisas futuras são recomendadas para trazer mais experiência prática para a teoria e destacar os efeitos culturais da transformação digital para as organizações.
**Originalidade/valor:** Os resultados mostram que a natureza complexa da transformação digital exige e faz com que o número de publicações cresça exponencialmente. Além disso, isso pode ajudar os líderes empresariais a aproveitar os resultados para melhorar suas estratégias de transformação digital.

**Palavras-chave:** Transformação Digital dos Negócios, Digitalização, Complexidade, Maturidade Digital, Codificação Axial.

### TRANSFORMACIÓN DIGITAL: UN ESTUDIO COGNITIVO PARA LAS ORGANIZACIONES PARA DAR FORMA A SUS VIAJES

**RESUMEN**
**Propósito:** El propósito de este estudio es revelar noticias sobre transformación digital con un enfoque holístico basado en la experiencia de expertos, que puede ayudar a los líderes de negocios digitales a dar forma a sus viajes de transformación digital.
**Marco teórico:** Con la aceleración de los avances tecnológicos, la complejidad de la transformación digital aumenta y conduce a nuevos impactos. Como era de esperar, esto aumenta la dificultad de desarrollar una metodología final. Por lo tanto, aún se necesita más investigación para explorar estas novedades.
**Diseño/metodología/enfoque:** Como base, se inspeccionaron los modelos de madurez y los marcos existentes. A continuación, se entrevistó a gerentes de nivel C para explorar las novedades. Se utilizó codificación axial y selectiva para interpretar los datos de la entrevista.
**Resultados:** Los resultados mostraron que la transformación digital no se trata solo de tecnologías digitales, sino también de transformación de modelos de negocio y cambio cultural. Además, tecnologías como las redes de quinta generación (5G), la computación cuántica y la cadena de bloques pueden afectar más a estos modelos en el futuro. Es posible que las organizaciones deban considerar más las regulaciones legales, la contratación, el soporte de gestión y la experiencia del cliente para realizar una transformación digital exitosa.
**Implicaciones sociales, prácticas y de investigación:** Se recomienda que la investigación futura traiga más experiencia práctica a la teoría y resalte los efectos culturales de la transformación digital para las organizaciones.
**Originalidad/valor:** Los resultados muestran que la naturaleza compleja de la transformación digital requiere y hace que el número de publicaciones crezca exponencialmente. Además, puede ayudar a los líderes empresariales a aprovechar los resultados para mejorar sus estrategias de transformación digital.

**Palabras clave:** Transformación de Negocios Digitales, Digitalización, Complejidad, Madurez Digital, Codificación Axial.

## INTRODUCTION

According to recent studies, the behavior of digital transformation is described as versatile, continuous, disruptive, radical, and complex. (Brown & Brown, 2019) (Morakanyane, Grace, & Reilly, 2017) (Matt, Hess, & Benlian, 2015) (Ismail, Khater, & Zaki, 2018) (Pousttchi, Gleiss, Buzzi, & Kohlhagen, 2019) (Grab, Olaru, & Gavril, 2019)

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Organizational transformations are considered to be sets of complex and non-routine managerial tasks (Berghaus, 2018), therefore digital transformation also consists of a highly complex set of activities and is a major challenge for organizations (Ferreira, Moreira, & Seruca, 2017). And organizations require to form practices to overcome these complex transformations (Matt, Hess, & Benlian, 2015). So they are creating new departments and hiring specialists in different domains to drive their digital transformation strategy (Schallmo & Williams, 2018) while supporting their digital transformation journeys by looking into recent developments and frameworks (Valdez-de-Leon, 2016).

This study aims to uncover the complexities of digital transformation with justification by recent experiences of digital leaders and practices with the guidance of recent literature. Since it is expected that no final methodology for digital transformation is developed due to its complex nature, these experiences are continuously required (Reis & Melão, 2023) to collect patterns of data to overcome the uncertainties and confusion that emerged in complex environments and to develop viable strategies for driving the transformation process (Berghaus, 2016) This concept is also addressed as "fuzzy front-end" that is explained by the mystery of the beginning of an innovation process (Berghaus, 2018). Moreover, the innovation potential of digital transformation can only be seized by enabling organizations for empirical approaches to test new ideas (Berghaus & Back, 2017). This study will attempt to fulfill the gap between industry and academia (Grab, Olaru, & Gavril, 2019) which continuously emerges due to this complexity. On the other hand, there is also a lack of consensus on a framework for digital transformation that can be used in different industries (Reis, Amorim, Melao, & Matos, 2018) which is one of the reasons for remodeling the pillars with a holistic point of view, involving various experiences in different industries.

First, a conceptual background will be briefly presented as preliminary information. This will include the definition of digital transformation and evidence that surfaces the complexity of digital transformation. Secondly, maturity models and frameworks from previous studies will be overviewed along with comparative studies. Third, initial findings will be presented based on the literature. Finally, based on expert interviews, novelties, and verifications will be elaborated.

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**LITERATURE REVIEW**

The history of digital transformation goes to the 1990s, when digital technologies were already being used in business, however, with the rapid advancement of these technologies it became more popular, (Schallmo, Williams, & Boardman, 2017) influencing the business models (Ziyadin, Suieubayeva, & Utegenova, 2019).

Despite the concept of digital transformation being researched in many domains, there is still no certain methodology developed and the number of scientific studies is increasing to light this uncertain and complex area (Ziyadin, Suieubayeva, & Utegenova, 2019) (Yoshikawa, da Costa Filho, Penha, Kniess, & de Souza, 2020) (Ji & Li, 2022) (Figure 1).

