

# Towards Strategic Support and Guidance of the Digital Transformation: A Conceptual Model

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**Abstract.** Progress in digital technology has led to new business opportunity and changed the way in which organizations create, deliver, and capture value. Traditional companies could fail in operationalizing their digital transformation approach because they believe that they can pursue digitalization simply by applying new IT technologies. Having a profound impact on the way business is conducted, the digital transformation needs to be understood by the C-level executives of an organization. For this purpose, this research aims to identify and depict the core digital transformation concepts using conceptual modelling. The latter provides a common understanding for all stakeholders of an organization especially the board of directors from whom a clear vision and transformation support is required. The proposed framework provides a high-level overview of the custom digital transformation context that would help an organization in its digitalization journey and supports it to shift from an ad-hoc technology-driven approach to a rather systematic integrated approach to digital transformation.

**Keywords:** Digital Transformation · Conceptual modelling · Business model · Strategic support · Governance level

## 1 Introduction

Digitally enabled organizations are supported by emerging digital technologies, which increasingly promise great opportunities for growth [27]. These digital technologies embrace ICT systems such as mobility, analytical systems, and virtualization and are integrated with back-office ICT in order to provide a holistic view of the digital organization [27]. Such initiatives are known as being part of the Digital Transformation (DT) of organizations and require them and their respective management to reflect on the process of implementation.

With the shift to digitalization, organizations cannot focus their behaviour and reflection only on the physical/traditional world [11]. Managers in any organization must be able to recognize and anticipate technology-enabled change,

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assess its potential and impact, and understand how to leverage digital technology in order to capture and create value for their organizations [11]. Successful management of an organization in a digital era requires rethinking the organizational strategy, business model, and key business drivers [11].

Studies show that implementing large-scale ICT-enabled change initiatives does not have a great rate of success across organizations [27, 1, 23]. The extensive and diverse literature on DT suffers from a missing common agreement on the exact definition of DT [47] and what it encompasses [51]. In order to address this gap, this paper aims to address key DT concepts and provide a high-level overview of the custom DT context which will help organizations succeed in their DT journey. For that, we will present a framework that helps organizations recognise DT concepts and then instantiate this framework to the case of a digitally-enabled hospital to better understand its applicability.

The rest of this paper is structured as follows. Section 2 focuses on the research approach followed to carry out this research. Section 3 provides some background information about DT and the existing research on DT conceptual models. A running example is then provided in Section 4. Section 5 depicts the proposed DT framework. Finally, Section 6 and 7 provide a discussion and the resulting conclusion respectively.

## 2 Research Positioning and Objectives

**Research Question** Being in the paradigm of Design Science Research (DSR) [22], this research has the aim to propose a solution to the problem of recognizing the necessary DT concepts in order to provide a high level view that helps executives, at the strategic level of any organization in different industries, transform their business with a minimum rate of failure. For that, this paper aims to address the following research question (RQ): *How can we represent through conceptual modelling the key DT-related concepts/elements that can be used at the governance-level to drive a successful DT?*

The artefact built through the DSR approach is a metamodel and is, once instantiated onto an organization, aimed to support strategic reasoning into organizations willing to have a structured DT approach.

**Research Methodology** The metamodel is based on a literature review leading to a careful reading and examination of the identified sources and was validated on the basis of an internal discussion. The literature review indeed allowed us to identify the key contributions in the field of the DT. This was then followed by the overall study of the identified resources which led to the extraction of the key concepts. Each of the identified concepts were then discussed and validated based on the basis of a discussion among the authors of the paper. The metamodel is presented in Section 5. The latter provides an explanation of each of the identified concepts as well as the resources they were extracted from. The metamodel is then instantiated on a case (see Subsection 5.2) to better show the applicability of each of the identified concepts in the metamodel.

## 3 Related Work

### 3.1 The concept of DT

DT has become a buzzword in contemporary academic and practitioner conversations [17]. Furthermore, as to its strategic importance [43], DT is affecting and challenging managers and C-level executives across industries and contexts (eg. [53, 1, 8, 3]). Moreover, the emergence of the Covid-19 pandemic have further urged organizations into action by increasing awareness regarding the need to accelerate DT [14].

