



Vaasan yliopisto
UNIVERSITY OF VAASA

OSUVA Open
Science

This is a self-archived – parallel published version of this article in the publication archive of the University of Vaasa. It might differ from the original.

Explanation of a Sustainable Digital Transformation Process in a Firm

Author(s): Dang, Duong; Vartiainen, Tero; Do, Thai

Title: Explanation of a Sustainable Digital Transformation Process in a Firm

Year: 2023

Version: Accepted manuscript

Copyright © Springer. This is a post-peer-review, pre-copyedit version of a book chapter published in *Information Systems Research in Vietnam, Volume 2: A Shared Vision and New Frontiers*. The final authenticated version is available online at: <https://doi.org/10.1007/978-981-99-4792-8>

Please cite the original version:

Dang, D., Vartiainen, T. & Do, T. (2023). Explanation of a Sustainable Digital Transformation Process in a Firm. In N. H. Thuan, D. Dang-Pham, H-S. Le, T. Q. Phan (Eds.), *Information Systems Research in Vietnam, Volume 2: A Shared Vision and New Frontiers* (pp. 137–151). Springer. https://doi.org/10.1007/978-981-99-4792-8_10

Explanation of a Sustainable Digital Transformation Process in a Firm

Duong Dang*¹, Tero Vartiainen¹ and Thai Do²

¹ University of Vaasa, Wolffintie 34, 65200, Finland
{duong.dang, tero.vartianen}@uwasa.fi

² FE Greenwich Vietnam, Cau Giay, Ha Noi 100000, Vietnam
ThaiDM3@fe.edu.vn

Abstract. We are living in the digital era, in which firms often face many challenges due to the rapid development of digital technologies. Thus, firms need to reform their traditional business models by integrating digital technologies into all areas of existing business processes for their survival. This integration process is called digital transformation (DT). However, the understanding of how to develop a sustainable DT process for firms remains incomplete and fragmented. As a result, we studied how DT unfolds over a period of years in the case of telecenters (TCTs) in the context of sustainability. We used a qualitative case study as our research approach. We contribute to the literature by introducing a model of a digital transformation process and its relationship with sustainability. We also contribute to practice by suggesting that in order to ensure sustainability for the long term, managers need to prioritize the sustainable factors in each phase of the DT process while maintaining, continuously seeking, and implementing new digital initiatives.

Keywords: Sustainability, Digital Transformation, Telecenters, Case Study.

1 Introduction

Digital transformation refers to the process of integrating digital technologies into businesses [1, 2], helping organizations take advantage of digital technologies and transforming their business model [3]. As a result, understanding DT is important for both academics and practitioners [4, 5]. Digital transformation may occur in various scenarios, such as being part of a firm's plan [6] or in an unexpected situation [7]. This is because digital technologies involved in DT seem to have more generative, malleable, and combinatorial properties compared to traditional information technology (IT) [8].

* corresponding author.

Cite this chapter:

Dang, D., Vartiainen, T., Do, T. (2024). Explanation of a Sustainable Digital Transformation Process in a Firm. In: Thuan, N.H., Dang-Pham, D., Le, H.S., Phan, T.Q. (eds) Information Systems Research in Vietnam, Volume 2. Springer. https://doi.org/10.1007/978-981-99-4792-8_10

In addition, the boundaries of digital technologies are more open, flexible, and ubiquitous compared to traditional IT [9]. This may explain why so many DTs fail [10].

Recent literature has called for a greater understanding of DT at the micro level (c.f. [6]) to help firms achieve sustainable DT [11, 12]. Here, sustainability includes the natural environment, society, and economic performance components [13]. In other words, besides economic performance, the other two components are equally important for a firm to achieve sustainability. Thus, this paper studies sustainable DT. We particularly answer the research question: How does a firm develop a sustainable digital transformation process?

We used an interpretive case study as the research approach. The data collection for this study included three main sources: secondary data, a survey, and interviews. We contribute to the literature by providing a sustainable DT process model for firms. In particular, DT is a never-ending process that can be triggered and shaped by digital technologies, regulations, and competitions. Under these pressures, digital initiatives are formed and implemented at the subsystem level. After that, best practices are chosen to be implemented in a wider range at the organizational level. Digital initiatives are then refined, revised, or new ideas continue to be implemented at the subsystem level, and the process continues. From the perspective of sustainability, economic factors are the most important in every step of the DT process. Social and environmental factors are equally important, especially in the implementation phase. However, as evidenced by this study, a firm could not achieve social and environmental factors if it did not receive support from other shareholders, such as the government, in this case study. The government establishes friendly policies that help firms contribute to other factors while maintaining appropriate revenue.

