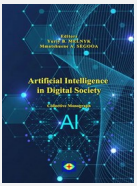
Artificial Intelligence in Digital Society, Volume 1, 2026
DOI: 10.26697/9786177089192.2026
ISBN 978-617-7089-19-2 (Vol. 1)
ISBN 978-617-7089-18-5 (Series)



Chapter 3. Bridging the Society-Artificial Intelligence Gap through Holistic Digital Transformation

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Received: *14.12.2025;* ***Accepted:*** *10.02.2026;* ***Published:*** *10.03.2026*

Abstract
A widening gap exists between artificial intelligence's (AI) rapid advancement and society's capacity to govern and benefit equitably from these technologies. AI adoption is treated as technical implementation rather than comprehensive socio-technical transformation, creating dangerous misalignments between technological capabilities and societal readiness. This chapter examines the multifaceted relationship between digital transformation, artificial intelligence, and societal change, analysing how technological advancement reshapes social institutions, governance structures, and human relationships. Through qualitative documentary research and comparative case study analysis across healthcare, finance, education, and public services, the chapter explores both the enabling potential and adverse consequences of AI-driven transformation. The analysis reveals that while AI acts as a catalyst for innovation in healthcare diagnostics, precision agriculture, circular economy practices, and educational personalization, it simultaneously introduces critical challenges including labour displacement, wealth inequality, algorithmic bias, and threats to human agency. Drawing on Vial's Building Blocks of Digital Transformation framework, four key themes emerge: foundational integration infrastructure, equitable value distribution, trustworthy organizational practices, and societal impact priority. The chapter demonstrates that successful AI integration requires moving beyond purely technological metrics toward human-centred approaches that prioritize transparency, trust, fairness, and environmental sustainability.

Keywords: digital transformation, artificial intelligence, society 5.0, human-centred technology.

Cite this chapter as:
Baduza, G., Penxa, L., & Ramafi, P. (2026). Bridging the society-artificial intelligence gap through holistic digital transformation. In Y. B. Melnyk & M. A. Segooa (Eds.), *Artificial Intelligence in Digital Society, Vol. 1.* (pp. 42–54). KRPOCH. https://doi.org/10.26697/aids.2026.3
The electronic version of this chapter is complete. It can be found online in the AIDS Archive https://doi.org/10.26697/aids

Introduction

The concept of digital transformation (DT) was introduced in 2000 (Patel & McCarthy, 2000) but it became popular to researchers and practitioners after 2014 (Reis, Amorim, Melão & Matos, 2018). Most DT definitions shows that it is techno-social changes in institutions and their environments resulting from the adoption and use of new digital technologies in societies (Stolterman et al., 2004; Fitzgerald et al., 2014; Kraus, Jones, Kailer, Weinmann, Chaparro-Banegas & Roig-Tierno, 2021; Vial, 2019, and Tana, Breidbach, & Burton-Jones, 2023). Moreover, successful DT must consider factors that can hinder the execution of their transformation (Vial, 2019).

DT in society must consider several factors including social inequality and digital divide. The debate about social inequality and the digital divide began in the 1990s focusing on access to computers and the internet. In the 2000s, the debates focused on access to the internet and its impact on people's lives (Matzat & 2020). The digital divide is still prevalent in many social institutions (Tang et al., 2025). Modern digital technologies have transformed the way people socialise, communicate, work, learn, entertain, and share their emotions and expressions. It has influenced and shaped other social institutions resulting in massive transformations in the public, private and civil society sectors. This leads to the debate of how to digitally transform society and its institutions.

Literature Review

Digitally Transforming Societies

Digitally transforming societies requires a collaborative effort from different relevant actors have shared values and norms, pursue a joint objective (Tana, Breidbach & Burton-Jones, 2023). In Africa, DT was set to impact all areas of African society (Kazim, 2021). DT in Africa needs to consider heterogeneity of African countries and must be context specific. There are technological and economic challenges which include digital infrastructure, inadequate internet connections, digital skills, affordability of digital services, regional integration of digital infrastructure, etc. (Kazim, 2021). These challenges reveal the degree to which African countries can effectively digitally transform their societies (African Union, 2020).

