Formulating a Conceptual Model of Digital Service Transformation Based on a Systematic Literature Review

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ABSTRACT

Digital service transformation study is a part of research in the field of digital transformation, which is devoted to exploring the transformations that occur in digital service products, which have been intensely explored in recent years to address digital disruption. Several concepts and definitions of digital service transformation have emerged as a result of an approach from the point of view of digital transformation and digital services concepts. This paper is organized to provide a foundational understanding of digital service transformation terminology. This paper uses the systematic literature review method to compile 52 qualified articles from previous studies. We conduct an analysis and synthesis of articles to answer research questions. The results of this study are a descriptive summary of research in the digital service transformation field, determining digital service transformation terminology and components, and also a proposed digital service transformation model to explain the position of transformation in digital service products in the overall transformation process. We construct this model using the findings of previously determined components synthesis.

Keywords: digital transformation, digital service, service transformation, digital service transformation, conceptual model, systematic literature review

1. INTRODUCTION

1.1. Research Background

Digital technology, digital innovation, and digitization have fundamentally changed every social, cultural, and economic aspect of human life. This phenomenon has changed business aspects such as processes, products, services, and relationships (Osmundsen et al., 2018). Digitalization is experiencing dynamic development along with the presence of Industry 4.0 and rapid environmental changes such as the emergence of the COVID-19 pandemic (Kutnjak, 2021). Industry 4.0 is supported by digital technology and innovations known as SMACIT (Vial, 2019) such as social media, mobile apps, data analytics, cloud computing, and the Internet of things (IoT), to add potential value to the enterprise. Meanwhile, the emergence of pandemic impacts reducing social interaction, social distancing, lockdowns, and movement restrictions force enterprises to accelerate new value creation by optimizing digital technology and digitization.

The new value-creation process utilizing digital technology, innovation, and digitization is referred to as digital transformation (Aguiar et al., 2019). Digital transformation is a new effort in utilizing digital artifacts, symbols, and systems to enable business development such as improving customer experience, streamlining business processes, or creating new business models (Fitzgerald et al., 2014). Digital transformation covers almost all aspects and dimensions of the organization (Gebayew et al., 2018; Zaoui & Souissi, 2021). Service and its innovation as an organization's product is the one aspect which is transformed (Mihardjo et al., 2020a). Another source states that for a successful implementation of digital transformation, service is the core of all (Matzner et al., 2018). Service innovation, including digital services, is an important focus to consider in the transformation process. Digital services that experience a transformation process through digital technology/innovation become part of digital transformation (Matzner et al., 2018). Some refer to it as digital service transformation (Klötzner, 2016; Matzner et al., 2018).

Until this research was conducted, not so many studies have specifically discussed digital service transformation terms. Some publications mentioning digital service transformation equate this concept with digital transformation (Mihardjo et al., 2020a, 2020b) or service transformation (Omar et al., 2017; Weerakkody et al., 2016) or digital servitization (Klötzner, 2016). The digital service transformation concept still varies according to the understanding of each researcher. This difference is caused, as an example,

in manufacturing enterprises; relevant research on digital service transformation is still insufficient, particularly in terms of empirical testing and transformation mechanisms (Shen et al., 2021). Another study stated there is a gap in digital service ecosystem transformation theoretical knowledge. The conceptual boundaries are still ambiguous, and research in this area lacks impact (Tana et al., 2019), which becomes a research potential in the context of digital service transformation (Augenstein, 2017).

1.2. Scope and Purpose

This research aims to formulate a conceptual model of digital service transformation to provide a more comprehensive and systematic understanding in answering problem statements. It will also discuss identified components for the digital service transformation model. The contribution of this research is to enrich research related to digital transformation as well as to add insight regarding research on digital service transformation for further research.

This publication is structured as follows. Section 2 will discuss research related to digital service transformation, including digital transformation, service transformation, and digital service. Section 3 discusses methodology and data collection. Section 4 discusses the results and discussions related to digital service transformation. Section 5 provides conclusions from this research and shows the limitations and plans for future research.

2. RELATED WORKS

2.1. Digital Transformation

The presence of digital technology triggers digital disruption and forces digital transformation in organizations to adapt to these conditions, thus creating new organizational value (Vial, 2019). The results change organizational structure, processes, and business models. Digital transformation brings benefits such as increasing customer satisfaction, improving customer experience, increasing productivity, reducing costs, and gaining competitive advantages (Gebayew et al., 2018).

According to Verina and Titko (2019), three main components need to be aligned for the successful implementation of digital transformation, such as technology, human resources, and business/management processes. Digital transformation is initiated by driver components including digital technology, executive support, and increasing competition, as well as customer demands. The results include creating business value, increasing effi-

ciency and reducing costs, providing competitive advantages, and other benefits. Fig. 1 shows an image of a digital transformation process model in an organization.

The digital transformation process occurs primarily in three areas: customer experience, operational processes, and business models (Westerman et al., 2011). Each area contains nine building elements in total. According to Vial (2019), the impact of digital transformation on value creation and organizational structure can be positive or negative. These components were also identified as critical success factors for successful digital transformation implementation (Morakanyane et al., 2020).

Digital transformation affects business process, including products, offerings, and models (Bosch, 2018). Businesses are always aware of their customers' needs. They have shifted from traditional methods (through surveys and interviews) to digital ones (personalization platforms and big data) due to the emergence of digital technology. The purchased item was converted into a service product, followed by physical offerings evolving into digital media. Manufacturing companies have moved from producing only products to producing products including services. Meanwhile, the service industry transforms physical services into digital services. This process of transforming products and services can be considered as digital service transformation.

