

DIGITAL TRANSFORMATION METRICS: A CONCEPTUAL VIEW

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ABSTRACTS

This research makes a major contribution to the current body of digital transformation knowledge. Firstly, develop a comprehensive understanding of the required distributions and barriers that have prevented the successful digital transformation projects. Secondly, illustrates how digital metrics knowledge can be used to benefit the whole digital transformation process.

Keywords: Digital transformation; Transformation metrics; Organization agility; Operations flexibility; Digital resources and customers focused.

BACKGROUND

Everything that can be digitized will be digitized, and whatever that can be connected to a network will be connected to a network. This includes both humans and computers, as well as products and services. Since all these networked computers must be managed and all digital data must be collected, interpreted, and meaningfully analyzed, the needs to understand digital transformation and evaluation of performance in organizations in each stage becomes a key factor to success in the digital economy. Many executives are now convinced that the time has come to get things back on track. Organizations are planning for the possibility that new technologies will potentially bring their own business model into question (Scheer, 2017; Ahmad et al., 2021a,b,c). Digital transformation requires rethinking or, at the very least, reworking existing business models (Ahmed et al., 2021d; Harahsheh et al., 2021; Almaazmi et al., 2020). However, digital transformation may also give rise to completely novel, revolutionary approaches. Many innovative emerging organizations share a consistent emphasis on customer value and the use of superior software platforms that enable them to attract a significant number of consumers quickly (Alshurideh et al., 2019; Nuseir et al., 2021; Svoboda et al., 2021). This is how Airbnb became the world's largest hospitality provider despite not owning a single property and how Uber became the world's largest taxi operator despite not owning a single vehicle. The rate at which organizations must adapt to new demands is increasing. There was a time when an organization's estimated life expectancy was 75 years. Now, it's just 15 (Hagel, 2010). The absence of digital transformation approaches and evaluations is the key determinant factor. Take for example Kodak: The camera and photo pioneer once employed 140,000 people and had annual revenue of about \$28 billion USD. Kodak lost out on the digital transformation and was

forced to declare bankruptcy. Parallel to this, with just 13 people, a tech company called Instagram grew to become the world's largest digital photo-sharing service. Instagram was sold to Facebook for one billion dollars in 2012 (Thun, 2014). Digital transformation and digital investment are surely the right actions for most organizations, but organizations still struggle to achieve expected results 66% to 86% of digital transformation project fails due to a lack of understanding of new competencies and business model (Libert et al., 2016). The subsequent speed of growth has been remarkable, with estimates forecasting the worldwide Internet of Things market to arrive at \$1.56B by 2025, with “75.44 billion connected to online devices”. New digital trends and technologies drive innovation and change the way industries around the world operate their businesses (Rizvi et al., 2020). With the rising digital transformation of organizations and ecosystems, digital transformation generates challenges, and the critical challenge is that current organizations amend (Tilson et al., 2010; Yoo et al., 2012; Naqvi et al., 2021). Therefore, organizations must always observe developing digital technologies and evaluate their capabilities and threats (Bharadwaj et al., 2013; Al Mehrez et al., 2020; AlMehrizi et al., 2020). Both scholars and practitioners have recognized the importance of digital technologies for organizations. This understanding of how new digital technology practices transform organizations in extraordinary ways impacts internal processes and how they relate to their external environment (Kurdi, et al., 2020; Alshurideh et al., 2021; Alzoubi et al., 2021). Previous studies of technology and organizations often focus on the organization's digitalization (Majchrzak, et al., 2013; Leonardi, 2014; Leonardi, 2015). Digital developments have transformed organizations dramatically organizations are now relating to their customers and markets (Aral et al., 2013; Granados & Gupta, 2013). To understand the possibility of digital transformation, organizations need to measure the performance improvements on key performance indicators to accelerate learning and fine-tune business models and digital metrics (Ghannajeh et al., 2015; Al Naqbia et al., 2020; Alameeri et al., 2021). The application and use of performance indicators may change across different stages of digital transformation. Metrics, including the return on investment, profitability, and revenue growth usually remain essential for organizations involved in digital transformation. While the ultimate objective of new business models created by digital transformation is to generate revenues, profits and improve investor value (Teece, 2010; Hayajneh et al., 2021; Obeidat et al., 2021). Digital transformation can be considered as a useful approach to track relative outcomes using process related metrics to evaluate the effectiveness of new digital business models in creating value, particularly in the digital transformation phases (AlSuwaidi et al., 2021; Al-Marouf et al., 2021; Capuyan et al., 2021). This research is interested in extracting the most important metrics that affect the digital transformation process in the context of developing countries. More specifically, the research aims to establish the foundation of studying digital transformation metrics and their relationship to the level of digital transformation in UAE engineering service provider sector. By highlighting several important performance metrics within the organization that measures the success of digital transformation as a main goal and the role of these metrics in each phase of the transition. This research also determines the main internal challenges and constraints facing UAE engineering service providers during the transformation process and how UAE engineering service provider response and develops new metrics for these constrains. Moreover, the research suggests needed recommendations that can help in enhancing digital transformation process and metrics system to evaluate the performance of transition, allowing fast track action to fine tune the process to achieve the maximum output of the transition in UAE engineering services