According to the European Commission forecasts, one of the leading global trends to 2030 will be a *transformative industrial and technological revolution*. There are many definitions provided by business experts, academicians and government authorities. For example OECD [34] states that “*digital transformation refers to the economic and societal effects of digitization and digitalization. Digitization is the conversion of analog data and processes into a machine-readable format. Digitalization is the use of digital technologies and data as well as their interconnection which results in new or changes to existing activities*”. On the other hand, Bloomberg [6] explains that “*Digital transformation requires the organization to deal better with change overall, essentially making change a core competency as the enterprise becomes customer-driven end-to-end. Such agility will facilitate ongoing digitalization initiatives but should not be confused with them*”. For Verhoef et al. [45], DT is the way in which “*a firm employs digital technologies, to develop a new digital business model that helps to create and appropriate more value for the firm*”. Last but not least, according to Lucas et al. [28], changes driven by DT relate to changes in the relationship between the organization and employees and customers, adjustment to the business processes, and market condition. DT and the following business model innovations have basically changed customer needs and behaviour, disrupted many markets, and suppressed traditional firms [45]. Continuous changes in customer expectations and behaviour are forcing organizations to take the lead in the DT [33].

### 3.2 DT challenges and conceptual solution

To appropriately incorporate disruptive technologies, organizations must include the DT within their core strategy [18]. Westerman et al. [53] note that “*executives are digitally transforming three key areas of their enterprises: customer experience, operational processes and business models*”. According to Heavin and Power [18], there are major challenges of DT facing managers such as *priorities* (i.e. does increasing the efficiency of existing operations have more priority than focusing on the customer and their needs?) and *security vs accessibility* (i.e. managers must balance the sensitivity and importance of data with accessibility concerns).

Different opinions do exist among researchers about how DT should be supported [54]. Some studies emphasize the importance of focusing mainly on customers and their needs [42, 9]. Likewise, Bloomberg [6] states that “*digitization*

*and digitalization are essentially about technology, but the digital transformation is not. Digital transformation is about the customer*". Some other studies insist on importance of the fact that executives should support and initiate the incorporation of digital culture as well as the processes of organizational change [42, 15, 19]. In their study, Verina and Titoko [46] propose a conceptual framework to provide a deep understanding of DT concepts. Their framework is based on three categories of DT in business, namely technologies, people, and processes and management. In another study, Chernbunroong et al. [7] propose a conceptual model of DT by focusing to deliver greater business outcomes for Thai SMEs. They also emphasize the three elements of people, process, and technology, and they consider the "people" element to have the most important role in DT process. Other studies have been addressing DT by focusing on the Covid-19 pandemic issues. For example, Muditomo and Wahyudi [31] present a conceptual model for small and medium-sized enterprises. In their study, they focus on DT drivers as well as strategic imperatives and DT milestones. They emphasize that external DT drivers such as digital competition, digital technology, and digital customer behaviour are the main triggers for DT.

## 4 Running Example: Digital transformation in Healthcare

As with many other industries, Healthcare has seen major benefits from DT with the adoption of new digital technologies helping to deliver high-quality, secure patient care and drive greater business efficiency. Electronic Health Records (EHR), Enterprise Resource Planning systems (ERP), digital imaging, e-prescription, are all among the digital technologies that have been integrated into the IT systems of many healthcare organizations [16]. Adopting technological innovations has primarily had an impact on the positioning of the patients and the internal processes within the healthcare system [25].

The rising relevance of the DT in healthcare became evident to both practitioners and scholars [40]. One of the DT services popular in the healthcare industry is Telemedicine. The latter traces back to the 19th century [2] and refers to "the delivery of [HC] services, where distance is a critical factor, by [...] using [ICT] for [...] treatment and prevention of disease and injuries, research and evaluation, and for continuing education of [HC] providers, all in the interests of advancing the health of individuals and their communities" [35].

