Operationalizing the Twin Transition: An organizational change approach for integrating digital and sustainability transitions

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Abstract

Organizations increasingly face the challenge of integrating digital and sustainability transitions. This development is often referred to as the Twin Transition [1,2]. This topic receives growing attention in European policy agendas and ICT for Sustainability (ICT4S) research. Digital technologies can support sustainability efforts by enabling monitoring, optimization, and regulatory compliance. At the same time, they create new environmental pressures. These pressures relate to energy consumption, resource use, and electronic waste [3,4]. Despite the availability of strategic frameworks, many organizations struggle to put the Twin Transition into practice. This indicates an operationalization gap [2,5]. This study addresses this gap by developing, implementing, and evaluating an organizational change approach that supports the operationalization of the Twin Transition. It follows a Design Science Research (DSR) approach [6], developing design artifacts consisting of an adaptive operating model and a practical toolbox, supported by a conceptual framework. The toolbox includes a serious business game, a TechRadar, and a roadmap. The approach helps decision-makers understand continuous digital and sustainability pressures and coordinate initiatives across organizational domains. In response to these pressures, organizations often lack a clear and structured set of actions and a corresponding actionable perspective. The operating model provides a structure to organize and categorize potential actions into a manageable set. This structure is then reflected in the toolbox, where board members and sustainability managers can select appropriate actions. The TechRadar and roadmap support prioritization, monitoring, and phased implementation of these actions. By doing so, this study contributes practical instruments and conceptual insights that support organizations in operationalizing the Twin Transition. In addition, the approach aligns digital initiatives with broader sustainability objectives, including contributions to ESG performance and SDG-related goals.

Keywords

Twin Transition, Operationalization, Organizational Change, Design Science Research, ICT4S

1. Introduction

Organizations increasingly integrate their digital and sustainability transitions. They do so in response to growing technological, regulatory, and societal pressures to contribute to their sustainability objectives. In this study, the term digital transition is deliberately used instead of the term digital transformation. Digital transformation often suggests a shift towards a predefined future state driven by technological change [7]. In contrast, the digital transition emphasizes a continuous and adaptive process. This process evolves under changing technological, regulatory, and societal pressures within the dynamics of socio-technical transition [8]. Historically, digitalization and sustainability were driven by different pressures. Digitalization was mainly shaped by technological developments and opportunities to improve efficiency. Sustainability, in contrast, was largely driven by regulation and increasing societal pressure. Over time, these developments have become more intertwined. Organizations recognize that long-term competitiveness depends on aligning economic performance with environmental and societal responsibility [9,10]. Currently, digital technologies support sustainability goals through mechanisms such as data-driven monitoring, and regulatory compliance [9,11]. However, digitalization also creates new sustainability challenges. Technologies such as artificial intelligence increase energy use, raw material demand and electronic waste [3,4]. As a result, digitalization both enables and constrains

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sustainability objectives. The concept of the Twin Transition highlights this interdependence. It emphasizes that digital and sustainability transitions should be addressed together rather than as two separate developments [2,10]. However, previous research shows that digitalization and sustainability are often studied separately [9,12]. European policy agendas and ICT for Sustainability (ICT4S) research increasingly emphasize the importance of the Twin Transition [1,12]. Various strategic frameworks have been developed to support this ambition. Yet many organizations still struggle to translate these ideas into practice. Organizations often lack a clear concept that helps them turn the Twin Transition into concrete and coordinated actions [2]. As a result, an operationalization gap emerges. This gap is also visible in the barriers organizations encounter when trying to integrate digital and sustainability initiatives [2,3]. Addressing this challenge is difficult because the Twin Transition includes multiple perspectives, such as technological, organizational, regulatory, and societal. Each of these evolves at a different pace. In addition, they also interact in complex and often non-linear ways [2,8]. Because of this complexity, linear planning approaches are often insufficient. Organizations therefore need more integrated and adaptive governance structures to manage these dynamics [8,13]. Rather than progressing toward fixed end states, organizations must continuously realign strategy, governance and operations. When these dimensions evolve out of sync, tensions may emerge in the form of misaligned investments, delayed service delivery, and increased operational complexity. This may lead to declining stakeholder satisfaction, including customers and personnel [13]. This reinforces the urgency of operationalizing the Twin Transition in a coordinated manner. To address this challenge, this study develops, implements, and evaluates an organizational change approach. It supports continuous adaptation across digital and sustainability perspectives. Building on operating model literature [13], the approach combines the coordinating strengths of traditional operating models with adaptive characteristics.