2 Theoretical Background

2.1 Digital Transformation and a Sustainable Digital Transformation Model

Digital transformation is increasingly considered an important socio-technical concept in information systems (IS) literature [14–16]. Organizations transform their business models based on digital technologies. Digital technologies refer to systems, tools, devices, technologies, and resources that generate, process, or store information [3, 17, 18]. Information systems scholars mainly focus on the application and impact of digital technology, rather than on digital technologies on their own [19, 20].

There are different views of DT. For example, it may refer to organizational changes using certain digital technologies, or even using any information technologies or systems [1, 2]. The scopes of DT also range from organizations to industrial to societal [2, 6, 21]. Another view is that DT has four main properties: *(i)* target institution, to indicate where DT is taking place; *(ii)* scope, to indicate where the changes are taking place; *(iii)* means, to indicate where the technologies are involved; and *(iv)* expected outcomes, to indicate the outcomes of DT [7]. Digital transformation can be intended by and takes place within the boundaries of an organization [6, 7]. However, it is argued that, in reality, DT is not necessarily initially intended from inside an organization. This is what we view as DT in this paper. Different DT models have been discussed in the

literature in the context of established companies, digital companies, the public sector, and developed countries [22, 23]. For example, DT models in the public healthcare sector need to put aside economic factors [24], while the economy is a critical factor in companies or sectors that are market-driven [25]. Moreover, citizen science is an important factor that should be taken into consideration when establishing sustainable DT models [26]. However, there is a lack of studies on sustainable DT at the micro level in the context of less developed countries. Thus, we aim to fill this gap in the literature. To understand the case, we used practice theory [27] as the theoretical lens. Practice refers to “embodied, materially mediated arrays of human activities centrally organized around shared practical understanding” [27, p.11]. This theory allowed us to focus on stakeholders’ activities, from individual to organizational levels [24].

2.2 Telecenters, Their Challenges, and Sustainability

Telecenters (TCTs) have been established around the world due to their advantages of helping close the digital divide, improving equality, and developing societies and economies [28]. However, rapid technological changes are disrupting the traditionally successful business models of TCTs, as they no longer provide traditional telecommunications services (phone services, computer services, and the Internet). This has led to the disappearance of TCTs in the developed world, while the remaining TCTs in less developed countries face crises or are closed down due to unsustainable operations [29, 30].

To survive, TCTs need to evolve by transforming and shifting their traditional business models to new ones that can operate and adapt to technological and infrastructure changes [30–32]. A few examples of new models include e-health, e-learning, and e-commerce. Transforming TCTs using technology is considered one of the solutions to improving sustainability [32]. Unfortunately, while there are many studies on TCTs themselves, studies on this phenomenon in the new conceptual light of DT are scarce; thus, we focus on an analysis of such a particular case.

The sustainability of TCTs has been discussed in the literature. Although there are different factors in the models for sustainability, it is clear that the main common components of the models are economic or financial factors, social or cultural factors, and environmental factors. Economic factors refer to the achievement of TCTs in terms of positive revenue. Social factors indicate the positive impact of TCTs on the socio-economic development of communities. Environmental factors indicate the environments in which TCTs operate. The literature also discusses that one of the most important environmental factors is the political and regulatory environment [33], while the technological factor is also important in the sustainability of a TCT, as technology allows a TCT to meet the needs of its users [34].

3 Research Methods

We used an interpretive, in-depth case study approach. We believe this approach is appropriate for our research, as an interpretive approach helps researchers understand

the context and the process of IS [35] as well as allowing a view of the real world as socially constructed. We also adopted the principles of conducting a case study [36].

3.1 Case and its Context

The case study is of a state-owned company, VNP, which is based in Vietnam and has approximately 70,000 staff members operating in the fields of post, delivery, telecommunications services, distribution, and IT services (e.g., computers and Internet services). The company operates telecenters (TCTs) throughout the country. A telecenter refers to a physical location that provides services such as ICT, commerce, or e-government to communities, especially those living in isolated or remote areas. Telecenters were established in 1998, and as of 2018, there were approximately 8,100 TCTs across the country, providing services to about 90% of the rural population, or about 58 million people.

VNP's structure is divided into three levels. There are the VNP headquarters, 63 level 1 branches, and each level 1 branch has its sub-branches (level 2 branches). There are more than 8,100 TCTs across the country (level 3). In general, TCTs all over the country have similar settings, services, and business models. However, depending on the situation, TCTs can also have comparatively different operations. Telecenters are directly managed by level 2 branches, and indirectly by the VNP headquarters and its level 1 branches. Moreover, to understand the case study's context, we present the main statistics for subscribers of telephones, mobile phones, and the Internet in the country between 1998 and 2020 in Table 1.

