

From Digital Human Capital to University Resilience: The Role of Digital Transformation Maturity in Crisis-Affected Higher Education

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Available online at: <https://doi.org/10.66422/RJMU.ID.75>

Received: 3 April 2026

Revised: 30 May 2026

Accepted: 20 July 2026

Abstract— Digital transformation has become a strategic concern for higher education institutions, particularly in environments exposed to recurrent disruption and resource constraints. This conceptual and analytical article develops an integrative framework linking digital human capital, digital transformation maturity, and organizational resilience. Drawing on human capital theory, the resource-based view, and the dynamic capabilities perspective, it argues that employees' digital knowledge, skills, attitudes, and experience are strategically important but do not automatically generate institution-level resilience. Their value depends on the extent to which universities embed digital capabilities in governance, infrastructure, data systems, academic and administrative processes, and organizational routines. The article synthesizes recent peer-reviewed literature published mainly between 2020 and 2026 and develops four theoretical propositions. Digital transformation maturity is positioned as an institutionalization mechanism that converts individual digital capability into coordinated organizational capacity, while resilience is conceptualized through anticipation, coping, and adaptation. The framework contributes by integrating three streams of literature that are often examined separately and offers practical implications for crisis-affected and resource-constrained higher education systems, including Syrian public universities.

Keywords— digital human capital; digital transformation maturity; organizational resilience; higher education; crisis-affected environments; digital capabilities.

1. Introduction

Digital transformation has moved from a peripheral technological initiative to a strategic concern for higher education institutions. Universities are increasingly expected to integrate digital technologies into teaching, research, administration, governance, communication, and decision-making. This transition extends beyond the acquisition of platforms or infrastructure; it requires changes in institutional strategy, organizational processes, leadership practices, data governance, workforce capabilities, and relationships among academic and administrative actors. Recent research therefore treats digital transformation in higher education as a multidimensional organizational process in which technology, people, strategy, and routines must evolve

together (Benavides et al., 2020; Fernández et al., 2023; Chounta et al., 2024).

The importance of this transformation is amplified in crisis-affected and resource-constrained environments. Universities exposed to recurrent economic, political, infrastructural, or social disruption must preserve academic continuity, protect information, maintain administrative services, and respond to changing conditions with limited resources. Technological availability alone does not guarantee these outcomes. Institutions may possess digital platforms while their information systems remain fragmented, responsibilities unclear, data poorly integrated, cybersecurity capabilities uneven, and employee digital competence highly variable. Evidence from conflict-affected higher education

likewise suggests that digitalization can support continuity and sustainable institutional functions, but its effectiveness remains dependent on governance, capability, and infrastructure (Habib, 2023; Al-Shaer et al., 2025).

This distinction directs attention to digital human capital: the accumulated knowledge, skills, attitudes, and experience that enable organizational members to work effectively in digital environments. Yet capable individuals do not automatically produce resilient institutions. A university may employ digitally competent staff while its initiatives remain disconnected from strategy and institutional processes. Digital transformation maturity therefore becomes a critical intermediate concept, reflecting the extent to which digital practices are embedded in leadership, governance, infrastructure, data, academic processes, services, and routines. Recent studies show that digital maturity is uneven across universities and depends on configurations of human competence, infrastructure, governance, and strategic coordination rather than technology adoption alone (Bravo-Jaico et al., 2025; Llopis-Albert et al., 2026). Organizational resilience adds a further level to this argument. Resilience is the capacity to anticipate potential disruption, cope while preserving essential operations, and adapt through learning and reconfiguration afterward (Duchek, 2020). The central argument advanced here is that digital human capital is important but insufficient for university resilience. Its institutional value depends on whether universities can absorb and organize individual capabilities through mature digital systems and processes. The article therefore develops an integrative framework in which digital transformation maturity functions as a conversion mechanism between individual digital capability and organizational resilience.

2. Analytical Approach

The article adopts an integrative conceptual and analytical approach rather than an empirical design or formal systematic review. The analysis synthesizes literature across three connected domains: digital competence and human capital, digital transformation maturity in higher education, and organizational resilience. Priority was given to peer-reviewed studies published between 2020 and 2026, while established conceptual sources were retained when they provided the theoretical foundations for the model. Sources were identified through focused searches around combinations of the focal constructs and higher-education terms, followed by backward and forward examination of relevant conceptual and review literature. Studies were retained when they addressed at least one focal construct and contributed directly to

competence, maturity, institutionalization, learning, crisis response, or resilience; particular weight was given to higher-education evidence and crisis-affected or resource-constrained settings. The synthesis then compared recurring mechanisms—capability development, institutionalization, integration, learning, and adaptation—and interpreted them through human capital theory, the resource-based view, and dynamic capabilities theory. This procedure is selective and theory-driven rather than exhaustive: its purpose is to establish conceptual coherence and formulate testable propositions, not to estimate effect sizes or claim systematic-review coverage.