To illustrate and understand different DT concepts within the healthcare industry, we take into account an evolution of the Saint-Romain hospital which is a fictive example but partially based on previously collected data presented in [49] and [48]. Let's consider that due to the Covid-19 pandemic, the governance board decides to adopt a telemedicine service. Being able to identify the related DT concepts especially at the strategic level, Saint-Romain not only accelerates the adoption of telemedicine but also avoids possible adoption challenges. As such, the more guided and supported the hospital boards and executives become regarding the adoption of telemedicine, the more effectively they can survive in the digital world.

## 5 The proposed DT Conceptual Model

This section presents the identified DT concepts in the form of a metamodel. The main goal is to be able to recognise DT concepts especially at strategic level. As previously mentioned in Section 2, the metamodel is built on the identification of the key contributions in the field of DT. Table 1 shows each of the identified concepts as well as the sources from which these concepts were retrieved.

Concepts	Sources
<i>Customer</i>	Matarazzo et al. (2021) [29], Fitzgerald et al. (2014) [13], Berman (2012) [4], Lemon et al. (2016) [26]
<i>Customer Value</i>	Matarazzo et al. (2021) [29], Berman (2012) [4], Pereira (2017) [38]
<i>DT Service</i>	Wautelet (2019) [48]
<i>Technology Asset</i>	Ferreira et al. (2020) [11], Andriole (2017) [1], Sahu et al. (2018) [41], Henriette et al. (2015) [20]
<i>Market Demand</i>	Ebert and Duarte (2018) [10], Bharadwaj et al. (2013) [5]
<i>DT strategy</i>	Correani et al. (2020) [8], Kane et al. [24], Bharadwaj et al. (2013) [5], Morakanyane et al. (2020) [30], Hess et al. (2016) [21]
<i>DT Objective</i>	Wautelet (2019) [48]
<i>Business Model Technique</i>	Zott and Amit [55], Osterwalder and Pigneur [36], Weill and Vitale [50], Loonam et al. [27], Westerman, Bonnet, and McAfee [52], Myrthianos et al. (2014) [32], Parry et al. (2014) [37]

**Table 1.** DT concepts and the associated literature sources

### 5.1 DT Metamodel

Based on the literature study, some of the important DT concepts are identified and described below. Each concept is illustrated on the case described in Section 5.2. The resulting metamodel is represented in Figure 1.

#### 1. *Digital Service*

**Description:** A digital service is a coarse-grained functional element. It refers to the adoption of new digital technologies in order to sustain DT objectives and bring value [49, 48].

**Illustration:** In Fig. 1, a digital service will be an instance of the `Digital_Service` class.

**Example:** *Adoption of telemedicine is an example of a digital service in Saint-Romain.*

#### 2. *Customer*

**Description:** One of the most important motivations for organizations to go through their DT, is *improving customer experience* [13]. *“The customer dimension concerns about the entire customer interaction journey with the organization through digital transformation”* [4, 26]. According to surveys, improving customer relationships is the area where organizations have the most success with digital technologies. Improving customer experience followed closely by customer-friendly ways of enhancing products and services, is one of the most prominent examples [13].