Table 1. Telephone, mobile phone, and Internet subscribers per 100 inhabitants. Source: Statistics Vietnam and MIC, 2021.

Year	Telephone subscribers	Mobile phone subscribers	Internet subscribers
1998	2.6	0.001	0.00014
2009	20.2	113.4	26.5
2013	7.5	137.9	37.0
2016	6.0	139.2	54.2
2020	3.5	128.2	72.0

3.2 Data collection

Multiple sources of data were used in this study, including secondary data, surveys, and interviews. First, we gathered secondary data from various sources, including the authority in charge of TCT-related regulations, funding organizations or non-governmental organizations (NGOs) that sponsor TCTs (e.g., Bill & Melinda Gates Foundation, Public-utility Telecommunication Service Fund), VNP, and reputable magazines or news sources. The secondary data helped us primarily understand the phenomenon and complemented the primary data (e.g., interviews and surveys).

Second, we conducted a survey focusing on TCTs' staff and their customers in May and June 2020. The aims of the survey were primarily to understand TCTs' equipment, services, customers' and staff's background, the changes in TCTs over time, experiences of the staff at the TCTs, views on TCTs' overtime, their views on technologies, and to evaluate how TCTs adopt technologies.

Third, the input from the first two steps helped us establish topics and questions for the interviews. Semi-structured qualitative interviews with open-ended questions were used. We conducted 21 interviews from June 2020 to March 2021 (face-to-face) and two interviews from October and November 2021 (online). The list of interviewees and their positions are shown in Table 2. The questions were based on two main themes: sustainability and DT. Instead of recording, we took extensive notes during the interviews, which lasted from 21–75 minutes, and there were several informal conversations. During the interview process, secondary data (e.g., archival data) and information from the survey were gathered continuously. By doing so, it helped to triangulate information from the interviews.

Table 2. List of interviewees, numbers, and their positions.

Interviewees	#	Position
Head of division	1	TCT Division, VNP Headquarters
CEO	1	Yen Bai branch of VNP (level 1)
Senior staff	3	Sales Division, Dak Lak branch (level 1); Sales Division, Kon Tum branch (level 1); and Krong Bang branch of Dak Lak's VNP branch (level 2)
Staff	12	Two staff in TCTs of Dak Lak branch of VNP, and 10 staff in TCTs of Kon Tum branch
Customer	2	Using services at the TCT of Dak Lak's Ea Tan branch of VNP
Head	1	ICT department of Hatinh province
Leader	3	Ha Mon (Kon Tum branch), Ea Tan (Dak Lak branch), Cu Sa (Dak Lak branch) commune committees
Total	23	

3.3 Data analysis

We followed the guidelines of [37], and the process of data analysis was emergent and nonlinear [35]. During the data analysis process, we constantly moved between and reflected on the data and the theoretical lens and our research approach. We also used narrative analysis to inform the coding of our data [38]. We analyzed and traced the events and phenomena from both the internal and external contexts of TCTs [39].

In the early phase of the data analysis, we relied on secondary data. However, in the later phases, we used all data sources, time-mapping events, and constantly refined and analyzed the data based on all the sources. This helped us identify and categorize the phases and activities or phenomena in these phases. Three main phases of the

sustainable DT of TCTs were identified at the end of the data analysis process. In addition to the narrative analysis, the authors discussed and refined this process, and all differences were bilateral agreements.

4 Findings

4.1 Sustainable Digital Transformation Process in the Case Study

Phase 1. Preparation phase. After the period of inception and development, TCTs were forced to change their traditional business model due to digital technologies. The DT process was kickstarted by the company seeking out new digital initiatives. In this period (2009–2012, Phase 1, Table 3), TCTs across the country were significantly disrupted by technological changes that influenced their traditional business models. For example, the rapid growth of telephone, mobile phone, and Internet subscribers (Table 1) led to a massive loss of customers. Due to these external triggers, revenue streams at the TCTs gradually decreased. In addition, IT capabilities were also a problem. For example, the TCTs' equipment and technologies (e.g., software and hardware) were outdated. Further, the competition from other companies in the postal services led to the situation worsening. This led to the income being unable to cover operational costs. As a result, about 320 TCTs were closed temporarily, and the operation of the rest was unstable or inefficient, as voiced by the head of the ICT department of Hatinh (level 1): “There were increasing trends in TCTs that they did not meet the operational [cost] conditions, while the rest of TCTs were ineffective, or in the stage of revenue losses or on the verge of bankruptcy.”