The Covid 19 pandemic contributed to fast-tracking DT in all countries of the world. In Higher Education (HE) institutions, universities had to embrace distance teaching and learning using online platforms (Mhlanga et al., 2022 Pypenko et al., 2020). They had to leverage existing and acquired new digital technologies. However, they exposed a digital divide in terms of staff digital incapacities, lack of internet infrastructure, spatial distribution of internet facilities and digital literacy (Zeleza & Okanda, 2021). This suggested that DT in HE institutions requires digital capacities and skills of the relevant actors.

DT has a potential to address government administrative inefficiencies and enhance public services. DT can improve government decision-making efficiencies, optimize resource allocation, and enhance the quality and efficiency of public services (Yang, Gu & Albitar, 2024). DT serves to enhance government transparency, enabling the public to hold government accountable (Stratu-Strelet et al., 2023).

Consequently, the construction of a digital government is an integral pathway to satisfying public expectations and boosting public trust (Yang, et al., 2024). Moreover, both Europe and Asia Pacific countries are actively promoting the DT of their governments. The eGovernment Benchmark report of 2022 shows that 35 countries in Europe are providing and promoting eGovernment services. Asia Pacific countries have also made significant progress in this area (Priharsari et al., 2023). Additionally, China's rapid economic expansion serves as an influential catalyst for governmental DT.

Negative Impacts of AI Adoption on Society

DT threatens traditional values and cultures while reshaping how people socialise, communicate, learn, and work, with implications for privacy and security. The growing use of Artificial Intelligence (AI) is transforming contemporary society by altering power structures through decentralisation and the emergence of new social classes (Gutorovich & Gutorovich, 2019), as well as increasing social connectivity and enabling virtual socialisation (Caceres Zapatero et al., 2017 cited in Hanandini, 2024).

DT has enhanced communication and human interaction through widespread use of media and messaging platforms (Carter, 2005) enabling online socialisation, dating, business engagement, and long-term relationships (Guzman & Lewis, 2020). However, it has also reduced face-to-face interaction, increased cyberbullying, online deception, and predatory behaviour (Kumari & Oman, 2024).

DT can exacerbate inequality, weaken security, and threaten privacy, thereby affecting human agency and human rights (Kumari & Oman, 2024). It also contributes to unemployment by reshaping job types toward technology-oriented roles and disrupting existing skills, making technology literacy, cognitive problem-solving, and analytical thinking increasingly essential (World Economic Forum, 2023).

DT has reshaped how knowledge is created and accessed (Melnyk & Pypenko, 2020; Mhlanga, 2024). It has also transformed formal education by expanding access through e-learning and enabling more personalized learning experiences.

According to Taufik (2025), DT has expanded to include AI, bringing ethical and existential risks such as algorithmic bias and the potential erosion of human critical thinking (Makridakis, 2017; Farina et al., 2022). This shift requires a human-centred approach that balances innovation with transparency, trust, and the preservation of social values.

Digital Transformation and Ethics

DT poses important ethical concerns about equity, privacy, and responsible technology use (Klein, 2022; Schuster & Kilov, 2025). Bias and the lack of fairness of the AI systems have additionally cast doubt as such systems are not culturally, politically, or morally neutral (Schuster & Kilov, 2025; Stapleton, 2025). They embody human biases that are unconsciously programmed into them and can relentlessly target the most vulnerable (Stapleton, 2025). AI systems reflect to us our mistakes, problems, errors, biases, prejudices and failures of wisdom (Stapleton, 2025). When automated systems produce correct outcomes rapidly, humans, risk acting merely as validators of machine-generated decisions rather than informed agents, which can erode epistemic autonomy and human judgment (Bokhari, Park and Manzoor, 2025; Stapleton, 2025). In fields like social robotics, the inability of robot friends to mimic the complex styles of human friendship (such as being constructively critical) raises ethical concerns, as this relationship may gradually contribute to a loss of important societal values like honesty and respect (Farina et al., 2022).

AI as a Tool to Enable Holistic Digital Transformation

AI acts as a catalyst for new skills, institutions, and governance by augmenting and automating human cognitive tasks, thereby enabling societal and economic transformation (Makridakis, 2017). AI drives value creation by enhancing decision-making through big data analytics, automation, and predictive capabilities across sectors (Foresti et al., 2020; Feroz & Kwak, 2024; Bokhari, Park & Manzoor, 2025).

