

Digital Universities and the Future of Knowledge Production Strategic Transformation in Higher Education

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ABSTRACT

This study examined the role of digital transformation in shaping knowledge production within universities using a qualitative research approach. Data were collected through semi-structured interviews, document analysis, and observation from faculty members, administrators, and IT staff. The findings revealed four major themes of digital transformation: digital infrastructure, research support systems, faculty digital competence, and institutional strategy alignment. Digital infrastructure emerged as a dominant enabling factor, facilitating access to advanced technologies, data systems, and collaborative tools. Research support systems were found to be inconsistently implemented across departments, limiting their effectiveness in supporting knowledge production. Faculty engagement with digital platforms was generally high, particularly in terms of frequency of use and perceived usefulness, but integration into research workflows remained uneven due to variations in digital skills and training. The study also identified moderate levels of research collaboration, with digital tools enhancing cross-departmental interaction and global partnerships, although institutional and structural barriers restricted deeper engagement. Furthermore, digital transformation improved knowledge dissemination through increased use of repositories and open-access platforms, contributing to enhanced research visibility and impact. The study concluded that digital transformation was a complex and ongoing process requiring not only technological investment but also strategic alignment, leadership support, and continuous capacity building. These findings emphasized the need for universities to adopt integrated and inclusive digital strategies to maximize knowledge production in the evolving academic landscape.

Keywords: Collaboration, Digital transformation, Knowledge production, Research dissemination, Technology integration, Universities

Introduction

The digital technologies redefining institutional structures, modes of teaching and knowledge production, higher education experienced a radical strategic shift. Researchers noticed that digital transformation in higher education institutions was not only catalyzed by the introduction of sophisticated technologies like cloud computing, analytics, and artificial intelligence (AI), but also by a more comprehensive organisational change that necessitated a shift in governance, pedagogical, and research operations (Fernández et al., 2023; Wang, 2025). The global competitive pressures and the fast development of the digital infrastructure contributed to this transformation and the need to redefine the core missions of the higher education institution (HEI) as flexible, connected, and innovative (Wang, 2025; Nazyrova, 2025).

The creation of the digital university did not come with the mere technological improvements, but universities were reimagined as digitally empowered systems in which knowledge production was combined with digital technologies and networked policies (Fernández et al., 2023). By implementing the use of digital systems, HEIs were discovered to provide individualised learning experiences, boost international partnerships, and speed up the dissemination of research findings (Kayanja, 2025). In addition to teaching, digital maturity and strategic digital efforts were more and more associated with research performance (Sun and Yoon, 2025; Kayanja, 2025).

There was a possibility of greater knowledge production, strategic gaps were experienced in most universities in the integration of the digital transformation in the overall plans. A systematic review of digital transformation projects showed that most HEIs were still in the initial phases of digital maturity with one-off projects that were not strategically integrated and therefore could not have a significant impact on institutional research cultures and outputs (Fernández et al., 2023). The accelerated speed of technological evolution revealed enduring issues like the lack of digital literacy, the inadequacy of infrastructure, and the reluctance of all organisations to embrace change (Mabotha and Ngcamu, 2026; Barrios ihrdel bzw. Angelo et al., 2026).

Empirical studies also showed that digital self efficacy of faculties and taskWEF fit also played an important role in determining the effect of digital transformation on academic performance highlighting human and contextual aspects of strategic change (Sun and Yoon, 2025). With the introduction of digital technologies into the research processes in universities, faculty competencies and institutional support systems became the key factors influencing successful knowledge production (Sun and Yoon, 2025; Barrios trabajdelangen et al., 2026).

Research Background

Digital transformation in higher education was placed in the framework of the Fourth Industrial Revolution where digitalisation reshaped economic, social and educational paradigms (Mabotha & Ngcamu, 2026). Not only did HEIs embrace new technologies to enhance the efficiency of their administration, but they were also able to promote new learning and research models (Fernandez et al., 2023). Research reported the proliferation of digital transformation to go beyond entry-level eLearning tools to include strategic uses of advanced analytics systems, cloud

solutions, and AI powered systems, which facilitated institutional innovation and cross-disciplinary cooperation (Fernandez et al., 2023).