provider sector. The research is an exploratory qualitative research. It highlights important metrics that drive the digital transformation in the UAE engineering service provider sector. In addition, it is one of the early studies to specially address digital transformation and its phases as well as digital metrics associated with it in the UAE engineering service provider sector.

Research Question

A literature review was used to determine gaps in existing knowledge linked to the identified problems and our current gaps in understanding; there is a need for more fine-grained discussions of how organizations are responding to both the opportunities and obstacles presented by the new wave of digital transformation. Despite the growing research interest in digital transformation performance management, literature on digital transformation performance management still in a beginning stage. Most of the studies on digital innovation look at transformation from a technical, architectural or information system perspective, but not from a managerial viewpoint. Moreover, few recognized studies tackle the specific selection of organizational performance measures. Most available literature assesses this issue from practitioners' viewpoints. As a result, this research takes a different approach to digital transformation by choosing the digital metrics context to see how organizations response and develop metrics across the different phases of digital transformation. This study addresses these literature gaps by raising the bellow research question:

RQ1. Which metrics are critical for the different phases of digital transformation?

The difficulties in measuring digital maturity progress for each phase of digital transformation occur based on the lack of contextual alignment between input and output variables used to measure maturity progression.

LITERATURE REVIEW

Digital Transformations Phases

The concept of digital transformation is multidimensional and covers a wide range of subjects and activities. To understand what is known about organizations' digital transformation. Using multidisciplinary literature reviewed. Rather than relying on a single field to better understand current knowledge, the intersection of different fields must be studied (Tarafdar & Davison, 2018; Aburayya et al., 2020; Mouzaek et al., 2021). Since digital transformation has several functional areas, like marketing, information technology, innovations, strategic and operations management, a border exchange of knowledge helps us to know the operational needs of digital transformation. Understanding the different research venues aids scholars in stimulating the cumulateness of research (Foss & Saebi, 2017). To make an efficient decision about how to react to digital technologies, continuous improvement and organizational changes, practitioners must be brought together perspectives from information systems, marketing, strategic management, innovation, and operations management (Paré et al., 2015). A review of the multiple arenas of information systems, marketing, innovation, and strategy reveals that all fields identify multiple stages of digital transformation, ranging from relatively minor to more major changes. Three stages of digital transformation identified digitization, digitalization, and