Figure 1. Number of publications in Article category from 2014 to 2023 with "Digital Transformation" keyword in the Title or Abstract
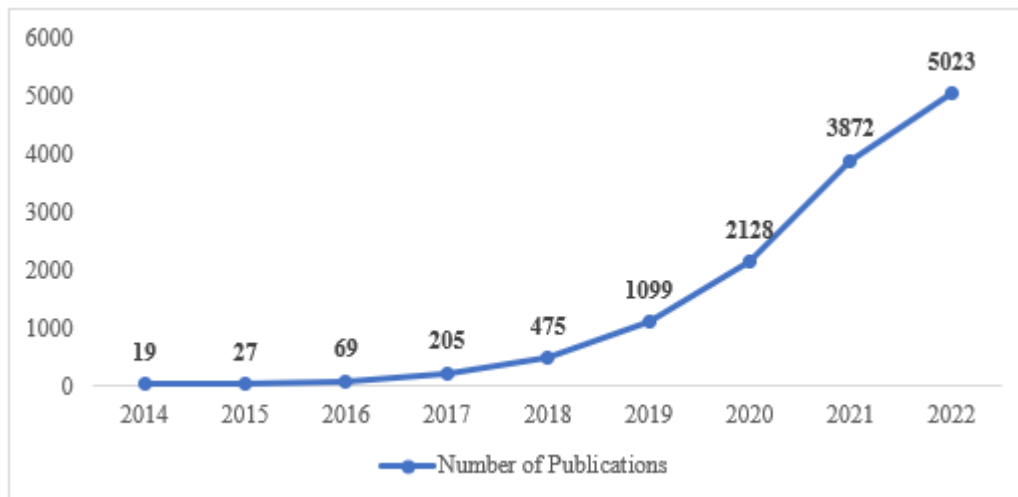


Source: (Dimensions, n.d.)

Correspondingly, there is a lack of consensus on an acceptable and robust framework to guide companies on how to digitally transform their organizations (Nwaiwu, 2018). Due to the complexity of digital transformation, it still requires empirical practices to increase the robustness of its definitions. Hence theoretical frameworks and examples based on real-life empirical studies will provide a useful reference for researchers and practitioners (Brown & Brown, 2019) In a sense, in the domain of emerging practices and experiments, current best practices will not work, and this is expected. (Bils, 2018)

### Definitions of Digital Transformation

Before defining digital transformation, it is important to distinguish digitalization and digitization concepts from each other (Ros, 2017). In a brief description, digitization means transforming data from analog to digital, while digitalization uses the value created from digitization to change business models and operations (Schallmo, Williams, & Boardman, 2017). On the other hand, digitization is more about operational excellence and cutting costs. However, digitalization has a broader approach and is about recreating the entire organization's value proposition (Reis, Amorim, Melao, & Matos, 2018). In addition, research shows that it is important to consider digital transformation as an exhaustive organizational approach rather than moving services to digital from analog, also known as "digitization" (Mergel, Edelmann, & Haug, 2019).

The most accurate and common definition of digital transformation is that "digital transformation is a massive change journey that organizations take due to the emergence of new technologies and its potential social and economic effects to optimize their business effectiveness" (Pousttchi, Gleiss, Buzzi, & Kohlhagen, 2019) (Kraus, et al., 2022) (Liu, Chen, & Chou, 2011) (Granito, 2023). It majorly affects organizations believing that small improvements are adequate to keep their business (Grab, Olaru, & Gavril, 2019) for it highly affects organizations' business value proposition and ways to reach their customers (Tolboom, 2016). It is not a single event but a new discipline requiring organizations to adopt continuous change, evolve, and innovate (Grab, Olaru, & Gavril, 2019).

On the other hand, studies show similarities between digital transformation and business process re-engineering which focuses on the reconstruction of the business processes using a rule-based approach, while digital transformation has a similar focus with a more empirical approach as it collects and uses new data to rebuild these rules and processes (Schallmo, Williams, & Boardman, 2017) (Schallmo & Williams, 2018). Successful digital transformation may also be achieved by re-engineering and optimization of business processes (Schwertner, 2017).

### The Complexity of Digital Transformation

The main purpose of this study is to contribute to reducing the continuously emerging complexity of digital transformation. Findings in the literature regarding the relationship between complex domains and digital transformation will be explained in this section.

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The word "complexity" that is used in this paper refers to the complex domain in the sense-making model called the *Cynefin Framework* developed by *Dave Snowden*. Complex domain shows emergent behaviors as unexpected interactions, and it is not possible to foresee any kind of causal relationship between these interactions. These causalities can only be understood in hindsight as patterns of data are being explored (Snowden, 2005). In addition, decision-making abilities are also impaired which is caused by the complexity of unpredictable changes (Shalbafan, Leigh, Pollack, & Sankaran, 2017). So, business leaders should enable the creation of experiments that allow patterns to emerge (Fierro, Putino, & Tirone, 2018).

Both in practice and literature, digital transformation is referred as a complex phenomenon in different aspects, meaning the practice progresses a lot faster than the theory (Gudergan & Mugge, 2017). Technological change increases the disruptive effect more than IT-enabled business transformations (Ismail, Khater, & Zaki, 2018) (Vial, 2019). Disruptive change requires redefining organizational strategies. Such activities and their outcomes are likely to be unclear in a complex environment (Berghaus, 2016) (Berghaus, 2018) (Berghaus & Back, 2017). Thus, researching to understand the patterns and interactions that emerge during these activities will guide organizations to take corrective actions to manage their digital transformation journeys successfully by keeping their approaches up to date (Morakanyane, Grace, & Reilly, 2017) (Jöhnk, Oesterle, Ollig, & Riedel, 2020) (Moreira, Ferreira, & Seruca, 2018) (Pousttchi, Gleiss, Buzzi, & Kohlhagen, 2019).

