DIGITAL TRANSFORMATION AS A STRATEGIC LEVER FOR ENHANCING SUSTAINABLE DEVELOPMENT IN IRAQ: AN ANALYSIS OF REALITY, STRUCTURAL CHALLENGES, AND FUTURE DEVELOPMENT OPPORTUNITIES

Hassan Abdullah Ahmed

University of Kufa, Kufa, Iraq
*Corresponding author, email: hassana.alsalihi@uokufa.edu.iq

doi: 10.17977/um066.v6.i6.2026.5

Keywords
Digital transformation
Social development
Iraq
Economic development
Digital infrastructure

Abstract
In this study, digital transformation in Iraq is discussed within its development period from 2015 to 2025, and the impact of digital transformation on supporting sustainable development is assessed. It explores the association between a set of selected digital and developmental indicators, as well as the main structural barriers to digitalization, and reflects on potential future opportunities for boosting its developmental impact. The descriptive analytical method is used, relying on data collected from C.S.O., C.B.I., UNDP and some academic sources. The results show that financial inclusion and access to public services have also been improving, as has been selected development indicators, in line with digital expansion. However, the developmental impact of digital transformation is still limited due to poor quality digital infrastructures, traditional and oil-based economic structures, weak institutions and lack of digital skills. The study suggests that a more comprehensive model needs to be implemented to achieve wider development benefits, which is based on investments in digital infrastructure, knowledge, institutional change, and human capacities.

1. Introduction

The world economy and society have been transformed by the fast-growing development of the information and communication technology in recent decades. In this overall digital revolution, digital transformation is a critical tool for economic, social and environmental development. It is no longer just a technologizing tool of the improvement of processes and services, but it is a process that is more and more strategic, through which economic, administrative, and social systems are reorganized. This makes it even more connected to a country's ability to progress towards the Sustainable Development Goals (SDGs) and to be more competitive in the global economy.

This backdrop has created a framework of sustainable development that aims to balance the economic, social and environmental aspects of growth. The synergy between DT and sustainable development has, therefore, been a subject of a lot of research in the fields of economics and development in recent years. Digital technologies can help to achieve more efficient use of resources, more effective public services, improved transparency and governance, and increased productivity and innovation – all of which can help achieve progress towards several SDGs.

Iraq's interest in digital transformation increased significantly from 2015 to 2025, as well as general internet access, electronic services, and the establishment of digital financial systems. The developments took place as more and more public policy aimed towards alignment with the Sustainable Development Goals. However, structural and institutional barriers persisted in their limitation of the development values of digitalization. The study then explores the state of digital transformation in Iraq, assesses its contribution to sustainable development, pinpoints key barriers to digital transformation, and looks at potential future opportunities for enhancing its developmental impact.

1.1. Research Problem

While there have been tangible advances over the past few years in digital transformation, progress in sustainable development indicators has been less than desired in Iraq. The current situation poses a crucial research question related to the correlation between digital transformation and sustainable development, and the role digitalization can play in overcoming development challenges facing the Iraqi economy.

1.2. Significance of the Research

This study is significant because it helps to understand the strategic role that digital transformation plays in sustainable development. It reviews the current level of digitalization in Iraq (2015-2025), analyzes its linkages to economic, social, and development trends, and crafts a visionary outlook that could help in shaping more coherent digital and development policies in the future.

1.3. Research Objectives

The study was based on the main hypothesis which holds that digital transformation can be a strategic tool to achieve sustainable development in Iraq and can be effective if it faces structural, institutional and economic barriers. Three related propositions are explored: (1) the improvement of digital transformation indicators is positively associated with the improvement of sustainable development indicators; (2) poor digital infrastructure reduces the contribution of digital transformation to sustainable development; and (3) enhanced digital governance and financial inclusion will augment the development outcomes of digitalization.

1.4. Research Hypothesis

The study proceeds from the central hypothesis that digital transformation can operate as a strategic lever for sustainable development in Iraq, while its effectiveness is conditioned by structural, institutional, and economic constraints. Three related propositions are considered: (1) improvement in digital transformation indicators is positively associated with progress in sustainable development indicators; (2) inadequate digital infrastructure weakens the contribution of digital transformation to sustainable development; and (3) stronger digital governance and broader financial inclusion can increase the developmental benefits generated by digitalization.