2.2. Service Transformation

Service transformation is an idea changing traditional products and services by adopting manufacturing concepts to create new value, such as profits (Matzner et al., 2018). Service transformation has the same meaning as servitization, service infusion, or service transition (Dombrowski & Fochler, 2018). Servitization is a paradigm shift in which organizations initially only selling products switch into selling products with integrated services on

these products (Klötzner, 2016). Service transformation is an attempt to generate new markets and reshape existing ones, which they call service innovation with a focus on creating value for the organization (Kandampully et al., 2021).

Service transformation has a close relationship with digital transformation. Since 2011 and 2013, service transformation and digital transformation have been the subject of continuous and pertinent research (Dombrowski & Fochler, 2018). It is essential to recognize that digital transformation technology is a key driver of service transformation. Service transformation driven by digital technology and all types of smart machines are just called digital transformation (Matzner et al., 2018). Despite coming from different fields, service transformation and digital transformation can converge as the concept of digital servitization, the transition to intelligent service-product software systems that generate value via monitoring, control, optimization, and independent management (Shen et al., 2021).

2.3. Digital Service

Generally, services are intangible products or solutions produced by suppliers by utilizing existing resources to meet customer demands (Alter, 2008). From the standpoint of value creation, services are experienced and co-created by customers (Ben Letaifa et al., 2016). Digital service is service that utilizes digital technology as support. It is also known as advanced service technologies that rely on digital components embedded in physical products (Linde et al., 2023).

Digital services are objects of change in digital transformation. Organizations must use a combination of products, services, and software to derive value from digital services. These digital services must be personalized, dynamic, digital, and have high-quality solutions that emphasize perceptibility and connectivity, as a combination of physical products and services with digital value added (Shen et al., 2021). Digital services can be code-based software modules acquired and communicated via digital transactions, which are then sent to users via Internet protocols and supported by technological infrastructure (Ghazawneh, 2019).

3. METHODOLOGY

The discussion about digital service transformation literature review follows the systematic literature review guidelines in Kitchenham et al. (2009) and Henriette et al.
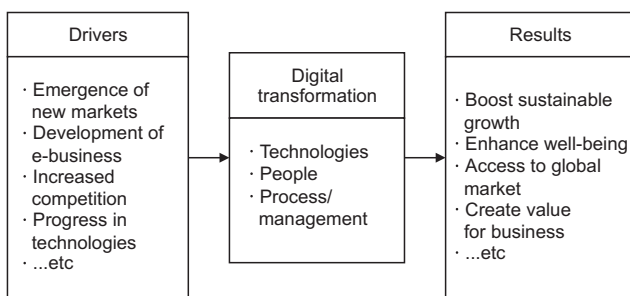
Fig. 1. Conceptual model for digital transformation (Verina & Titko, 2019).
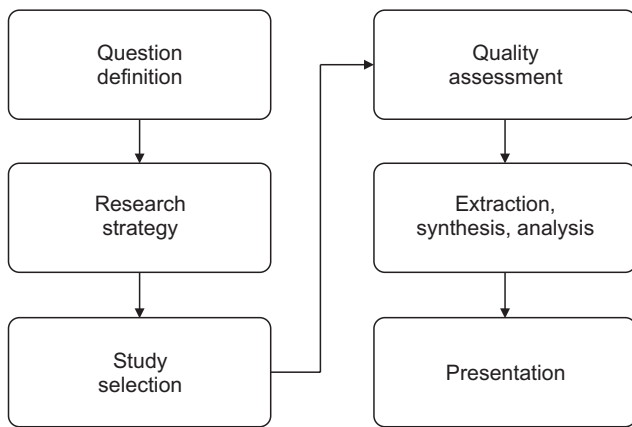
Fig. 2. Systematic literature review method (Henriette et al., 2015; Kitchenham et al., 2009).

(2015) as mentioned in Fig. 2.

3.1. Research Questions

We formulate the following research questions:

1. What research related to digital service transformation has been done?
2. What are the definitions contained in the research related?
3. What are the components of digital service transformation?
4. How can we develop a digital service transformation model based on the specified components?

3.2. Research Strategy

The main keyword used in this research is "Digital Service Transformation," using quotation marks (" ") to indicate that the search objective wants to get publications that mention the term *digital service transformation* both in the content, title, and metadata. To expand on the research, keywords are added to its building elements such as digital transformation, service transformation, and digital service. Keywords for searches include:

1. "Digital Service Transformation";
2. "Digital Service" AND ("Digital Transformation" OR "Digitalization" OR "Digitalisation");
3. "Digital Service" AND ("Service Transformation" OR "Servitization" OR "Servitisation").

The search of articles was conducted regardless of time limit by using some sources including ACM, IEEE, and Scopus (Henriette et al., 2015). The article search was conducted on September 14, 2021.

3.3. Study Selection

This section defines included/excluded criteria for found publications. The criteria for filtering include: written in English, scientific publication, focus on discussing digital service transformation, digital transformation, or service transformation on digital service. The scientific publication criteria accept papers, journals, conferences, proceedings, theses, dissertations, and research reports, and exclude white papers, reports, wire feeds, web pages, and blogs. Other criteria for rejected articles are informal literature surveys, duplicated articles from the same studies, and articles discussing the procedures used for evidence-based software engineering or systematic literature review. Articles in the form of short papers, abstracts, and incomplete articles will also be rejected (Gebayew et al., 2018).