From the aspect of business excellence, existing frameworks can be applied to any organization regardless of their purpose of digitally transforming or sustaining their digital business value. Therefore, specific requirements for digital business transformation cannot be addressed by these generic-focused business excellence frameworks sufficiently and it is required to develop an adequate framework to focus on the unique properties of digital transformation (Ali, 2019).

The complexity of digital transformation cannot be overcome without considering potential future changes. Digital organizations encourage their employees to self-organize so that new ideas and experiments can be worked on to reduce the complexity. Leaders encouraging empirical studies to allow experimenting and fast failure will enable new developments and patterns to emerge, which is crucial in a complex environment (Gudergan, et al., 2019).

Digital transformation is considered the most complex phase of digital changes in an organization and there are no multidisciplinary discussions including the use of technologies, changing the business organization, and delivery of business value. (Verhoef, et al., 2021).

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With this elaboration on digital transformation, the following research questions are posed.

- RQ1: Which key elements can be identified as valid or invalid to represent a framework for digital transformation in terms of creating business value?

- RQ2: Which key elements will be more valuable or will be essential in the future for a successful digital transformation?

**METHODOLOGY**

To extract information from the literature, dimensions from maturity models were selected first. Many intersecting dimensions were identified and were used as a base for identifying and mapping the concepts that have a direct or indirect relationship with digital business transformation. Then, digital transformation frameworks were surveyed to extract the key concepts. (Figure 2) The rationale for this methodology is to explore the concrete effects on practice since structural approaches like frameworks and maturity models help organizations reach an extensive road map for digital transformation (Gokalp, Sener, & Eren, 2017).

Figure 2. Methodology Steps
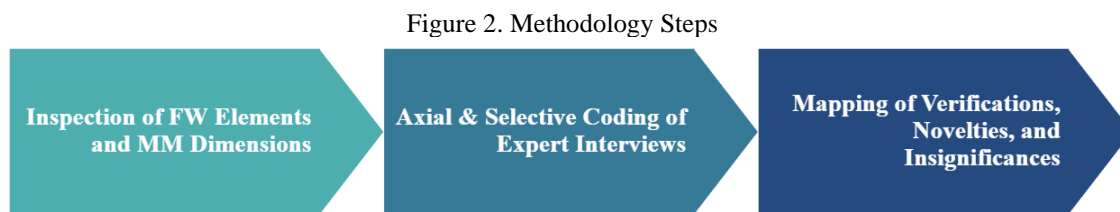


Source: Author's Illustration

**Frameworks and Maturity Models for Digital Transformation**

In this section, digital transformation frameworks, maturity models, and evaluative (comparative) studies are inspected. Studies that are strictly focusing on the process of manufacturing are disregarded not to lose focus on the business management aspect of digital transformation. Digital Transformation, Frameworks, maturity-assessment models, and comparative studies abbreviated as DT, FW, MM, and CM respectively.

Sector-based approaches focus on industry-specific requirements, whereas holistic approaches focus on digital transformation on a more general level. On another layer, impact analysis approaches analyze digital transformation with a cause-and-effect lens. (Table. 1)

Table. 1. Digital Transformation Approaches in the Literature (Sorted by Year)

| # | Abbrv. | Reference | Year | Approach |
|---|--------|-----------|------|----------|
| 1 | MM1 | (Valdez-de-Leon, 2016) | 2016 | Sector Based |
| 2 | MM2 | (Schumacher, Erol, & Sihn, 2016) | 2016 | Sector Based |
| 3 | MM3 | (Leyh, Schäffer, Bley, & Forstenhäusler, 2016) | 2016 | Holistic |
| 4 | FW1 | (Tolboom, 2016) | 2016 | Impact Analysis |
| 5 | MM4 | (Berghaus & Back, 2016) | 2016 | Holistic |
| 6 | MM5 | (Gokalp, Sener, & Eren, 2017) | 2017 | Sector Based |
| 7 | MM6 | (Boström & Celik, 2017) | 2017 | Holistic |
| 8 | MM7 | (Liebrecht, Jacob, Kuhnle, & Lanza, 2017) | 2017 | Sector Based |
| 9 | FW2 | (Ferreira, Moreira, & Seruca, 2017) | 2017 | Sector Based |
| 10 | FW3 | (Moreira, Ferreira, & Seruca, 2018) | 2018 | Holistic |
| 11 | CM1 | (Nwaiwu, 2018) | 2018 | FW Comparison |
| 12 | CM2 | (Unterhofer, Rauch, Matt, & Santiteerakul, 2018) | 2018 | MM Comparison |
| 13 | FW4 | (Gimpel, et al., 2018) | 2018 | Holistic |
| 14 | CM3 | (Bumann & Peter, 2019) | 2019 | FW & MM Comparison |
| 15 | MM8 | (Schumacher, Nemeth, & Sihn, 2019) | 2019 | Sector Based |
| 16 | MM9 | (Kozina, 2019) | 2019 | Holistic |
| 17 | MM10 | (Aguiar, Gomes, da Cunha, & da Silva, 2019) | 2019 | Holistic |
| 18 | FW5 | (Erbay & Yildirim, 2019) | 2019 | Technology in DT |
| 19 | FW6 | (Sousa & Rocha, 2019) | 2019 | Skills in DT |
| 20 | FW7 | (Verina & Titko, 2019) | 2019 | Holistic |
| 21 | FW8 | (Grab, Olaru, & Gavril, 2019) | 2019 | Impact Analysis |
| 22 | FW9 | (Pousttchi, Gleiss, Buzzi, & Kohlhagen, 2019) | 2019 | Impact Analysis |
| 23 | FW10 | (Vial, 2019) | 2019 | Literature Review |
| 24 | FW11 | (Ali, 2019) | 2019 | Holistic |
| 25 | FW12 | (Morakanyane, Reilly, Mcavoy, & Grace, 2020) | 2020 | Impact Analysis |
| 26 | FW13 | (Zaoui & Souissi, 2020) | 2020 | Literature Review |
| 27 | MM11 | (Gollhardt, Halsbenning, Hermann, Karsakova, & Becker, 2020) | 2020 | Sector Based |
| 28 | FW14 | (Verhoef, et al., 2021) | 2021 | Literature Review |
| 29 | FW15 | (Konopik, Jahn, Schuster, Hoßbach, & Pflaum, 2022) | 2022 | Holistic |
| 30 | CM4 | (Ciruskabiri & Varnaseri, 2023) | 2023 | FW Comparison |
| 31 | FW16 | (Mahboub & Sadok, 2023) | 2023 | Holistic |
| 32 | MM12 | (Haryanti, Rakhmawati, & Subriadi, 2023) | 2023 | Holistic |
| 33 | FW17 | (Guerra, del-Valle, & Suárez, 2023) | 2023 | Impact Analysis |