2. Method

The descriptive analytical methodology was used, because it is suitable to the study aims and characteristics. The analysis is based on relevant literature and statistics related to digital transformation and sustainable development in Iraq in the period 2015-2025. Comparative and interpretative methods were also employed to provide clarity of pattern and relationships between variables examined.

3. Results and Discussion

3.1. The Concept of Digital Transformation and Sustainable Development

3.1.1. The Concept of Digital Transformation

There are various approaches to defining digital transformation, with the majority of definitions focusing on the changes in the organizational environment. It is defined in this study as a change of institutions that includes coordinated integration of digital technologies, processes and capabilities at organizational levels. This type of integration redefines the way operations are conducted and can enable institutions to achieve strategic goals more efficiently, accurately, quality and cost effectively (Nadkarni & Prügl, 2021).

Digital transformation can also be seen as a mix of technology, culture and organizational change that institutions undertake to meet customer needs, new work needs and new digital skills. It can be used for the redesign of business models and the digitalization of processes for the purpose of optimizing potential and financial performance and enhancing competitive position. More generally, it shifts the way organizations function by incorporating digital technologies into production processes and decision-making and customer interactions (Verhoef et al., 2021). In this

sense, digital transformation can be defined as the transition to organizational models in which information, knowledge and digital investment are key resources to increase the efficiency, quality and performance of the organization.

3.1.2. Objectives and Importance of Digital Transformation

Digital transformation is a strategy that organizations use to fulfill strategic objectives, increase their operational efficiencies, cut expenses, and enhance the workplace. It has the following primary goals: (1) to create integrated information and data-management systems that integrate data from various sources to make information more accessible and reliable; (2) to enhance administration decision-making with coherent and interconnected information resources; (3) to use digital technologies for the implementation of collaborative, interactive and knowledge-sharing environments among employees; (4) to optimize communication and coordination between administrative units and ensure the flow of information; (5) to make digital technologies more efficient in administrative and service processes; and (6) to improve resource utilization and reduce operating costs through more efficient digital systems.

The advantages of digital transformation are also multi-faceted (Boateng et al., 2021). These encompass: (1) increased institutional efficiency and productivity by optimizing working methods and processes; (2) faster transactions and simpler administrative processes by rethinking processes and employing digital workflows; (3) improved service quality, through more timely, accurate and flexible service delivery; (4) reduced operating costs and efficient use of resources, with less reliance on traditional processes; (5) more innovation and organizational development, via the creation of a more flexible environment that supports new and improved services; and (6) better management and decision making, through timely information and more effective flows of data between different units of the institution.

3.1.3. The Concept and Objectives of Sustainable Development

Sustainability was born in ecological thinking and it was employed to describe continuity and subsequent changes of dynamic systems under structural changes in their components and interactions. With development thinking developing, sustainability also acquired the sense of the inseparability between economy and nature. The components of the natural habitat and their relationships are ecology and how resources are used and managed efficiently are economics (Al-Athari, 2016).

The Arabic word 'istadama' is linked to the verb 'istadame' which comes from the root 'dawm' meaning continuity, stability and persistence, and is used in Arabic with the meaning of sustainability. This linguistic origin imparts the temporal meaning of endurance to this concept. The renderings of ‘Sustainable Development’ in Arabic have been done with similar terms, the main difference being the formulation of the term. The term corresponding to sustainable development is the prevailing one (Al-Jawarin, 2015) in the contemporary academic literature and international reports.

Sustainable development is now a key topic in the current development agenda and has received continued research and policy and international interest. It has many definitions, which vary according to the different disciplines, their analytical approaches and their research goals. The concept has been developed theoretically and practically by international institutions and economics, sociology and environmental studies scholars (Turki, 2010).

