

THE DEVELOPMENT OF VALUE PROPOSITION IN HEALTHCARE IN THE COURSE OF DIGITAL TRANSFORMATION

ABSTRACT

Recent research differentiates digital transformation from former transformations by the concept of value proposition. However, with this distinction, it remains unclear, particularly in knowledge-intensive sectors such as healthcare, how the core value-defining activities change and when they are considered extended or changed. As it is expected in research and practice that the healthcare sector is facing a fundamental digital transformation, this sector is particularly suitable for exploring how a changed value proposition can be conceptualized. This is particularly relevant as it helps further understand healthcare's underlying transformation dynamics. To identify core value-defining activities and their changes, we conducted 15 semi-structured interviews with employees from various healthcare organizations. We analyze the interviews with the inductive category formation of qualitative content analysis. The analysis enables us to classify the identified categories into five non-transformative cases, in which the value-adding activities of an organization are supported by IT, and four transformative cases, in which the value-adding activities of an organization are redefined. Overall, our findings contribute to a better understanding of the digital transformation at the organizational level in the healthcare sector. Furthermore, we highlight important areas for future research based on the four identified DT characteristics.

Keywords:

Digital transformation, Healthcare, Value proposition change, IT-enabled organizational transformation

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INTRODUCTION

Since its widespread adoption in organizations in the 1980s, IT has always impacted organizations in various ways (Besson & Rowe, 2012). With the aim to improve efficiency and productivity, IT has altered how organizations operate, changing the organizational work practices of employees and how organizational processes are structured (Besson & Rowe, 2012; Chantias, Myers, & Hess, 2019). These changes are typically referred to as “IT-enabled organizational transformation” (ITOT). Contrasting to this phenomenon, recently, the term “digital transformation” (DT) has been used in research and practice (Vial, 2019) to refer to more severe changes to organizational operations induced by the introduction of IT. In spite of the progress made in defining and delineating both phenomena (Baiyere, Grover, Lyytinen, Woerner, & Gupta, 2023; Ologeanu-Taddei, Guthrie, & Jensen, 2023; Wessel, Baiyere, Ologeanu-Taddei, Cha, & Blegind Jensen, 2021), the exact dynamics of DT and how it can be differentiated from ITOT are still the topic of an ongoing academic debate.

A distinguishing factor between ITOT and DT that has been identified in the literature is the emergence of a new or redefined value proposition in DT (Wessel et al., 2021). Accordingly, while ITOT relates to transforming value-supporting activities, DT relates to transforming core value-defining activities (Wessel et al., 2021). This can be observed in many organizations over the last few years, as organizations seek to use IT no longer for focusing on organizational efficiency only but also for capturing value in a different way (Baiyere et al., 2023; Demirkan,

Spohrer, & Welser, 2016; Wessel et al., 2021). As such, today, IT is one of the main vehicles enabling organizations to enhance their product and service offerings.

However, with this distinction, it remains unclear, particularly in knowledge-intensive sectors such as healthcare, how core value-defining activities change and when core value-defining activities are considered to be extended or changed. Since it is expected in research and practice that the healthcare sector is facing a fundamental digital transformation due to the increasing use of new IT (Levin-Epstein, 2019; Ologeanu-Taddei et al., 2023), it is particularly suitable for showing the first directions in which the core value-defining activities of organizations can change during DT.

Thus, in this paper, we explore which changes to the value proposition of healthcare organizations we can qualify as DT and how we can differentiate DT in healthcare from ITOT, building on the discussion about value proposition change present in contemporary literature. Hence, we ask the following research question:

RQ: How does the use of new IT impact the value propositions of healthcare organizations?

To answer this question, we conducted semi-structured interviews with 15 stakeholders from different organizations in the healthcare sector. We identify core value-defining activities, value-supporting activities, and related changes to both. Based on the differences between the stakeholders' views of the ongoing and emerging changes in value propositions, we describe the main categories of transformations to activities and processes in healthcare organizations. In doing so, we clarify for knowledge-intensive and service-oriented sectors like healthcare, which changes to organizational activities and processes leave the current value proposition untouched and which changes will eventually result in DT. This is especially relevant (for practitioners and researchers)

as it helps to understand the transformational dynamics at play in the landscape of healthcare organizations and foresee developments in the healthcare industry.

With this work, we contribute to research on DT and ITOT in two ways. First, by elaborating on characteristics and differences between redefined or new value propositions and supporting existing ones, we provide guidance on how ITOT can be differentiated from DT in healthcare. Second, we provide important areas of DT in healthcare that warrant closer attention by researchers, practitioners, and policymakers.

We proceed with the paper as follows. First, we elaborate on the concept of DT and value proposition, describe the status and trends of new IT in the healthcare sector, and the related new opportunities in how healthcare organizations can capture value. Second, we outline our research approach. Subsequently, we present our results based on the interviews and continue with the discussion of the results. Lastly, we conclude by discussing our principal findings, limitations, and opportunities for future research.

THEORETICAL BACKGROUND

Digital Transformation

Literature provides various definitions for DT (Hanelt, Bohnsack, Marz, & Antunes Marante, 2021; Vial, 2019). A common notion that underlies most definitions is that DT, compared to traditional ITOT, brings about more severe changes. DT is characterized by the introduction of “combinations of information, computing, communication, and connectivity technologies that aim at improving an entity by “triggering significant changes to its properties” (Vial, 2019: 121).

The starting point of transformation is based on the assumption that adaption revolves around the environmental and organizational context in which the occurring change takes place

(Pettigrew, 1987). As DT is driven by upcoming technologies and changing competition with organizations that introduce a new value proposition to the market, this technological change needs to be understood in its context. Also, as a consequence, organizations create a transformation agenda to react to these drivers in the organizational environment (Wessel et al., 2021).