digital transformation (Loebbecke & Picot, 2015; Matt et al., 2015; Parviainen et al., 2017). *Digitization* is the converting of analog data into a digital format (Yoo et al., 2010; Dougherty & Dunne, 2012; Loebbecke & Picot, 2015). The study also refers to digitization as a transformation of analog to digital tasks (Li et al., 2016; Sebastian et al., 2017), or it is defined as the creation or facilitation of cost-effective resource configurations through the use of IT (Lai et al., 2010; Kamp & Parry, 2017; Al Kurdi et al., 2021). Based on the above definitions, digitization is the process of transferring analog information into digital information. Digitization generally digitalizes internal and external procedures but does not change value creation. *Digitalization* explains how information technology or digital technologies can be used to change existing processes (Li et al., 2016). Such a transformation applied widely to the development of new complex adaptive processes using metadata, which would not be possible without digital technologies (Dougherty & Dunne, 2012). In digitalization, IT is a critical enabler for seizing new business opportunities by changing existing business processes such as communication tools, distribution of the services or management of business relationships (Doorn et al., 2010; Leviäkangas, 2016; Ramaswamy & Ozcan, 2016). Organizations use digital technologies to optimize existing business processes by allowing for more efficient coordination between processes and create additional customer value by enhancing user experiences (Pagani & Pardo, 2017). As a result, digitalization is not only concerned with cost savings but also with process improvements that may improve customer experiences. *Digital transformation* is the most widely recognized phase and describes a business change that leads to the development of new business models that may be revolutionary to the organizations or industry. Organizations compete and can achieve a competitive edge by utilizing different ways of doing things (Casadesus-Masanell & Ricart, 2010; Iansiti & Lakhani, 2014; Kane et al., 2015; Pagani & Pardo, 2017), which is described as "how the organization generates and provides value to its customers, turning payment received to revenues" (Teece, 2010). Digital transformation affects the entire organizations and its ways of doing business, and it extends beyond digitalization, which involves the modification of simple organizational processes and tasks. It rearranges processes to adjust an organizations business process or value creation process (Raphael & Zott, 2001; Gölzer & Fritzsche, 2017; Li et al., 2018). Furthermore, digital transformation makes use of digital technologies to enable cross-border connections with providers, customers, and competitors (Singh & Hess, 2017).

Assessment of Digital Transformation

This section contains an analysis of recent studies on "*Digital Maturity*" and its evaluation, beginning with a consequences and relations to other organizational issues such as transition process and employee's capability as the driving force. Literature provides an analysis of existing maturity models also highlight some practicable models. The classification is built on (Urbach et al., 2009; Voß & Pawlowski, 2019) classification structure and highlights the various approaches to digital transformation readiness assessments, and how they were produced. *The Digital Maturity Model* is based on a business engineering landmark (Back & Berghaus, 2016) and consists of nine dimensions "*Customer Experience, Product Innovation, Strategy, Organization, Process Digitalization, Cooperation, Information Technology, Culture, Expertise and Transformation Management*". Each factor, which consists of around three maturity requirements, is obtained from literature analysis, and validated by expert interviews. Since the

model is very general, it can be applied to a wide range of scenarios. *The transformation model* presented as comprehensiveness approach in 2017 by Deloitte (2018), based on a 2015 report of Swiss manufacturing firms' digital future preparation, which included interviews with board and senior management members. The model has four dimensions: "Organization, Culture, Digital Environment, and "People," with each dimension having two subcategories. *Digital Transformation Structuring Model* by Gimpel et al. (2018) suggests six categories "Customer, Data, Value Proposition, Organization, Operations and Transformation Management". assessing the transformation. Each category contains four action items that work together to include a "holistic and realistic perspective" on digital transformation. *Critical Decisions for a Digital Transformation Strategy* by Chanas and Hess (2016) focuses on Eleven strategic questions will help in the development of a digital transformation plan. The questions address both the technology context and the organizations' behaviors. The questionnaire inquiries about the organization's ability to adapt in terms of value creation as well as organizational adjustments. *Readiness-Model* by Lucas Jr et al. (2013), its complicated yet detailed model considers all facets of the production process. It places a strong emphasis on the technical aspects of digital transformation in mechanical engineering. The model provides for a detailed overview of the organization to be assessed by considering the employees' actual degree of skill. *The Digital Transformation Framework* by Matt et al. (2015) A simple model that emphasizes on four dimensions' "Use of Technologies, Structural Changes, Financial Aspects, and Changes in Value Creation" and link it with the strategic consequences for managers. *Industry 4.0 readiness and maturity model* by Schumacher et al. (2016) consist eight dimensions "Products, Customers, Operations and Technology" to assess the basic enablers. Additionally, "Strategy," "Leadership," Governance, "Culture" and "People" allow for including organizational aspects. The model focuses on the softer elements and solely focus on manufacturing organizations, since their practice seems to be quite sustainable because they view readiness assessment as the first step before starting the maturing process, while maturity assessment is capturing the overall condition during the maturing process allowing for a clearer differentiation.