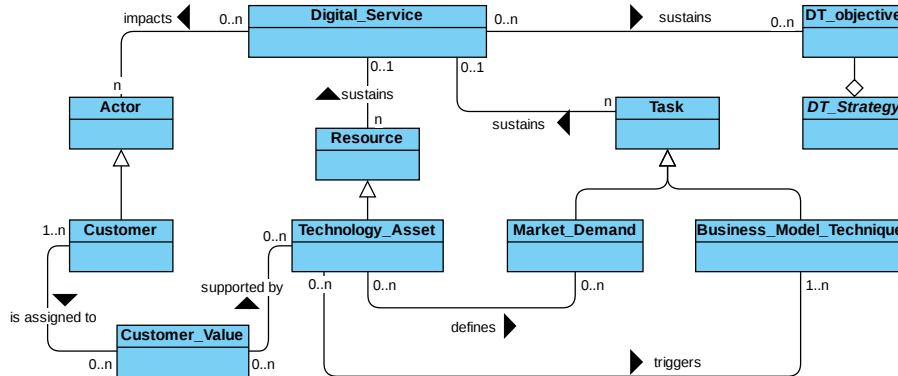


Fig. 1. Digital Transformation Metamodel

**Illustration:** In Fig. 1, a customer will be an instance of the Customer class.

**Example:** *In the context of Saint-Romain, patients are referred to as patients cared by the hospital. For that, to successfully transform, Saint-Romain executives must focus on improving patient experience.*

### 3. Customer value

**Description:** To improve customer experience, a successful DT requires to take into account various business factors, among them *value proposition* [4]. The latter measures the value customers realize from consuming products and services of an organization. Moreover, it captures the total benefit the customer achieves through the consumption of the product or service, which satisfies their latent demand [38].

**Illustration:** In Fig. 1, a customer value will be an instance of the Customer\_Value class.

**Example:** *As explained previously, In Saint -Romain, customers are patients and the value brought to them through telemedicine includes “healthcare access from home”, “prescription delivery”, “rapid care”, “quality care”, etc.*

### 4. Technology Asset

**Description:** Most transformational leverage are driven from tried-and-true strategic technology (e.g., customer relationship management software, ERP, etc.) and operational technology (such as networking and databases) [1]. Usually there are five aspects, namely (i) platforms, (ii) functions, (iii) infrastructure, (iv) applications, and (v) channels that have to be considered [41]. Technology assets are digital resources with the purpose to optimize and transform business activities [20].

**Illustration:** In the metamodel, a technology asset will be an instance of the Technology\_Asset class.

**Example:** *An example of the telemedicine-related technologies used by Saint-Romain include a platform for enhancing communication between healthcare providers, which increases diagnostic accuracy of some difficult cases as well as improving the treatment results of critical or severe Covid patients with*

limited medical resources. A remote-monitoring tool - to better perceive the evolution of Covid disease - is another example of telemedicine-related technologies.

#### 5. **Market Demand**

**Description:** Another business factor that can impact the success of DT is *market analysis* [5]. According to Ebert and Duarte [10] “*Disruptive companies explore the occupation gaps left by the market leaders*”.

**Illustration:** In the metamodel, a market demand will be an instance of the `Market_Demand` class.

**Example:** *With the raise in the number of people infected with Covid, Saint-Romain executives sensed the acceleration in the use of telemedicine platforms among healthcare organizations. To successfully transform, Saint-Romain must analyze the current and the future of the telemedicine market. As an example, knowing that patients need to buy their medicine after every televisit, it will be profitable for Saint-Romain executives (and more convenient for its patients) to integrate online pharmacy apps into the telemedicine service.*

#### 6. **Business Model Technique**

**Description:** There is no widely accepted definition of the business model concept. According to Zott and Amit [55] business model is a “system of interdependent activities that transcend the focal firm and spans its boundaries”. On the other hand, Osterwalder and Pigneur [36] view this concept as a support “in articulating how the firm creates and captures value”. Finally, Weill and Vitale [50] describe it as a set of “roles and relationships among firm consumers, customers, allies, and suppliers”. Despite the differing views, there is a consensus amongst practitioners and scholars alike that a business model is an important tool in supporting the strategic choices of an organization [32, 37].

According to Loonam et al. [27], organizations seeking to deploy digital technologies in order to gain greater competitive advantages must also ensure that their business models are aligned respectively. In their study, Westerman, Bonnet, and McAfee [52] state that digital technology can drive five archetypes of business model reinvention, namely (i) substituting products and services, (ii) rethinking value propositions, (iii) re-configuring value delivery models, (iv) creating new digital businesses based on new products and services, and finally (v) reinventing the entire industry. In this study we will use the word *business model technique* to refer to these five archetypes.

**Illustration:** In the metamodel, a business model technique will be an instance of the `Business_Model_Technique` class.