The changes brought about by DT are discussed in research based on three main perspectives. First is the individual perspective, which focuses on how employees perceive and react to the changes in IT, organizational structure, and processes (Guse, Thiebes, Hennel, Rosenkranz, & Sunyaev, 2022). Second is the strategic-economical perspective, which focuses on how disruptions emerge and how DT unfolds in organizational ecosystems (Rowe & Markus, 2023). Third is the organizational perspective, which deals with how major transformations impact and redefine organizational strategies, structures, processes, and value propositions (Vial, 2019; Wessel et al., 2021). This is the main perspective we contribute to with this work. While these perspectives differ in their scope, they are interconnected by the changes to organizations' way of operating and business models as these both influence the individual perspective by shifting employees' work practices and job identity (Wessel et al., 2021) and the strategic-economical perspective by introducing a new market force in their ecosystem potentially disrupting the ecosystem they operate in (Hanelt et al., 2021; Vial, 2019).

From an organizational perspective, research suggested to limit DT to the changes emerging in organizational structures and processes as a result of the automation of tasks or the introduction of new IT such as social media, cloud, or mobile computing (Hanelt et al., 2021; Legner et al., 2017; Vial, 2019). Leveraging the possibilities and changes created by the new IT and accelerating the transformation of business activities and processes are common goals in DT research (Chanias et al., 2019; Demirkan et al., 2016). It links the conceptualization of DT to

organizational strategy and covers all consequences and aspects around the use of available IT with the goal of improving business outcomes in different dimensions (Vial, 2019). While this may include significant changes to organizations, it conceptually broadly resembles the ideas embedded in earlier research on ITOT (e.g., Markus & Robey, 1988; Zuboff, 1988). According to Vial (2019), the most salient difference between these concepts is that while the ITOT is rather about optimizing processes of a single organization and impacts only the organization itself and its value network to some extent, DT is about fundamentally changing processes of an organization leading to a change of whole industries or societies in the long run. While the impact beyond an organization helps to draw a boundary, it does not allow for a judgment of what changes in an organization will impact a whole industry.

A direct link between the organizations and the impact on industry that can be found in DT research is business model change enabled by IT, as it directly links the organization with its ecosystem (Hanelt et al., 2021). These changes range from adaptations of specific facets of organizational design to transformation of the organizational design as a whole. The aim of this change is to create and appropriate more value for an organi (Verhoef et al., 2021). While this is an important factor in DT, it again closely resembles ideas from earlier research on IT innovation (Baiyere et al., 2023).

Integrating the ideas present in contemporary literature on DT, a clearer demarcation is provided by Baiyere et al. (2023). They provide four major shifts that represent DT: Agential shifts, semiotic shifts, infrastructural cum combinatorial shifts, and economics shifts. These shifts are based on the idea that DT is built around a plethora of digital objects (e.g., databases, cloud services, etc.) that shift organizational contexts by expanding action possibilities of users and organizations while establishing stronger interconnections to the world (Baiyere et al., 2023).

Infrastructural cum combinatorial shifts and economics stand out from an organizational perspective and extend the notion of business model innovation by expanding value creation and building new value propositions based on recombinations of digital objects (Wessel et al., 2021) (see also Wessel et al., 2021). Although one of these shifts alone can suffice to justify a DT, Baiyere et al. (2023) call for further research on DT that goes beyond the pure articulation of exemplary cases. Moreover, they caution to outline both the ontological standpoint and a qualitative difference between DT and prior knowledge. Hence, we deem it of utmost importance to explore the fundamental changes to an organization's value creation paths and value propositions in further detail.

Differentiating Digital Transformation Through Value Proposition Change

There is a plethora of research that considers changes to an organization's value proposition a defining characteristic of digital transformation (Verhoef et al., 2021; Vial, 2019). To explore the difference between ITOT and DT, Wessel et al. (2021) provide an example for using the value proposition of an organization as a defining characteristic of DT. In their research, they explore a new sociotechnical environment that has developed over time through the interactions and dependencies of (new) digital objects. By showing that a value proposition change possibly threatens an existing organizational identity and leads to the emergence of a new identity (Ravasi & Schultz, 2006), they define a value proposition change as a key characteristic of DT. In contrast to ITOT, which supports the already existing value proposition (Wessel et al., 2021), DT involves defining a new or redefining an existing value proposition through the use of digital technologies.

Wessel et al. (2021) contributed important results on using the alterations of value propositions for understanding DT. They describe the difference between activities (re)defining and activities supporting value propositions briefly. The redefinition of a value proposition is

explained as creating “a fundamental change in the conception of the value offered by that company” (Wessel et al., 2021). They also state that “DT is much more about transforming work around the core value-defining activities of an organization, whereas ITOT relates more to transforming work around core value-supporting activities” (Wessel et al., 2021: 118). Still, they do not go into detail about the main differences between both kinds of activities apart from stating that technology is the key aspect for (re)defining the proposed value. As an important step towards understanding how a value proposition changes during DT, this conceptualization can be used as a starting point for further research. Nevertheless, within the DT literature, what represents a “significant” value proposition change remains unclear (Baiyere et al., 2023; Vial, 2019; Wessel et al., 2021).

While there are many different definitions of what makes up a value proposition (Payne, Frow, & Eggert, 2017), we choose the following to take the close connection to organizational effects of a changing value proposition into account: A value proposition is “the totality of the activities within a company required to provide a service or a product of value to the customer” (Müller, 2012: 12). If the totality of the activities within an organization changes, the value proposition can be deemed to have changed. This can be achieved by creating a new value proposition or redefining and extending an existing value proposition.

Solely considering strategic dimensions is not beneficial for understanding the ongoing transformation (Wessel et al., 2021). A focus on value proposition change helps understand the consequences of the ongoing transformation for customers, organizational partners in an organization’s value chain, and work implications for employees. In this way, findings on the state and future of DT can make a key contribution to deriving actions for policy and organizations.

New Opportunities Enabled Through Digital Transformation

DT is increasingly seen as critical to organizations' future and long-term success, making it crucial to formulate a DT strategy and adapt to new IT (Matt, Hess, Benlian, & Wiesböck, 2016). As part of their strategy, organizations can aim at gaining competitive advantage by (re)defining their value proposition and offering customers new features and services that differentiate their brands (Berman, 2012).