Digital Transformation Metrics

The Oxford dictionary defines a "Metrics" as a system or standard of measurement. In businesses they use the definition "a set of figures or statistics that measure results." in other words a metric is a tool to measure something. A ton of research has been done on performance measurement and management processes in general, and many studies have looked at the complexity of transforming factors. When it comes to digital transformation projects performance management, the most important thing is: Do we know how to measure the value proposition intended by the transformation, and do organizations manage what they can measure? Physical capital (making and distributing products or services) or human capital (delivering products or services) are the primary target areas for most organizations. Inventory, efficiency, productivity, as well as other traditional key performance indicators (KPIs) are all monitored by these organizations The KPIs that an organization is now measuring aren't always affected by digital change. Indeed, the ultimate aim of digital transformation is to increase sales, sustainability, and customer satisfaction as well as network cocreation and value sharing (Libert et al., 2016; Kurdi et al., 2020; Al-Dmour et al., 2021; Sultan et al., 2021). According to Boulton (2017), Digital KPIs will be used to determine how well an organization has progressed on its

Digital Strategy and how far it is optimizing its digital market results. When transformation is completed and digital business becomes standard operating practice, some KPIs will be "transitional," while others will become permanent metrics for business success. For example, Neely (1999) discusses the performance measurement movement, claiming that the evolving nature of employment, intensified competitiveness, development programs, quality awards, changing corporate positions, and changing external expectations, as well as rises in information technology, have all contributed to performance assessment increased popularity. Few organizations have a formal mechanism in place to control the evolution of their measuring structures (Kennerley & Neely, 2002). The need for dynamic rather than static performance measurement system, as well as a transition from performance analysis to performance management, was emphasized (Neely, 1999). The same conclusions noted that the course of evolution has changed from static to dynamic performance measurement system, with an emphasis on management rather than calculation, among other things (Adobor & Daneshfar, 2006; Alshraideh et al., 2017; Al-Duhouri et al., 2020). A solid design of performance measurement system could help organizations move from a cost model to one that supports radical innovation rather than cost efficiencies, because of the increased need to develop new capabilities (Micheli & Mura, 2017; Al Suwaidi et al., 2020; Alyammahi et al., 2020). Internal and external communications and business structures that are digitally represented are all part of the digital transformation process, because of technical advancements in information technology, including applications, computing power, and surrounding technologies such as phones and sensors. New opportunities in performance assessment arise because of these changes (Delen & Demirkan, 2013). According to Fitzgerald et al. (2014) embracing digital technology is a new strategic essential, one of the most visible obstacles to digital transformation is a lack of understanding on the payoff organizations deserve to know that their investments in digital technology are yielding results. To aid in the implementation of digital transformation, organization managers must use metrics.

DISCUSSION

Despite multiple published Readiness Assessments on digital transformation, it appears that this subject is yet to be investigate from the viewpoint of transformation metrics and how organization select or response to these metrics. The aim of the study to provide a framework that includes the organization's key transformation metrics "*organization agility, operation flexibility, customers focused measures, digital resources, value proposition of product and services and transition management*" (Back & Berghaus, 2016; Chanias & Hess, 2016; Gimpel et al., 2018) and how it's correlate with each phase of the digital transformation (Korachi & Bounabat, 2019). Digital transformation literature state, the popular measures used to gauge success are either organization or product/services related, which often target markets "market size and time to market" and finances "net present value or similar" and whether the pre-established plan of transformation is followed (Blindenbach-Driessen et al., 2010; Henttonen et al., 2016). Net present value, Return on Investment, Time-to market and Success/failure rate of projects frequently used metrics for innovation projects (Griffin & Page, 1993; Bremser & P. Barsky, 2004; Kirsner, 2015). Many studies have investigated the links between management processes or efficiency dimensions and organizational performance. Adam Jr (1994) investigated the interaction between alternative quality management methods and operational and financial