AI has played a key role in advancing healthcare and precision medicine by supporting healthcare professionals with diagnostic insights, operational efficiency, and patient engagement. It enhances hospital logistics, resource allocation, real-time patient monitoring through wearables, and continuous support via virtual nursing assistants (Varnosfaderani & Forouzanfar, 2024).

AI is emerging as a critical enabler of sustainability and the circular economy by supporting the achievement of the Sustainable Development Goals (SDGs). In agriculture, machine learning-enabled drones and satellites enhance productivity and food security by monitoring soil conditions and predicting environmental effects on crops, while AI-based digital twins allow organisations to optimise energy consumption and significantly reduce carbon emissions (Ali et al., 2024; Varnosfaderani and Forouzanfar, 2024).

In education, AI is redefining learning by promoting autonomous and self-regulated approaches that empower students to take ownership of their educational journeys. Through prompt engineering, students use AI as a conversational and intellectual partner for idea generation and research refinement, while automated assessment tools provide instant, human-like feedback that supports real-time learning and faster mastery of complex concepts (Mzwri and Turcsányi-Szabo, 2025).

Essentially, AI functions as an enabling infrastructure that enhances human capabilities by processing complex data, revealing hidden patterns, and delivering actionable insights. This supports new forms of institutional practice and governance while expanding access to advanced analytics that promote progress toward sustainable development goals.

Synergy and Integration between the Future Society and AI

The synergy and integration of AI and future society reflect a shift toward a human-centric model aligned with Society 5.0, which merges physical and digital spaces through Human-Cyber-Physical Systems to address social challenges and enhance human well-being (Foresti et al., 2020). This smart society envisions AI enabling sustainability through human–machine cooperation, predictive and adaptive systems, and organisational strategies of "Digitalization" that prioritise value creation, augmentation, and operational excellence over simple automation (Feroz &Kwak, 2024; Foresti et al., 2020).

The success of digital government transformation depends on stakeholder trust acting as a bridge between technology and institutional change, with effective integration enhancing public value through fairness, inclusivity, and transparency (Bokhari, Park &Manzoor, 2025). AI and Digital Twins serve as essential enablers for transitioning to a Circular Economy, particularly through closing material loops by tracking and mapping resources to achieve UN SDGs (Ali et al., 2024). This includes AI-driven drones and sensors that monitor environmental impacts in real-time to facilitate smart and sustainable agriculture that protects biodiversity (Ali et al., 2024). Long-term synergy may even involve incorporating AI into democratic political institutions in ways that reduce conflict and enhance governance effectiveness.

The deepest level of integration involves the concept of the "generated human," where human judgment aligns with algorithmic language while preserving cognitive independence, ensuring humans remain informed agents rather than mere validators of machine-generated decisions (Branda, 2025). This requires reflective empowerment, in which AI enhances human reflection and agency instead of undermining it (Branda, 2025; Farina et al., 2022). Integration for social and moral good is guided by a virtue ethics approach centred on human flourishing and the development of techno-moral wisdom, enabling AI to support meaningful lives within communities through flexible, context-sensitive ethical engagement rather than rigid rule-based frameworks (Farina et al., 2022).

Methodology

This chapter adopted a qualitative documentary research approach as a methodological framework. Data collection was done through the peer reviewed literature review and case studies. The literature review examines peer-reviewed papers on DT, organizational studies, public governance and ethics. The comparative case studies analysed AI implementation initiatives in healthcare,

finance, education, and public services and society, identifying patterns distinguishing successful holistic transformations from fragmented implementations. The collected data followed the framework-based thematic analysis. Framework-based analysis applies Vial's model ("Building Blocks of Digital Transformation") to categorize findings across triggers, barriers, strategic responses, and outcomes, revealing how dimensions interact during AI adoption.