DT offers many opportunities and improvements to organizations. First, organizations can integrate customers via direct channels (e.g., social media), creating a higher reach and offering additional services or products to them (Berman, 2012). Companies use different strategies to implement this (Andal-Ancion, Cartwright, & Yip, 2003). First, in the disintermediation strategy, institutions leverage digital technologies to avoid having intermediaries between the institution and the customer. This enables direct exchanges among individuals in the network. In this case, companies typically first create basic structures that allow them to engage customers directly, thereby redefining their value proposition (Berman, 2012). Another existing strategy is remediation (Andal-Ancion et al., 2003).

Second, the augmentation of products and services with digital capabilities enables potential network effects on a bigger scale than exclusively physical products or services (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). In a connected world, the value of these products and services increases with the number of users and complementary, interconnected products and services. The additional data available from augmented products and services can then be used to generate new business cases and (re)define digitally delivered services, information, or content. Even organizations specializing in physical products can enhance their products with smart and connective capabilities, offering new software and services in their

portfolio, possibly reducing or even stopping lines of business (Porter & Heppelmann, 2014; Wessel et al., 2021).

Third, the availability of high-performance cloud computing capabilities and cloud services (Berman, 2012). Through DT, institutions have the possibility to better adapt to emerging trends and changes in their environment (Llopis-Albert, Rubio, & Valero, 2021). A reason for this is that new IT has enabled access to amounts of new data and potential insights (Berman, 2012). Social media, the Internet of Things, and sensors embedded in products are new sources of data that can be analyzed to improve business outcomes (Bharadwaj et al., 2013). Managing and analyzing data on that scale represents a challenge for institutions. In this regard, the available high-performance computing capabilities represent an opportunity (Berman, 2012). These computing systems enable the use of business analytics, machine learning, and data storage, which are crucial to better understanding and making the best use of the available data. Thanks to the technological developments in cloud computing it is possible for companies to scale up and down on computing capabilities whenever it is needed (Bharadwaj et al., 2013).

Status of Digital Transformation in the Healthcare Sector

DT in the healthcare sector has long been expected and discussed (Agarwal, Gao, DesRoches, & Jha, 2010). While there are examples of other industries that already went through DT (Chancias et al., 2019; Karimi & Walter, 2015), the healthcare sector is still at the beginning of its DT journey (Eden, Jones, Casey, & Draheim, 2019; Levin-Epstein, 2019; Ologeanu-Taddei et al., 2023), even though the COVID-19 pandemic accelerated many DT initiatives in the healthcare sector (Alt & Zimmermann, 2021).

Adopting IT and leveraging the available data has become a necessity for healthcare organizations around the world (Alt & Zimmermann, 2021). As a consequence of the new dynamics in the healthcare industry, there has been an emergence of new market players in the ecosystem (Hermes et al., 2020). Furthermore, existing organizations in the healthcare sector have already begun to change their value propositions, such as manufacturers of physical operation instruments that offer additional telemedicine services (Alt & Zimmermann, 2021). This also puts organizations in the healthcare sector under pressure to turn to new actors within the value network while at the same time threatening existing value propositions (Hermes, Riasanow, Clemons, Böhm, & Krcmar, 2020).

Further, healthcare organizations are also facing higher costs due to the rising complexity of the industry (Hermes et al., 2020). This is accentuated by regulations, especially in data privacy, that have not been moving fast enough to match the pace of innovation and puts healthcare organizations under high pressure to survive, while other players enter the market and profit (Alt & Zimmermann, 2021; Hermes et al., 2020). Thus, organizations like hospitals that manage patient data have limited opportunities to create new revenue streams. Nevertheless, the healthcare sector also profits from innovations such as smart devices that enable patients to remotely access healthcare services through different online platforms and apps (Hermes et al., 2020), which offers the potential to adapt or redefine existing value propositions towards these innovations.

A frequent example of transformations that healthcare organizations like hospitals are going through is the migration from paper-based processes to an electronic health record (EHR) system (Agarwal et al., 2010; Alt & Zimmermann, 2021; Wessel et al., 2021) in order to reduce error rates, improve patient care and administrative processes (Agarwal et al., 2010). While the introduction of an EHR system typically changes work practices around value-supporting activities

in a healthcare organization (Wessel et al., 2021), it still builds the basis for further transformation. Likewise, there are more examples of IT-enabled transformations in the healthcare sector that enable further transformation and provide a good foundation for analyzing the impacts of ITOT and DT (Kraus, Schiavone, Pluzhnikova, & Invernizzi, 2021).

Opportunities for Value proposition Change in Healthcare Organizations

There are several trends that will further enable new ways of capturing value for healthcare organizations. These are driven by new IT solutions such as time and resource savings through telemedicine, genome-sequencing capabilities, and increased accuracy in diagnosis through machine learning (Edwards, 2014; Fera, Doty, Gerhardt, & Elsner, 2020). Furthermore, higher availability of patient data is expected to build the basis for new insights generated by machine learning and enhanced patient care (Alt & Zimmermann, 2021). As EHR adoption rates increase every day, more patient data is accessible to healthcare providers. Moreover, wearable health devices can track patients' vital signs and behavior and yield even further data (Haggerty, 2017). Because of the growing data analysis community, several organizations have already taken steps to foster innovation in the healthcare sector by launching different innovation platforms and development environments that allow external developers to use the organization's technology and data to develop applications (Hermes et al., 2020). Furthermore, based on available patient data, artificial intelligence (AI) has already been shown to outperform human counterparts in predicting patterns in patient data, carrying out digitized processes, and recognizing mistakes in medical documents and can redefine the value propositions of organizations by providing new services based on patient data (Haggerty, 2017).