Sustainable development can be defined as a process of development which satisfies the needs of the present while ensuring that the future generations are able to meet their own needs. It needs to be used in a sensible manner, to have balance in nature, economic efficiency and social justice. It also reflects inter-generational responsibility, particularly in terms of natural, human, social and cultural capital conservation, through effective use of natural resources and minimisation of environmental degradation and resource depletion to ensure development opportunities continue to be available over time.

SDGs set a general plan to translate sustainable development into actionable priorities (Loumi, 2018). The 17 goals include: No Poverty (eliminating poverty and strengthening social protection

and living conditions), Zero Hunger (food security, better nutrition, and sustainable agriculture), Good Health and Well-being (healthy lives and well-being), Quality Education (inclusive and equitable education and lifelong learning), Gender Equality (equal rights and opportunities and the empowerment of women), Clean Water and Sanitation (access to safe water, and adequate sanitation), Affordable and Clean Energy (ensure access to reliable, sustainable, and efficient energy), Decent Work and Economic Growth (promote sustained economic growth and productive, (decent work), Reduced Inequalities.

3.2. The Reality of Digital Transformation and Sustainable Development in Iraq

3.2.1. The Reality of the Relationship

Digital transformation and sustainable development are interlinked in the Iraqi context. The potential of digitalization to contribute to the economic, social and environmental SDG Goals is accelerated. The use of digital technologies in public institutions can enhance the efficiency in the use of resources, increase the quality of public services, increase transparency and good governance, and have consequences on SDG performance.

Economic dimension: Digital transformation contributed to some aspects of economic performance in Iraq between 2015 and 2025, and it did so through automation of public procedures, growing electronic payment systems, reduction of some operating costs and limitation of administrative inefficiencies. It also helped to create a more conducive business and investment environment through facilitating processes and easing the burden of bureaucracy in line with SDG 8 and SDG 9. Issues around digital infrastructure and the continued reliance on oil limited the scope of these economic gains, though.

Social dimension: Digitalization has improved access to services like electronic learning, digital health and online government services. Such changes can contribute to social inclusion and partially close some development gaps, bridging the relation between digital transformation and SDG 3, SDG 4 and SDG 5. However, there remain significant urban-rural access gaps to these benefits.

Environmental dimension: Digital technologies can help achieve environmental sustainability in the areas of paperless processes, environmental information management, and smart systems for environmental monitoring. They can also help with water-resource management and climate adaptation (SDG 12 and SDG 13). However, the use of digital solutions for environmental purposes is still relatively limited in Iraq.

Critical assessment: The association between digital transformation and sustainable development in Iraq is still at the preliminary stages of consolidation. However, digitalization has not yet become a key enabler of development due to digital governance shortcomings, low investment in technology, lack of institutional integration, persistent digital divides, and a lack of infrastructure.

Despite the fact that digital transformation is not fully applied in Iraq yet, it can be seen as a strategic tool for sustainable development in the future in the period 2015 until 2025. To increase its development contribution, there is a need for a comprehensive national digital strategy, better legislation and continued investments in infrastructure and human resources to advance digitisation to better serve the economic, social and environmental aspects of sustainable development.

3.2.2. The Impact of Digital Transformation Indicators on Sustainable Development in Iraq (2015–2025)

A study of the indicators for 2015–2025 indicates that the slow progress in Iraq's digital infrastructure is linked to progress in selected development outcomes. But there's not yet the structural impact needed for wide-ranging development. The country witnessed more proliferation of information and communication technology (ICT) usage, higher penetration rate of Internet,

more ATMs and electronic financial services, and growing attention for the government's e-government and digital transformation throughout the period. These trends suggest a shift from traditional services to digital technologies in both service delivery and resource management.

Digital indicators correlated with relative improvements in a number of social and economic indicators, especially education, health, and banking services, from the sustainable development viewpoint. This facilitated financial inclusion and facilitated access to information and public services. Digitalization further enhanced some of the aspects of administrative efficiency, as it reduced the time and effort required for transactions, which served to strengthen the principles of transparency and good governance, which is critical to sustainable development (Al-Sayyid, 2016).