3.4. Quality Assessment

To evaluate the rigor and credibility of the chosen articles, it is necessary to define criteria for quality assessment. Evaluation requires a thorough examination of existing articles. The criteria for quality include an adequate description of the research context, a clear statement of research objectives, an explanation of the research question, a concise statement of the findings, and others (Henriette et al., 2015). One focus of quality assessment is the suitability of the research design to research objectives. The authors select articles based on criteria that emphasize transformation in the provision of digital services. Articles containing these elements but lacking correlation will be rejected.

4. RESULT AND DISCUSSION

4.1. Research Related to Digital Service Transformation

Results from searching databases obtained 427 articles in total. After processing study selection and quality assessments, 52 qualified articles were obtained. Conducting descriptive analysis is one of the data presentation processes. Grouping includes publication year, bibliographic form, research method, and implementation area. Grouping is based on year in Table 1, bibliographic form in Table 2, research method in Table 3, and implementation area in Table 4.

Based on Table 1, the term *digital service transformation* was still not widely known until 2016, despite hav-

Table 1. Articles based on year of publication

Year	Count	References
2006	1	(Zysman, 2006)
2011	1	(Westerman et al., 2011)
2014	1	(Fichman et al., 2014)
2015	1	(Yeager, 2015)
2016	4	(Berghaus & Back, 2016; Klötzner, 2016; Truong, 2016; Weerakkody et al., 2016)
2017	7	(Augenstein, 2017; Fleig & Augenstein, 2017; Frach et al., 2017; Ismail et al., 2017; Mceachern & Cholewa, 2017; Omar et al., 2017; Ramadani et al., 2017)
2018	9	(Bracken & Greenway, 2018; Ghazawneh, 2018; Granados, 2018; Henfridsson et al., 2018; Matzner et al., 2018; Osmundsen et al., 2018; Swan, 2018; West et al., 2018; Zaoui & Souissi, 2018)
2019	9	(Ghazawneh, 2019; Jordan, 2019; McParland & Connolly, 2019; Sklyar et al., 2019a, 2019b; Tana et al., 2019; Verina & Titko, 2019; Vial, 2019; Zaki, 2019)
2020	10	(Bannister & Connolly, 2020; Bian, 2020; Germak et al., 2020; Gomes et al., 2020; Liu & Deng, 2020; Mihardjo et al., 2020a, 2020b; Park et al., 2020; Rajab, 2020; Sila & Martini, 2020)
2021	8	(Barravecchia et al., 2021; Kandampully et al., 2021; Manser Payne et al., 2021; Newsom & Jones, 2021; Rackwitz et al., 2021; Scupola & Mergel, 2021; Senyo et al., 2021; Shen et al., 2021)
2023	1	(Frennert, 2023)

Table 2. Articles based on bibliographic forms

Type	Count	References
Journal	23	(Augenstein, 2017; Bannister & Connolly, 2020; Barravecchia et al., 2021; Chatfield & Reddick, 2019; Fichman et al., 2014; Frennert, 2020; Gomes et al., 2020; Henfridsson et al., 2018; Kandampully et al., 2021; Manser Payne et al., 2021; Matzner et al., 2018; McParland & Connolly, 2019; Omar et al., 2017; Rackwitz et al., 2021; Scupola & Mergel, 2021; Senyo et al., 2021; Shen et al., 2021; Sila & Martini, 2020; Sklyar et al., 2019b; Vial, 2019; Weerakkody et al., 2016; Zaki, 2019; Zaoui & Souissi, 2018)
Conference	14	(Berghaus & Back, 2016; Germak et al., 2020; Ghazawneh, 2018, 2019; Granados, 2018; Mceachern & Cholewa, 2017; McParland & Connolly, 2019; Mihardjo et al., 2020a, 2020b; Osmundsen et al., 2018; Ramadani et al., 2017; Verina & Titko, 2019; West et al., 2018; Yeager, 2015)
Working paper	2	(Tana et al., 2019; Zysman, 2006)
Thesis	6	(Bian, 2020; Jordan, 2019; Klötzner, 2016; Rajab, 2020; Swan, 2018; Truong, 2016)
Book articles	7	(Augenstein, 2016; Bracken & Greenway, 2018; Frach et al., 2017; Ismail et al., 2018; Jones, 2021; Liu & Deng, 2020; Westerman et al., 2011)

ing been coined in 2006. The number of publications has increased over the past few years and is becoming more commonly known as of 2021. According to Table 2, publications that use the digital service transformation term the most are journals, followed by conferences and book articles. Grouping by research method according to Palvia et al. (2006) in Table 3 shows that proposing conceptual frameworks or models is most frequently discussed. Other sources discuss how to assess the implementation of digi-

tal service transformation using surveys and interviews. Others examine digital service transformation using literature analysis. Others monitor implementation using case studies and other qualitative methods. Table 4 shows digital service transformation has been implemented in numerous service areas, with the private sector taking the lead. There are also those studies that cannot be classified in any sector. Specific discussions in the private sector include finance, industry, manufacturing, health, and trans-