The developments in smartphones and wireless technology have boosted the field of telemedicine applications. In combination with the advantages AI offers, a shift in the healthcare

model from a reactive to a proactive approach is expected (Hermes et al., 2020). The goal of this shift is to improve patients' health by aiming to stay healthy and prevent illness instead of trying to recover already ill patients (Hermes et al., 2020). To achieve this, it is expected to connect healthcare providers, patients, and their relatives and leverage telemedicine technology to offer continuous monitoring of their health and notify them in case of major risks (Hermes et al., 2020). This becomes an even greater opportunity in the case of developing countries where access to hospitals and doctors on-site is limited, and telemedicine can fill in the needed healthcare (Combi, Pozzani, & Pozzi, 2016).

Overall, there are a plethora of technologies that can be used and recombined by organizations in different ways to change their value proposition. In essence, the convergence of these technological advancements opens doors for healthcare organizations to strategically redefine their value propositions, ultimately revolutionizing the entire care paradigm.

METHODS

To answer our research question and to investigate which value propositions of healthcare organizations IT may support and which it may fundamentally change, we pursued a qualitative, explorative research approach. To this end, we conducted a total of 15 interviews with various stakeholders from different organizations in the healthcare sector, which allowed us to obtain a multifaceted overview of the fundamental transformation dynamics from different perspectives. We oriented our semi-structured interview approach toward the recommendations by Myers (Myers, 2019) and analyzed the interview data using qualitative content analysis, according to Mayring (2014).

Acquisition of Interview Partners

As interview partners, we acquired various experts who work in different positions in a variety of healthcare organizations in Germany. Our sample includes experts from various administrative levels in public and private hospitals, GP practices, inpatient and outpatient care services, dental practices, emergency services, psychotherapeutic practices, medical device manufacturers, dental equipment manufacturers, pharmacies, and health insurance companies. The interview partners were recruited through cold calling and personal contacts. Participation was voluntary and took place without any form of compensation or reimbursement of expenses. A total of 15 experts were recruited for the study. Table 1 provides an anonymized overview of the experts interviewed.

Interview Process

The interviews lasted an average of around 26 minutes and aimed to identify changes in the value propositions of healthcare organizations in the context of DT. To conduct the interviews, two authors of the study developed an interview guide consisting of four blocks of predominantly open questions. The first block comprised an introduction and clarification of the general interview process. In order to establish the different perspectives and contexts of the individuals, the second block of questions included questions about the person and their organization as well as basic terms such as digital transformation. The third block of questions constituted the main part of the interviews. It consisted of questions about which technologies, processes, and applications are used in the respective interviewees' working environments as part of the DT and what influence these have on the treatment of patients today and in the future. Each interview was concluded with a fourth block of questions, which provided space for further thoughts, questions, or comments. For the subsequent analysis, the interviews were recorded and transcribed with the consent of the

respective interview participants. After the transcripts were created, they were sent for approval to the respective interview partners.

Insert Table 1 about here

Interview Data Analysis

To analyze the interview data, we employed qualitative content analysis, according to Mayring (2014). Specifically, we applied a multi-stage coding procedure for inductive category formation (Mayring, 2014)

After defining the research question, the theoretical foundations (step 1), and determining the level of abstraction (step 2), an initial codebook was created (step 3) on the basis of approx. 50% of the interviews ($n = 7$), following the recommendations of Mayring (2014) on inductive category formation. For this purpose, three authors of the study independently went through the first seven interviews line by line and coded passages that described perceived changes in value propositions of healthcare organizations due to digital technologies in the form of redefining or supporting extant value propositions. Based on the value proposition definition by Müller (2012), we focused on core value-defining and value-supporting activities related to the value propositions of healthcare organizations and investigated:

- 1) whether an altered or new activity was required, i.e., a core value-defining activity
- 2) whether the service or product for the customer or patient changed

If both assumptions were fulfilled, we categorized the transformation activity as one fundamentally (re)defining the value proposition.

After completing the coding of the first seven interviews, the authors involved in this phase of coding discussed their codes with each other and created the initial codebook, which comprised a total of eight perceived changes of value propositions, some of which indicated the support of extant value propositions through IT and some of which indicated the redefinition value propositions (step 4).

Following the definition of the codebook, the codebook was checked for possible inconsistencies and compliance with the previously defined level of abstraction by two other authors of the study who were not involved in the initial coding step. This did not initially result in any changes to the codebook. Based on this, the same two authors independently conducted a final coding run in which all 15 interviews were coded using the established codebook (including the re-coding of the first seven interviews) (step 5). The two researchers discussed their codes after each interview. During this coding run, a further code emerged, which described a perceived change in supporting an extant value proposition. Thus, all interviews that had already been coded by the time this additional code emerged were then once again examined for this code. No further changes were made to the codebook in the final coding run.

Finally, in step 6, we formed the main codes and divided the codes in our final codebook into two categories: (S) perceived changes supporting extant value propositions (S1-S5) and (R) changes redefining extant value propositions (R1-R4). After the final coding run, we examined inter-coding agreement (step 7), which with a level of 88,23% was found to be relatively high, and developed an initial interpretation of the results in joint discussions (step 8).

RESULTS

An Overview of the final codebook is depicted in Table 2.

Insert Table 2 about here.

In the following, we describe the identified characteristics for value proposition support and value proposition (re)definition. If the interviewees are cited directly, the statements are translated from German to English.

S1 – Improvement of Diagnostics

This characteristic describes that IT can improve diagnostics through various mechanisms. While IT changes activities (e.g., how an x-ray image is post-processed or how a decision is reached for a diagnosis with a clinical decision support system) during the diagnostic process, it only changes the quality and efficiency of diagnostics. Thereby, IT supports the current value proposition of diagnosis.

S2 – Improvement of Treatment

Related to patient treatment activities, interviewees stated that with the introduction of IT systems, the current treatment process has improved and been supported. Interviewees named clinical decision support systems for medication and mobile training systems for dementia patients as examples that support the current value proposition of their organization.