Finances: increased the scope of electronic banking services, enabled financial transactions and improved conditions for digital entrepreneurship and investment. Despite all this, their overall impact remained limited due to the dominance of oil and the contribution of other productive sectors to GDP is limited. Overall, in the study period, the level of economic diversification that digitalization brought to the economy was not enough to achieve sustainable development (Naama et al., 2019). Socially, wider internet penetration and digital technologies offered better access to knowledge, education and access to government services, as well as better communication between citizens and institutions. However, there remained a lack of equity in both the distribution of these gains across governorates and the distribution of these gains between rural and urban areas, and a lack of digital skills prevented some groups from gaining fully. Digital tools provide significant potential for smarter natural-resource management, enhanced environmental data, and decreased reliance on paper, in terms of their environmental effects. The use of these in Iraq is still in its infancy and has not yielded significant results to address the ongoing challenges of water shortages, desertification, and pollution (Al-Waeli et al., 2026).

Combined, the evidence indicates that digital transformation was a facilitator of sustainable development in Iraq for the period 2015-2025, but was not the main driver of development in that country. The limited role is due to several structural and institutional hurdles, such as the lack of digital infrastructure, lower investments in technology and innovation, weak coordination between government institutions, and a need for more robust legislation on the digital economy, cyber security and data management.

The analysis thus suggests a positive and growing relationship between digital transformation and sustainable development, but also indicates that the benefits of digital transformation will be further achieved by shifting from mere technology adoption to more holistic, innovative and institutionally coordinated and human capital-intensive digital transformation efforts. The role of digital transformation in enhancing economic efficiency, social equity, and environmental sustainability while aligning with a comprehensive long-term development strategy will be a key factor in Iraq's achievements on the SDGs. The connection between the selected digital transformation and sustainable development indicators is summarize.

Table 1 was compiled by the author using data from the Central Statistical Organization of Iraq, the Central Bank of Iraq, and the United Nations Development Programme. The figures show substantial growth in selected digital indicators between 2015 and 2025: internet use rose from 38% to 82%, while the number of ATMs increased from 580 to 2,800. Over the same period, the poverty rate declined from 22.5% to 18.5% and the Human Development Index increased from 0.668 to 0.696. Unemployment, by contrast, fluctuated, with a marked deterioration in 2020 amid the COVID-19 pandemic and associated economic pressures. The parallel movement of several indicators is consistent with a positive relationship between digitalization and sustainable development, including through financial inclusion and improved access to services. Nevertheless, development indicators improved more slowly than digital indicators, suggesting that structural constraints—including dependence on oil revenues, limited diversification, and unequal digital access across governorates—reduced the conversion of technological expansion into broad development gains. Greater coordination between digital policies and economic and social development programs is therefore necessary if digital technologies are to contribute more effectively to inclusive and sustainable long-term development.

Table 1. Impact of Digital Transformation on Sustainable Development Indicators in Iraq

Year	Internet usage %	ATMs	Poverty rate%	Unemployment rate%	HDI
2015	38	580	22.5	15.2	0.668
2016	41	650	22	15.4	0.671
2017	45	760	21.8	15.6	0.673
2018	49	900	21	15	0.676
2019	55	1100	20.5	14.8	0.679
2020	60	1350	24.8	17.5	0.674
2021	66	1650	23	16.8	0.68
2022	70	2050	21.5	16	0.685
2023	73	2300	20	15.5	0.689
2024	78	2550	19.2	15	0.692
2025	82	2800	18.5	14.6	0.696

3.2.3. Structural Challenges and Future Development Opportunities for Digital Transformation in Iraq

The first is the digital weak infrastructure and weak institutional integration. Poor telecommunication and Internet access quality, lack of adequate data-center capacity and poor electronic interconnection between public institutions are hindering the effectiveness of digital services, and limiting digital governance and development informed decision-making (Al-Ali, 2024).

Another constraint is the legislative, regulatory and cybersecurity landscape. Lack of legal clarity and security in the areas of personal data protection, electronic signature and e-commerce, combined with cybersecurity threats, can undermine the trust in digital services and hamper the digital economy's growth.