**Maturity Models**

The term maturity is defined as the levels or measurement of the progress of developments or improvements on a specific system (Boström & Celik, 2017) (Schumacher, Erol, & Sihn, 2016). Systems that are assessed with maturity models are broken into dimensions which are evaluated

individually by their progress or levels (Berghaus & Back, 2016). These dimensions are identified as the key drivers for digital transformation and evaluated to measure digital maturity (Valdez-de-Leon, 2016).

In the literature, most of the maturity models are implemented using a scale for levels of maturity along with their dimensions. These dimensions are determined based on the application domain or a holistic point of view. (Valdez-de-Leon, 2016) (Schumacher, Erol, & Sihn, A Maturity Model for Assessing Industry 4.0 Readiness and Maturity of Manufacturing Enterprises, 2016) (Unterhofer, Rauch, Matt, & Santiteerakul, 2018) (Leyh, Schäffer, Bley, & Forstenhäusler, 2016) (Berghaus & Back, 2016) (Gokalp, Sener, & Eren, 2017) (Boström & Celik, 2017) (Schumacher, Nemeth, & Sihn, 2019) (Kozina, 2019), while others have more unique approaches such as attempting to address the financial impact to close the knowledge gap (Liebrecht, Jacob, Kuhnle, & Lanza, 2017) or describing the context, inputs, purposes, outcomes, and practices to add road mapping capabilities to a maturity model. (Aguiar, Gomes, da Cunha, & da Silva, 2019) (Haryanti, Rakhmawati, & Subriadi, 2023)

There are substantial digital maturity modeling studies in the literature with clearly defined dimensions, enabling the identification of the factors related to digital transformation and for further evaluation.

**Frameworks**

Frameworks guide identifying the core concepts, impact factors, and causes of digital transformation more in-depth (Verina & Titko, 2019) (Pousttchi, Gleiss, Buzzi, & Kohlhagen, 2019). Since there is no single framework that fits every digital transformation journey in practice, it is required to combine diverse approaches to overcome specific complexities of organizations (Nwaiwu, 2018).

Several approaches were used in the literature to develop frameworks such as finding the impacts of digital transformation on business and strategy models (Tolboom, 2016), (Grab, Olaru, & Gavril, 2019), (Ali, 2019) approaching from the aspect of organizational training and skill development (Ferreira, Moreira, & Seruca, 2017), (Sousa & Rocha, 2019), extending existing approaches (Moreira, Ferreira, & Seruca, 2018) (Haryanti, Rakhmawati, & Subriadi, 2023), attempting to find the benefits (Erbay & Yildirim, 2019), verification from experiences (Gimpel,

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et al., 2018), (Verina & Titko, 2019), (Pousttchi, Gleiss, Buzzi, & Kohlhagen, 2019) and surveying the literature (Vial, 2019), (Verhoef, et al., 2021).

These frameworks are useful knowledge sources since they include the support of empirical evidence revealing the key elements, impacts, effects, enablers, and concepts of digital transformation in a complex environment.

**Evaluative Studies**

As structural approaches to digital transformation continue to be developed, studies that evaluate and compare these approaches are being developed as well to analyze their benefits. These studies can help increase the speed of finding new contributions as they reduce the risk of competition between ideas by going through their elements of applicability (Berghaus & Back, 2017). Especially in business, consultancy firms developed several maturity models and frameworks for digital transformation. However, they lack transparency due to commercial reasons and they do not offer any details or logic behind their approaches (Schumacher, Nemeth, & Sihn, 2019); lacking scientific validation (Aguiar, Gomes, da Cunha, & da Silva, 2019). Studies in this section attempt to review approaches both from academia and business. So that any gap (Gudergan & Mugge, 2017) (Ciruskabiri & Varnaseri, 2023) on this matter could be captured.

The conceptual frameworks for digital transformation that were developed both in business and academe were reviewed using a qualitative approach (Nwaiwu, 2018), (Bumann & Peter, 2019) while a combination of qualitative and quantitative factors was also used to verify the maturity models in terms of compliance and accuracy (Unterhofer, Rauch, Matt, & Santiteerakul, 2018), proving their validity in the literature.