S3 – Digital Documentation

The most prevalent characteristic that all interviewees describe was the introduction of digital documentation such as EHR systems, order management systems, or administration and scheduling systems. Digital documentation requires employees to change their interaction types from taking notes on paper to taking notes digitally (e.g., with a tablet). However, IT does not change but only supports the activity of documentation and the overall value proposition of patient care of the healthcare organization.

S4 – Digital Data Transmission

Another characteristic that is mentioned by all interviewees, but one psychologist (I15), is the digital transmission of data to other actors in the healthcare system. This encompasses the transmission of patient data or billing data. While this improves the data transmission speed and quality compared to a postal transmission, it only changes a supporting activity for the overall value proposition of patient care in the healthcare organization.

S5 – Change in the Process of Patient Admission

This characteristic relates to an improvement in the patient admission process via online portals, including relevant patient data for diagnosis and treatment. Although the admission process speed increases, it only changes a supporting activity for the overall value proposition of patient treatment in the healthcare organization.

R1 – Fundamental Changes in Medical Treatment Processes

Result R1 extracts the possibility of digital technologies changing the actual process of treating a patient. With this finding, we summarize all occurrences of healthcare professionals

interacting with their patients differently and performing treatment tasks they were not able to before due to the creation of altered processes in the value chain. This includes new ways to diagnose or cure diseases based on emerging technological potentials.

One example of digital technologies changing the diagnosis process was elaborated by an expert from the field of radiology (I6). She explained that progress in visualizing computed tomography images led to changes in how incoming patients with potential or existing heart diseases were treated. Before this digital technology reached its new capabilities, invasive heart catheter examinations represented the usual way of diagnosis. But things have changed significantly. The expert claimed: “This three-dimensional imaging allows me to visualize the coronal arteries (...) and the calcium in them just as well as I can in the cardiac catheterization”. She explained that the patient was able to leave within the course of several minutes instead of staying in the hospital for 24 hours after the operation. This example shows how upcoming or, in this case, improving digital technologies can redefine the value proposition by changing the treatment medium and shifting the responsibility from one medical field to a completely different one.

In another example, a nursing service manager discussed new possibilities in interacting with and helping the clients of nursing services (I10). Due to the ongoing lockdowns during the COVID-19 pandemic, as well as the general problem of elderly people suffering from loneliness, the management of nursing organizations introduced new ways to connect with their clients. They instructed their clients on how to set up video calls on tablets so they could play games, cook, or just communicate with others. By implementing this kind of service, the nursing activities would no longer be solely focused on helping their clients physically. As she stated, in the face of a lack of personnel and tight time frames for nurses, digital technologies could help support elderly

people mentally. Video group calls could be an easy alternative to help people with limited mobility keep in touch with others. Looking at what value a nursing service can propose, the opportunity to ensure clients' mental health would be added.

Similar stances were provided by a psychotherapist (I2) who mentioned that the value proposition would change from an in-person therapy to an AI-supported therapy where a psychotherapist would increasingly only be a remote consultant for certain aspects of therapy. Also, a health insurance worker explained a similar shift in that health insurances provide additional online services and products that educate patients and help them with preventive medicine (I15).

R2 – Specialists Advising Healthcare Professionals Remotely

R2 is based on changing activities in the treatment process that require certain qualifications to be carried out to comply with qualitative or legal standards. IT can enable specialists like emergency medical physicians (EMP) are legally required to perform those tasks to remotely advise other healthcare professionals. The healthcare professionals on-site can carry out the treatments, lowering the reaction times as well as the overall time consumption of specialists and patients by changing the service they offer to patients and, hence, the organizational value proposition.

An interviewed EMP (I5) envisioned a treatment process where she could remotely advise paramedics to avoid losing time and increase her availability. "So I am often called to missions where I sometimes think to myself, okay, what, (...) am I supposed to do here now? (...) I think telemedicine would simplify a lot of things (...) They [the paramedics] are actually not allowed to prescribe [certain] medication, (...). Sometimes, I am just called in to prescribe medication". She

further explained that many emergencies during her shifts were not potentially fatal or even in actual need of a doctor's diagnosis. Instead, sometimes minor accidents or feelings of illness led to patients calling an emergency. With quick video calls giving an impression of the patient's condition, doctors would be able to make a decision remotely if there was clearly no urgency to perform critical treatments on-site. Independent doctors could become service providers helping in diagnosis and decision-making, whereas the on-site duties would be fully performed by paramedics. This would redefine the value proposition of hospitals to more service-oriented consulting functions, while the paramedics would be able to offer a new value proposition to the healthcare system without an EMP. An interviewed paramedic confirmed this result independently (I8).

Developments in ophthalmology go in a similar direction, as stated by an expert from the field of research and development in healthcare (I13). Since the development of eye examination hardware progressed, as well as the technological possibilities of live streaming, the actual diagnosis no longer needs to be performed by on-site doctors. In many cases where only the visual acuity is to be measured, eye examinations could be done remotely with opticians operating the hardware systems and an ophthalmologist consulting and finally analyzing the test results. Up until now, patients in need of glasses have had to wait until they get an appointment in a practice where they can be examined. With the help of digital transformation, opticians can offer many types of eye examinations within their shop, saving time for customers as well as doctors. Furthermore, some patients who are not in range to visit an ophthalmologist will be able to receive results about their visual acuity. Again, the doctor's organization would change its core value-defining activities from on-site examination to consulting.

R3 – Fundamental Changes in the Production Processes of Medical Products

R3 describes the fundamental changes in activities in the production of medical devices such as implants or prostheses. Based on small-batch and one-off production, the emerging manufacturing technologies, as well as related IT solutions, redefine the value proposition of organizations of dentists and dental technicians from provisional and manufacturing activities and taking a dental impression to digital modeling activities.

