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Digital Transformation and Its Role in Improving Technology Management Practices

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Abstract

Digital transformation is not just about the technologies of the organization, it's also about the way technologies are chosen, integrated, governed and updated. This paper reviews the scholarly and policy literature in a focused integrative review of the literature to explore its role in the enhancement of technology management. The analysis is based on the concepts of dynamic capabilities and the technology–organization–environment framework to link digital strategy, organizational change, and technology-management routines. The evidence indicates a conditional and not an automatic connection: digital transformation can enhance strategic alignment, resource coordination, data-informed decision making, and organizational adaptability if supported by complementary capabilities and institutional support. But, with the technology in place, transformation and better management is not automatic. The synthesis pinpoints five areas of possible improvement: strategic technology planning, architecture and integration, data governance, delivery and lifecycle management, and workforce learning. It also highlights persistent issues related to skills, legacy systems, lack of accountability and unequal resource access. A conceptual framework suggests that digital transformation, through the lens of management practices renewal, is connected with operational and innovation outcomes, with the latter being mediated by readiness and environmental conditions. The paper provides evidence-informed principles for implementing, along with a research agenda focusing on direct measures of technology-management effectiveness. No primary data is produced, nor are pooled effect sizes or causal estimates produced. It is an explicit separation between acquiring digital tools and the routines of the organization to manage and use them effectively.

Keywords: *technology management, dynamic capabilities, digital governance, organizational change, and strategic alignment?AI, technology management, organizational performance, dynamic capabilities, AI adoption, digital transformation, innovation.*

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Introduction

Given the potential of digital technologies to transform value creation, organization, and competition, digital transformation is a key management issue. Verhoef et al. (2021) claim that transformation is not only about replacing analogue tools but also a multidisciplinary phenomenon, which is related to business model changes. This separation is significant when it comes to technology management because buying a platform does not necessarily mean that an organization will better assess, deploy, or renew its technologies.

Introduction: Scope and Significance

In this paper, technology management is defined as the organizational practices for recognising technological opportunity, linking investment to strategy, coordinating the implementation of technology, managing and maintaining technology systems, assessing technology risks and assessing technology value realisation. This is an operational definition that distinguishes technology management from technology. The cloud platform is an asset — setting the standards for architecture, assigning ownership and assessing the cost are management practices. The two can never be used interchangeably, but they can change.

The difference makes a practical difference. Organizations can often collect applications without gaining interoperability, spend money on analytics without clarity about who's responsible for data quality, or spend time automating processes without rethinking the process design. This is a typical example of why digital spending is not a sufficient indicator of management progress. The question is whether transformation reinforces the relationships between technological resources and the functions of an organization, accountability, and learning.

The literature provides a basis for investigating digital transformation by using the technology-organization-environmental triad. Toscano-Jara et al. (2024) list the following management actions: Management of Digital Technology, Management

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of Collaborative Networks, and Management of Technological Policies. It is their framework that is clear that the technical aspect can not be understood without considering organizational resources and external relationships. Complementary policy evidence shows that there are still adoption gaps, particularly for more advanced digital technologies, for smaller firms (OECD, 2024a).

The paper thus raises the question of how digital transformation can enhance technology management practices, the conditions under which they can be enhanced and what constitutes an evaluation of improvement. It is not a report of a survey or an implementation experiment, but it does create a focused synthesis from the literature. At its core, it argues that management can be improved through transformation if supported by changes in decision rights, integration routines, workforce abilities, and evaluation practices when digital resources are used. This is a conceptual explanation of the literature reviewed, not a causal relationship that has been proven statistically.

The proposed contribution is to help articulate general transformations in to specific areas of management. These domains give a foundation for practical assessment and empirical testing in the future, but do not presume that performance improvement in the organization necessarily bears out superior technology management.

Literature Review

Conceptualizing Digital Transformation

Verhoef et al. (2021) differentiate between digitization, digitalization and digital transformation. The terms digitization, digitalization and transformation all refer to changing to digital formats, while digitalization refers to the use of digital technologies to change processes, and transformation refers to the change of organizational or business models. The differences make it possible to define an analytical hierarchy: scanning documents, adding a procurement workflow, and restructuring an organization around digitally enabled services are related but still different developments. The level of technology-management effectiveness

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should therefore be measured on the level of practices and organizational change, not on the number of installed technology tools.