Table 3. Articles based on research method

Method	References
Framework and conceptual model	(Augenstein, 2016, 2017; Bannister & Connolly, 2020; Bian, 2020; Bracken & Greenway, 2018; Chatfield & Reddick, 2019; Granados, 2018; Jones, 2021; Jordan, 2019; Kandampully et al., 2021; Manser Payne et al., 2021; Matzner et al., 2018; Mceachern & Cholewa, 2017; Mihardjo et al., 2020a, 2020b; Rackwitz et al., 2021; Rajab, 2020; Ramadani et al., 2017; Verina & Titko, 2019; Vial, 2019; West et al., 2018; Yeager, 2015; Zaki, 2019)
Literature analysis	(Barravecchia et al., 2021; Chatfield & Reddick, 2019; Ghazawneh, 2018; Gomes et al., 2020; McParland & Connolly, 2019; Mihardjo et al., 2020a; Sklyar et al., 2019b; Zaoui & Souissi, 2018)
Case study	(Frach et al., 2017; Ghazawneh, 2019; Omar et al., 2017; Scupola & Mergel, 2021; Sklyar et al., 2019a; Truong, 2016; Weerakkody et al., 2016)
Survey	(Frennert, 2020; Germak et al., 2020; Klötzner, 2016; Manser Payne et al., 2021; Mihardjo et al., 2020b; Shen et al., 2021)
Mathematics analysis	(Liu & Deng, 2020; Mihardjo et al., 2020a; Zysman, 2006)
Qualitative	(Jordan, 2019; Osmundsen et al., 2018; Senyo et al., 2021; Sila & Martini, 2020; Swan, 2018; Tana et al., 2019)
Interview	(Frennert, 2020; Ismail et al., 2018; Klötzner, 2016; Scupola & Mergel, 2021; Sklyar et al., 2019a; Westerman et al., 2011)

Table 4. Articles based on implementation area

Sector	Area	Count	References
Private	Financial	4	(Bian, 2020; Granados, 2018; Tana et al., 2019; Truong, 2016)
	Industry	7	(Ghazawneh, 2018; Mihardjo et al., 2020a, 2020b; Sklyar et al., 2019a; West et al., 2018; Yeager, 2015; Zaki, 2019)
	Health	2	(Frennert, 2020; Mceachern & Cholewa, 2017)
	Manufacture	2	(Klötzner, 2016; Shen et al., 2021)
	Transportation	1	(Rajab, 2020)
Public	Government	13	(Bracken & Greenway, 2018; Chatfield & Reddick, 2019; Frach et al., 2017; Germak et al., 2020; Jones, 2021; Jordan, 2019; Omar et al., 2017; Rackwitz et al., 2021; Ramadani et al., 2017; Scupola & Mergel, 2021; Senyo et al., 2021; Swan, 2018; Weerakkody et al., 2016)
Unclassified	Organization in general	23	(Augenstein, 2016, 2017; Bannister & Connolly, 2020; Barravecchia et al., 2021; Bian, 2020; Fichman et al., 2014; Ghazawneh, 2019; Gomes et al., 2020; Henfridsson et al., 2018; Ismail et al., 2018; Kandampully et al., 2021; Liu & Deng, 2020; Manser Payne et al., 2021; Matzner et al., 2018; McParland & Connolly, 2019; Osmundsen et al., 2018; Sila & Martini, 2020; Sklyar et al., 2019b; Verina & Titko, 2019; Vial, 2019; Westerman et al., 2011; Zaoui & Souissi, 2018; Zysman, 2006)

portation in which their products are services. Industries and manufacturers not only participate in providing products but also services supporting products.

Research on digital service transformation also includes value co-creation of the digital service transformation process (Manser Payne et al., 2021; Scupola & Mergel, 2021), the role of servitization, digitalization, and innova-

tion performance in manufacturing companies (Shen et al., 2021), research on the service-product system as the combination of services and products as part of servitization (Barravecchia et al., 2021), digital platformization as a transformation strategy (Senyo et al., 2021), optical communication technologies for 5G (Liu & Deng, 2020), servitization in the context of IoT (West et al., 2018),

Table 5. Relevant studies about digital service transformation

Ref.	Research focus	DST definitions	Elements/Components
(Klötzner, 2016)	Service transformation and servitization on manufacturing industries	...is the process of converting manufactured products into commercial services that are provided via digital channels, such as the Internet. The general goal is to provide the customer with a subscribable digital solution that fulfills the same needs as the physical product.	Servitization, digital servitization, digital transformation, digital service, integrated digital service, add-on digital service, purely digital service, digital transformation maturity model
(Zaki, 2019)	Four trajectories of digital transformation to reshape digital service	...process to address the challenge: how to create new propositions for customers that will deliver a return on investment, how to change from a rules-based culture to support innovation and take risks, and how to solve the challenge while existing business is still running	Big data, customer value, customer service, Service encounters, business model, digital service, digital economy, machine learning, AI, digital technologies, digital strategy, customer experience, data-driven business models
(Zysman, 2006)	Algorithmic for service transformation	The services that ride on the product platform become the differentiated asset that creates value for the firm	Digital technology, financial engineering, products and services, algorithmic service transformation
(Matzner et al., 2018)	Role of digital transformation in service management	Service transformation that is being enabled by digital and mostly smart machines	Customer contact, simultaneity, demand fluctuation, customization, service orientation, network ubiquity, blockchain, distributed ledger technology
(Ghazawneh, 2019)	Five main categories of digital services to develop created by the service provider by digital transformation	Although digital technologies are significant for digital service transformation, the processes, knowledge, and experience of developing these digital services are equally important which is facilitated by the adoption of digital platforms and ecosystems	Digital service; service transformation; platforms; service ecosystems; services experience; service process; service capabilities; service environment; service delivery; service provider: business, interaction, technological; service experience: website service experience, app service exp., soc-med exp., Internet bot exp.; service process: standardized, semi-standardized, non-standardized; service capabilities: technology capability, platform capability, hardware-device capability; service environment: user experience, service integration, service customization; service delivery: service delivery cost, service delivery review, service delivery infrastructure
(Rajab, 2020)	To explore how values and emotional engagement impact well-being in Self-Service-Technology	...the increased efficiency of service technology and its cost-effectiveness, service providers are rushing and competing toward digital transformation	Digital well-being, service quality, service design, emotional engagement, personalization, aviation, distance learning, self-service technology, service quality model
(Ghazawneh, 2018)	Role of digital transformation in the development of digital services	Digital transformation of services involves the digitalization of services from analog to digital and the change of the actual process generated by digitization	Digital services, service transformation, digital platforms, service ecosystems, service development