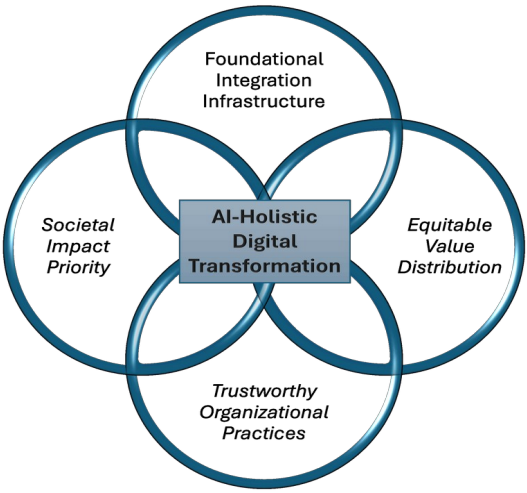
Findings

The section presents findings that emerged from case study analysis through Vial's model ("Building Blocks of Digital Transformation"). Various themes emerged from the analysed case studies. Some of the case studies were focused on industrial companies and how they had aimed at integrating machine learning and deep learning into their business development, focusing on telecommunications, automotive, packaging, pumps, and an AI platform provider.

The next set of case studies proved that agricultural and agri-tech companies use artificial intelligence and digital twins to support circular economy practices and multiple UN Sustainable Development Goals. These firms deploy AI and DT for precision agriculture, waste minimization, water conservation, renewable energy integration, and resource recovery, thereby operationalizing strategies like narrowing, slowing, closing, and regenerating resource loops. The cases highlight that, despite barriers such as data, cost, and change-management challenges, AI and DT enabled solutions have already helped participating companies contribute to several SDGs. Based on these case studies and the analysis utilizing the select theoretical lens the following key themes emanated as per Figure 3.1.

Figure 3.1

AI-Holistic Digital Transformation Themes



Theme 1: Foundational Integration Infrastructure

The first theme emerging from these case studies reveal that successful AI integration requires fundamental building blocks that span technical infrastructure, human capacity, and institutional readiness. Through the case studies, a key element was how across embedded systems, microgrids, and agriculture, AI acts as a disruptive technology that only creates value when tied to clear business and societal goals (Feroz & Kwak, 2024; John et al., 2022). These foundational elements include the development of robust data ecosystems, the cultivation of digital literacy and prompt engineering skills among users, the establishment of adaptive governance frameworks (John et al., 2022), and the creation of interoperable systems that enable seamless human-machine collaboration across diverse societal contexts (Varnosfaderani & Forouzanfar, 2024; (Bokhari et al., 2025). This implies that, at a societal level, AI should be framed as an instrument for public-interest outcomes (e.g., safety, sustainability, resilience), rather than as an end or a pure efficiency play.

Theme 2: Equitable Value Distribution

This theme emphasizes that the extraction of insights and generation of value from data cannot be pursued in isolation from considerations of who has access to AI systems. This entails understanding whose data is being used, and whether algorithmic outcomes maintain or reduce existing social inequalities therefore, requiring deliberate design choices that prioritize inclusive participation and equitable distribution of AI-generated benefits (Fox & Griffy-Brown, 2022; Lucchi, 2023). Data as a key enabler in utilising AI, there is continued need to identify where the data is emanating from through new value paths (Lucchi, 2023). Through the case studies it has been identified these paths include predictive maintenance, AI-designed microgrids emission cuts, and AI/DT-enabled circular agriculture which in turn advances multiple SDGs (Ali et al., 2024; Alam et al., 2025). At the same time, they expose that high data and infrastructure demands can exclude smaller actors, regions with weaker connectivity, and less digitized farmers or firms (Ali et al., 2024). For society, this means AI needs governance and business models that share data benefits more broadly through fair access, capacity building, and safeguards against concentration of data and platform power. Data-driven value creation through AI must be fundamentally aligned with principles of fairness and inclusion to ensure equitable benefits across society.