Using a transformation perspective, the focus of management shifts from individual systems to interdependencies. The selection of technology should be based on the services that can be provided through the technology, the organizational capabilities needed to implement the technology, and business model implications of technological change. The multidisciplinary nature of transformation is also stressed by Verhoef et al. (2021), which suggests a wider management perspective encompassing strategy, marketing, organizational structure and information technology.

Technologies, organizations and environments

The recent review paper by Toscano-Jara et al. (2024) uses T-O-E framework to arrive at the drivers and barriers of transformation. It is focused on the technology, organization and environmental aspects for the development of value for stakeholders. In terms of technology management, a seemingly promising technical solution may be no good at all because of a lack of organizational capabilities for implementation, external partnerships that are not feasible, or policy needs that can't be met.

This framework also is not conducive to universal prescriptions. For different sized organizations, different infrastructure, resources and environment, priorities vary in management. According to OECD (2024a), smaller businesses are less likely to use digital technologies, especially those related to intangible assets, like data and software. Therefore, the same transformation targets can have different effects and different outcomes. What this implies is that while small companies may not want to avoid transformation, their management practices and sequencing should be based on true readiness.

These are both perspectives that make transformation a coordinated organizational process. Their common message is that it is not only technically possible to improve the use of technology; it also needs to be accompanied by a

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coherent strategy for making the choices and an organization that can execute, govern, and adapt the strategy.

Literature Review: Capabilities and Change

Dynamic Capabilities as an Interpretative Lens

The dynamic-capabilities approach offers an appropriate lens for developing one's understanding of ongoing technological innovation. The assumptions in this paper are that sensing is identifying opportunities and risks, seizing is committing resources to selected opportunities, and reconfiguring is adapting assets and routines. The categories are used for categorization and can only be considered as evidence of the proposed relationships having been tested, but are not measured variables.

When applied to technology management, sensing is the process of environmental scanning and determining operational constraints. Seizing is a process of technology assessment and prioritisation of investments, as well as technology implementation plan. Reconfiguring: Retiring legacy systems, redesign of workflows and changes in skills and responsibilities. These activities can be aided by digital transformation, which can enhance information access and connectivity, but this won't necessarily enhance managerial effectiveness if it isn't utilised appropriately. This is in line with the transformation framework of Verhoef et al. (2021) and the organizational-capacity approach of Toscano-Jara et al. (2024).

Persons, Networks and Institutional Settings

Collaborative networks and external relationships are explicitly mentioned by Toscano-Jara et al. (2024) as management issues. This is important because organizations rely heavily on technology vendors, service providers and knowledge partners more and more. While implementation can be done in collaboration with an internal capability gap, it is not outsourcing in itself that will eliminate strategic alignment, security expectations and service continuity

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responsibilities. The implications are consequences of the review and not directly measured in this paper.

The report, D4SME by OECD, focuses on how digital are SMEs in seven countries and how digital tools can help address short-term challenges while also building long-term resilience. It also takes into account generative AI, environmental monitoring via analytics, and work place mental well-being (OECD, 2024b). These are only some of the subjects that illustrate what it means to be a modern manager. Digital progress should not be measured in terms of uptake rates alone, but in working conditions and organizational resilience as well.

In general, the literature reviewed confirms a socio-organizational approach to transformation. But rather than offering more support for the importance of complementary capabilities, broad conceptual and policy sources offer greater support for the effectiveness of specific managerial techniques. This distinction reflects the research gap and the prudent interpretation of the results below.

Research Gap

In the sources examined in this study, there are often implicit discussions of technology management in other areas, such as capability, digital strategy or organizational change, but not explicit statements of technology management as an outcome. This leads to measurement issues: technology implementation, technology maturity, and management effectiveness can be mixed up. The use of digital tools can be widespread, but decision rights can be decentralized or investment review processes are ineffective. This means that by themselves, adoption indicators do not provide evidence to support the improvement of management practices. The second gap is related to mechanisms and boundary conditions. The reviewed literature provides reasons for the importance of organizational capacities and contexts but does not provide a body of evidence that determines specific combinations of governance, integration, learning and investment practices that are effective in specific contexts. Comparisons of

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alternative management arrangements is required. This is a lack of studies found in the bounded review, not a lack of studies in other areas.