**Example:** *As Saint-Romain is only willing to expand the use of technology in its business model, it will focus on reconfiguring its value delivery models so that it can provide online services during pandemic*

#### 7. **DT Objective**

**Description:** A DT strategy is composed of fine-grained DT objectives [48].

**Illustration:** In the metamodel, a DT objective is represented as a class `DT_Objective`. As DT objectives are refinements of DT strategy, we used the aggregation link to model this in the metamodel.

## 8. *DT Strategy*

**Description:** According to Kane et al. [24], “*what separates digital leaders from the rest is a clear digital strategy combined with a culture and leadership poised to drive the transformation*”. Digital strategy refers to an organizational strategy formulated and executed through the leverage of digital resources to create differential value [5].

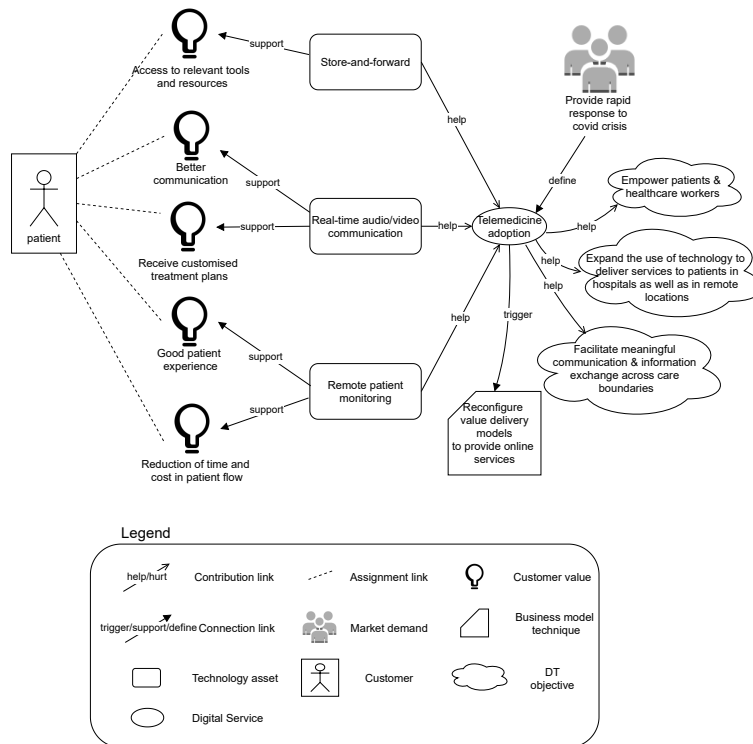
**Illustration:** In the metamodel, a DT strategy is represented as an abstract class `DT_Strategy`. The latter is an aggregation of DT objectives.

**Example:** *In the case of the Saint-Romain, their DT strategy is an aggregation of the following DT objectives: “increased value for patients”, “provide healthier future for individuals by providing access to mobile healthcare”, “improve employee and patient experience by removing paperwork, save time and cost”, “access to real-time patient information”, and “reach to remote areas and provide personalized healthcare with use of technology”.*

## 5.2 Model-based Representation of DT concepts

To better understand the DT concepts already presented in the metamodel (see Fig. 1), in this section we provide a respective instantiation, called “*DT Strategic Diagram*”, by considering the case of a digitally enabled Saint-Romain. The resulting representation is depicted in Fig. 2. Following the DT strategic diagram, we can see the important role of patient (customers of healthcare) and their associated values. For example, for patients, it is important to have *low care costs* or to be able to *easily communicate with their physicians*. Saint-Romain can provide value to the patients by adopting a new digital service, here *telemedicine*. The latter is operationalized through the deployment of a number of technology assets, namely *Real-time audio/video communication*, *store-and-forward*, and *remote patient monitoring*. While *real-time audio/video communication* provides patients with *better communication* and *receiving customized treatment plans*, *remote patient monitoring* supports patient values such as *good patient experience* and *reduction of time and cost in patient flow*. The telemedicine adoption is mainly defined by the analysis of the market and triggers Saint-Romain to come up with new techniques regarding its business models. For example, because of the Covid-19 pandemic, the healthcare market is pushing the healthcare industry towards more virtual ways of working. Based on such market demand, Saint-Romain decides to adopt telemedicine which triggers the hospital to reconfigure its value delivery models in order to provide online services to the patients especially during Covid-19 pandemic. Subsequently, the adoption of the new digital service will have an impact on the strategic objectives of the Saint-Romain, here, using telemedicine helps the hospital to expand the use of technology to deliver services to patients as well as in remote locations.