One of the most interesting trends in the literature was the move away from technology adoption in isolation to the more holistic digital transformation strategies that would match technology to the institutional missions and long-term objectives (Wang, 2025). Nonetheless, a research also found that this integration was a challenge to many universities as only a small percentage of formal strategic frameworks to direct digital efforts, resulting in a fragmented product and a small amount of value creation (Fernandez et al., 2023). Such an informational void was manifested in the differences between institutions in the form of investment in infrastructure, organisational preparedness, and leadership involvement.

The role of faculty and performance became the core of the discussions of digital transformation, and empirical research revealed that digital ecosystems might positively affect research productivity when they are backed by a high level of digital technology to the task (Sun & Yoon, 2025). It was found that strategic transformation not only needed to invest in technology but also in capacity building, professional growth and cultural change to allow a successful adoption by academics. The study also identified obstacles that perpetually weakened digital transformation such as poor levels of digital literacy, organisational change resistance, poor infrastructure, and strategic misfit (Mabotha and Ngcamu, 2026). It was believed that to take full advantage of the digital transformation and aid knowledge production in the digital age, it was necessary to address these barriers that digital transformation presented to universities.

Research Problem

There was growing academic and practice interest in the concept of digital transformation, there was still an empirical gap in comprehending the influence of strategic digital transformation on the processes of knowledge production and research findings in higher education. Although many studies have outlined the patterns of technology adoption, not many have presented evidence in a rigorous way on the impacts of digital strategies on the institutional research cultures, productivity, and scholarly innovation. This study has shown that the concept of digital transformation has the potential to affect the performance of the faculty and pedagogical outcomes because little research has been conducted directly on the connection between strategic digital transformation and the creation, distribution, and assessment of knowledge. This pointed to a necessity to investigate how digital capabilities can be used by HEIs to improve the quality of research, the cross-disciplinary work, and the exchange of knowledge worldwide.

Research Objectives

1. To examine the strategic transformation processes undertaken by universities in implementing digital transformation initiatives.
2. To assess the influence of digital transformation on knowledge production and research outcomes.
3. To analyse faculty digital competencies and their role in shaping digitally enabled research ecosystems.

4. To identify the major barriers and enablers to strategic digital transformation supporting enhanced knowledge production.

Research Questions

- Q1. What strategic transformation processes did universities undertake to evolve toward digital universities?
- Q2. How did digital transformation practices influence research and knowledge production activities?
- Q3. What roles did faculty digital competencies play in shaping digital research ecosystems?
- Q4. What were the major barriers and facilitators to achieving strategic digital transformation for improved knowledge production?

Literature Review

Conceptualising Digital Transformation in Higher Education

The discussion on transformation in higher education always focused on digital transformation as not just embracing new technologies, but also transforming institutional structures and educational practices with integrated digital strategies. Digital transformation was portrayed as a multidimensional process, which entailed organisational strategy, infrastructure, and stakeholder role changes to develop a digitally mature university environment (Tang et al., 2025). Institutional responsiveness, research collaborations and personalised learning were perceived as facilitated by digital technologies like high-end analytics and cloud platforms, which required new visions and policies to make sustainable digital developments in higher education.

The scholars also stressed the need of a comprehensive view of digital transformation that went beyond the uptake of technology to encompass cultural and pedagogical changes in universities. To demonstrate how digital transformation may be conceptualised in the context of authoritative academic institutions, Tang, Huang, and Yan (2025) introduced a triple logical framework: value logic, technological logic, and practical logic. This framework implied that the digital transformation of universities needed not only the digital solutions but also value-based strategies that combined technological innovation with the user experience and institutional purpose.

Emerging bibliometric studies reported that studies on digital transformation in higher education were becoming more immersive technology-based, institutionally strategic, and digitally literate which reflected a research trend worldwide into comprehensive digital ecosystems to support learning, research and spreading knowledge (Shenkaya & Kim, 2023; Singun, 2025). These papers indicated that the research on digital transformation was evolving to go beyond campus computing to entail organized involvement with new technology such as AI, VR, and analytics and how digital ecologies related to institutional competitiveness and research capacity.

Digital Transformation Barriers and Problems to Strategic Digital Transformation

An important line of literature discussed the obstacles to successful digital transformation in higher education, in which structural, cultural, and capacity-related issues resulted in the lack of strategic development. In a systematic review, Singun (2025) found nine dimensions of barriers, including the lack of digital vision, deficient leadership support, unsupportive policies of digital, and poor stakeholder engagement, highlighting that an institutionally prepared environment was the key to success in transformation. These results were indicative of a coherent body of evidence that in the absence of coherent strategic frameworks and enabling governance, the digital transformation initiatives were still disjointed and did not significantly influence institutional performance.