Thus, TCTs had to change themselves in order to survive; VNP searched for new initiatives in order to deal with the significant changes in technology and infrastructure. Solutions to TCTs' challenges were discussed with the VNP management board. However, they had to find solutions, and even the discontinuation of services by closing down TCTs over the country was on schedule, as voiced by the head of the ICT department: “The management board was very slow in finding solutions. One of the reasons is that there was a fast-changing technology infrastructure, leading to a significant loss of customers. Regulatory change was also a factor because it allowed more companies to provide services.” The breakthrough ideas came to the new management board in early 2012, and VNP focused on seeking new business models that developed TCTs based on digital technologies—digital initiatives. Unlike the previous approach of seeking ideas from the management board, this time the ideas came from a variety of levels. They came from the sub-system level (e.g., from TCTs' staff), the organizational level (e.g., the board and TCT division staff at VNP Headquarters), and from society (e.g., customers and start-ups).

They also focused on the scope of the work, approaches, and products. It is interesting to note that the IT department was not in charge of DT work. Instead, a task force was established with people from different departments. As there was no universal understanding of DT in the company, it created many problems in practice. For example,

it was difficult to decide for what scope DT should be implemented (organization-wide or limited), which approach should be used (short-term benefits vs. long-term benefits; sustainability vs. economic benefits; or top-down vs. bottom-up metrics for evaluation), and what would be the products and services that the TCT would offer (new cost-revenue business models or improved cost savings of the current models). This resulted in a set of documents for different solutions. As a result, several digital initiatives were chosen for the next phase, such as web-enabled e-government services, platform-based e-learning, platform-based e-commerce, e-health, and social insurance.

In terms of sustainability, the management board evaluated the digital initiative as follows: The economy was a strong factor, although there was a crisis at the end of Phase 1. Social factors focused on supporting reading services to all localities—that is, promoting culture, promoting public health, and reading culture reaching out to youth. There was no indication of environmental factors during this period. However, they provided information on environmental awareness to rural dwellers.

A summary of the process, its context, and its features can be seen in Table 3. The details of the next two phases (Phase 2 and Phase 3) are described in the following sections.

Table 3. Timeline, context, and features of TCTs in the sustainable DT process.

Phase	Name	Pe-riod	Context	Features
1	Preparation phase	2009–2012	There was a rapid growth in telephone, mobile phone and Internet subscribers in the country (Table 1); TCTs receive some support from external parties (e.g., funds); Increasing number of competitors.	Unstable development; TCTs were in crisis, as traditional models did not generate revenues; TCTs were forced to seek new business models, i.e., seeking digital initiatives to deal with the crisis and to sustain their businesses; These digital initiatives were based on digital technologies.
2	Trial	2013–2015	Mobile phone and Internet subscribers were continuing to grow at a fast pace in the country (Table 1); Significantly growing competitors (about 200 competitors).	Several digital initiatives were proposed to transform their business models; Trail business models at subsystem levels; TCTs implemented digital initiatives and partly transformed their businesses.
3	Implementation	2016–2020	Internet subscribers were very high (about 70%)—this percentage was close to the percentage of	Best practices of digital initiatives (business models) chosen from the trial phase were

Phase	Name	Pe-riod	Context	Features
			Internet subscribers in developed countries (more than 80%); Continued growth in competitors (515 competitors in 2020).	implemented at a large scale at all levels; TCTs refined and continued to seek new digital initiatives; More than 80% of the revenue came from new business models.

Phase 2. Trial phase. After the first phase, digital initiatives were selected. In this phase, the chosen initiatives were implemented to a limited degree in the TCTs—at the subsystem level. For example, VNP cooperated with its partners to pilot a project on social insurance via the TCTs, or PayPost app for financial services, and the PTCom app for ecommerce was installed at selected TCTs. It is noted that new digital initiatives came from several sources, such as society (e.g., start-ups and contests) and inside organizations (e.g., staff).

From those pilot initiatives, when they proved their advantages, new digital initiatives were considered best practices and became candidates to pilot on a larger scale at other TCTs at the organizational level; otherwise, they were halted. In other words, they used a “trial and error” approach to find best practices. The criteria for initiatives to be considered as best practices were financial, technological, social, political, and environmental factors, as voiced by the head of the division: “Revenue was our first priority, as it contributed to the sustainability of TCT. Technologies played a central role in all of our selection steps as we transformed our business based on technologies. We also considered social factors, because the majority of our TCTs are located in disadvantaged areas, and political factors were taken into consideration because they affect TCTs. Finally, we took the environment as one of our criteria for a better life for the community.” In this phase, new ideas were continuously refined and revised based on their performance according to these criteria. A priority was to increase revenue and move business models from basic services to multiple digital technologically-based services. It is noted that telecommunications services almost disappeared in TCTs; only postal services were in operation. However, it faced stiff competition from other companies. For example, in 2016, there were more than 200 companies, in 2018, 250 companies, and in 2020, about 515 companies in the country provided similar services.