Comparative studies aid the investigation and mapping of the factors and key elements of digital transformation. Thus, they are included in the study.

**Expert Interviews**

For data verification, Executive (C-level) managers that have led digital business transformation in their organizations for three or more years were interviewed. The interviews were designed to be conducted in an average of 60 minutes. The employee count of a minimum of 1000 is selected as a criterion to address most aspects of a corporate structure.

Since digital transformation strictly requires experience in practice, the interview questions are focused on their experience and projections based on these experiences. Details are shown below in Table 2.

Table 2. Expert Interview Details

| Role | DT Experience | Interview Type | Industry |
|---|---|---|---|
| Chief Executive Officer | 6 Years | Face to Face | Fintech |
| Chief Executive Officer | 5 Years | Face to Face | Technology R&D |
| Chief Executive Officer | 7 Years | Video Call | Energy |
| Chief Digital Officer | 6 Years | Video Call | Banking |
| Chief Information Officer | 8 Years | Face to Face | Retail |
| Chief Information Officer | 5 Years | Face to Face | Aviation |
| Chief Information Officer | 4 Years | Face to Face | Financial Services |
| Chief Information Officer | 5 Years | Face to Face | Home Appliances |

Source: Prepared by the Authors (2023)

Axial and selective coding was used to identify core categories in interviews. Axial coding provides a structure to generate and categorize data into more organized sets of data under hierarchical categories and sub-categories. This adds more refinement to emergent elements extracted from the analysis and reveals relationships between them as well as helps to reach a framework-like result. In addition, this technique continuously requires the reshaping of emergent patterns respective to the amount of data analyzed (Scott & Medaugh, 2017). Hence, the complexity can be addressed more efficiently. Results from axial code are further detailed into a singular theory by merging related, common, and mutual categories by using selective coding (Vollstedt & Rezat, 2019). So that relationships between dimensions, key elements, or concepts can be deducted.

After interviews with experts, intersecting ideas and future projections were analyzed. The results from selective coding were matched with the results from the current literature to verify validities, reveal novelties or drop insignificant concepts.

Verification of data was made by collecting common or uncommon concepts both from the literature and interview results. Therefore, results from interviews revealed concepts that generate any business value or result in business failure. In addition to verifications, new concepts were explored as technological advancements continue to emerge (Mergel, Edelmann, & Haug, 2019).

**RESULTS AND DISCUSSION**
**Findings From the Literature**

To provide an answer for RQ1, findings from the literature are aggregated.

By going through the dimensions of maturity models, elements of digital technologies, business management, people, customers, ecosystem, and company culture were captured as the factors affecting digital maturity. These overlapping items are identified as the focal points of maturity models in the literature.

By going through the elements of frameworks, technologies such as mobile, cloud, digital channels, robots, cyber-security, artificial intelligence (AI), data processing, and internet of things (IoT) were identified as significant drivers for digital transformation. Second, social factors such as employee skills and digitalization, leadership, and employee training were identified. Third and last, significant business management fields were identified such as strategy, operations, value and process management, and organizational structure.

These findings are categorized under three different pillars for digital transformation. (Figure 3.)

Figure 3. Digital Transformation Pillars
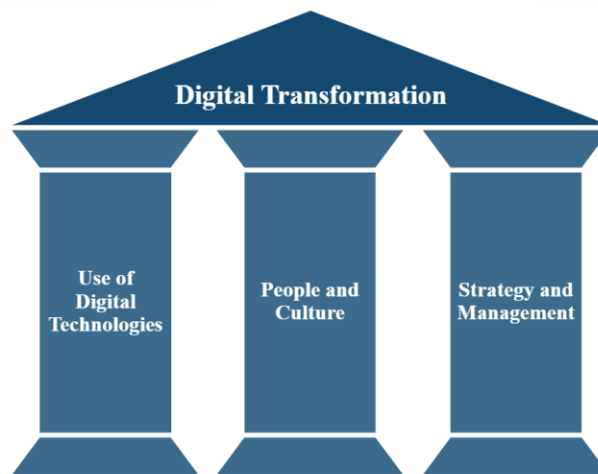


Source: Prepared by the Authors (2023)

**Pillar 1: Use of Digital Technologies**

Digital technologies are used for planning, deployment, and integration in digital transformation (Valdez-de-Leon, 2016) as well as the exploitation of data (Boström & Celik, 2017). The potential of digital technologies is so significant that they can disrupt and change existing value propositions (Vial, 2019). This potential has a significant impact, especially on employees, customers, business, products, and processes (Pousttchi, Gleiss, Buzzi, & Kohlhagen, 2019). Hence, digital technologies can be accounted as one of the pillars of digital transformation as it also scored 84% in Kappa's Agreement developed in FW7 (Verina & Titko, 2019).
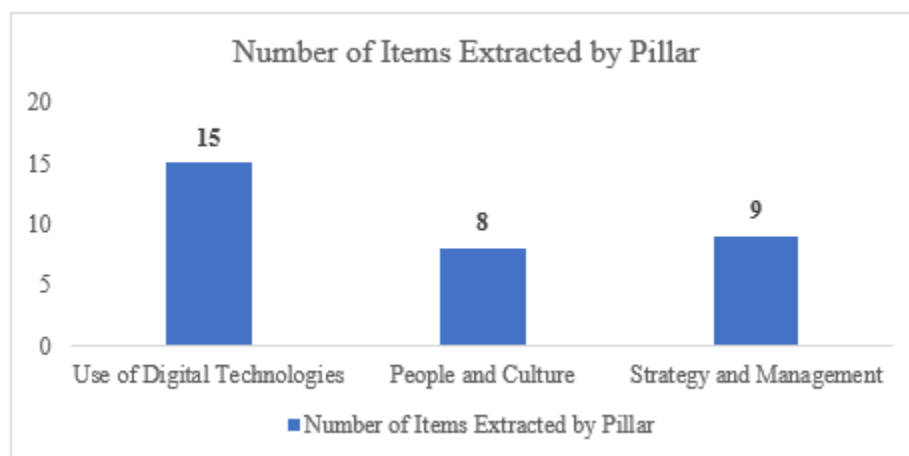
**Pillar 2: People and Culture**