success, discovering a close connection between the method and outcomes. Samson and Terziovski (1999) investigated the relationship between total quality management activities and organizational efficiency; they found that leadership, people management, and customer focused were all powerful predictors of success. Few studies looked at cause and effect relationships of correlations between organizational effectiveness metrics. Studies by Bernhardt et al. (2000); Brandt (2000) and Edvardsson et al. (2000) looked at the relationship between customer satisfaction, reliability, and engagement and financial outcomes. Other study looked at the connection between employee behaviors and customer retention (Tornow & Wiley, 1991), and the link between the workplace atmosphere and financial performance (Wiley, 1991). The results of study analyze the influence of efficiency on organization success on 43 case studies, and develops a theoretical framework demonstrate the effects from excellence the quality to higher profitability (Hardie, 1998). To explore alignment, Sinclair & Zairi (1995) reviewed outcomes from 22 organizations, focusing on relationships between success metrics, strategic priorities, and growth areas. Their findings indicated a misalignment between targets goals and performance measures in use. Studies have focused on either the selection of performance measures or specific relationships among key measures, there is lack on literature in either research or practice that attempts to understand the measurement system in context of the digital transformation evaluations and how organizations use these metrics to assess performance of digital transformation in each phase. To better understand these challenges, a conceptual framework and digital metrics mapping represented by Figure 1 were created to collect specific information about the organization and its performance, the types of measures used in each digital transition phase, frequency of data analysis, and the types of analyses performed to address below propositions.

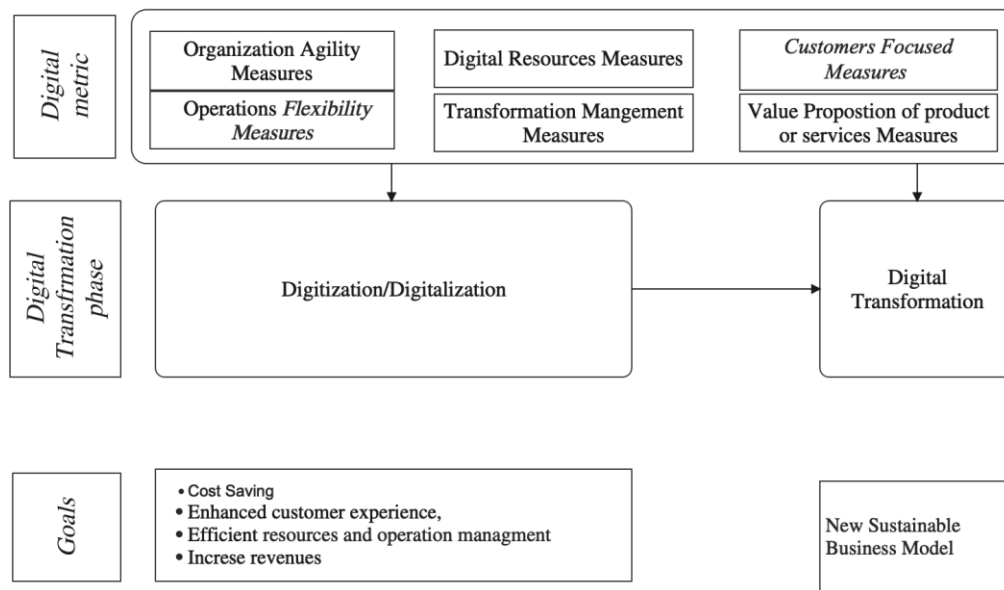


FIGURE 1

BASIC CONCEPTUAL FRAMEWORK

Source: Back & Berghaus, 2016

Key Digital Metrics of Digital Transformation

According to the *Literature above*, the key factors of digital transformation of the organizations should be revisited and evaluated on a regular basis and make sure that the action plan for implementing phase of the digital transformation is on the right track:

Organization agility

As the digital economy promotes individuality and agility as core principles and rejects work processes that focus on predictability, uniformity, and continuity, existing organizations are challenged to meet rapidly evolving customer needs and offer creative value propositions (Notter, 2015). Organizations also make fast changes to their operational structures foster continuous innovation capability. Organizations also face a lack of ability to fundamentally reform their organizational structures in response to changes in employee and management capabilities and mindsets (Kerpedzhiev et al., 2017). Agility is described as an organization's ability to access digital market opportunities faster than its competitors (Sambamurthy et al., 2003). Agile project management, process flexibility, design thinking, rapid deployment, and streamlined production and operations are also examples of organizational agility. Organizations should aim for a balance between exploitative and explorative capacities (Raisch & Birkinshaw, 2008) by integrating a stable core that increases productivity by standardization, modularization, and automation with flexible boundaries that allow for rapid and continuous innovation (Sarkees & Hulland, 2009; Alameeri et al., 2020; Alsuwaidi et al., 2020). According to Bharadwaj et al. (2013), the pace at which organizations make decisions is critical for them to remain competitive. The increasing use of technology influences how companies and individuals approach their jobs (Colbert et al., 2016). Changes in employee attitudes and thinking processes can make it more important for future workplaces to support collaboration. Working in the digital focus organization requires dynamically organizing individuals into project teams that bid for high-value projects. As a result, the future workplace should encourage collaborative models that free work from limitations such as time and place (Brynjolfsson & McAfee, 2014). Establishing a digital mindset as a key component of organizational culture is key to improve organizations digital transform success. Where, effectiveness in digital transformation is determined by the mindset of its staff and managers instead of an organization's age (Kane et al., 2015). Organization's facing difficulty of empowering customers when the workforce is unexcited about smart value propositions, business models, and visionary goals.

Operations flexibility

Organization needs to rethink their organizational structures, market strategies, and supply networks as the digital and physical environments start to overlap because of digitalizing of operation activities. Achieving this goal requires a scalable and integrated IT infrastructure, as well as automated operations, supply networks, and manufacturing capability (Lasi et al., 2014). Integrated IT systems, ensures that modules, processes, networks, and applications can all fit together. However, this task is not unique to digital transformation, organizations identified it as a necessary precondition for success (Jöhnk et al., 2017; Gimpel et al., 2018), data collection and

device integration should be flawless in order to have smart products and services and a smooth user experience. Many Organizations consolidate their IT infrastructure before and after the implementation of digital transformation projects to ensure value creation (Lee et al., 2015). Organizations will benefit from investing in the flexibility of their IT infrastructure and its alignment with rapidly evolving emerging technology while consolidating their IT infrastructure to further turn their industries (Lee et al., 2015). Dynamic markets and wide range of products and services organizations should improve agile operations skills and plan their processes accordingly for achieving good value propositions in the digital economy (Lasi et al., 2014). Flexible operations enable organizations to create smaller production sizes, where they use to personalize products or services to fulfill constantly changing customer needs (Jöhnk et al., 2017). Digital supply networks support agile operations by facilitating the end-to-end sharing of resources, products, services, and data among participating organizations, digital supply networks foster reliability at a higher degree than flexible operations and help mitigate operational risks (Khaitan & McCalley, 2014).