Theme 3: Trustworthy Organizational Practices

This theme highlights that organizations need to develop institutional competencies that ensure AI systems are trustworthy. Through explainable decisions, reliable performance across conditions, and ethical frameworks guiding development and deployment. These capabilities are now as essential to organizational excellence as technical skills. Case studies show that many organizations introduced structural changes and new capabilities to support AI adoption. They invest in DevOps/DataOps/MLOps, cross-functional AI teams, and

continuous monitoring, but still face challenges with transparency, training–serving skew, and model drift, particularly in safety-critical areas such as autonomous driving and energy systems. For society, AI needs to be developed with built-in explainability, robustness checks, and clear accountability so people can trust systems that increasingly affect mobility, infrastructure, and resource allocation (Holmstrum, 2021; Varnosfaderani & Forouzanfar, 2024). Organizational capabilities for AI deployment must intrinsically embed ethics, reliability, and transparency as core operational principles rather than peripheral concerns (Makridakis, 2017; Feroz & Kwak, 2024; Vial, 2019).

Theme 4: Societal Impact Priority

This theme emphasises that the true measure of AI success lies in its contribution to human development, environmental sustainability, democratic governance, and social cohesion. These require that technological advancement be evaluated not merely by what it can do, but by whether it genuinely enhances public value and supports the achievement of broader societal goals such as the SDGs (Ali et al., 2024; Alam et al., 2025). For AI to serve society, evaluation metrics need to move beyond accuracy and Return of Investment (ROI) to include distributional effects, ecological impact, and long-term resilience (Makridakis, 2017; Holmstrom, 2021; John et al., 2022). These criteria feed back into how disruptions are sensed, strategies chosen, and structures redesigned. Societal outcomes must be elevated based on people-success criteria in evaluating AI implementation, moving beyond narrow metrics of efficiency or profitability (Farina et al., 2022; Branda, 2025).

Discussion

The key findings reveal that holistic DT requires an integration of foundational infrastructure, equitable value distribution, ethical organisational practices. Tana, Breidbach & Burton-Jones (2023) argue that this integration requires a collaboration with different actors with a shared goal. We argue that AI requires the collaboration between the public and private sectors and civil society to help navigate the interplay between technological advancements, social implications, environmental concerns, ethical considerations.

The findings from case studies revealed that successful AI integration requires fundamental building blocks that span technical infrastructure, human capacity, and institutional readiness. These findings respond to the existing technological challenges outlined in the literature such digital infrastructure, digital skills, affordability of digital services and inequality (Kazim, 2021).

Theme two above is equitable value distribution which argues that AI use must be aligned with principles of fairness and inclusion to ensure equitable benefits across society. Similarly, the literature showed that DT poses important ethical concerns about equity (Klein, 2022; Schuster & Kilov, 2025). Additionally, equitable value distribution theme responds to the existing challenges that AI

systems reflect biasness and lack of fairness highlighted in the literature by Schuster & Kilov (2025) and Stapleton (2025).

Theme three argues for trustworthy organizational practices. This ethical issue aligns with Klein's (2022) argument that DT requires responsible technology use. Additional to trustworthy organizational practices, Bokhari et al. (2025) argued that stakeholder trust is key to integrate technology to organisational changes leading to successful DT.

Theme four is about societal impact as a priority. The theme argues for AI to contribute to people, environment, government and inclusive society. In alignment with this theme, the literature showed that AI has transformed the way people socialise, communicate, work, learn, entertain, and share their emotions and expressions (Tang et al., 2025). Similar to the theme arguing for AI to contribute to government, Yang et al. (2024) contends that AI can improve government decision-making efficiencies, optimize resource allocation, and enhance the quality and efficiency of public services.

Concluding Remarks

Artificial intelligence is reshaping social values, cultural norms, relationships, and the physical environment, while also intensifying social inequality and the digital divide. This chapter has shown that AI and DT are fundamentally socio-technical processes that affect institutions, human agency, and social cohesion. While AI offers significant opportunities such as improved healthcare, sustainable agriculture, personalised education, and more transparent governance, these benefits are unevenly distributed. In regions such as Africa, infrastructure gaps, limited digital literacy, labour displacement, algorithmic bias, and privacy risks threaten to deepen existing inequalities and undermine democratic trust. AI can make a meaningful contribution only if it enhances human well-being, supports environmental sustainability, strengthens democratic governance, and advances broader societal goals such as the Sustainable Development Goals. Achieving this requires collaborative, human-centred governance that balances innovation with ethical responsibility, ensuring that technological progress ultimately serves social justice and shared human values.

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