3. Theoretical Foundations

Human capital theory treats employees' knowledge, skills, experience, and competencies as productive resources whose development can improve organizational outcomes. In digitally transforming universities, this logic extends to competence in information, data, communication, cybersecurity, digital content, and technology-enabled problem solving. The resource-based view adds that organizational advantage depends not simply on owning resources but on deploying valuable capabilities in ways that are embedded in the institution. Digital competence is therefore more strategically meaningful when it is distributed across faculty, administrators, technical staff, and leaders rather than concentrated in a narrow technology function.

Dynamic capabilities theory extends this logic to environments characterized by change and uncertainty. It focuses on the organization's ability to sense developments, seize opportunities, and reconfigure resources and routines. Digital knowledge is thus only a starting point: universities must organize, integrate, and redeploy that knowledge as conditions change. Combining these perspectives produces a multilevel explanation in which digital human capital is the resource base, digital transformation maturity is an integrating institutional capability, and organizational resilience is the higher-order capacity to anticipate, respond, recover, and adapt.

4. Digital Human Capital as a Strategic University Resource

Digital human capital is broader than technical proficiency. DigComp 2.2 organizes digital competence into five areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem solving (Vuorikari et al., 2022). In universities, information literacy supports evidence-based academic and

administrative decisions; digital communication enables coordination across organizational boundaries; content creation supports teaching, research, and services; safety protects institutional and personal information; and problem solving enables employees to adapt tools and processes when normal arrangements fail.

These capabilities are particularly relevant under disruption. Employees who can learn new tools, identify alternatives, share knowledge, protect information, and modify working methods are less dependent on fixed routines. Integrating digital competence into human resource policies and professional development can strengthen learning, innovation, and operational efficiency (Rohayati, 2024). Recent research also emphasizes that digital competence should be connected with leadership, infrastructure, readiness, and organizational support rather than developed in isolation (Kovnir, 2026; Singun, 2025). Digital human capital should therefore be treated as a strategic organizational resource, although its impact remains contingent on an institutional environment capable of absorbing and scaling it.

5. Digital Transformation Maturity as an Institutionalization Mechanism

Digital transformation maturity describes the extent to which digital technologies have moved from isolated applications toward integrated institutional practice. Mature transformation is characterized by strategic alignment, clear leadership responsibilities, governance, reliable infrastructure, integrated data, digitally enabled academic and administrative processes, and continuous evaluation. Research shows that universities can possess advanced technologies without reaching high maturity when initiatives remain fragmented or disconnected from institutional strategy (Rodríguez-Abitia & Bribiesca Correa, 2021; Fernández et al., 2023). Contemporary frameworks reinforce this multidimensional view. Higher education maturity can be organized around digital leadership and governance; infrastructure, data, and security; digitization of teaching and research; and digitization of administration and services (Chounta et al., 2024; Bravo-Jaico et al., 2025). Kovnir (2026) similarly links higher education digital maturity with staff competence, digital leadership, analytics, digital culture, and professional development. Llopis-Albert et al. (2026) further show that high university digital maturity emerges from combinations of human competence, robust infrastructure, strategy, stakeholder involvement, and pedagogical innovation. The strategic importance of maturity lies in institutionalization. A digitally competent employee

can improvise a temporary solution, but resilience requires solutions that are transferable, repeatable, scalable, and supported by systems. Digital maturity converts successful individual practice into shared routines, standards, integrated platforms, data arrangements, and organizational knowledge. It is this conversion that allows human capability to generate effects beyond the individual employee.

6. Organizational Resilience in Higher Education

Organizational resilience should not be reduced to survival after a crisis. Duchek (2020) conceptualizes it through three interrelated capabilities: anticipation, coping, and adaptation. Anticipation involves identifying threats, monitoring conditions, planning scenarios, and establishing preparedness before disruption. In universities, it may include backup systems, continuity plans, alternative teaching arrangements, cybersecurity preparation, and identification of critical services. Coping refers to prioritizing essential activities, mobilizing resources, communicating, protecting data, and maintaining operations during disruption. Adaptation occurs when institutions incorporate lessons learned, modify structures and procedures, and institutionalize effective practices.