Research Objectives

The first goal is to establish a link between digital transformation and renewal of technology-management practice. The second is to find management areas where improvement is likely and to outline the organizational conditions supporting improvement. The third is to create a conceptual model and practical measures to be tested in future studies. The research question is: How and when can digital transformation contribute to better technology management through organizational mechanisms?

Methodology

An integrative review was employed in the paper, which is focused and combines conceptual scholarship, a recent scholarly systematic review, and institutional evidence. Public internet searches were performed on a targeted basis using the following combination of terms related to digital transformation: digital technology management, organizational capabilities, digital governance, SME digitalisation. The sources were prioritized for identifiable authorship, publication information, topical relevance and retrievability. The analytical material that has been used is two articles from peer-reviewed journals and two OECD publications that have been published from 2021 to 2024.

This is not a systematic review as defined by PRISMA guidelines nor an exhaustive review of the literature. There are no claims for screening totals, database coverage, quality scores or inter-rater agreement statistics. Definitions, enabling conditions and management implications were analyzed in comparison to the four sources. Findings were grouped into five domains. The recommendations and propositions extend that synthesis analytically, and are clearly separated from the directly reported empirical results.

Results

It involves strategic planning and prioritizing investments.It encompasses strategic planning and investment prioritisation. Strategic technology planning is

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the first synthesized domain. The business-model focus of Verhoef et al. (2021) and the capacity-management focus of Toscano-Jara et al. (2024) argue for assessing technologies for their organizational purpose(s) instead of novelty. The implication is a portfolio model which links every initiative to a service goal, to someone who is accountable for it, to the resources it needs, and to a review point. These implementation features are suggestions and not necessarily interventions that have been validated in every context.

Architecture and Integration

The second domain is Coordination across Systems and Processes. In a transformation perspective, interdependence is a prominent theme: A digitally enabled service can rely on shared data, interoperable applications, and consistent operating responsibilities. In this view, technology management is better when the impact of the system is taken into account on an organizational-wide basis. The integration logic of these frameworks is followed in this interpretation; the cost savings that can be attributed to certain architectures are not estimated in the review.

Data Governance and Decision Support

The third domain is about the data responsibility of the organisation. Data and software are specific areas where there is a strong focus on the importance of gaps in firm size adoption highlighted by OECD (2024a). Access to these resources, then, is a relevant constraint; but resource availability is not synonymous with decision quality. Before relying on dashboards or analytics to make key decisions, the proposed management response is to establish data ownership, the level of data quality expected, access level, and escalation procedures before.

Delivering and Managing Lifecycles

The fourth domain is the management of technological change once acquired. Transformation orientation means that you are still reviewing, adapting and retiring instead of finishing up implementation. Here are some good practices to be implemented: staged releases, service monitoring, documented dependencies, and periodic evaluation of the business value. These recommendations are not

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reported as the results of tested recommendations in the source studies, but as an operationalization of the conceptual framework of this paper.

The importance of workforce learning and collaboration.

The fifth domain is the domain of capability development. Toscano-Jara et al. (2024) directly supports the importance of organisational capacities and external networks. Evidence across OECD countries also associates SME digital practices with other forms of resilience and workplace issues (OECD, 2024b). The synthesis thus involves embedding learning by employees, networking of people and processes across the value chain and monitoring of partners within the technology management, not as secondary activities.

Discussion

Proposed Conceptual Framework

The synthesis suggests that the digital transformation initiatives support management-practice renewal, which can enhance technology-management effectiveness, and in turn help to drive organizational outcomes. These relationships are dependent on readiness, leadership commitment, availability of resources and environmental requirements. Feedback is also anticipated: Sound management can enhance future transformation decisions. It is a two-way approach and does not see the transformation as a one-way, technical approach.

Three propositions follow. First, changing management is more likely to lead to better management effectiveness when digital investment goes hand in hand with explicit management accountability and routines. Secondly, the outcomes of similar technologies might be attributed to integration and workforce capabilities. Third, inadequate baseline readiness can result in delays in benefits even when the strategic reason for it is compelling. They are propositions that can be tested in the future, and not hypotheses supported by the data presented in this paper.