Both experts elaborating on R3 refer to cases in the field of dental medicine. A software developer at a dental technology manufacturer (I14) described how software-based tooth modeling innovations change the production chain of dental crowns. Whereas traditionally, the dental technician models crowns manually based on the dental impression, she is no longer involved in the actual production phase of the crown. Due to intraorally scanning and better solutions for the digitization of dental impressions, they are transferred into a computer-aided design (CAD) model. This technological advancement enables completely new processes of dental crown production. Technical craftsmanship is no longer required as subtractive or additive manufacturing (AM) processes can use these CAD models and operate profitably despite single-item production. The value proposition of a dental technician is redefined as he is no longer the physical producer but only in charge of setting up the digital model.

Using the same example, the interviewed dentist (I3) explained the new value chain from a dentist's point of view: "There are small milling machines that you can have in the practice. In other words, the dentist does everything himself. You sit down at the PC for half an hour to design the crown, switch on the milling machine, mill the crown, and he can put it in directly. All in one appointment!" With falling prices and smaller additive and subtractive milling machines, some are already producing the crowns just in time in their own practice. The CAD model is, therefore,

automatically transferred into production code, and the milling machines go to work. The offered value propositions, hence, do no longer include a cumbersome process with dental impressions and provisionals or taking but just-in-time self-manufactured crowns.

R4 – Medical Tasks are Performed by Profit-driven Companies Instead of Traditional Healthcare Providers

R4 describes that profit-driven companies try to get involved in medical processes like treatment or diagnosis. These involvements by profit-driven stakeholders redefine their own value propositions as well as the value proposition of traditional healthcare providers. A profit-driven company thereby can offer new services or products, while a traditional healthcare provider increasingly ceases to offer a particular service or product.

Similar to R3, an interviewed dentist (I3) explained that contract manufacturers are increasingly taking part in the small-batch production of dental crowns. In this case, the software-based models are advanced to one of the offering companies where the crown is manufactured either subtractively or additively. Like in R3, the craftsmanship part previously performed by dental technicians is replaced, offering a new value proposition through contract manufacturers.

Another example discussed by a software developer at a dental technology manufacturer (I7) has not reached market maturity yet but is one of the main research topics in dental technology companies. The expert's organization aims to participate not only in modeling and visualizing teeth and dentition but also in the simulation of how teeth should be aligned: "The software is not able to move to the teeth completely on its own, but it is also able to move 99%. And the orthodontist will only be there in the future to make sure that the teeth move as planned. He will only be there for the check-ups and then less for this manual screwing around and adjusting." If

the product is introduced in the market, the company could provide a value proposed previously exclusively provided by orthodontists. The software would simulate the shift of a misaligned to a corrected dentition and draw up the required treatment steps to reach the required results. This would substitute many of the orthodontist's traditional manual tasks and responsibilities, making him an advisor redefining the practice's value proposition.

This redefinition can also be found in radiology as profit-driven companies take part in diagnosis and treatment. The radiology nurse (I6) explained that there are already companies offering examinations of patients' medical reports to give approval to radiological diagnosis processes. This value proposition enables healthcare professionals to perform radiological tasks without having to wait for advice or approval from a radiologist. This introduces another value proposition to the market as a radiologist's value proposition is gradually replaced by profit-driven companies.

DISCUSSION

Based on the perceptions of different healthcare professionals, our research shows how the value proposition for the different stakeholders in the healthcare industry is changing, driven by different technologies. Also, it yields a detailed frame for differentiating DT and ITOT by focusing on the differences in value proposition (re)defining and supporting activities.

Defining Characteristics and Differences of Value Proposition (Re)defining and Supporting Transformation Activities

Similar to the data we gathered from the interviews, one approach conceptualizes the characteristics of value propositions as the three dimensions of cost, performance, and customer roles: "While performance and cost dimensions identify the content of value, a value proposition

defines the relationship between the customer and various dimensions of product value.” (Kambil, Ginsberg, & Bloch, 1996). The concept also lacks clarification between supporting and (re)defining activities, especially the results on different customer roles, as key points of value propositions are complementary to our results. In the paper, the different roles of customers interfering with the product or service (buyer, user, co-creator, transferrer) are presented (Kambil et al., 1996). From R1 – R4, it is evident that the role of the customer (i.e., the patient or other healthcare professionals in the healthcare ecosystem) changes for every characteristic. In other words, we find that altering the relationship between the customer and the provider also alters the value proposition. For our identified characteristics, we observe that relationships between customers and the product or service were terminated through new value propositions by other healthcare professionals or profit-driven companies (R1, R4). Also, the relationship between doctors being solely responsible for treatment and patients morphed into a relationship where a doctor is only consulting or remotely examining (R2). Moreover, healthcare professionals were enabled to participate in creating value by being customers to the health companies offering new digital technologies (R3). This way, the newly responsible healthcare professionals working on-site could be seen as co-creating customers themselves.

Even though our results support the importance of the relationship between the customer and the value in defining value propositions, we would extend the definition to the level of relationship between the customer and the suppliers providing the value. This result shifts the focus to the actors in the value chain for which roles changed. We suggest adding to the finding customers playing altered parts in (re)defined value propositions and also the alteration of roles for additional providers in the respective value chain. This is also validated by our findings S1-S4, which did not include changes of roles or new players in the value creation process. Overall, the

emergence of new actors, the disappearance of old ones, and fundamental changes from being the manufacturer of a certain medical product to only building a CAD model are noteworthy modifications of the value proposition.

Another approach builds up a holistic framework of the value proposition emphasizing the importance of operating and work practices in the value creation process (Skåln, Gummerus, von Koskull, & Magnusson, 2015). Our results support this view and the idea of value propositions as “promises of value creation that build upon configurations of resources and practices” (Skåln et al., 2015). Going through the different cases, we investigated, it becomes clear that at least one process step within the value creation always significantly changed. In the cases of R1 and R3, we observe that newly implemented technologies alter methods of manufacturing or the ways a patient receives treatment. For the characteristic R2, from the point of view of the previously value-providing supplier, the task performed is a completely new one. The doctors responsible for treatments or diagnosis are no longer involved in physically treating the patient and are only remotely involved in either diagnosing the condition of the patient (I2) or examining radiological results (I4).