2. Research Objectives and Questions

The objective of this study is to design, implement, and evaluate an organizational change approach that enables organizations to operationalize the Twin Transition. The aim is to support organizations in doing so in a structured and adaptive way, while taking their specific context into account. Figure 1 illustrates the main elements of the approach: pressures, capabilities, governance structures and practical interventions. Rather than focusing solely on technological solutions, this study approaches the Twin Transition as an organizational change approach. It examines how organizations can use capabilities to respond to continuous pressures. It also explores how these pressures can be translated into coordinated actions. In addition, this study considers how an operating model and supporting instruments can help organizations implement the Twin Transition and contribute to their sustainability objectives. The main research question of this doctoral research is:

How can board members and sustainability managers operationalize the integration of digital and sustainability transitions to contribute to their SDG and/or ESG objectives?

This question is elaborated through the following sub-questions:

1. What barriers do board members and sustainability managers experience when integrating digital and sustainability transitions within their organization?
2. Which implementation strategies and actions can be applied to overcome these barriers and operationalize the Twin Transition?
3. How do these strategies and actions contribute to the SDG and/or ESG objectives of an organization?
4. Which instruments could a Twin Transition toolbox include to support organizations in integrating and monitoring digital and sustainability transitions?
5. How can the effectiveness of this toolbox be evaluated and communicated during implementation within participating organizations?

3. Theoretical Foundations for Organizational Coordination and Adaptation

Building on the challenges outlined in section 1, this section introduces the theoretical perspectives that inform the proposed organizational change approach. Specifically, it draws on operating model literature and dynamic capability theory to provide a governance and capability-based foundation for Twin Transition actions [13-15]. These perspectives inform the design of the operating model and the instruments in the toolbox.

3.1. Operating models as governance architecture

Operating models describe how organizations translate strategy into operational practice [13]. They clarify how processes, decision rights, responsibilities and technology are organized to enable concrete action. In this way, operating models function as governance structures that embed strategic priorities in everyday organizational processes and decision-making [13]. When organizations seek to integrate digital and sustainability objectives, coordination across traditionally separated domains becomes essential. This insight informs the governance perspective guiding this study. It underpins the focus on designing an operating model that supports alignment between digital initiatives, sustainability ambitions and organizational decision-making processes. It also connects directly to the central research question, which examines how decision-makers can operationalize this coordinated integration.

3.2. Organizational capabilities under continuous pressures

Organizations facing continuous regulatory, technological, and societal pressures need more than strategic ambition. They require capabilities that help them interpret these pressures, make decisions and adjust structures over time. Dynamic capability theory refers to this as sensing, seizing and reconfiguring [14,15]. It explains how organizations can systematically respond to changing conditions. In the context of the Twin Transition, this suggests that integrating digital and sustainability objectives requires structured coordination and prioritization across organizational domains [9,14,15]. This perspective informs this study's focus on capability development as a core element of the proposed organizational change approach. It also provides theoretical grounding for the structured interventions and feedback mechanisms embedded in the operating model and toolbox.

4. Conceptual Framework: The Twin Transition organizational change approach

This study proposes a conceptual framework for operationalizing the Twin Transition. The framework shows how organizations can turn continuous pressures into coordinated action across digital and sustainability domains. These pressures can lead to a wide range of potential actions. To make informed decisions, organizations use the operating model to structure and categorize these options. This results in a structured set of potential actions that can be prioritized and implemented in a coordinated way. The framework also guides the design of the toolbox developed in this study. The toolbox includes a serious business game, a TechRadar, and a roadmap. Figure 1 shows how pressures, capabilities, governance structures and practical interventions form the main elements of the proposed approach.