Digital transformation is not only about implementing digital technologies, it requires organizational and cultural change (Verina & Titko, 2019) (Valdez-de-Leon, 2016), employees being open to new technologies (Berghaus, 2016) (Schumacher, Erol, & Sihn, 2016) (Schumacher, Nemeth, & Sihn, 2019), self-motivation and readiness to accept changes (Verina & Titko, 2019) (Boström & Celik, 2017), continuous skill development (Grab, Olaru, & Gavril, 2019) (Sousa & Rocha, 2019), team work and collaboration (Moreira, Ferreira, & Seruca, 2018) (Vial, 2019) (Berghaus, 2016) (Ferreira, Moreira, & Seruca, 2017). Therefore, the human factor is one of the main focuses (Verina & Titko, 2019) key resources, (Tolboom, 2016) and pillars for digital transformation.

**Pillar 3: Strategy and Management**

Defining a clear business strategy rather than just implementing digital technologies is crucial for successful digital transformation (Brown & Brown, 2019) (Schwertner, 2017). Therefore, top management needs to acknowledge the importance of digital transformation (Berghaus, 2016). So that strategic and organizational alignment can be achieved and communicated throughout the organization (Gokalp, Sener, & Eren, 2017) (Boström & Celik, 2017) (Verina & Titko, 2019) (Moreira, Ferreira, & Seruca, 2018) (Alasiri & AlKubaisy, 2022). The total number of items extracted for each pillar is illustrated in Figure 4.

Figure 4. Number of Items Extracted by Pillar



Source: Prepared by the Authors (2023)

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**Findings From Expert Interviews**

In this section, findings from c-level management interviews will be presented. To answer RQ1 and RQ2 altogether, results from axial coding were divided into three categories: verifications, novelties, and insignificant elements. All the categories are evaluated by their link to business value generation and their place in previously designed frameworks and models. Items that are mapped in the interviews are presented under these categories. (Figure 5.)

Figure 5. Number of Items Mapped in Interviews
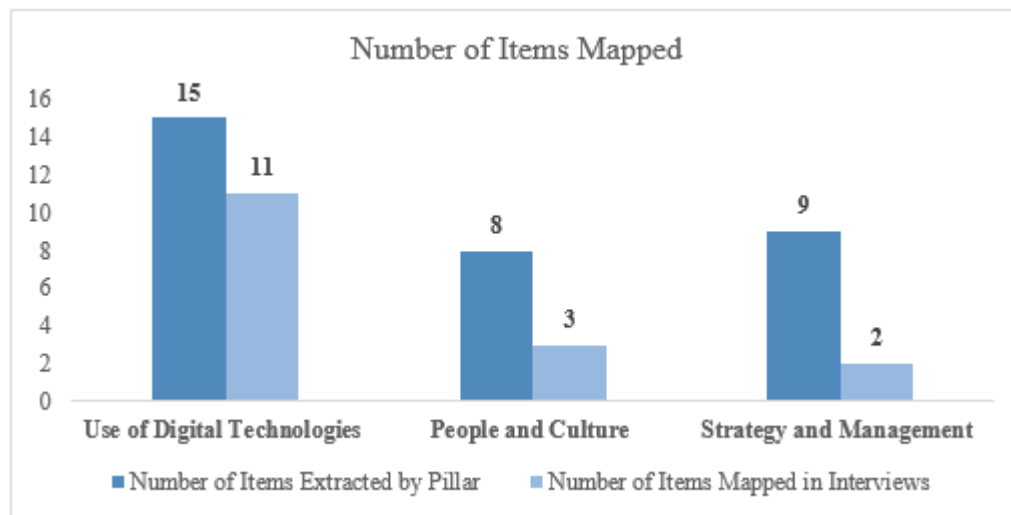


Source: Prepared by the Authors (2023)

**Verifications**

The most common and difficult area for driving a successful digital transformation came to light was leading cultural change. Findings showed employee and leadership culture should be aligned with the digital ecosystem and strategy of the organization. The difficulty of challenging and enabling employees to understand the importance of gathering valuable consumer data to harness the potential of digital technologies and regardless of department, empowering every employee to build and communicate their ideas around business value-driven digital transformation were given as examples in practice. This is also covered in the literature as the requirement of employees to be open to new technologies and readiness to accept changes (Schumacher, Nemeth, & Sihn, 2019) (Verina & Titko, 2019) (Guerra, del-Valle, & Suárez, 2023) (Granito, 2023) (Reis & Melão, 2023).

Secondly, a consensus was reached in terms of generating business value. It was pointed out that the idea, use of digital technologies, communicating or hyping digital transformation in

the entire organization were meaningless unless there is a potential business value. Hence, a focus on customer experience should be leveraged first, not only at the business unit level but from the aspect of every employee in the organization. This will enable a more value-oriented idea and create more tangible results.