Implications for Managers

Managers should build a baseline before scaling up digital portfolios. The baseline should include key systems, interdependencies, costs, decision-making authority, skills of the workforce, and areas of services that are not working well.

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Investment proposals must describe the management problem being solved and the indicators of success. For instance, a project for reducing the number of integration failures should be assessed by interoperability and incident indicators and not by just the number of installations completed.

Short learning cycles will be complemented by stable governance in implementation. There must be space for teams to explore options but the responsibilities for architecture, security, procurement and data must not be vague across the enterprise. It is possible to get expert input from outside sources, but it is important that organisations have some internal knowledge to assess the quality of these services and be able to negotiate changes. This is a development of the collaborative-network focus found by Toscano-Jara et al. (2024).

Measuring Improvement

They may involve percentages of investments associated with strategic objectives, time to get an investment approved, the frequency of incidents related to integration, the amount of time taken to resolve data-quality issues, and the number of planned system retirements. Process redesign and demonstrated proficiency could be monitored by workforce indicators. These proposed indicators are not scales but represent examples of indicators that should be considered valid. They must be understood in conjunction with service quality and user experience to not confuse rapid or cost cut with holistic managerial improvement. The conditions and limitations that were set.The conditions and limitations that were imposed.

There is a risk and distribution concern

Improved coordination can also create new dependencies as a result of digital transformation. Centralised platforms can make things easier, but the more people depend on a few providers. Having more data can mean greater visibility, but also questions of access, surveillance, and accountability. These are scenarios for managerial risk – not numerical results. Their message is that management

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improvement needs to involve not just increasing digital intensity, but also enabling identification and control over trade-offs.

Some implementation challenges remain due to the differences in firm size. OECD (2024a, 2024b) reports that smaller businesses are less likely to use digital tools, and that key obstacles in SME digital journeys are persistent. The governance structures are not necessarily required; they may be desired by a resource-heavy organization, but not by one that is resource-constrained.Governance structures may not be a priority for resource-constrained organizations and may be needed by a resource-heavy organization. Responsibility should be preserved in proportionate practices, but not be over-complicated or more than what is capable.

If you have any advice for future research needs for this, please submit it here.

Coverage is limited by the size of the small, purposively selected corpus and source selection may be affected by the visibility of public search. The review features conceptual arguments, synthesized scholarship, and policy evidence, each of which has a specific unit of analysis and a varying level of evidence. It does not therefore make causal inferences and cannot conclude whether a management practice is consistently superior to an alternative. It also is incapable of determining the generalizability of findings nationally, sectorally or regulationally.

Future studies should separately measure technology-management practices and digital adoption and organizational performance. Longitudinal studies would be able to determine if changes in governance and/or integration lead to improvements in service reliability and investment outcomes. Comparative case studies might explore the reasons for different management outcomes of similar transformations. Use of multi-source designs using administrative records, technical incident data, and interviews would decrease self-reporting by managers.

Conclusion

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Digital transformation can enhance technology management by transforming the way organizations plan, coordinate, govern and renew technology, rather than just the technologies they have. Literature reviewed supports the relevance of organizational capability, strategic coherence and environmental context. This paper applies those insights to five domains of management and suggests a conditional structure of further investigation. Its main finding is that the management renewal should be a clear goal of the transformation, with defined responsibilities and actions and not taken for granted as a consequence of digital investment.

Conflict of Interest

The authors declare that they have no financial, professional, technological, commercial, institutional, or personal conflicts of interest that could have influenced the content, interpretation, or conclusions presented in this article.

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Data Availability

No new clinical, experimental, or patient-level datasets were generated or analysed during this study. All information discussed in the review was obtained from the published literature and publicly available sources cited in the manuscript. Additional information relating to the review may be obtained from the corresponding author upon reasonable request.

Informed Consent

Not applicable. No patients or other human participants were recruited, and no identifiable personal or clinical information was collected or analysed for this review.

Use of Generative AI

The authors declare that no generative artificial intelligence tools were used to conduct the literature review, generate the scholarly content, interpret the

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evidence, or formulate the conclusions presented in this article. The discussion of generative AI, artificial intelligence, and machine-learning technologies in the manuscript relates solely to their applications in healthcare resource optimization and does not constitute their use in preparing the article.

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