The framework consists of four elements. First, continuous external and internal pressures determine organizational responses to the Twin Transition. These pressures arise, for instance, from technological developments, regulatory changes, and societal expectations. They evolve over time and require organizations to continuously reassess priorities and adjust their responses. Second, the organizational capabilities enable these responses. These capabilities support organizations in interpreting pressures, making decisions, and coordinating action across digital and sustainability domains. Third, an operating model provides a governance structure for coordination and alignment. The operating model connects

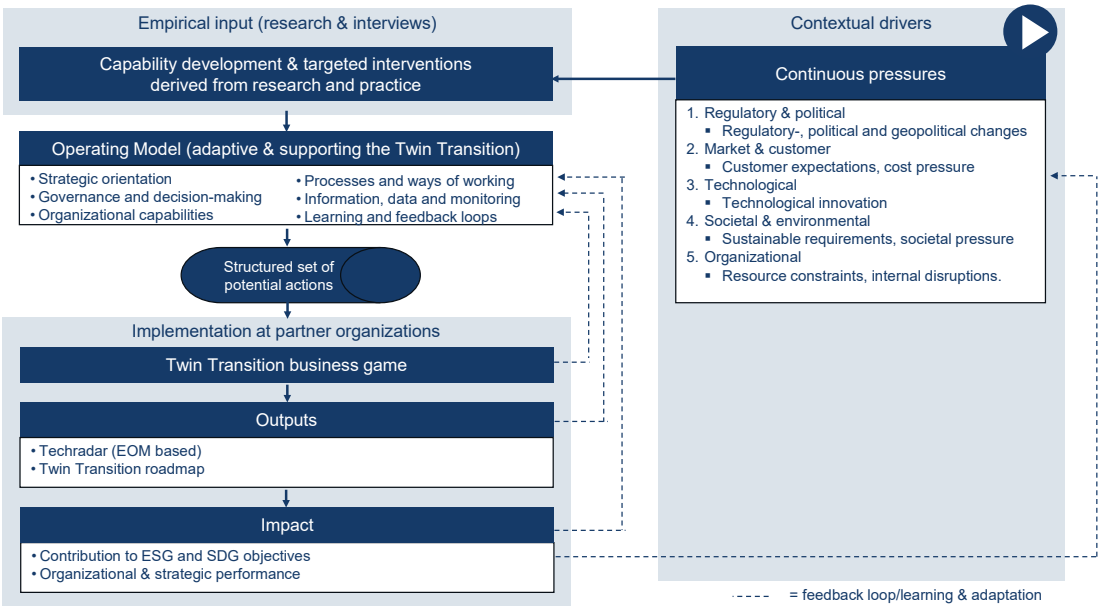


Figure 1: Conceptual framework of the proposed organizational change approach for the Twin Transition.

strategic direction, processes, technology, roles, and performance management. It supports coordination between digital and sustainability initiatives and enables continuous adaptation when priorities or external conditions change. Fourth, a practical toolbox supports implementation. These instruments function as practical interventions that help organizations translate insights from the framework into concrete actions. The toolbox includes a serious business game, a TechRadar, and a roadmap. The game helps board members and sustainability managers explore pressures and identify possible actions. The TechRadar positions these actions across the elements of the operating model, while the roadmap translates selected actions into a phased implementation plan. Together, these elements support coordinated organizational adjustment. They help organizations translate continuous Twin Transition pressures into concrete actions that contribute to their sustainability objectives.