Based on these resemblances, we state that (re)defining transformation activities includes fundamental changes of key processes creating the value proposition. Our thesis is also substantiated by the findings related to the value proposition supporting activities. Although the context or the interactions change for the characteristics S1 – S5, the underlying process itself remains the same. As paper-based processes were transformed into digitized formats like documentation (S3), data transmission (S4), or patient admission (S5), the key work tasks of documenting, transmitting, and processing data remained the same. The same holds true for the improvement of visualizing diagnostic images (S1) or clinical decision support (S2), where the

change was just added onto an existing diagnostic and treatment process that was improved in quality and speed.

One further strand of the literature on value propositions deals with the linkage between competencies, skills, and qualifications of the key value creators and the value proposition. The linkage is based on the contribution of the personal value proposition of employees to the overall value proposition of an organization (Wnek & Williamson, 2010). Our results strongly support this relation. For instance, in R1 in radiology, the skillset required for examining heart diseases shifted from radiology to cardiology (I4), and nursing personnel require more skills in social work than within their practical household tasks (I5). With remotely advising specialists, the now responsible healthcare workers will need to fulfill more tasks and expand their knowledge to work single-handed on-site (R2). In addition to that, the specialists need the right capabilities to give advice and assessments from a distance. Even more radical were the alterations of required skillsets for the job impacted in R3: the profession of a future dental technician will most likely be built around handling software and modeling tools rather than around physical craftsmanship (I7). Doctors will need to be capable of handling manufacturing machines (I1). In R4, the newly required qualifications can mainly be found within the workforce of the upcoming profit-driven participants of the value chain. Also, the healthcare professionals cooperating with those companies will need less of their existing knowledge and new competencies for external software and more. Compared to that, findings related to the support of value propositions (S1 – S5) showed that required skills are reduced with automation instead of requiring a new skill set. Hence, another indicator for a redefinition of a value proposition is a changed skillset.

Although there are many different concepts for characterizing the value proposition and consequently how to (re)define it, we see the three elaborated findings as key to moderating the

continuum between (re)defining and supporting transformation actions. In general, the literature on value propositions focuses heavily on marketing, customer communication, and services, making it hard to apply to the transformation process on a higher organizational level (Bailetti, Tanev, & Keen, 2020; Holttinen, 2014). Still, with the three major similarities discussed, we find a way to evaluate the impact of DT on what and how value propositions emerge.

Comparison Between Findings R1 – R4 and the State of the Art in Healthcare

Our first finding, R1, describes the fundamental changes in medical processes. Fundamental changes can be a new treatment or diagnostic method that leads to shifts in responsibilities among the different medical specialists. This finding is backed up by further literature that compares the feasibility and diagnostic accuracy of cardiac computed tomography (CCT) with cardiac magnetic resonance (CMR) (Andreini et al., 2023). CCT was performed with comparable and partly higher accuracy than CMR in the tested diagnostic procedures. Therefore, the CCT appears to be a viable alternative to the CRM for diagnosing patients. Because of the change in diagnostic methods, the medical processes undergo a significant change, and the responsibilities of healthcare professionals shift.

The second finding, R2, describes the development of medical specialists taking over a consulting function. This development is enabled by the rapid development of connective digital technologies. This finding is supported by the rapid development of new organizational set-ups to support telemedicine for intra-organizational consulting (Chandwani, De', & Dwivedi, 2018). In another study, it is described that the telemedical support of specialists in intensive care units has a positive effect, consequently of a structural political change supporting the development of connective digital technologies in the healthcare sector (Guinemer et al., 2021). These studies would support our finding R2, but it also must be taken into consideration that both studies

conclude that the development of digital technologies in the healthcare sector lags behind that of other industries.

R3 identified in the interviews in which the value proposition (re)defined is the fundamental changes and altered roles in the production of medical devices such as implants or prostheses. In the literature on additive manufacturing (AM), it is observed that because there are no geometric limitations in AM, the manufacturing data can be used directly by organizations to analyze and improve the processes (Hesse & Özcan, 2021). AM is particularly suitable for manufacturing prostheses and implants (Hesse & Özcan, 2021). The introduction of AM in medical technology is coherent with the finding R3, as it is a fundamental change in roles and manufacturing processes.

The fourth finding describes that companies try to develop new ways to create new markets and to get involved in medical processes. A survey conducted in Finland in 2020 is in contrast to our finding R4: the effect of digitalization on private health companies is described as hardly positive or, depending on the evaluation procedure, as negative (Holopainen, Niskanen, & Rissanen, 2022). This is also a common theme in prior literature. As a consequence of the new dynamics in the healthcare industry, there has been an emergence of new market players in the ecosystem (Hermes et al., 2020). One reason for the contradiction could be the subjective assessment of our interview partners. The consulted experts partially working within the development of healthcare products would naturally tend to focus on market potentials and improvements. Nevertheless, also the other interviewed healthcare professionals mentioned the upcoming new profit-driven companies in the sector (e.g., I3), and there is literature emphasizing this trend as well (Hermes et al., 2020). In general, the overall views on private companies'

prospect of success enabled by DT seem to be much more positive compared to Holopainen et al. (2022).

With different possibilities for digital documentation (S2), data transmission (S3), and patient admission (S4), the presented concepts of paperless hospitals are supported by our results (Haggerty, 2017; Wessel et al., 2021). Also, the finding of improvements in diagnostics (S1) goes in line with the current literature. As stated by our expert from the field of radiology (I4), for example, digital post-processing of images represented a major improvement to computer tomographic diagnostics. This is also pointed out by further literature on the topic. For instance, the major impact advanced IT has had on CT is further elaborated (Pain, Egan, & Chen, 2022).