Institutional culture and change resistance were also reported in the research and found to be formidable obstacles to digital change. The concept of resistance to change was a common occurrence in the literature based on organisational factors of higher education, in which the well-established academic cultures were not very fast to embrace digital technologies and strategic changes (Singun, 2025). This cultural stagnation hindered cross-departmental research and sharing of knowledge and minimized the possible impact of digital systems to institutional knowledge production. Studies thus highlighted a requirement of leadership allegiance, holistic online policies, and persistent capability advancement to break these embedded issues.

Research Ecosystems, Knowledge Production, and Digital Transformation

Research on the impact of digital transformation on research and knowledge systems suggested that the incorporation of digital platforms and data analytics, and collaborative technologies was underway and had started to shape the organisation, ways of conducting and disseminating research. There was evidence that digital environments were providing more opportunities to engage in cross-institutional collaboration, especially in the data targeted research fields because researchers were able to use digital tools to reach larger datasets and reach global collaborators (Tang et al., 2025). These changes corresponded to the idea that digitally transformed universities had the potential to improve the production of knowledge by improving the scholarly communication channels and decrease the traditional obstacles in research cooperation.

The studies on digital transformation underlined the fact that the process of knowledge production was becoming more networked and participatory and was facilitated by digital infrastructures. Shenkoya and Kim (2023) emphasized that digitalisation enabled the creation of open knowledge ecosystems and collaborative research platforms that defy geographical limits and increased opportunities in knowledge creation. These innovations implied that not only internal academic practice was being impacted by digital transformation but that the university was also transforming its role in supporting wider scholarly communities, bringing institutional research interests into line with global knowledge networks.

Research Methodology

Research Design

In this study, the researchers used a qualitative research design to investigate the impact of digital transformation initiatives on knowledge production in higher education institutions. The choice of the qualitative approach was influenced by the fact that it allowed an in depth knowledge of the experiences, perceptions and reflections of the participants on strategic digital transformation. The study was designed to produce in-depth descriptive data, not numerical measures to reflect the complexities of the institutional change, faculty participation, and research culture changes. The research was framed within a multiple case study design to explore various contexts in a number of universities which had undertaken digital transformation strategies.

Selection of Cases and Context

The identification of higher education institutions that had embarked on digital transformation strategies to improve research and knowledge production was done through a purposeful sampling strategy. The selection of the institutions was determined by their reported adoption of digital systems, strategic digital plans and participation in digital research ecosystems. These criteria were used to ensure that, the cases that were selected were rich in information that could be useful in the research problem. Three universities of different sizes and levels of strategic maturity were taken into the sample, which made it possible to compare various digital transformation paths and the results of research.

Participants and Sampling

The purposeful and snowball sampling methods were used to select participants in order to get a wide range of perspectives in terms of their institutional roles. The sample comprised top administrators in charge of digital strategy, faculty researchers working in digital research ecosystems, and IT staff in charge of supporting digital infrastructure. A total of 25 participants were interviewed, consisting of 10 senior administrators, 10 faculty members and 5 digital infrastructure managers. This sampling plan guaranteed the presence of people who had direct experience with planning, implementation, and experience of the digital transformation processes that impacted knowledge production.

Data Collection Methods

Semi Structured Interviews

The main source of data was semi structured interviews. To understand the perspectives of the participants on the strategies of digital transformation, institutional support structures, faculty involvement, and effects on research, an interview guide was created. The interviews were done both online and face-to-face and lasted between 45-90 minutes. All the interviews were audio-

recorded with the permission of the participants and verbatim transcription was done to analyze the audio interviews. This approach allowed adaptability in the exploration of the experiences of the participants and coverage of the main research topics.

Document Analysis

Analysis of documents was done to supplement the interviews and give a contextual evidence. There was a systematic review of institutional documents like digital strategy plans, annual research reports, and strategic vision statements. These reports provided an idea of the declared organisational intentions, strategic priorities and recorded advancement concerning the digital transformation and knowledge production. The analysis of documents was used to supplement the information of interviews and enhance the validity of the results.