5. Research Methodology

This study uses the Design Science Research (DSR) methodology. DSR is suitable to address complex practice-driven problems and fragmented knowledge. It focuses on designing and evaluating practical solutions that can support organizational decision-making [5]. In this case, organizations struggle to translate Twin Transition pressures into concrete actions. Therefore, this study focuses on designing, implementing and evaluating artifacts that help board members and sustainability managers operationalize the Twin Transition. The primary artifact is the Twin Transition organizational change approach introduced in Section 4. This artifact integrates an adaptive operating model and a practical implementation toolbox, supported by a conceptual framework. Following the concept of design echelons [16], the artifact consists of several interrelated design elements operating at different levels of abstraction. This approach helps address the socio-technical complexity of the Twin Transition, where technological, organizational and governance aspects interact. The research follows iterative Design Science Research (DSR) cycles of problem identification, design, development, implementation, and evaluation [5]. The problem identification combines insights of both literature and semi-structured interviews. These interviews are conducted with board members, sustainability managers, and other experts involved in the Twin Transition. The gained insights help define the design requirements and identify actions. Empirical work is conducted with at least one public-sector and one private-sector

organization. The study aims to include approximately seven public-sector and seven private-sector organizations to capture variation in governance structures, digital maturity, and sustainability practices. Interviews are primarily conducted with board-level and senior management roles, such as CIOs and sustainability leads, who are directly involved in digital and sustainability decision-making. These interviews support the identification and validation of organizational barriers and implementation strategies. In addition, they provide input for the iterative design of the proposed toolbox. Following the Design Science Research approach, initial implementation and evaluation of the toolbox will take place in at least one public-sector and one private-sector organization, as required by the Professional Doctorate framework. Additional organizations may be included if opportunities arise during the research trajectory. The inclusion of both public and private organizations is intentional. Public and private sectors operate under different regulatory pressures, and market dynamics that influence how Twin Transition strategies are developed and implemented. Empirical findings from prior MBA research [5] indicated that private-sector organizations often demonstrate relatively higher levels of maturity in integrating digital and sustainability initiatives compared to public-sector organizations. Including both sectors in this study supports cross-sector learning. The operating model and toolbox will be developed and refined iteratively through co-creation workshops, serious business game sessions, and evaluation meetings with participating organizations. The evaluation focuses on the practical usefulness and impact of the artifacts. It examines whether the proposed approach helps organizations translate these pressures into a structured set of potential actions and operationalizes the Twin Transition in practice. It also assesses whether the operating model and toolbox improve alignment between digital and sustainability domains and support progress toward ESG and SDG objectives. Feedback, observations, and reflections are documented and used to refine the design. During the intervention process, the researcher acts as both design researcher and facilitator.

6. Preliminary Results

This study is currently (April 2026) in the design and early validation phase. At this stage, the conceptual framework for the Twin Transition organizational change approach has been developed and is being further refined. Feedback from the supervisory team and experts from both the public and private sectors will be used to further validate and improve the framework and the proposed artifacts. In parallel, exploratory research has been conducted through open interviews and discussions with organizations, including IT hardware and solutions providers and IT Asset Disposition (ITAD) providers. These interactions focused on understanding how organizations address digital and sustainability objectives in practice and on identifying recurring challenges in their integration. Insights from this exploration have contributed to the development of an initial Twin Transition Life Cycle Management model. This model describes how organizations move through different stages when integrating digital and sustainability objectives over time. The lifecycle perspective will be used as input for the adaptive operating model and toolbox.

7. Expected Contributions and Benefits

7.1. Contribution to the ICT4S community

This study contributes to ICT4S research by addressing the challenge organizations face in translating the Twin Transition into concrete organizational practices. It contributes to ICT4S research in four ways. First, it introduces a pressure-driven perspective on the Twin Transition that explains how continuous regulatory, technological, market, and societal pressures shape organizational responses. Second, it develops a capability-based organizational change approach that helps organizations translate these pressures into a structured set of potential actions and operationalize the Twin Transition in practice. Third, it provides practice-oriented design artifacts, including an adaptive operating model and a toolbox with a serious business game, TechRadar, and roadmap, that support organizations in identifying and

implementing concrete Twin Transition actions. Fourth, this study contributes empirical insights from the design and evaluation of these artifacts in public and private organizations, strengthening the link between ICT4S research and the practical operationalization of digital and sustainability transitions.