Another challenge is the prevailing rentier economic structure and underinvestment in R&D and innovation. These conditions limit diversification and diminish opportunities for the development of a knowledge economy that would be able to develop domestic digital products and solutions and sustain the economy for the long-term.

Limited sustainable development due to persisting digital divide and financial exclusion. Access to technology and electronic and financial services is unequal, with differences between governorates, between the urban and rural, and between social groups, all of which decrease digital inclusiveness.

One aspect of limitation is lack of digital skills and competences. Lack of alignment among education and training providers, and the requirements of the digital economy and the Fourth Industrial Revolution constrains the ability of institutions and labour markets to adapt to new technologies and gain productivity.

The environmental and climate pressures are another challenge, and digital tools are not widely used in the management of environmental and climate pressures. Water scarcity, desertification, climate change are increasingly impacting the water resources in Iraq while smart digital applications in the field of natural-resource management and environmental sustainability are still limited.

3.3. Future Vision and Digital Transformation Scenarios for Promoting Sustainable Development in Iraq

The evidence presented for the period 2015–2025 shows that digital transformation has the potential to contribute to sustainable development in Iraq, and that there is evidence of a gradual improvement in the use of digital technology, digital services, and financial inclusion. The size of its contribution to the future will however rely on the capacity of the state to overcome structural challenges related to infrastructure, governance, human capital and economic diversification. The integrated model for digital-development should then be the key focus of a forward-looking strategy that leverages technology to enhance economic growth, quality of life, and environmental sustainability in line with the SDGs and Iraq's long-term development agenda.

To achieve such vision, a slow transition towards a knowledge and innovation-driven digital economy, grounded in sophisticated infrastructure, public institutions that are connected, and a conducive legal framework is needed. These conditions can enhance resource management efficiency, quality of services, transparency and good governance. Concurrently, an inclusive digital society needs to foster equitable access to technology and services, boost digital competencies and promote innovation and entrepreneurship that can have a positive impact on human development, employment and productivity. Based on the above trends, three general scenarios can be assumed for the future connection between digital transformation and sustainable development for Iraq.As per the observed trends, three general scenarios for the future relationship between digital transformation and sustainable development for Iraq can be assumed.

3.3.1. Optimistic Scenario (Comprehensive Digital Transformation Scenario)

The optimistic scenario assumes success in institutional and legal reforms, greater investments in digital infrastructure, enhanced public-private partnerships, and digital skills and human capital development. Digital transformation would then take a more prominent place in sustainable development, in terms of economic diversification, the improvement of the business climate, financial inclusion and smart public services. This could enhance human-development outcomes, contribute to the reduction of poverty and unemployment, and boost productivity and competitiveness levels, leading to a more stable and sustainable development trajectory.

3.3.2. Baseline Scenario (Gradual Improvement Scenario):

The baseline scenario is that the government digitalization efforts will be continued, with the key structural constraints having only been partially addressed. Digital indicators would experience a gradual improvement, especially in the field of e-government and financial inclusion, which would still contribute to sustainable development, albeit moderately. Human and economic development indicators would then progress slowly, at a pace insufficient to meet the degree of structural change necessary.

3.3.3. The Pessimistic Scenario (The Digital Stumbling Scenario)

The negative outlook scenario represents a situation of ongoing structural imbalances, insufficient investment in technology and digital infrastructure, reliance on oil income and a slowdown in institutional and legislative reform. In such scenarios, the developmental impact of digital transformation will be limited, and digital disparities and issues of poverty, unemployment, and low productivity may persist. Iraq may also experience greater challenges competing with a more digitalised global economy.

The scenarios show that Iraq's future sustainable development course is closely linked with the quality and depth of its digital transformation and the extent to which its digital policy is linked to broader economic and development policy. Infrastructure, governance, human capital and innovation improvements would enhance the potential of digitalization in supporting development. A broad framework is thus available for the expansion of the developmental role of digital technologies in Iraq that integrates technological change with economic growth, social welfare and environmental sustainability.