Observation Notes

The researcher kept observation notes during site visits and virtual meetings to be able to record nonverbal cues, situational dynamics, and environmental factors that impacted the practices of digital transformation. These notes added extra information to deepen the insight into the institutional culture and online interaction.

Data Analysis Procedures

Thematic analysis was used to analyze the data, which included systematic coding and development of themes through all the interview transcripts, documents, and observation notes. The data were initially read over again to familiarize with the transcripts. Then, open coding was used to extract significant parts in terms of digital strategies, organisational support, faculty experiences, and the outcomes of knowledge production. Thematically similar codes were clustered and patterns were found within the cases. The data were repeatedly compared to increase the analytical rigor. NVivo programme was adopted to code and manage themes and codes.

Results and Analysis

Digital Transformation Implementation in Universities

Data were analyzed using thematic analysis of interviews, institutional documents, and observation notes. The findings revealed four major themes: digital infrastructure, research support systems, faculty digital competence, and institutional strategy alignment.

Table 1. Key Themes of Digital Transformation in Universities

Theme	Description
Digital Infrastructure	Availability of advanced technological systems such as cloud computing and high-speed networks
Research Support Systems	Institutional tools supporting research activities and collaboration
Faculty Digital Competence	Skills and ability of faculty to use digital technologies effectively
Strategy Alignment	Alignment between digital initiatives and institutional goals

The results showed that the theme of the digital infrastructure became the most prevalent one, and participants were constantly emphasizing the active institutional funding of technological resources. It was noted by faculty and IT staff that high-speed internet, cloud-based systems, and AI-integrated tools greatly helped streamline research workflows, collaborate remotely, and have access to data. This implied that infrastructure served as a catalyst to digital transformation and facilitated the other dimensions in their operations. The research support system theme was moderately developed. Respondents admitted that digital research platforms and databases exist, but they stressed that there was inconsistent uptake by various departments. Digital repositories and collaborative tools were actively used by some faculties and traditional methods were used by others. This difference meant that the systems were not available to be used effectively and that institutional support and standardization were important. The analysis also found that the faculty digital competence was different among individuals and departments. Although most of the participants expressed their knowledge of digital tool usage, some people used self-directed learning because they were not trained in this area. This formed an imbalanced assimilation of digital tools in research practices. Also, strategy alignment was a weaker theme as participants said there was poor communication of digital objectives, and institutional direction. These results indicated that human and organisational factors were a crucial element in determining the success of digital transformation.

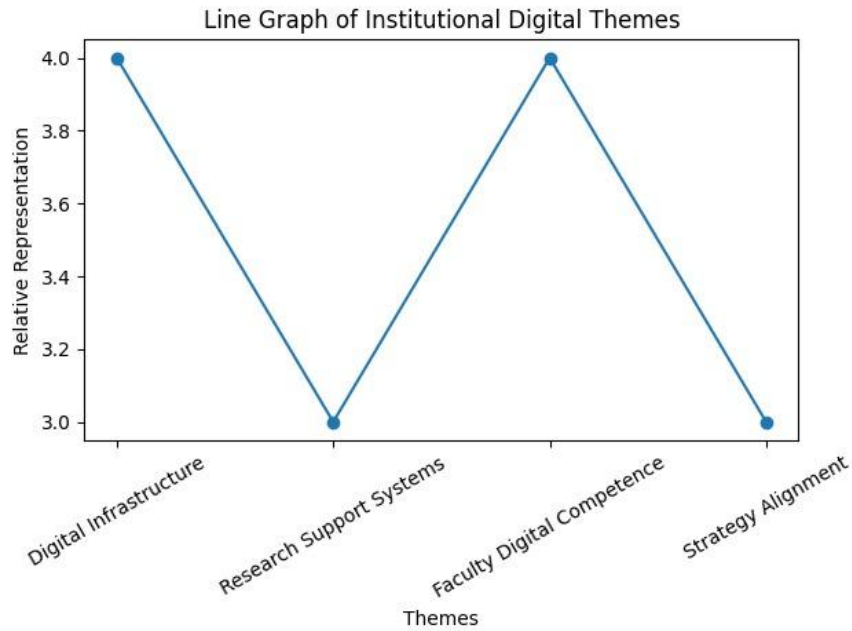


Figure 1. Key Themes of Digital Transformation in Universities

Faculty Engagement with Digital Research Platforms

The analysis identified three key themes related to faculty engagement: frequency of use, integration into research workflows, and perceived usefulness of digital platforms.