Contrarily, hyping to announce the importance of digital transformation has a significant impact to gain high-level management support and putting digital transformation on their agenda. Without the support and an adequate budget, potential benefits would not be recognized. Therefore, a solid management strategy should be planned.

Lastly, in the digital technology pillar, the use of cloud computing, robotic process automation (RPA), and applications of artificial intelligence (AI) was verified to be the most value-generating digital technologies. Companies usually begin by moving their digital assets to the cloud so that benefits like real-time data processing, seamless service delivery, omnichannel marketing, and DevOps would be reaped. Focusing too much on strategic changes without sustaining operational excellence is considered a mistake in digital transformation. Therefore, technologies such as RPA were used to automate repeating operational tasks which enable employees to be more efficient. Finally, applications of AI such as face recognition, customer data processing for predictions, and voice recognition were crucial in terms of generating business value.

**Novelties**

Novelties have been explored by analyzing the interviews and are based on new emerging digital technologies and their potential results.

The common experience about emerging technologies was the level of relationship between the technology and a true business case. The next-generation 5G networking technology is disrupting existing business models and enabling new business opportunities. These opportunities were exemplified by improvements in customer experience, transferring, processing big data in a fast and more reliable way, and improving machine-to-machine communication. Also, it was stated that data processing power was also important for improving customer experience and predicting potential business opportunities. Therefore, quantum computing is also taking place in company strategy horizons.

On the other hand, blockchain technology is being used for data communications and energy trading. Even though research areas for blockchain and data communications exist, such as

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for autonomous driving (Ayvaz & Cetin, 2019) or communication security (Fan, et al., 2019) use of blockchain for data communications resulted more in employee satisfaction rather than solid business cases. However, it was pointed out that increasing demand for more reliable payment systems will result in organizations implementing a blockchain infrastructure, which will disrupt and threaten the banking industry in the following years. Thus, blockchain technology would take place in digital transformation frameworks.

All these emerging technologies raise the phenomenon of organizations requiring them to comply with new legal regulations. This was also not addressed in digital transformation frameworks in-depth. While governments like China enable and empower to process personal data for harvesting benefits of AI applications, governments limiting these applications by personal data protection laws (General Data Protection Regulation – GDPR) require organizations to address regulatory compliances before initiating a digital strategy

In the software industry, organizations gained benefits from software technologies such as service-oriented architecture, micro-services, platform applications, and providing software as a service (SaaS). Companies like *Uber*, *AirBnb,* and *Amazon* were pointed out as the trendsetters of these applications. On the other hand, it was stated that these IT transformations were also included in digital transformation road maps. Therefore, these technologies should also be included in digital frameworks in terms of business value generation.

Finally, to initiate cultural change, organizations began their digital transformation journeys by hiring employees with the awareness of the potential impact of digital technologies on business. This included highly qualified software developers, designers, product managers, and a young workforce with a familiarity with the digital world. Also, specific departments were created to drive digital transformation and cultural change, so that it can be aligned with organizational strategy.

**Insignificances**

Insignificant elements were identified as practices and technologies that organizations would not like to prioritize and therefore may be dropped out of digital transformation frameworks.

Hardware technologies such as RFID, 3D printing, virtual and augmented reality (VR/AR) were used to increase operational effectiveness and refine business value. However, due to strategic reasons, in the interviews, it is stated that the organizations did not intend to invest in these technologies as they did in AI or data analytics. Experiences in digital transformation showed that

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top management decisions are based strictly on business value and avoiding any hyped technologies that would jeopardize their value creation. Similarly, Analytical Hierarchy Process (AHP) scores of RFID and 3D printing in FW5 resulted in low weights in terms of their benefits (Erbay & Yildirim, 2019). And RFID was referred to as "legacy technology" which is being replaced by IoT in organizations in the interviews.

All findings are summarized in Table 3

Table 3. Summary of Findings

| Element | Value Result | Reason | Reference |
|---|---|---|---|
| Cultural Change | Valid | DT Enabler | (Valdez-de-Leon, 2016) |
| | | | (Berghaus, 2016) |
| | | | (Schumacher, Erol, & Sihn, 2016) |
| | | | (Boström & Celik, 2017) |
| | | | (Schwertner, 2017) |
| | | | (Ferreira, Moreira, & Seruca, 2017) |
| | | | (Moreira, Ferreira, & Seruca, 2018) |
| | | | (Schumacher, Nemeth, & Sihn, 2019) |
| | | | (Verina & Titko, 2019) |
| | | | (Vial, 2019) |
| | | | (Morakanyane, Reilly, Mcavoy, & Grace, 2020) |
| | | | (Zaoui & Souissi, 2020) |
| | | | (Gollhardt, Halsbenning, Hermann, Karsakova, & Becker, 2020) |
| | | | (Guerra, del-Valle, & Suárez, 2023) |
| | | | (Granito, 2023) |
| | | | (Haryanti, Rakhmawati, & Subriadi, 2023) |
| Customer Experience | Valid | Business Value Enabler | (Valdez-de-Leon, 2016) |
| | | | (Schumacher, Erol, & Sihn, 2016) |
| | | | (Tolboom, 2016) |
| | | | (Berghaus, 2016) |
| | | | (Schwertner, 2017) |
| | | | (Moreira, Ferreira, & Seruca, 2018) |
| | | | (Schumacher, Nemeth, & Sihn, 2019) |
| | | | (Verina & Titko, 2019) |
| | | | (Grab, Olaru, & Gavril, 2019) |
| | | | (Pousttchi, Gleiss, Buzzi, & Kohlhagen, 2019) |
| | | | (Zaoui & Souissi, 2020) |
| | | | (Gollhardt, Halsbenning, Hermann, Karsakova, & Becker, 2020) |
| | | | (Verhoef, et al., 2021) |
| | | | (Haryanti, Rakhmawati, & Subriadi, 2023) |