Value proposition of digital transformation product and services measures

Customers in the digital economy demand creative value propositions that make use of digital technology. Customers expect integrated, simple, and personalized solutions. Some organization admitted to engaging in digital value offerings to avoid consumer turnover rather than to pursue alternative revenue sources (Römer et al., 2017). Organizations must gain momentum to keep up with the technical and continuous growth capabilities of digital leads. Such organizations may seek to develop novel digital value propositions by converting their legacy products and processes into assets and participating in digital ecosystems (Porter & Heppelmann, 2014). Smart products augmented with sensors, actuators, processing capacity, and connectivity were seen as having enormous potential by organizations. Similarly, organizations may enhance their value proposition by using smart services, either in combination with smart products or on their own. Though thing-centric services are closely tied to digital products, complementary services use physical products as value carriers, and ecosystem services aid in the integration of physical products into larger product and service environments (Al-Zu'bi et al., 2012; Porter & Heppelmann, 2014; Püschel et al., 2016). Porter and Heppelmann (2014) also argues that the foundation of competition moves from single products to smart products and services, product and service networks, and systems of systems, from single products to smart products and services. While this transition attracts new players from other markets, it also provides existing organizations with new revenue streams. Smart products are a promising way to stay in touch with consumers. Whereas previously, consumer experiences stopped at the point of sale, smart devices allow continuing relationships, which can revolutionize existing organizations' and industries' after-sale strategies (Porter & Heppelmann, 2014). In the context of digital transformation, time-to-market refers to the amount of time it takes to get a product from concept to market (Crawford, 1987). It is considered as a crucial competitive advantage for businesses, especially in industries with short cycle times (Stalk, 1988; Stalk Jr & Hout, 1990; Altamony et al., 2012). Early entry into the market strengthens market domination. It further improves the organization's ultimate competitiveness, being the first to market has a significant comparative edge (Montgomery & Lieberman, 1988; Ford & Sterman, 2003; Carbonell & Rodriguez, 2006).

Customers focused measures

Customers are becoming more educated, evaluating value propositions, and making purchasing choices because of digitalization. Customers in the digital economy are well-informed, self-assured, linked, and convenience-obsessed (Nguyen & Mutum, 2012; Hosseini et al., 2015; Nuseir et al., 2021). Even though digital transformation pioneers and start-ups adhere to a customer-first approach customer experience management is critical in the digital economy for any organization who wants to build and maintain customer relationships. In contrast to sales digitalization, customer service management focuses on subjective experiences rather than reliability and straight-through processing; the subjective views of customers because of direct and indirect interactions with organizations. Customers interact with organizations on a variety of levels (rational, emotional, visual and physical), making this experience unique and unpredictable (Gentina et al., 2020). Digital transformation measures will benefit from a better understanding of how digital technology, which can seamlessly integrate into consumers' lives, impact consumer service at any point. By gathering customer data during customer journeys, via digital touch points, or while consumers use smart products and services, technology services provide organizations with innovative opportunities to obtain customer insights (Brynjolfsson & McAfee, 2014; Porter & Heppelmann, 2015). Organizations can gain insights into their consumers' mindsets, moods, motives, wishes, and expectations thanks to the amount and variety of consumer data available. These experiences form the basis for personally personalized products and services, accurate predictions of customer behavior, and improved customer retention, engagement, and experience. Customers communicate with organizations through digital and traditional channels in such an integrated way in the digital economy that many organizations avoid segmenting their customers based on channel use behavior (Melero et al., 2016). Finally, digitalization encourages hybrid consumer engagement, in which consumers communicate with companies across several networks at the same time and may deviate from organizationally established trends (Ehrnrooth & Gronroos, 2013; Nüesch et al., 2015; Alshurideh et al., 2019).

Digital resources measures

To truly leverage the power of digital transformation, organizations must manage significant changes, including changes to the design of the IT function, particularly in terms of IT agility and IT exploration capabilities (Fitzgerald et al., 2014). Information system research's and practices have addressed how to organizations particularly managed the IT function to contribute to the organization's performance effectively, debating this change has only intensified in the context of digital transformation (Bossert, 2016). Practitioners have recognized that traditional governance and rules are "restricting" the necessary trials and innovations required for organizations to be successful in the digital economy (Colella et al., 2014). IT agility refers to the IT function's ability to identify opportunities for innovation and respond quickly. This enables the IT function to capitalize on opportunities by quickly adapt to external developments in areas such as technology and legislation. An agile IT function can become actively involved and continuing to drive the changes that competitors must respond to (Chi et al., 2010). Agile IT leads to faster correction of misalignment between business and IT in the context of alignment. The ability to collect and interpret big data for decision making is critical during the digital transformation process (Loebbecke & Picot, 2015; Dremel et al., 2017). Data impacts multiple