Implications for Research and Practice

The results show that it is possible to extract findings based on DT by utilizing the definitory separation of supporting and (re)defining value propositions by Wessel et al. (2021). Basing our research on the mentioned transformation process model describing DT transformation on a strategical, organizational level, we took a different approach with a value proposition definition as “the totality of the activities within a company required to provide a service or a product of value to the customer” (Müller, 2012). Interviewing 15 experts searching for transformation within those activities, we found three major characteristics that occurred whenever a value proposition was (re) defined:

- alteration of roles and responsibilities for proposing the value
- significant alteration of the required skillset for creating value
- fundamental change of key processes creating the proposed value

As these findings did not appear in any of the cases in which the value proposition was only supported, they can build the foundation for future research that tries to disentangle transformation processes that fundamentally (re)define the value proposition, preventing possible blurring boundaries to other transformations like ITOT, digitalization or digitization.

The results also imply different findings for practice. The changes categorized in R1-R4 describe several alterations of value purposing processes and, therefore, imply a need for adaption. As some job profiles may change to a certain point where they are no longer interchangeable (e.g., dental technicians or orthodontists), these might lead to the disappearance of certain professions and might determine whether employees perceive DT as positive or negative. Hence, policymakers must balance enabling the advantages of new technologies and simultaneously adapting the job profiles within education and related requirements for health insurance systems. Also, legal and even moral debates need to be advanced so that the regulatory framework can be in place before technological progress is missed. A focus for developing regulation must be on upcoming profit-driven stakeholders so that industrial innovations and advancements can be used without allowing process quality and safety to be sacrificed for efficiency and margins.

Limitations and Future Research

The first limitation of our research is the number of recruited experts. While 15 interviews allowed for a solid basis for our results, further research is needed to include more healthcare professionals from further perspectives to strengthen the outlined value proposition changes. In our interviews, we focus on the application of new technologies in certain areas of healthcare. Thus, more experts on different levels in further areas of healthcare should be included in future research. It should be ensured that the time frame of the interviews can be extended in such a way that it does not impose a limit on the content of the experts' explanations. When selecting the

experts, it should be ensured that the diversity of the healthcare sector is reflected in the selection of the experts. Supplementary to further qualitative research, the researchers could choose a mixed-method approach and combine quantitative and qualitative data to generate a broader view of the healthcare sector.

Considering the theoretical contribution of this work, more clarification is needed for the three major characteristics. More interviews need to be conducted to investigate if the findings are indeed applicable to every case of value proposition (re)defining transformation activities and, consequently, DT. The characteristics could also be elaborated on how the changes in work practices, skillsets, roles, and responsibilities differ in detail from possible minor changes in the same categories caused by value proposition supporting transformation activities.

CONCLUSION

As new technologies emerge, DT and other transformations significantly affect the healthcare sector and its opportunities to propose value. We use the difference in transformation activities supporting and (re)defining value propositions to distinguish ITOT and DT. We find that DT increasingly pushes the boundaries of organizational processes, either through altering the process so immensely that the services or products offered to patients change or in a way that pushes the boundaries of the organizational process outside the traditional way of capturing value. This can happen through organizations by assuming new business functions enabled by IT, by replacing activities within core value-defining processes (e.g., moving from being an on-site doctor to being a remote consultant), and by changing the interactions with traditional actors to new, emerging profit-driven companies. Finally, we develop characteristics that help future research to draw a clearer boundary between DT and ITOT.

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TABLE 1**Descriptive Data of Interviewees**

ID	Organization	Position	Work Experience in Years	Age Group	Contact with Patients	Duration of Interview
1	Pharmacy	Pharmacist	5	20-30	Direct	19 min
2	Private Practice	Psychotherapist	16	40-50	Direct	20 min
3	Private Practice	Dentist	3	20-30	Direct	27 min
4	Private Practice	General Practitioner	4	50-60	Direct	38 min
5	Municipal Hospital	Assistant Doctor, Emergency Medical Physician	4	30-40	Direct	33 min
6	Municipal Hospital	Radiology Nurse	30	50-60	Direct	19 min
7	Private Hospital	OR Nurse	22	60-70	Direct	27 min
8	Local Emergency Medical Services Provider	Paramedic	5	20-30	Direct	45 min
9	Temporary Employment Agency	Elderly Care Nurse	5	20-30	Direct	40min
10	Nursing Service	Management	6	20-30	Indirect	26min
11	Nursing Service	Head Nurse	7	30-40	Indirect	20 min
12	Nursing Service	Nurse	20	40-50	Direct	13 min
13	Medical Device Manufacturer	Development Manager	7	40-50	None	16 min
14	Dental Technology Manufacturer	Software Developer	4	20-30	None	21 min
15	Public Health Insurance	Project Manager	21	20-30	Indirect	25 min

TABLE 2

Identified Characteristics for Value Proposition Support and (Re)definition

ID	Characteristic	Description	Supporting Data
	(Re)definition		
R1	Fundamental Changes in Medical Treatment Processes	IT redefines activities for medical treatment by replacing physical or in-person treatments with digitized treatment	I2, I3, I6, I10, I15
R2	Specialists Advising Healthcare Professionals Remotely	IT redefines activities of healthcare specialists by replacing their on-site activities with a remote service offering	I5, I6, I8, I10, I13
R3	Fundamental Changes in the Production Processes of Medical Products	IT redefines production activities of medical products like implants by replacing manual production activities of healthcare professionals with modeling activities	I3, I14
R4	Medical Tasks are Performed by Profit-driven Companies Instead of Traditional Healthcare Providers	IT defines new activities for organizations taking over production and advising activities traditionally performed by healthcare providers	I1, I2, I7, I6, I13, I14
	Support		
S1	Improvement of Diagnostics	IT supports diagnostic activities by improving the quality and efficiency of diagnostics	I4, I6, I9, I14
S2	Improvement of Treatment	IT supports treatment activities by increasing the quality of care	I1, I4, I5, I7, I9
S3	Digital Documentation	IT supports care process activities by facilitating documentation availability and quality	all Interviews
S4	Digital Data Transmission	IT supports the intra- and inter-organizational care process activities by facilitating data transmission	I1, I3 - I15
S5	Change in the Process of Patient Admission	IT supports the activities of patient admission by accelerating the process of patient data entry	I3, I4, I5, I6, I8, I10