As seen, while economic factors continued to be considered as very important, social and environmental factors received considerable attention. This was thanks to a policy from the government that supported citizens in rural areas through TCTs (e.g., policies by the authority). Moreover, data from interviews showed that technology played an important role in sustainability, as almost all interviewees agreed on the importance of technology.

Phase 3. Implementation phase. In the implementation phase, VNP selected “best practices” to be expanded throughout the entire organization on an organizational level. First, they scaled up the infrastructure at both the back end and front end. Apps and

platforms were officially introduced. Services were transferred to platforms and apps. Customers were also able to obtain their services online and offline via TCTs. At the organizational level, VNP was responsible for designing, setting up, updating databases, and processing business transactions. Alternatively, the TCTs assisted with the normalization of their customers' processes and guided them to use services that had improved efficiency during the trial period. For example, they used Postmart platforms (e-commerce) to help local farmers sell their goods. Through Postmart, TCTs cooperated with different service providers and service content to provide services to customers. Based on digital technologies, they were able to change business models to B2B, B2C, and C2C models.

As a result, revenue coming from services based on digital technologies accounted for more than two-thirds of the total revenue of TCTs. Other sources of revenue included postal services and financial services. For example, the survey indicated that, by 2019, more than 80% of revenue came from new business models, and only 16% of revenue came from traditional services. This helped VNP to contribute to communities. For example, TCTs were an important channel for assisting locals during the Covid-19 pandemic (e.g., services from governments, other benefits, or support from outside or other organizations). Telecenters continued to contribute and promote culture to locals (e.g., free books, policies, and magazines, with more than 1,730 TCTs of 57 level 1 branches participating, with more than 10 million users in 2018). Further, most of the 8,100 VNP TCTs' staff were members of the local communities and were in their 30s (e.g., 92% of the staff at Kon Tum and Dak Lak's TCTs were local, more than 90% of the staff at Kon Tum and Dak Lak's TCTs were local women).

When it came to sustainability, as the economic factors were very positive, the company had more resources to focus on social factors. For example, the company prioritized hiring locals and continued to support and promote culture, public health, and awareness of environmental issues. In addition, the company received support from the government through the "One Commune One Product-OCOP" program (Decision No 490/QD-TTg issued by the Prime Minister, 2018). This was aided by technology. For example, apps and platforms were encouraged to be used and installed by all customers of TCTs. All services provided by TCTs were also available on apps.

5 Discussion

5.1 Sustainable Digital Transformation Process Model for a Firm

Figure 1 illustrates a sustainable DT process model for a firm and its components, showing all phases of the sustainable digital transformation process. Each component of the model was generalized from our empirical data, which are described in the Findings section.

There are three phases in the process of sustainable DT: the preparation, trial, and implementation phases. During the preparation phase, a firm prepares to transform its business models using digital technologies. The trial phase shows the DT strategy and methods of deployment of digital initiatives in a firm, while the implementation phase illustrates how a firm transforms its business models on a large scale. Moreover, the

methods of deployment indicate the scope and direction of DT, while the DT strategy indicates the strategy that organizations adopt in their transformation process. These strategies are influenced by sustainability factors (thick up-down gray arrows, Figure 1). In turn, sustainability factors influence the DT process, as they play a role as both outside and inside influencers. However, these sustainability factors have different degrees of influence. The details of the model are described as follows.

