Digital Deployment and Innovation Technology

Journal Homepage: https://journal.ddit.hk/

Comment on: Global Digital Transformation: Pathways for Deployment Upgrade and Technological Innovation

Dong Wang[1*]

[1] *Adam Smith Business School, The University of Glasgow, 2 Discovery Place, Glasgow, G11 6EY, Scotland, UK*

*Correspondence: Dong Wang (*dongwang6688@outlook.com)*

Dear Editor,

Global digital transformation is entering a stage in which the central challenge is no longer the isolated invention of digital technologies, but their reliable conversion into operational systems. Artificial intelligence, big data, cloud-edge computing, digital twins, blockchain, industrial Internet platforms, and intelligent terminals are increasingly moving from laboratory verification toward large-scale engineering implementation. Yet the practical value of these technologies remains constrained by a persistent "last-mile" gap between technical possibility and deployable performance. The original article on global digital transformation identifies this problem by emphasizing the need to connect digital theory, engineering deployment, and industrial innovation [1]. This letter further develops that argument by proposing that deployment should be treated as an integral research domain rather than as the final technical step after innovation.

Current digital research frequently privileges algorithmic novelty, predictive accuracy, and model-level performance. These criteria remain important, but they do not fully capture whether a system can operate effectively under heterogeneous hardware conditions, constrained computational resources, unstable communication environments, changing data distributions, and complex organisational workflows. A model may achieve excellent performance on a standardised dataset while remaining too costly, fragile, opaque, or incompatible for industrial use. Deployment-oriented research therefore requires a broader understanding of technological performance.

We suggest that deployment-centred digital innovation can be organised around four interdependent dimensions: architectural readiness, contextual adaptability, operational assurance, and iterative learning. Together, these dimensions provide a practical framework for evaluating whether digital technologies can move from experimental success to sustained application.

First, architectural readiness determines whether a digital solution can be integrated into an existing technical environment. Contemporary digital systems rarely operate as isolated applications. They depend on combinations of cloud platforms, edge nodes, sensors, communication networks, databases, legacy information systems, and heterogeneous terminal devices. Consequently, the deployment of a digital solution requires decisions about system architecture, workload allocation, model partitioning, data transmission, interface standards, and resource scheduling.

Research on digital deployment should therefore evaluate computational latency, memory consumption, interoperability, scalability, energy use, maintainability, and lifecycle cost alongside accuracy. These indicators are especially important in edge artificial intelligence, where real-time inference must often be achieved on devices with limited computing capacity and energy supply. Edge intelligence can reduce communication latency, support local responsiveness, and limit dependence on continuous cloud connectivity. However, its practical effectiveness depends on the coordination of model compression, hardware capabilities, network conditions, and workload distribution [2,3]. A model-centred evaluation may consequently overestimate the real-world usefulness of an edge AI system.

Second, contextual adaptability should be recognised as a core property of digital innovation. Digital technologies are deployed in heterogeneous economic, institutional, organisational, and infrastructural environments. The same technical system may generate substantially different outcomes across manufacturing, healthcare, education, energy, transportation, and urban governance. Even within a single industry, differences in data quality, employee capabilities, managerial support, equipment standards, and regulatory requirements can alter implementation outcomes.

Deployment should therefore not be understood as the replication of a fixed technological package. It is a process of socio-technical adaptation in which technical functions must be aligned with local workflows, organisational routines, user capabilities, and governance arrangements. This perspective shifts digital transformation research away from a simple adoption

ISSN Pending / DOI will be assigned upon official publication

Received 10 August 2026; Received in revised form 10 August 2026; Accepted 12 August 2026; Available online 15 August 2026

Ywain

question—whether an organisation has introduced a particular technology—toward an integration question: whether the technology has been embedded effectively in decision processes, operational structures, physical infrastructure, and systems of accountability. Existing research on digital transformation and dynamic capabilities similarly suggests that technological change requires continuous organisational renewal rather than one-time acquisition [4,5].

Third, operational assurance must accompany deployment-oriented innovation. As digital systems become more interconnected, they introduce new forms of vulnerability. Failures may arise from data drift, model degradation, cybersecurity attacks, network interruption, system incompatibility, inappropriate automation, or excessive human reliance on machine recommendations. These risks are particularly consequential in high-stakes settings such as healthcare, energy, transportation, industrial control, and public administration.

A system cannot be considered successfully deployed merely because it operates under normal conditions. Its behaviour under abnormal, adversarial, and resource-constrained conditions must also be assessed. Deployment studies should therefore incorporate reliability, resilience, security, privacy, explainability, recoverability, and human oversight into system design and evaluation. Relevant procedures include stress testing, failure simulation, fallback mechanisms, incident reporting, access control, post-deployment monitoring, and periodic recalibration.