4. Conclusion

The study records significant shifts in the digital transformation metrics of Iraq in the period of 2015-2025. The percentage of households with internet connection grew from 38% to 82% and the number of ATMs increased from 580 to 2,800, reflecting a wider digital infrastructure and utilization of electronic and financial services. In the same period, the poverty rate decreased from 22.5% to 18.5% and the Human Development Index rose from 0.668 to 0.696. Larger scale digital services and financial inclusion may have helped some aspects of living conditions and human development, but effects were uneven, as seen in these parallel trends. Despite digital expansion, unemployment did not fall in line, and was between 14.6% and 17.5% of the workforce, suggesting that digital economy is yet to make a significant contribution to sustainable jobs. The severe drop-offs in poverty (24.8% in 2020), unemployment (17.5%) and HDI (0.674) further demonstrate the fragility of development outcomes in the face of shocks like the COVID-19 pandemic. In general, digital indicators advanced more rapidly than development indicators, indicating a persistent gap

in moving from digital technology towards inclusive development gains. However, structural factors such as lack of infrastructure, the rentier economy, limited institutional integration and digital access disparities between governorates continue to constrain this process. This indicates that there is scope for moving from technology growth and expansion to a more holistic shift towards digital transformation based on innovation, digital governance and economic diversification. Based on these findings, the study recommends the following: (1) accelerate the development of the national digital infrastructure by expanding high-speed telecommunications and improving the quality of services in all governorates; (2) increase the digital financial inclusion by increasing the number of ATMs, electronic payments and digital banking, especially in disadvantaged areas; (3) link digital-transformation initiatives with poverty-reduction and social-protective policies; (4) develop national training programs for strengthening the digital skills of young people, graduates and public and private-sector employees; (5) invest in the digital and technology industry, such as software, e-commerce, fintech, and artificial intelligence, for sustainable jobs; (6) expand e-learning and digital health services to strengthen the connection between digital transformation and human development; (7) reduce geographical and social digital divide by targeting investment to disadvantaged regions; (8) use digital transformation to support productivity and knowledge-based sectors, and decrease dependence on the oil sector; (9) strengthen digital governance and update laws related to data protection, cyber security, electronic signatures and ecommerce; and (10) create a national system of periodic measures for monitoring the contribution of digital transformation to sustainable development and policy adjustment based.

References

Al-Ali, M. S. (2024). Determinants and strategies for transitioning toward digital governance in Iraq. Al-Bayan Center for Studies and Planning.

Al-Athari, A. D. (2016). Foreign direct investment and sustainable development in selected Islamic countries (1st ed.). Dar Ghaidaa Publishing.

Al-Jawarin, A. F. (2015). Sustainable development in Iraq: Reality and challenges (1st ed.). Al-Saqi Publishing.

Al-Sayyid, O. A. S. (2016). Digital economy. Dar Ghaidaa Publishing.

Al-Waeli, A. H., et al. (2026). The role of digital transformation in achieving sustainable development in Iraq. Tikrit Journal of Economic and Administrative Sciences, (1).

Nadkarni, S., & Prügl, R. (2021). Digital transformation: A review, synthesis and opportunities for future research. Management Review Quarterly, 71(2), 233–341. https://doi.org/10.1007/s11301-020-00185-7

Boateng, R., Odoom, R., & Kolog, E. (2021). Digital transformation process and the capability and capacity implications for small and medium enterprises. International Journal of E-Entrepreneurship and Innovation, 10(2). https://doi.org/10.4018/IJEEI.2020070102

Hasan, M. S. (2025). The impact of digital transformation on improving employee service quality. International Journal of Financial, Administrative and Economic Sciences, (9).

Loumi, M. (2018, February). Implementing the Sustainable Development Goals: Early experiences in the Arab region. Emirates Academy.

Naama, N. H., Najm, R. M., & Ali, H. A. M. (2019) Harnessing digitalization to achieve the 2030 Sustainable Development Goals. Iraqi Journal of Market Research and Consumer Protection, 11(1).

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research, 122, 889–901. https://doi.org/10.1016/j.jbusres.2019.09.022

Turki, M. S. (2010). Development economics (1st ed.). Ithraa Publishing.