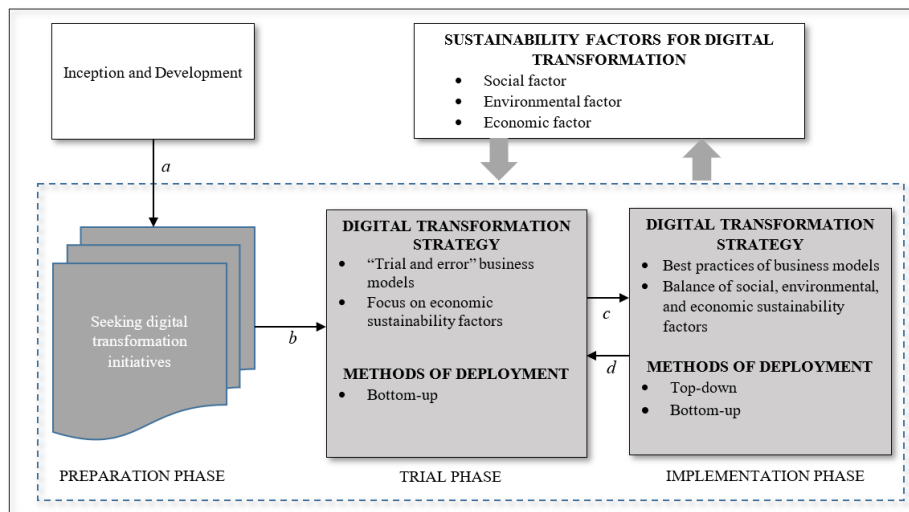


Figure 1. The process of sustainable digital transformation. NOTE: The thin arrows represent transitions among phases, and the thick arrows represent influences among components. They do not represent a statistical or causality relationship.

First, in the preparation phase, after the period of inception and development, a firm has to seek DT initiatives for its survival for various reasons (arrow a, Figure 1). These reasons are either intentions from inside a firm and planned [16, 36] or are mainly due to outside factors, as in this case. An example of an outside factor is technological change, which can take place outside the boundaries of a firm. This change leads to changes in customer behavior and affects how customers use services. For example, the number of subscribers on the Internet and mobile phones was growing at a rapid pace during a certain period, which led to a significant decrease in customers using phones or the Internet at service points. Instead, they could use it on their phones or at home. This was the main factor that led the firm into crisis, as traditional business models no longer produced enough revenue. To survive, a firm needs to change. In addition, after seeking DT initiatives, the firm chose potential initiatives to deploy in the trial phase (arrow b, Figure 1). Digital transformation initiatives may come from both inside and outside of a firm, as evidenced by this case, in which they came from several TCTs, start-up companies, non-profit organizations, and even from the government.

Second, in the trial phase, “trial and error” is applied to digital initiatives. This means that each initiative will be implemented on a small scale within the firm. For example, a firm can choose to deploy certain services in different branches or areas across the

country to implement DT initiatives. If these initiatives prove to be beneficial or have potential competitive advantages for the firm, they become “best practices.” Next, the trial phase will move to the implementation phase (arrow c, Figure 1). In the trial phase, a firm is mainly focused on the economic sustainability factor. The deployment methods are bottom up. This allows a firm to easily adjust and revise its business model in a manageable manner. Moreover, this phase also helps firms gain knowledge in DT, learn, train their human resources, and prepare their capabilities and resources for the next phase of the DT process.

Third, in the implementation phase, a firm adopts best practices from the previous phase and invests heavily in implementing these best-practice business models on a large scale. For example, a firm can now implement its initiatives in all branches and services. The chosen models are implemented in a top-down manner in the sense that they are implemented on a larger scale in all organizations at different levels, from headquarters to branches. At the same time, a firm continues to use its “test and trial” approach to revise its current business models or deploy new ideas in a limited number of branches or services (arrow d, Figure 1). By doing so, it helps a firm continue its renewal and take advantage of digital technologies. It also helps them achieve dynamic and flexible change with high competitiveness and growth. Moreover, a firm can achieve a better balance in terms of sustainability factors, such as economic, environmental, and social factors.

5.2 Relationships Between Sustainable Factors in Digital Transformation

Due to the enormous pressures of rapidly changing digital technologies and the uncertainties of environments [22], many firms around the world are facing uncertainty and unsustainable operations. Thus, it is important for companies to seek sustainable business models to ensure their survival. Economic sustainability is a key factor in DT, which is very challenging for firms seeking a balance with other factors, such as environmental and social factors. This is because economic sustainability is a major concern in any ICT project and is the main reason why many firms close down [40–43]. Moreover, this study indicates that economic factors are a major motivation that leads TCTs to transform their services.

During the DT process, a firm needs to take into consideration social and environmental factors to achieve sustainability. As shown in the case study, TCTs provided various services and activities in the country to close digital gaps, promote culture, and help others, especially for those citizens in rural areas. For example, TCTs were used for social insurance, social assistance, and other services, which helped to increase the company’s reputation and acceptance by the community.

In our study, in addition to economic, social, and environmental factors, digital technology and political factors indirectly influenced the sustainability of DT. For example, as demonstrated in the case study, government policies helped TCTs facilitate and expand their services to a wider range of customers. Through these policies, TCTs were able to provide e-government services to citizens and establish their services in communities. Such government support can contribute to economic and social factors in the process of sustainable DT [42, 43].