Table 5. Continued

Ref.	Research focus	DST definitions	Elements/Components
(Liu & Deng, 2020)	Overview of the emerging optical communication technologies	Digital service transformation which will minimize operating costs, deliver efficiencies, and drive revenue growth	5G oriented optical network, optical communication technology, optical transport network
(Barravecchia et al., 2021)	To explore research topics and future trends for product-service systems research	Digitalization supports companies in the development of new services, business models, and innovative products	Product-service systems, Text mining, latent Dirichlet allocation, topic landscape, servitization, technical services, extended service blueprint, digital servitization
(Chatfield & Reddick, 2019)	Process of building framework for IoT-enabled smart government	Developing and exploiting IoT-enabled dynamic capabilities to drive, further, and accelerate the process of digital transformation of public administration and governance	Digitalization, servitization, service ecosystem, digitization, centralization, integration
(Kandampully et al., 2021)	To explore paths of service transformation and identify situations and contexts of it	Digitalization is not only an antecedent and an outcome of service transformation. It is also one of its main partners in the effort to maintain viability, achieve growth, and realize superior service performance over the long term in a quickly changing and challenging business environment.	Service transformation, reformation, renovation, reincarnation, digitalization
(Scupola & Mergel, 2021)	To explore value co-creation in digital service transformation	Digital transformation is a holistic effort to revise core processes and services of government beyond the traditional digitization efforts. It evolves along a continuum of transition from analog to digital to a full-stack review of policies, current processes, and user needs and results in a complete revision of the existing and the creation of new digital services.	Digital transformation, public value, co-production, public service delivery, public administration, digital strategy, digital policy, digital service, service policies, digital transformation of public administration, economic value, administrative value, citizen value, democratic/societal value
(Augenstein, 2017)	Design intelligent business model transformation tool	…since the age of digitalization, services have become more and more important in companies' strategies. Additional pressure is created through the fact that consumers are more than ever able to compare these services on the markets.	Business model, business model canvas, design science, development tools, enterprise resource planning, business model mining
(Shen et al., 2021)	To explore the role of servitization and digitalization in manufacturing	The transition to intelligent product-service software systems that generate and capture value through monitoring, control, optimization, and self-management. According to this view, enterprises must use a combination of products, services, and software to derive value from digital services.	Servitization, digitalization, dynamic capabilities, enterprise innovation performance, digital servitization transformation, enterprise innovation, PSM-DID
(Sklyar et al., 2019b)	How to organize digital servitization from a service ecosystem perspective	The utilization of digital tools for the transformational processes whereby a company shifts from a product-centric to a service-centric business model and logic	Digitalization, servitization, service ecosystem, digitization, embeddedness, centralization, integration, digital servitization, digital service

Table 5. Continued

Ref.	Research focus	DST definitions	Elements/Components
(Senyo et al., 2021)	How does digital platformisation facilitate public sector transformation	Public sector transformation focused on ICTs to improve internal and external processes as well as structures to promote efficiency, transparency, and accountability	Digital platforms, digital platformisation, technology affordance, transformational affordance framework, developing economies, public sector transformation, paperless port, new public management
(Omar et al., 2017)	Enabling digital service transformation in UK public sector	Digitally-enabled service transformations in a government attempt to improve service delivery in public organizations	Digitally enabled transformation, public sector case, institutional theory, structuration theory
(Weerakkody et al., 2016)	Digitally-enabled service transformation in the public sector	As a policy instrument, digital initiatives continue to flourish in expectancy of enhancing the public service delivery system, lowering operational cost, and bettering government controls on information and data as well as transparency and efficiency	Public sector, service transformation, institutional theory, digital government, organizational change, digital-led service transformation, isomorphism process
(Truong, 2016)	To explore innovative edges of the financial technology	The disrupted financial markets have rapidly been transformed by the financial technology companies and transformed digital services	Blockchain, digital, finance, Fintech, investment, online, payment service, peer-to-peer, third-party integration
(Frach et al., 2017)	How to assess and compare digitalization in the public sector	A holistic approach to digital transformation emphasizes digital service transformation but includes workforce and internal process transformation measures	Digitalization, e-government, digital government, public service digitalization index, digital service delivery, digital enterprise, digital strategy, shared service
(Vial, 2019)	Understanding the framework and components of digital transformation	Transforming the organization to become a platform provider enabling customers to act as complements of the firm's digital services	Strategic responses, value propositions, value networks, digital channels, agility and ambidexterity, security/privacy, operational efficiency, organizational performance

framework for IoT (Chatfield & Reddick, 2019), designing an intelligent business model transformation tool (Augenstein, 2017), and others.

4.2. Defining Digital Service Transformation

The majority of collected articles do not explain the definition of the digital service transformation. Only an article with explicit definitions from Klötzner (2016) stated that digital service transformation is the process of transforming manufactured products into commercial services delivered through digital channels such as the Internet. This has the same meaning as servitization, as mentioned in Shen et al. (2021) and Sklyar et al. (2019b).

According to some researchers, digital service transformation is synonymous with digital transformation or service transformation. A study by Mihardjo et al. (2020a) implicitly describes digital service transformation as an organizational transformation based on digital service.