Digitalization can support all three capabilities by improving monitoring, enabling alternative channels, facilitating coordination, and preserving organizational knowledge. However, technology contributes to resilience only when it is combined with learning, governance, infrastructure, and human capability. Awad and Martín-Rojas (2024) show that digital transformation can enhance resilience through organizational learning and innovation, while Firmansyah et al. (2024) report a positive relationship between digital transformation and resilience in distance education. More recently, Vaz et al. (2026) demonstrate how crisis-driven technologies can evolve from emergency tools into embedded institutional infrastructure, supporting organizational learning and sustained resilience.

7. An Integrative Analytical Framework

The first proposed relationship links digital human capital with digital transformation maturity. The literature suggests that technologies are more likely to become organizationally embedded when employees can use, evaluate, adapt, and integrate them into work. Stronger digital competence may facilitate adoption, improve data use, support cross-unit collaboration, and reduce dependence on a small number of specialists. Digital human capital is therefore theorized as an enabling foundation for maturity.

Proposition 1: Higher levels of digital human capital facilitate the development of digital transformation maturity in higher education institutions.

A second proposed pathway links digital human capital directly to resilience. During disruption, digitally competent employees may be better able to identify alternative channels, access information remotely, collaborate across units, learn new systems, and solve emerging problems. These mechanisms provide the theoretical basis for expecting a broader institutional repertoire of responses, although the relationship requires empirical testing.

Proposition 2: Digital human capital strengthens university organizational resilience by increasing employees' capacity for digitally enabled problem solving, coordination, and adaptation.

Nevertheless, individual competence cannot by itself sustain complex university operations. Continuity across interconnected units depends on stable systems, data, responsibilities, and governance. Digital transformation maturity is therefore proposed to address this requirement by institutionalizing reliable digital alternatives and embedding them in organizational routines.

Proposition 3: Higher digital transformation maturity strengthens organizational resilience by institutionalizing reliable digital alternatives,

integrated information, governance mechanisms, and continuity capabilities.

The central conceptual contribution arises from integrating these proposed relationships. Digital human capital creates potential value, while digital transformation maturity is theorized to influence how extensively that potential becomes embedded within institutional routines and infrastructure. Maturity can therefore be conceptualized as a conversion mechanism between individual capability and organizational resilience.

Proposition 4: Digital transformation maturity conceptually mediates the relationship between digital human capital and organizational resilience by transforming individual digital competencies into coordinated institutional capabilities.

This conceptual mechanism does not imply that all benefits of digital human capital pass through formal structures. Informal collaboration, professional experience, and individual initiative may support continuity where institutional systems remain incomplete. The proposed relationship is therefore complementary: flexible individuals can support short-term continuity, while mature organizational arrangements may stabilize, coordinate, and scale those capabilities. Whether, and to what extent, these pathways operate in practice remains an empirical question.

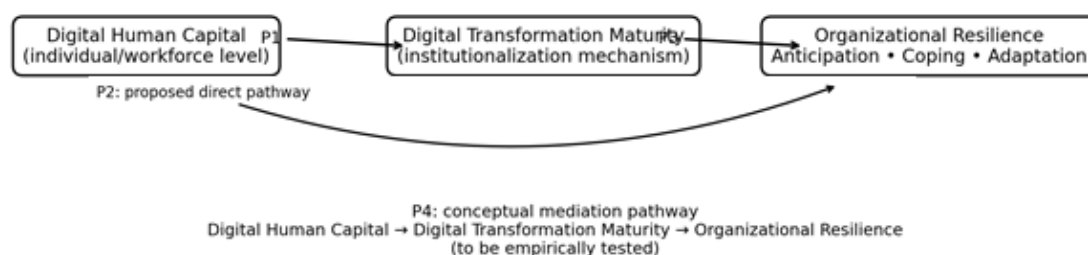


Figure 1. Conceptual framework and proposition structure

Table 1. Construct boundaries and illustrative indicators for future empirical testing

Construct	Level / boundary	Core dimensions	Possible indicators for future testing
Digital human capital	Individual/workforce resource	Information & data literacy; communication & collaboration; digital content creation; safety; problem solving	Competency scores; digital problem-solving; secure data practices; collaboration capability
Digital transformation maturity	Institutional capability/mechanism	Leadership & governance; infrastructure & security; integrated data; academic/administrative process digitization; evaluation	Governance clarity; system integration; data interoperability; service digitization; continuity and review routines
Organizational resilience	Higher-order organizational capability	Anticipation; coping; adaptation	Preparedness/backup arrangements; continuity during disruption; resource mobilization; post-crisis learning and reconfiguration

Note. Construct boundaries and indicators are synthesized from Vuorikari et al. (2022), Duchek (2020), Chounta et al. (2024), and Bravo-Jaico et al. (2025). Indicators are illustrative and require validation in future empirical studies.