6 Conclusion

We contribute to the literature by introducing a process model for sustainable DT in firms. We showed that the process of transformation can be unintentional and influenced by external factors. These external factors led a firm to change its business models for its survival in different ways at different stages. The firm needed to balance three factors: social, economic, and environmental factors. Furthermore, we also found that technological and political factors can aid a firm in achieving sustainability. These findings can be seen as the practical implications of this study, as managers should consider sustainability factors when implementing sustainable DT.

This study has several limitations. We used a specific case in a specific country in this paper; therefore, our conclusions may not be applicable to other organizations or in other countries, especially those with different contexts. However, we believe that our findings may be useful for similar organizations. In the future, we plan to conduct and analyze each phase in depth and explore how different sustainability factors affect each other during the process of transformation. We also aim to further examine the model that we proposed in the present paper to gain a better understanding of how the process of transformation unfolds over the years or to analyze in depth the relationship between capabilities and resources for DT in our case.

References

1. Nwankpa, J., Roumani, Y.: IT Capability and Digital Transformation: A Firm Performance Perspective. ICIS 2016 Proceedings. (2016).
2. Heilig, L., Lalla-Ruiz, E., Voß, S.: Digital transformation in maritime ports: analysis and a game theoretic framework. *Netnomics*. 18, 227–254 (2017).
3. Ross, J.W., Sebastian, I.M., Beath, C., Moloney, K.G., Mocker, M., Fonstad, N.O.: Designing and executing digital strategies, (2016).
4. Saldanha, T.J.V., Mithas, S., Krishnan, M.S.: Leveraging customer involvement for fueling innovation: the role of relational and analytical information processing capabilities. *MIS Q.* 41, 267–286 (2017).
5. Singh, A., Klärner, P., Hess, T.: How do chief digital officers pursue digital transformation activities? The role of organization design parameters. *Long Range Planning*. 53, 101890 (2020).
6. Vial, G.: Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*. 28, 118–144 (2019).
7. Lanamäki, A., Väyrynen, K., Laari-Salmela, S., Kinnula, M.: Examining relational digital transformation through the unfolding of local practices of the Finnish taxi industry. *The Journal of Strategic Information Systems*. 29, 101622 (2020).
8. Kallinikos, J., Aaltonen, A., Marton, A.: The Ambivalent Ontology of Digital Artifacts. *MIS Quarterly*. 37, 357–370 (2013).
9. Tilson, D., Lyytinen, K., Sørensen, C.: Research Commentary—Digital Infrastructures: The Missing IS Research Agenda. *Information Systems Research*. 21, 748–759 (2010).

10. Davenport, T.H., Westerman, G.: Why So Many High-Profile Digital Transformations Fail, <https://hbr.org/2018/03/why-so-many-high-profile-digital-transformations-fail>, (2018).
11. Davison, R.M., Martinsons, M.G.: Context is king! Considering particularism in research design and reporting. *J Inf Technol.* 31, 241–249 (2016).
12. Bai, Y.: Has the Global South become a playground for Western scholars in information and communication technologies for development? Evidence from a three-journal analysis. *Scientometrics.* 116, 2139–2153 (2018).
13. Dao, V., Langella, I., Carbo, J.: From green to sustainability: Information Technology and an integrated sustainability framework. *The Journal of Strategic Information Systems.* 20, 63–79 (2011).
14. Bogusz, C.I., Morisse, M.: (Special issue) How infrastructures anchor open entrepreneurship: The case of Bitcoin and stigma. *Information Systems Journal.* 28, 1176–1212 (2018).
15. Sandberg, J., Mathiassen, L., Napier, N.: Digital options theory for it capability investment. *Journal of the Association for Information Systems.* 15, 422–453 (2014).
16. Tumbas, S., Berente, N., Brocke, J. vom: Digital innovation and institutional entrepreneurship: Chief Digital Officer perspectives of their emerging role. *Journal of Information Technology.* 33, 188–202 (2018).
17. Karimi, J., Walter, Z.: The role of dynamic capabilities in responding to digital disruption: A factor-based study of the newspaper industry. *Journal of Management Information Systems.* 32, 39–81 (2015).
18. Setia, P.P., Setia, P.P., Venkatesh, V., Joglekar, S.: (Special Issue) Leveraging digital technologies: How information quality leads to localized capabilities and customer service performance. *MIS Quarterly.* 37, 565–590 (2013).
19. Hirschheim, R., Klein, H.: A Glorious and Not-So-Short History of the Information Systems Field. *Journal of the Association for Information Systems.* 13, (2012).
20. Bjørn-Andersen, N., Clemmensen, T.: The Shaping of the Scandinavian Socio-Technical IS Research Tradition. Confessions of an accomplice. *Scandinavian Journal of Information Systems.* 29, (2017).
21. Piccinini, E., Hanelt, A., Gregory, R., Kolbe, L.: Transforming Industrial Business: The Impact of Digital Transformation on Automotive Organizations. *ICIS 2015 Proceedings.* (2015).
22. Dang, D., Vartiainen, T.: Digital Strategy in Information Systems: A Literature Review and an Educational Solution Based on Problem-Based Learning. *Journal of Information Systems Education.* 33, 261–282 (2022).
23. Dang, D., Vartiainen, T.: Digital strategy patterns in information systems research. *PACIS 2019 Proceedings.* (2019).
24. Dang, D., Pekkola, S., Vartiainen, T., Pham, S.: Platformization Practices of Health Information Systems: A Case of National eHealth Platforms. In: *Proceedings of the 55th Hawaii International Conference on System Sciences.* , Hawaii, US (2022).
25. Svahn, F., Mathiassen, L., Lindgren, R.: Embracing digital innovation in incumbent firms: how volvo cars managed competing concerns. *MIS Q.* 41, 239–253 (2017).
26. Dang, D., Mäkipää, J.-P., Mäenpää, T., Pasanen, T.: Exploration of Ideas for Sustaining Digital Innovation Management: A Case Study in the Ostrobothnia Region of Finland. *AMCIS 2022 Proceedings.* (2022).