**Fig. 2.** Instantiation of Figure 1 - DT Strategic Diagram - case of a Digitally-enabled Saint-Romain

## 6 Discussion and comparison with other methods

With the provided metamodel our research allows executives to recognize important DT concepts as well as to see the impact of each of these concepts at the strategic level board decisions when it comes to the DT. On the other hand, instantiating the metamodel into a case study enables first, to represent each of the DT elements to emphasize its significant role when applied to an organization (here a healthcare) when it seeks to achieve DT, and second, to depict the possible impact each of these elements can have on each other. Finally, we can see how the adoption of new technologies affect the strategic objectives of an organization.

As previously mentioned in Subsection 3.2, similar studies exist with the focus on conceptual modelling. Some of these methods are listed below:

- **Muditomo & Wahyudi (2020)** [31]. Their conceptual support provides SMEs with a flow model that can describe decision-making steps in determining strategic imperatives and measurable DT milestones;
- **Verina & Titko (2019)** [46]. Their model focuses attention on factors enabling DT processes as well as on potential outcomes for business and society;

- **Udovita (2020)** [44]. Their method consists of identifying different dimensions of digital transformation that a firm can adopt in its DT process;
- **Heavin & Power (2018)** [18]. They provide a conceptual decision support guide for managers;
- **Rautenbach et al. (2019)** [39]. Their model aims to provide a diversified assessment toolset which helps organizations in enabling value-adding digital transformation by providing them a value equation for each digital dimension;
- **Chernbumroong et al. (2021)** [7]. Their model defines the states that enable digital transformation processes as well as the role and interaction of people.

Based on the analysis of each of the aforementioned studies and their respective methods, our approach entails novelty in that it makes use of conceptual modelling to help researchers and practitioners understand the many DT concepts that are required to be identified and understood by the top-level governance board of an organization as well as how these concepts are interrelated. We believe that to make DT operational, we should start from the governance level. Our framework helps C-level executives understand the requirements of DT and to identify its components.

## 7 Conclusion

In this paper we proposed a framework to model DT concepts and reconstitute a DT situation into an organizational DT strategic diagram. For that we first built a metamodel to introduce the new concepts and the way they are interrelated and second, instantiated the metamodel into an illustrative example of a healthcare instantiation (i.e. Saint-Romain hospital). With the constructed metamodel and the DT Strategic Diagram, we answer the research question raised in Section 2. As emphasized by Kane et al. [24], *more than being a matter of technology, DT is about adopting a consistent digital strategy*. Therefore, to successfully transform, organizations or more precisely executives, should be aware of important digitalization concepts beforehand. Having a clear vision and digital strategy helps them achieve the required DT maturity. Moreover, based on our research, one of the most important concepts is *customer value* as today customers are becoming more than ever digital-savvy and organizations should create products and services that meet customer value. To come up with such products and services and be able to create value, organizations need to reconfigure or reinvent their *business models* to define the required set of activities to create and capture value. For that, we consider the *business model* as another important DT concept. As for other important DT concepts, we can refer to *technology asset* and *market demand*. The analysis of the latter helps organizations in their adoption choice (i.e. which technology can help them survive in the market and avoid disruption) and sustain their strategic objectives.

Despite the advantages of the presented framework in recognizing key DT concepts, the framework has the limitations to not consider security and privacy

issues. Future work includes addressing the latter, which remain key factors (and a real dilemma in the case of healthcare [12]) when adopting new technologies.

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