7.2. Expected benefits from participation

Participation in the ICT4S Doctoral Symposium is expected to contribute to this study in several ways. It will help to improve the conceptualization of continuous pressures as drivers of the Twin Transition. The symposium will also provide an opportunity to evaluate the capability-based logic underlying the proposed organizational change approach. In addition, feedback from the ICT4S community can help improve the design of the adaptive operating model that supports the Twin Transition as a structuring mechanism for concrete action. Participation will also provide feedback on the use of serious gaming as an intervention tool to support decision-making and identify concrete Twin Transition actions. Finally, the symposium offers an opportunity to exchange insights with other researchers working on the operationalization of the Twin Transition in organizational contexts.

8. Conclusion

In ICT4S research, the integration of digital and sustainability transitions is increasingly recognized as important. However, many organizations struggle to translate this integration into concrete and coordinated actions. In practice, digital and sustainability initiatives are often developed separately. Governance structures and organizational capabilities do not always support their integration. This gap highlights the need for structured approaches that help organizations operationalize the Twin Transition. This study contributes to ICT4S research by developing, implementing and evaluating an organizational change approach that helps organizations operationalize the Twin Transition. This study approaches the Twin Transition as an adaptive organizational change approach shaped by continuous regulatory, technological, and societal pressures. Rather than focusing solely on technological solutions, it emphasizes governance structures and organizational capabilities that enable coordinated action across digital and sustainability domains. Using Design Science Research, this study develops, implements, and evaluates the Twin Transition organizational change approach, consisting of an adaptive operating model and a practical toolbox supported by a conceptual framework. The toolbox includes several instruments, such as a serious business game, a TechRadar, and a roadmap. These instruments help board members and sustainability managers explore pressures, identify potential actions, and structure their implementation. Through iterative evaluation in both public and private organizations, this study generates practical and theoretical insights into how organizations can coordinate digital and sustainability initiatives and translate continuous pressures into a structured set of potential actions that enables coordinated actions. In doing so, this study contributes an adaptive operating model and practical instruments that support coordinated organizational action and progress toward ESG and SDG objectives.

Declaration on Generative AI

During the preparation of this study, the author used ChatGPT to perform grammar and spelling checks, paraphrasing, rewording text, and providing feedback on structure. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the publication.

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9. Author information

9.1. Current position

The author is a senior advisor and doctoral researcher at the Dutch Ministry of the Interior and Kingdom Relations (BZK), Directorate for Public Service Delivery and Digitalization. This study is conducted as part of a Professional Doctorate (PD) program, with a 0.6 FTE research appointment. The author combines knowledge of the Twin Transition with experience in the public and private-sector and digital transformation. Expertise on the integration of sustainability and digitalization was developed through executive master education in Business and IT at Nyenrode Business University and at the University of California, Berkeley. In addition, the author contributed to the Sustainable IT Impact Assessment (SIIA) within the Dutch National Coalition for Sustainable Digitalization (NCDD). This combination of academic grounding and hands-on implementation experience positions the author to operationalize and evaluate the proposed organizational change approach. The author is seconded to HAN University of Applied Sciences, where the doctoral research is carried out in close collaboration with both public and private sector organizations. The project started in November 2025 and is currently in its initial phase, focusing on problem exploration, conceptual framing and research design refinement.

9.2. Supervisory team

The supervisory team consists of the following members:

- Prof. dr. Stijn Hoppenbrouwers – HAN University of Applied Sciences
- Prof. dr. Guido Ongena – Utrecht University of Applied Sciences
- Bert Voorbraak (MSc) – Director Logius (Executive Agency of the Ministry of the Interior and Kingdom Relations)
- Prof. dr. Albert Plugge – Associate Director KPMG Professor of ESG Transformation and Digital Innovation, Nyenrode Business University

This study is explicitly situated in the public and private sector. Empirical work is conducted in collaboration with both a public-sector organization and a private-sector organization. By this comparative analysis, cross-sector learning is enabled.

9.3. Participation mode

Planned mode of participation: on-site participation at the ICT4S conference.