Studies have also defined digital service innovation (Mihardjo et al., 2020b), digitally transformed public service (Germak et al., 2020), transformation on service ecosystem (Tana et al., 2019), transformation on enterprise services (Augenstein, 2017), or transformation in public services (Senyo et al., 2021). The same definition is also conveyed by Frennert (2023), Liu and Deng (2020), and Scupola and Mergel (2021). Others defined this term as service transformation enabled by digital technology and smart machines or digitally enabled service transformation (Omar et al., 2017; Weerakkody et al., 2016). Other studies consider it as a digitally implemented service process (Zysman, 2006), service transformation in the enterprise (Kandampully et al., 2021), service transformation in the industry (Ghazawneh, 2019; Zaki, 2019), or in government (Ramadani et al., 2017). Although these studies have considered similar terminology referring to service transformation, the definition does not mention the use of dig-

ital elements (Dombrowski & Fochler, 2018; Kandampully et al., 2021; Klötzner, 2016; Matzner et al., 2018); however, digital services require technology, platforms, and digital ecosystems which act as digital elements. Therefore, despite being classified as a service transformation, digital service transformation has the same meaning as digital transformation.

The variation of digital service transformation terminology based on each researcher's understanding is displayed in Table 5. This table outlines the research focus, proposed concept of digital service transformation, and terminology-related components. Based on definition analysis from Table 5, the authors attempt to formulate digital service transformation definition as: *a process of creating new/ improvement of digital service products as part of a business transformation and organizational strategy that aims to generate new added value through* *the use of digital technology.* The authors limit the scope of this definition to digital services because digital transformation, in general, can encompass many aspects of an organization. This definition will impact component determination and the proposed model.

4.3. Collecting Components of Digital Service Transformation

Based on its definition, the components of digital service transformation can be a combination of digital transformation and digital service components. According to Verina and Titko (2019), the conceptual model of digital transformation consists of three component categories: enablers, processes, and results. Similarly, Westerman et al. (2011) stated that digital transformation is enabled by digital capabilities, which initiate the process' key components (customer experience, operational processes, and

Table 6. Digital transformation components

Components	Sub-components	References
Drivers	Digital capabilities (digitization of tasks and processes, unified data and processes, analytics capability, business and IT integration, solution delivery)	(Verina & Titko, 2019; Vial, 2019; Westerman et al., 2011)
	Customer behavior and expectations	(Verina & Titko, 2019; Vial, 2019)
	Competitive landscape (new market, new business opportunities, increased competition)	(Verina & Titko, 2019; Vial, 2019)
	Executive support	(Verina & Titko, 2019; Vial, 2019)
	Law and regulation	(Verina & Titko, 2019; Vial, 2019)
Processes	Business model (digitally modified business, new digital business, digital globalization)	(Verina & Titko, 2019; Westerman et al., 2011)
	Operational process (process digitization, worker enablement, performance management)	(Verina & Titko, 2019; Westerman et al., 2011)
	The customer experience (customer understanding, top-line growth, customer touchpoints)	(Verina & Titko, 2019; Westerman et al., 2011)
	Use of digital technologies (social, mobile, analytics, cloud, IoT, platform, ecosystem)	(Verina & Titko, 2019; Vial, 2019)
Results	Value creation (value proposition, value networks, digital channels, agility, ambidexterity)	(Verina & Titko, 2019; Vial, 2019)
	Structural changes (organizational structure, organizational culture, leadership, employee roles, skills)	(Verina & Titko, 2019; Vial, 2019)
	Security and privacy	(Verina & Titko, 2019; Vial, 2019)
	Operational efficiency	(Verina & Titko, 2019; Vial, 2019)
	Organizational performance	(Verina & Titko, 2019; Vial, 2019)
	Industry and society improvements	(Verina & Titko, 2019; Vial, 2019)

Table 7. Digital service components

Components	Sub-components	References
Service function	Service as acts for the benefit of others	(Matzner et al., 2018)
	Service as outcomes	(Matzner et al., 2018)
	Service as exchange or value co-creation	(Matzner et al., 2018)
Service form	Integrated with product	(Klötzner, 2016)
	Add-on of product	(Klötzner, 2016)
	Purely service	(Klötzner, 2016)
Service development	Planning	(Scupola & Mergel, 2021)
	Design	(Scupola & Mergel, 2021)
	Management	(Scupola & Mergel, 2021)
	Delivery	(Scupola & Mergel, 2021)
	Assessment	(Scupola & Mergel, 2021)
Service value	Public value (economic, administrative, democratic, citizen)	(Jordan, 2019; Sklyar et al., 2019a; Zaki, 2019)
	Organizational value	(Jordan, 2019; Sklyar et al., 2019a; Zaki, 2019)
	Customer value	(Jordan, 2019; Sklyar et al., 2019a; Zaki, 2019)
	Shareholder value (market capitalization)	(Jordan, 2019; Sklyar et al., 2019a; Zaki, 2019)
Service objectives	Business	(Ghazawneh, 2018; Westerman et al., 2011)
	Interaction	(Ghazawneh, 2018; Westerman et al., 2011)
	Technological	(Ghazawneh, 2018; Westerman et al., 2011)
	Process	(Westerman et al., 2011)
Service experience	Website service experience	(Ghazawneh, 2018, 2019)
	App service experience	(Ghazawneh, 2018, 2019)
	Social media service experience	(Ghazawneh, 2018, 2019)
	Internet bot service experience	(Ghazawneh, 2018, 2019)
Service process	Standardized process	(Ghazawneh, 2018, 2019)
	Semi-standardized process	(Ghazawneh, 2018, 2019)
	Non-standardized process	(Ghazawneh, 2018, 2019)
Service capabilities	Technology capabilities	(Ghazawneh, 2018, 2019)
	Platform capabilities	(Ghazawneh, 2018, 2019)
	Hardware-device capabilities	(Ghazawneh, 2018, 2019)
Service environment	User experience	(Ghazawneh, 2018, 2019)
	Service integration	(Ghazawneh, 2018, 2019)
	Service customization	(Ghazawneh, 2018, 2019)
Service delivery	Cost delivery	(Ghazawneh, 2018, 2019)
	Review delivery	(Ghazawneh, 2018, 2019)
	Infrastructure delivery	(Ghazawneh, 2018, 2019)

business models). Similar to what is stated by Vial (2019), digital transformation is enabled by the use of digital technologies. Table 6 describes digital transformation components.

