Journal of Manmohan Memorial Institute of Health Sciences (JMMIHS) Vol 10 | Issue 2 | 2025

REVIEW ARTICLE

MAPPING PRACTICAL DIGITAL THINKING IN NEPAL TO INTERNATIONAL DIGITAL LITERACY FRAMEWORKS

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Received: 15 September 2025
Accepted: 11 October 2025
Published: 15 December 2025

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https://doi.org/10.3126/jmmihs.v10i2.86994

How to Cite

Devkota, N., Prasai, S., Giri, S., Singh, A., & Zazai, I. K. Mapping Practical Digital Thinking in Nepal to International Digital Literacy Frameworks. Journal of Manmohan Memorial Institute of Health Sciences, 10(2), 39–41. https://doi.org/10.3126/jmmihs.v10i2.86994

ABSTRACT

Nepal is shifting from traditional, intuition-based workflows to digitally driven approaches in governance and healthcare. Digital thinking, encompassing competencies such as data-driven decisions, task automation, mobile-first and user-centered design, cloud collaboration, remote work, predictive analytics, digital security, creativity, adaptability, networked decision-making, and sustainability, provides a framework for this transformation. This narrative review examines the adoption and challenges of these dimensions in Nepal, highlighting their potential to improve public health, administrative efficiency, and citizen engagement. Mapping these practical dimensions to DigComp 2.1 and United Nations Educational, Scientific and Cultural Organization (UNESCO) Digital Literacy Framework offers a structured approach for guiding policy and practice. Addressing gaps in literacy, infrastructure, and cybersecurity can accelerate Nepal's digital transformation and enhance health outcomes.

INTRODUCTION

Digital technologies are transforming governance and healthcare worldwide, enabling more efficient, evidence-based, and citizen-centered services.[1,2] In Nepal, however, many public institutions and health systems still rely on manual processes and intuition-driven decision-making, limiting their effectiveness and responsiveness.[2,3] Digital thinking extends beyond mere technology adoption, emphasizing a strategic mindset that integrates data-driven decisions, automation, user-centered design, collaboration, and secure operations.[1,3] In this review, digital thinking is conceptualized through twelve practical dimensions, adapted from digital literacy and innovation frameworks.[4,5] This framework highlights Nepal's gradual transition from traditional workflows to digital approaches, exploring adoption patterns, challenges, and opportunities, particularly in the health sector

METHODS

A structured narrative review was conducted to explore the adoption and implementation of digital thinking in Nepal's health and public sector. The review focused on recent evidence from national policies, digital literacy assessments, peer-reviewed studies, and reports on Information and Communication Technology (ICT) adoption and public service digitization, as well as broader analyses of digital access and infrastructure in developing countries. Literature published between 2018 and 2025 was included. Key themes related to digital adoption, literacy, and technology-enabled workflows were extracted, synthesized, and organized into a conceptual framework based on practical dimensions of digital thinking, providing a structured overview of the current status, challenges, and opportunities for digital transformation in Nepal.

Digital Thinking: Conceptual Model

Digital thinking encompasses key competencies that enable effective use of technology in health and public services. In Nepal, twelve practical dimensions illustrate this approach: data-driven decisions guide policies with evidence; task automation streamlines workflows; mobile-first and user-centered design improve accessibility and usability; cloud collaboration and remote work enablement support teamwork and flexibility; predictive analytics anticipates challenges; digital security and ethics protect information digital creativity fosters engaging content; adaptability and lifelong learning promote continuous skill development; networked decision-making controls multiple inputs; and sustainability ensures efficient resource use. Together, these dimensions form a framework for operationalizing digital thinking in modern governance and healthcare. The mapping of these 12 practical dimensions to DigComp 2.1 and UNESCO [4, 5] digital literacy areas is conceptual; while many align closely, some dimensions such as mobile-first design, adaptability, and sustainability extend beyond the scope of these frameworks (Table 1).