8. Implications for Crisis-Affected and Syrian Public Universities

The framework is especially relevant to higher education systems operating under sustained resource constraints. Evidence from conflict-affected higher education indicates that disruption, infrastructure limitations, and constrained institutional capacity can complicate digital transformation and continuity (Habib, 2023; Al-Shaer et al., 2025). The specific configuration and severity of such constraints should not be assumed to be identical across national systems. Within the present framework, the claim is therefore contextual: where budgets, infrastructure, specialized personnel, or service reliability are constrained, digitally capable employees may become especially important because they can adapt tools, share knowledge, protect information, and create practical alternatives.

Reliance on individual improvisation, however, creates vulnerability when knowledge is concentrated in particular employees or temporary solutions are not institutionalized. The framework therefore rejects the conventional choice between investing in people and investing in technology. Professional development should be tied to actual processes; effective practices should be converted into institutional standards; infrastructure investment should be accompanied by governance and support; and data should be integrated into decision-making.

For Syrian public universities, the application offered here should be read as a context-specific analytical inference rather than as a documented system-wide empirical finding. The framework suggests that continuity of teaching, research, student services, and administration under recurring constraints may be supported by selective institutionalization: identifying critical services, strengthening the digital competencies most closely linked to those services, and embedding effective practices in governance, data, infrastructure, cybersecurity, and continuity arrangements. Direct empirical research in Syrian universities is needed to establish the actual level of these constraints, the maturity of institutional systems, and the strength of the proposed relationships.

9. Theoretical Contribution and Future Research

The framework shifts attention from whether digital human capital and digital transformation are beneficial to how individual digital resources become organizational capabilities. It integrates three literatures often treated separately—human capital development, digital transformation maturity, and organizational resilience—and distinguishes among resources held by individuals, institutional

mechanisms that embed those resources, and higher-order capacities for adaptation. This multilevel distinction provides a clearer explanation of why similar levels of employee digital competence may produce different organizational outcomes across universities.

Future empirical research should test the four propositions across diverse higher education settings. Digital human capital can be operationalized through dimensions such as information and data literacy, communication and collaboration, digital content creation, safety, and problem solving (Vuorikari et al., 2022). Digital transformation maturity can be assessed through institutional domains such as leadership and governance, infrastructure and security, integrated data, digitally enabled academic and administrative processes, and continuous evaluation (Chounta et al., 2024; Bravo-Jaico et al., 2025). Organizational resilience can be examined through anticipation, coping, and adaptation capabilities (Duchek, 2020). Comparative and longitudinal designs should also test boundary conditions that may alter the proposed relationships, including crisis intensity, university size, governance autonomy, infrastructure reliability, financing capacity, and cybersecurity capability. Qualitative research could further examine how informal employee networks interact with formal digital governance in resource-constrained institutions.

Conclusion

Digital transformation has increased the strategic importance of human capability in higher education. Universities require employees who can work with data, communicate and collaborate digitally, create and adapt content, manage digital risks, and solve problems in changing technological environments. These capabilities constitute digital human capital and provide an essential foundation for institutional transformation.

The principal analytical conclusion is that digital human capital alone does not guarantee university resilience. Its organizational value depends on whether individual competence is embedded within digital governance, reliable infrastructure, integrated information systems, digitally enabled academic and administrative processes, and organizational learning. Digital transformation maturity therefore represents a critical bridge between individual and institutional levels. It converts digital knowledge and skills into repeatable organizational capacity, while resilience reflects the university's ability to use that capacity to anticipate threats, cope with disruption, and adapt through learning and reconfiguration.

The resulting framework proposes a progressive pathway from digital human capital to digital transformation maturity and ultimately to organizational resilience. For crisis-affected and resource-constrained universities, the strategic implication is that resilience is unlikely to emerge from technology acquisition alone or employee competence alone. It is strengthened when capable people, governance arrangements, infrastructure, data, organizational processes, and learning mechanisms function as an integrated institutional capability.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest.

Funding

The authors received no financial support for this book review.

Human Participants

This paper does not involve human participants.

Originality Note

The authors confirm that the manuscript is their original work, and if others' works are used, they are properly cited/quoted.

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