Digital service also has several component categories based on the collected articles. The components consist of: function (Matzner et al., 2018), form (Klötzner, 2016), development (Scupola & Mergel, 2021), value (Jordan, 2019; Sklyar et al., 2019b; Zaki, 2019), and objectives and developing processes (Ghazawneh, 2018). The components of digital services are outlined in Table 7.

4.4. Proposing Conceptual Model of Digital Service Transformation

The digital service transformation model is proposed to explain the position of digital service transformation and what or how its role is in the overall digital transformation. This model is proposed in Fig. 3. There are three primary building blocks in the model: driver/enabler, process/event, and result/impact, adopting from Vial (2019) and Verina and Titko (2019). These three primary building blocks become a foundation for this proposed model, as we consider the transformation of digital service products to be part of digital transformation as a whole. Drivers are a collection of components as enablers and determine the direction of transformation. A process is a group of components that are being changed/processed. Results are a group of impact components expected from a transformation.

Digital service transformation is triggered or enabled by a block which is named a 'driver.' The digital capabili-

ties component is highlighted because service objectives and functions (both being digital service components) are considered as transformation driver/enablers. Due to this service capability, a digital service can transform a process block. There, digital service component groups are categorized according to each digital transformation domain that participates in/experiences transformation (a business model, customer experience, use of digital technologies, and operational processes). The group of digital service components consists of a service process, service environment, service development, service capabilities, service delivery, and service experience. Here we can see which digital service components have changed following the digital transformation domain in which they are located. The transformation process then produces the result/impact explained in the result block. In this block, the impact can be value increasing of the digital services provided (in the service value component) or a change of digital services form (in the service form component). These two components are part of value creation domain, which is one of digital transformation's components.

This model is built based on the stages presented in Baslyman et al. (2020), which include component extraction, model design, and model validation. In this study, we did not validate our proposed model. This model adopts from Vial (2019) and Verina and Titko (2019) as the basis of its design. The component extraction process has been done in the previous section. From component extraction, component metrics are compiled to show reference indicators and strengthen concepts from the proposed model. Next, we organize the digital service component collec-
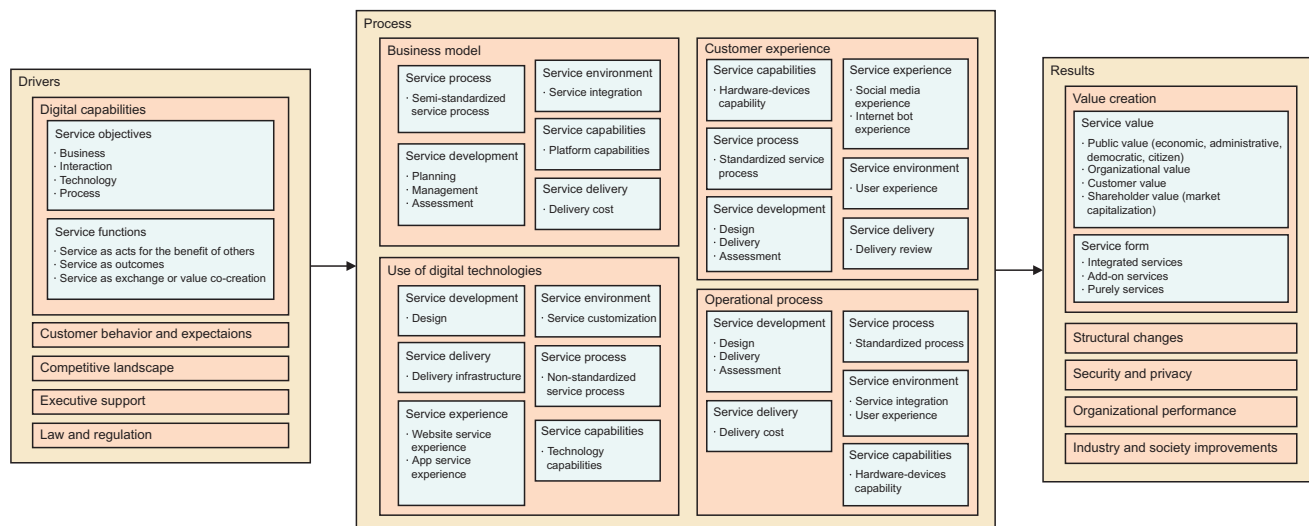

Fig. 3. Digital service transformation conceptual model.

tions into digital transformation blocks.

As previously mentioned, the three main building blocks of this proposed model are drivers, processes, and results. Each block contains several digital transformation domains, including five in the driver block, four in the process, and five in the results. There are digital capabilities in the driver block that include digital service components (service objectives and functions). Service objectives contain digital service goals, namely business, interaction, technology goals, and process. Business objectives are related to financial bottom line objectives, customer loyalty, brand formation, marketing, management, or strategies. Interaction is concerned with experienced users and process interaction design. Technology is related to technology and its components. Processes are related to improving routine services. Service functions relate to functions that can be provided by digital services, which include acts for the benefit of others as outcomes, and an exchange or value co-creation.