NARRATIVE SUMMARY OF THE PRACTICAL DIGITAL-THINKING DIMENSIONS

The twelve practical digital-thinking dimensions identified in this review can be organized into four overarching thematic categories that reflect the competencies required in modern digital-health ecosystems.

Data-Centered and Analytical Competencies

A core set of dimensions highlights the growing importance of data in shaping health decision-making. Data-driven decision-making emphasizes the shift from intuition-based choices to the use of analytics for planning, resource allocation, and policy formulation. [6,7,10] Closely related, predictive analytics and computational thinking enable health systems to anticipate outbreaks, optimize resource distribution, and respond proactively. These competencies reinforce evidence-based practices and strengthen strategic planning capacities across health organizations.

Digital Content Creation, User Experience, and Innovation

Another major cluster involves creating, designing, and communicating effectively in digital environments. User-centered design encourages health services that are intuitive and accessible, improving adoption and usability, particularly in digital health platforms.[6,7,8] Mobile-first design and accessibility ensure that services meet users where they are, especially important in mobile-dominant regions. Digital creativity and content creation supports the production of educational materials, infographics, and multimedia content that enhance health literacy. [8, 9] Collectively, these dimensions strengthen the communicative and experiential aspects of digital transformation.

Collaboration, Remote Work, and Networked Problem-Solving

Digital transformation also depends on the ability to collaborate effectively across distributed teams. Cloud collaboration and real-time sharing facilitate seamless information exchange, while remote work enablement supports decentralized health functions, reporting, and service delivery.[9,10,13] Networked decision-making and open innovation extend collaboration beyond organizational boundaries by integrating crowd sourced data, community insights, and multi-sector partnerships.[11,12] These dimensions highlight how digitally enabled teamwork enhances agility, inclusivity, and collective intelligence in health systems.

Digital Security, Ethics, Adaptability, and Sustainability

A final category captures the foundational values and adaptive capacities required for resilient digital ecosystems. Digital security, ethics, and resilience emphasize the need for strong cybersecurity practices, ethical data handling, and privacy safeguards.[11, 12] Digital adaptability and lifelong learning reflect the continuous evolution of tools and the necessity for rapid upskilling among health professionals.[10, 11, 13] Sustainability and resource efficiency ensure that digital solutions are environmentally responsible and strategically optimized.[9,13] Together, these dimensions promote trust, long-term resilience, and responsible digital development.

NEPAL'S DIGITAL LANDSCAPE AND DIGITAL THINKING IN OTHER DEVELOPING COUNTRIES

Nepal's digital transformation reflects a complex interplay between growing connectivity and limited digital capability.[13-15] Although mobile and internet penetration continue to rise, most citizens still rely on digital devices primarily for communication and entertainment rather than productivity-oriented tasks.[13,15] This gap between access and meaningful use parallels broader implementation challenges: despite the Digital Nepal Framework's ambitious slate of 80 + initiatives, progress is slowed by funding constraints, weak interoperability, and shortages in digital skills.[16-18] Additionally, broadband outages have revealed the fragility of Nepal's digital infrastructure, stressing the need for resilience and reliability as core components of digital thinking.[2,24]

Similar patterns appear across other developing countries.[18,19] Nations such as India, and other developing countries[19,20] have made substantial investments in digital public infrastructure, government digital identity systems, and digital literacy programs. Yet even with these advancements, limitations persist in the adoption of automation technologies, data analytics, and cyber security practices. These common challenges indicate that while connectivity is expanding, the deeper capabilities required for fully using digital systems, such as secure infrastructure, organizational coordination, and advanced digital competencies, remain uneven across emerging economies, including Nepal.