Digital twins illustrate the importance of operational assurance. By creating dynamic virtual representations of physical assets or processes, digital twins can support simulation, predictive maintenance, and real-time decision-making. Nevertheless, their effectiveness depends on the accuracy, continuity, and security of data flows between physical and virtual systems. Sensor failure, delayed communication, model mismatch, or unauthorised access may undermine the operational reliability of the entire system [6,7]. Digital-twin research should therefore examine the complete engineering architecture rather than treating the virtual model as an isolated technical artefact.

Fourth, iterative learning is necessary to connect deployment experience with subsequent technological development. Conventional innovation models often represent research, development, testing, and deployment as sequential stages. In practice, industrial implementation reveals limitations that cannot be fully identified in laboratory environments. Unexpected user behaviour, changing data distributions, hardware bottlenecks, workflow conflicts, maintenance burdens, and emerging security threats frequently become visible only after deployment.

Deployment should consequently generate structured feedback for model improvement, system redesign, and organisational adjustment. This requires mechanisms for collecting operational data, documenting implementation failures, evaluating user responses, and updating technical configurations. Under such a model, deployment is not the endpoint of innovation. It becomes a source of empirical knowledge that supports continuous technological iteration and strengthens the connection between research and industrial practice.

These four dimensions also imply a broader evaluation framework. Algorithmic accuracy should be supplemented by measures of deployment cost, latency, energy efficiency, interoperability, scalability, robustness, security, user acceptance, maintainability, and long-term operational stability. Comparative benchmarks should reflect different implementation environments rather than relying exclusively on standardised laboratory datasets. A technology that performs moderately but consistently under realistic constraints may create more industrial value than a technically superior model that is difficult to integrate, maintain, or govern.

A deployment-centred agenda further requires closer collaboration among computer scientists, engineers, management scholars, social scientists, policymakers, and industry practitioners. Technical researchers can contribute expertise in algorithms and system optimisation; engineering practitioners can identify infrastructural and operational constraints; management researchers can examine organisational capabilities and implementation processes; and social scientists and policymakers can evaluate ethical, institutional, and regulatory implications.

Such interdisciplinary collaboration is essential because digital transformation cannot be explained by technological performance alone. Organisations may possess advanced digital systems but fail to generate meaningful value because of fragmented governance, weak managerial coordination, insufficient employee capabilities, or a mismatch between technological functions and operational requirements. Conversely, relatively mature technologies may generate substantial benefits when they are carefully adapted to local conditions and supported by effective organisational arrangements.

The issue is becoming more urgent as artificial intelligence, industrial Internet systems, 5G and emerging 6G networks, digital twins, and intelligent terminals become increasingly integrated. These systems are likely to be more distributed, autonomous, and interdependent than previous generations of digital infrastructure. Their development increases the need for standardised interfaces, lightweight deployment strategies, cross-domain coordination mechanisms, and reliable security architectures. It also raises an important research question: how can innovation be accelerated without weakening the reliability, accountability, and sustainability of deployed systems?

In conclusion, the next stage of global digital transformation will depend less on the isolated invention of new digital tools than on the capacity to convert those tools into dependable, adaptable, secure, and maintainable operational systems. Bridging the gap between technological possibility and practical value requires deployment-centred theory, multidimensional evaluation, and continuous feedback between research and application. Treating deployment as a distinct but integrated field of inquiry can help digital innovation produce measurable improvements in industrial productivity, organisational resilience, and social development.

ISSN Pending / DOI will be assigned upon official publication
Received 10 August 2026; Received in revised form 10 August 2026; Accepted 12 August 2026; Available online 15 August 2026

REFERENCES

[1] Zhao, S. (2026). Global digital transformation: Pathways for deployment upgrade and technological innovation. Digital Deployment and Innovation Technology, 1, 000–000.

[2] Li, E., Zeng, L., Zhou, Z., & Chen, X. (2020). Edge AI: On-demand accelerating deep neural network inference via edge computing. IEEE Transactions on Wireless Communications, 19(10), 6769–6782. https://doi.org/10.1109/TWC.2019.2946140

[3] Alam, S., Yakopcic, C., Wu, Q., Barnell, M. D., Khan, S., & Taha, T. M. (2024). Survey of deep learning accelerators for edge and emerging computing. Electronics, 13(15), 2988. https://doi.org/10.3390/electronics13152988

[4] Verhoef, P. C., Kannan, P. K., & Inman, J. J. (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

[5] Warner, K. S. R., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. Long Range Planning, 52(3), 326–349. https://doi.org/10.1016/j.lrp.2018.12.001

[6] Attaran, S., Attaran, M., & Celik, B. G. (2024). Digital twins and industrial Internet of Things: Uncovering operational intelligence in Industry 4.0. Decision Analytics Journal, 10, 100398. https://doi.org/10.1016/j.dajour.2024.100398

[7] Ye, J. (2026). Beyond binary diagnosis: Key questions on AI accuracy, real-world applicability, and safety in clinical decision support. International Journal of Medical Informatics, 106292. https://doi.org/10.1016/j.ijmedinf.2026.106292