Furthermore, in the process block there are four domains where digital transformation occurs. The following is a description of digital service components:

1) The business model has five service components:
   a. Service capabilities relate to platform capabilities. The determination of the platform is carried out as part of the transformation process. Various types of digital platforms have their advantages, features, and business goals. Here, the service provider must ensure the appropriate platform for transformation needs.
   b. Service development. The digital service transformation process in this component includes planning, management, and assessment. Planning includes reorganizing the strategy and digital strategy work team, establishing community/governance groups, regulations, and teamwork. Management includes collaborating with externals or managing employee contracts. Transformation assessment is necessary through business forums, regulations, executive boards, and other comparable assessment forms.
   c. Service environment relates to how a service can be integrated or adapted to other services. From a business perspective, this transformation process is essential to increase the user base and provide alternative options to existing business models.
   d. Service processes relate to the management of semi-standard services in order to transform pro-

cesses adhering to similar standards in order to create a new business opportunity.
   e. Service delivery in digital service transformation includes determining changes in service costs to end-users.

2) Customer experience has six service components:
   a. Service capabilities relate to device and hardware capabilities, in this case referring to device fragmentation across platforms where digital services are transformed. The greater the number of connected devices, the greater the customer-business interaction.
   b. Service experience. The transformation is accomplished by enhancing the user experience when interacting with social media and Internet bots. The social media experience identifies the integration of digital services with various social media tools, technologies, and networks. The variety of integrated social media channels and the level of interaction between these channels will impact the use of digital services. Experience with Internet bots is crucial due to the importance of feedback management and follow-up.
   c. The service environment in customer experience includes transformation of the digital service users' experience. Mapping the user experience is the foundation for creating a digital strategy to analyze customer growth rates. The transformation process is executed on services with specific user experience groups based on the results of growth rate analysis and organizational leadership decisions.
   d. Service process. The transformation in this case pertains to the standardized service process as the only service capable of user interaction.
   e. Service delivery. Transformation here pertains to the review of delivery to determine the end user's ability to interact with the organization or other users. Organizations must comprehend how the digital service transformation is implemented in order to create the simplest interaction features for end-users to review or be reviewed.
   f. Service development includes design, assessment, and delivery. The design includes transformation in digital service review and user tests as part of digital service design. The assessment includes the transformation of service assessments through forums and survey websites. The delivery includes transformation in the creation and delivery of digi-

tal services to additional service users.

3) The use of digital technology has five service components:

a. Service capabilities involve technology transformation to design and develop digital services. Organizations must be able to evaluate the robustness, performance, adaptability, and efficacy of the technology employed in the development of digital services.

b. Service environment includes transformation of service personalization to meet user requirements. In this case, service providers must collaborate with the corresponding service industry and end-users in order to adapt the customization process according to their needs.

c. Service experience involves transformation in the experience of utilizing website or application services. The website service experience shows that organizations need to transform based on the technology used by users according to their experience in using websites. Likewise, the same is done for app service users on mobile devices.

d. Service processes for non-standard services. This service is not standardized yet, so organizations must leverage their digital technology to adapt to the needs and preferences of users.

e. Service delivery entails identifying the technology infrastructure that enables the transformation of digital services for end-users. Digital service providers must collaborate across different infrastructure levels, including platform, ecosystem, and digital marketplace levels to ensure the transformation goes according to plan.

4) The operational process has five service components:

a. Service development. The transformed components include design, delivery, and assessment. The design includes transformation in reviews, user tests, and prototype tests in digital service design. The assessment process includes the transformation of service assessment through improvement forums and website surveys for employees. Service delivery entails the transformation of the creation and delivery process to end-users into a routine business operation.

b. Service processes. The transformation relates to standardized services as routine operations of the

organization.

c. Service delivery includes transformation for cost-efficiency of services to end-users. The provisioning costs and associated costs outlined in the digital strategy must be followed by routine operational processes.

d. The service environment includes service integration and user experience. Transformation occurs during the integration of services to enhance operational digitization. The user experience transformation process includes employee participation in customizing digital services.

e. Service capabilities are associated with the transformation of digital device capabilities, which result in more integrated services, strengthening employee interaction and communication.

Value creation is part of the service component included in the results block. Value creation includes service value and service form. Service value is a value expected to be achieved. These values can take the form of public values (economic, administrative, democratic, or community values) that government organizations are expected to achieve. Other values include organizational value, which is anticipated for the organization's growth and development; customer value, which is anticipated from customer satisfaction and the fulfillment of expectations; and shareholder value, which is an anticipated profit for private organizations. Service form is an expected result from transformation itself, which includes integrated services with goods products, add-on services as complementary functions for products, and pure service, which is unbound and independent from products.

5. CONCLUSION

This paper discusses the terminology of digital service transformation based on the results of a systematic literature study. This study was able to identify previous research related to digital service transformation. This study also defines the concept and terminology of digital service transformation and its components based on the results of literature analysis. Furthermore, the results also include a proposed digital service transformation model that explains the position of this terminology and its role in overall digital transformation.

Digital service transformation is the process of creating or improving digital service products as part of a transformation of business and organization strategy that aims

to create new added value through the use of digital technology. The digital service transformation components collected in this study are organized into reference metrics and might become a basis to develop the proposed model. Nonetheless, the model we propose has not yet been validated.

This study is expected to give a comprehensive picture of how digital services are transforming, which can serve as a reference for further related studies. This paper will become a foundation for further research, including validating the proposed model and creating a reference model and life cycle model of digital service transformation.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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