Barriers Limiting Digital Thinking in Nepal

Several barriers continue to limit the development of digital thinking in Nepal. Persistent digital literacy gaps constrain individual's ability to use technology meaningfully[21] while the affordability of devices and mobile data remains a major obstacle for low-income populations.[22] These challenges are compounded by infrastructure fragility, as demonstrated by recent broadband disruptions that expose the vulnerability of national connectivity systems.[2,23,24] At the organizational level, institutional inertia slows digital reform and reduces the uptake of innovative practices. Cultural factors, including low user confidence and fear of making mistakes, further discourage experimentation with digital tools.[3,13,23] Additionally, the lack of user-centered design in public digital services limits usability and adoption.[2, 3, 13, 14, 15] Finally, the limited integration of automation and data analytics into routine workflows restricts the shift from traditional decision-making to more data-driven, efficient processes.

Table 1: Practical Dimensions of Digital Thinking in Health and Public Sector: Mapping to DigComp and UNESCO Digital Literacy Frameworks

Practical Digital Thinking Dimension	Description / Example	Dig-Comp 2.1 Area	UNESCO Digital Literacy Area
1. Data-Driven Decisions	Using analytics rather than intuition for policymaking and health planning (e.g., vaccination campaigns based on epidemiological data)	Information & Data Literacy	Information & Data Literacy
2. Task Automation	Automating repetitive workflows, e.g., appointment reminders, lab report systems	Problem Solving	Problem Solving
3. Mobile-First Design & Accessibility	Designing services optimized for mobile devices, e.g., telemedicine apps	Digital Content Creation	Communication & Collaboration; Digital Content Creation
4. Cloud Collaboration & Real-Time Sharing	Using cloud platforms for team collaboration and data sharing	Communication & Collaboration	Communication & Collaboration
5. User-Centered Design	Emphasizing usability and user feedback for higher adoption	Digital Content Creation	Digital Content Creation
6. Remote Work Enablement	Enabling telework for health officers and data reporting	Communication & Collaboration; Problem Solving	Communication & Collaboration; Problem Solving
7. Predictive Analytics & Computational Thinking	Using data modeling to anticipate outbreaks or resource needs	Problem Solving	Problem Solving
8. Digital Security, Ethics, and Resilience	Applying cybersecurity, ethical data practices, encryption, and privacy	Safety	Safety
9. Digital Creativity & Content Creation	Producing health awareness content, infographics, videos	Digital Content Creation	Digital Content Creation
10. Digital Adaptability & Lifelong Learning	Rapidly learning and adapting to new digital tools	Problem Solving; Digital Content Creation	Problem Solving; Communication & Collaboration
11. Networked Decision-Making & Open Innovation	Using multi-source inputs including crowdsourced data	Communication & Collaboration; Problem Solving	Communication & Collaboration; Problem Solving
12. Sustainability & Resource Efficiency	Minimizing resource use and environmental impact via digital tools	Safety; Problem Solving	Safety; Problem Solving

Towards a Digital Thinking Society: Framework for Nepal

A transition towards a digital-thinking society requires coordinated progress across four complementary pillars. First, developing a strong digital mindset involves promoting data awareness, building user confidence, and integrating digital thinking into school curricula to nurture these habits from an early age. Second, strengthening digital skills is essential, with targeted training for teachers, public servants, and private-sector workers, alongside the expansion of digital literacy hubs beyond major urban centers to ensure equitable access. Third, robust digital infrastructure is needed to support this shift, including improving internet reliability, advancing cloud adoption, and enforcing cybersecurity standards that safeguard digital activities. Finally, fostering a vibrant digital culture and innovation ecosystem will accelerate progress by encouraging the use of automation and analytics, supporting startups that address local challenges, and promoting mobile-first, user-centered design principles that make digital services more accessible and impactful for all.

CONCLUSION

Digital transformation depends not on technology alone but on mindset, skills, and processes. Nepal has made strides in access but lags in capability. The next phase must focus on thinking digitally, designing digitally, and deciding digitally, ensuring systemic adoption of digital practices in education, governance, and business and health care.

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