fields linked to digital transformation, most of organizations state that data is the foundation of progress in the digital transformation such as customer insights, smart products and services, or digital manufacturing. As a result, learning how to absorb, evaluate, and transform data into an asset would help organization transformation success (Jöhnk et al., 2017). Data integration is one of the most difficult issues to resolve. The process of extracting and integrating different data and making it usable as an integrated shape and structure in a physical or virtual database is known as data integration. This process is essential to leverage the importance of data that becomes accessible in supreme volume, variety, and pace in the digital economy (Goodhue et al., 1992). Organizations struggle to transform data into actionable information, falling in a common big data traps like low-quality insignificant data. Predictive, analytics, deep learning, and artificial intelligence are becoming increasingly relevant in digital transformation (Shmueli & Koppius, 2011; Porter & Heppelmann, 2014). With the growing amount of available data and data-driven business models, the issue of who controls the data often arises. Data ownership and privacy are critical considerations in assessing an organizations strategic positioning and data policy. Data security is one of the most difficult aspects of digital transformation. Organizations must provide superior data protection as a brand guarantee and mitigate negative costs due to strict legislation and unexpected effects in the event of data breach or leakage (DalleMule & Davenport, 2017).

Transformation management measures

The main challenge for almost all organization seeking digitally transform is how to convert the current situation to a digitally enhanced state to maximize the benefits of digital technology and digital transformation, the ideal recommendation is to identify an effective digital plan that includes organizations vision, priorities, opportunities, and activities. Developed digital strategies should account for their legacy product range, operations, and IT. Because of the fast-moving nature of emerging technology, consumer demands, and competitiveness in the digital economy, organizations may benefit from recognizing that they may never achieve a completely clear objectives for their digital transformation effort (Hess et al., 2016). The need to decide who will oversee compiling an organization's digital agenda, nurturing a digital culture, and leading the organization towards digital transition adds to the complexities. The question is, how can transformational leadership show itself? Is it the responsibility of the CEO, the chief information officer, or CDO, the chief innovation officer (Weill & Woerner, 2013; Tumbas et al., 2017). The most powerful methods for delegating responsibility for digital transformation are determined by an organization's culture, strategic strategy, organizational structure, and, last but not least, the employees who occupy key roles within it (Rickards et al., 2015). Change has occurred in the digital economy. Transformation has become more volatile and difficult to expect. As a result, change management is arguably critical for achieving digital transformation goals. Organizations must maintain their evolution, interact with staff, and improve the way they act and think as part of digital transformation (Bennett & Lemoine, 2014). It requires training staff about digitalization and the improvements that may occur, as well as enhancing their expertise and attitude (Keen & Williams, 2013). Digital value ensures that organizations take full advantage of digital transformation; it aims to verify that an organization digital plan is broken down into a set of manageable, synchronized activities. It verifies that an organization can monitor the reach, growth, dependencies, and advantages of any of its digitalization initiatives. Digital value assurance also allows businesses to review and rethink their digital approach on a

regular basis. Organizations must be able to assess the importance of emerging technology in their own operations (Kane et al., 2015). In several organizations, digital transformation began with several unrelated pilot programs to try out new digital innovations, inspire staff, and show that taking advantage of digital resources is not impossible. Organizations began to align individual projects during this initiation process to combine technology and infrastructure growth initiatives with value proposition and legacy projects. To speed up promising digital initiatives and reduce innovation lag, some organizations implemented agile budgeting procedures. They also developed digital-specific reporting lines, management reviews, and performance assessment systems (Jöhnk et al., 2017).

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