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| | | | |
|---|---|---|---|
| Management | Valid | DT Enabler | (Valdez-de-Leon, 2016)<br>(Tolboom, 2016)<br>(Berghaus, 2016)<br>(Gokalp, Sener, & Eren, 2017)<br>(Schumacher, Nemeth, & Sihn, 2019)<br>(Verina & Titko, 2019)<br>(Grab, Olaru, & Gavril, 2019)<br>(Zaoui & Souissi, 2020)<br>(Konopik, Jahn, Schuster, Hoßbach, & Pflaum, 2022)<br>(Haryanti, Rakhmawati, & Subriadi, 2023) |
| Cloud | Valid | Business Value Enabler | (Leyh, Schäffer, Bley, & Forstenhäusler, 2016)<br>(Tolboom, 2016)<br>(Schwertner, 2017)<br>(Ferreira, Moreira, & Seruca, 2017)<br>(Gokalp, Sener, & Eren, 2017)<br>(Moreira, Ferreira, & Seruca, 2018)<br>(Schumacher, Nemeth, & Sihn, 2019)<br>(Verina & Titko, 2019) |
| AI | Valid | Business Value Enabler | (Gokalp, Sener, & Eren, 2017)<br>(Moreira, Ferreira, & Seruca, 2018)<br>(Erbay & Yildirim, 2019)<br>(Sousa & Rocha, 2019)<br>(Verina & Titko, 2019)<br>(Pousttchi, Gleiss, Buzzi, & Kohlhagen, 2019) |
| RPA | Valid | Operational Excellence | (Schumacher, Nemeth, & Sihn, 2019)<br>(Sousa & Rocha, 2019) |
| 5G | Emerging | High Speed Data Communication | Novel / Not Found |
| Quantum Computing | Emerging | High Speed Data Processing | Novel / Not Found |
| Blockchain | Emerging | Business Value Enabler | Novel / Not Found |
| Regulatory Compliance | Growing | Essential to Enable DT | (Schumacher, Erol, & Sihn, 2016)<br>(Schumacher, Nemeth, & Sihn, 2019) |
| Hiring | Growing | Essential to Enable Cultural Change | (Guerra, del-Valle, & Suárez, 2023) |

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| | | | |
|---|---|---|---|
| Software as a Service | Growing | Business Value Enabler | (Leyh, Schäffer, Bley, & Forstenhäusler, 2016)<br>(Gokalp, Sener, & Eren, 2017) |
| Microservices | Growing | Business Value Enabler | (Leyh, Schäffer, Bley, & Forstenhäusler, 2016)<br>(Gokalp, Sener, & Eren, 2017) |
| Platform Business | Growing | Business Value Enabler | Novel / Not Found |
| Radio Frequency Identification (RFID) | Not Observed | Being Replaced by IoT | (Erbay & Yildirim, 2019) |
| 3D Printing | Not Observed | Low Business Value | (Erbay & Yildirim, 2019) |
| Virtual / Augmented Reality | Not Observed | Low Business Value | (Moreira, Ferreira, & Seruca, 2018)<br>(Erbay & Yildirim, 2019)<br>(Sousa & Rocha, 2019) |

Source: Prepared by the Authors (2023)

**CONCLUSION**

Studies in the literature and findings show that to achieve a robust, sustainable, and non-complex framework or model for digital transformation, the gap between business and academia should be filled continuously. Scientific approaches to business practices should be <kept up to date. This study fills this gap by wrapping up the frameworks and maturity models built for digital transformation and colliding them with the actual experiences of digital leaders.

With the findings of this paper, managers who want to identify their digital transformation strategies will be able to adapt their approaches, avoid possible mistakes and explore new aspects to deliver more value. As such, considering regulations, top management support, company culture, and hiring to enable a successful digital transformation in an organization, will be essential to make use of methods, tools, and technologies to enable business value. Managers should consider that only using digital technologies will not be enough to have a successful digital transformation but experimenting to discover what generates actual business value.

The effects of emerging digital technologies will continue to disrupt business models, organizational strategies, customer experience, and organizational culture. Therefore, organizational behaviors will remain one of the significant elements of digital transformation. Organizations should manage their businesses and cultural transformations aligned with the results of these disruptions. Addressing these effects in scientific approaches will aid businesses to be more cautious, effective, and efficient in their digital transformation journeys.

With the help of these findings, organizations that want to drive their business transformations successfully, validate their strategies by formulating more effective tactics, focus on digital technologies to create business cases while not neglecting the people factor and cultural transformation, and therefore manage the risks that will emerge from the complexity.

Because of limited access to any organizational data, qualitative approaches are used more commonly in such business management cases. However, the methodology itself is not a limitation but a very effective point of initiation. Future studies can use the output of this study to pose additional research questions to explore more interconnections within the elements of digital transformation. In a sense, this study creates a new holistic aspect to uncover novelties that can be used as a starting point to conduct a more detailed study, that can use quantitative approaches to find out causalities and impacts of digital transformation on organizations and business models in detail.

Additionally, in the future, the complex nature of the topic will create another opportunity for the researchers to renew the study with more up-to-date qualitative data, which brings the experiences of digital leaders together.

On a final note, the results of this study will be used to construct a Structural Equation Model (SEM), and additional data collected based on the model will be analyzed using Confirmatory Factor Analysis to explore the emergence of interconnections of Digital Transformation to reduce its complexity.

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