27. Schatzki, T.R.: Introduction: practice theory. In: Cetina, K.K., Schatzki, T.R., and Savigny, E. von (eds.) *The Practice Turn in Contemporary Theory*. pp. 1–14. Routledge, London and New York (2001).
28. UN: Report on the United Nations/Malaysia Workshop on Bridging the Digital Divide: Space Technology Solutions. Presented at the UN/Malaysia Workshop on Bridging the Digital Divide : Space Technology Solutions (2000 : Kuala Lumpur) January 4 (2001).
29. Faroqi, Md.G., Siddiquee, N.A., Ullah, S.: Sustainability of telecentres in developing countries: Lessons from Union Digital Centre in Bangladesh. *Telematics and Informatics*. 37, 113–127 (2019).
30. Madon, S., Krishna, S.: *The Digital Challenge: Information Technology in the Development Context*. Routledge (2018).
31. Dang, D., Vartiainen, T.: Changing Patterns in the Process of Digital Transformation Initiative in Established Firms: The Case of an Energy Sector Company. *PACIS 2020 Proceedings*. (2020).
32. Thai, D.M., Duong, D., Falch, M., Xuan, C.B., Thu, T.T.A.: Factors affecting the sustainability of telecentres in developing countries. *Telecommunications Policy*. 46, 102265 (2022).
33. Bailur, S.: Using Stakeholder Theory to Analyze Telecenter Projects. *Information Technologies and International Development*. 3, 61–80 (2006).
34. Liyanage, H.: Sustainability First. In search of telecentre sustainability. Kotte: Sarvodaya Fusion. (2009).
35. Walsham, G.: Interpretive case studies in IS research: nature and method. *European Journal of Information Systems*. 4, 74–81 (1995).
36. Klein, H., Myers, M.: A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems. *Management Information Systems Quarterly*. 23, (1999).
37. Cohen, M.Z., Kahn, D.L., Steeves, R.H.: How to analyze the data. In: *Hermeneutic Phenomenological Research: A Practical Guide for Nurse Researchers*. SAGE Publications, Inc. (2012).
38. Myers, M.D.: *Qualitative Research in Business and Management*. SAGE (2019).
39. Pettigrew, A.M.: Context and Action in the Transformation of the Firm: A Reprise. *Journal of Management Studies*. 49, 1304–1328 (2012).
40. Madon, S.: Governance lessons from the experience of telecentres in Kerala. *European Journal of Information Systems*. 14, 401–416 (2005).
41. Dang, D., Pekkola, S.: Organizational Change and Enterprise Architecture Adoption: A Case Study in the Public Sector. In: Hoang Thuan, N., Dang-Pham, D., Le, H.-S., and Phan, T.Q. (eds.) *Information Systems Research in Vietnam: A Shared Vision and New Frontiers*. pp. 49–64. Springer Nature, Singapore (2023).
42. Do Manh, T., Dang, D., Falch, M., Tran Minh, T., Vu Phi, T.: The role of stakeholders and their relationships in the sustainability of telecentres. *Digital Policy, Regulation and Governance*. 25, 104–119 (2023).
43. Whyte, A.V.T.: *Assessing community telecentres: guidelines for researchers*. International Development Research Centre, Ottawa (2000).