Table 2. Themes of Faculty Engagement with Digital Platforms

Theme	Description
Frequency of Use	Regularity of digital platform utilization
Integration in Research Work	Extent to which tools are embedded in workflows
Perceived Usefulness	Faculty perceptions of benefits in research

The results indicated that the frequency of use was always high with the majority of the faculty indicating that they used digital tools regularly to review literature, analyze data and communicate. The respondents noted that digital platforms minimized time limits and enhanced the efficiency of the research process and were considered critical elements of the contemporary academic work. Assimilation into research processes was imbalanced. Although there were faculty members who have completely integrated digital tools in their research activities, others applied them only to certain activities. The interview information showed that structured training

and departmental support played a significant role in the levels of integration. None of the faculty who lacked institutional guidance used their methods effectively as they depended on trial and error. Perceived usefulness was a highly positive theme that participants noted that digital tools facilitated collaboration, access to global data, and increased visibility of research. These results showed that positive perceptions, coupled with ease of use and accessibility, were a key factor in driving digital adoption.

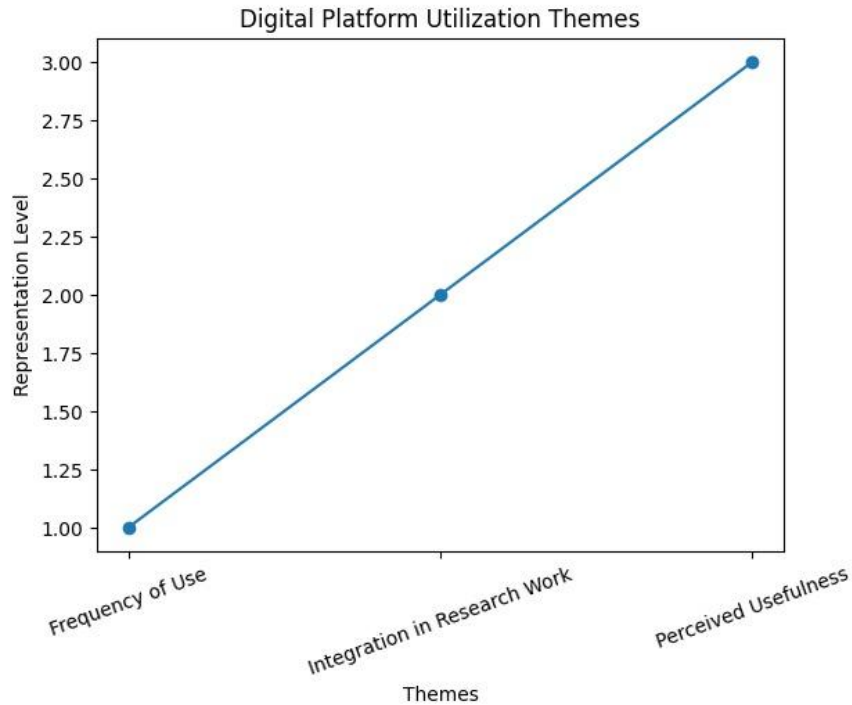


Figure 2. Themes of Faculty Engagement with Digital Platforms

Research Collaboration Across Digital Platforms

Three main themes emerged regarding collaboration: cross-departmental collaboration, international partnerships, and use of collaborative tools.

Table 3. Themes of Research Collaboration

Theme	Description
Cross-Departmental Collaboration	Collaboration within the institution
International Partnerships	Global research collaboration
Use of Collaborative Tools	Utilization of digital tools for teamwork

The results showed that the collaboration between departments was moderate, and digital platforms facilitated communication and sharing of data. Institutional silos and absence of incentives however curtailed more profound collaboration. International collaborations were not that salient, with players pointing at such challenges as time zone disparities, restricted availability to international arenas, and administrative impediments. Nevertheless, digital tools created chances of international interaction that was hard to attain in the past. The implementation of collaborative tools became a powerful theme, and cloud-based platforms, shared workspaces, and communication tools were often used by faculty. These technologies improved coordination, minimized the delays and allowed real-time cooperation, which suggests their key role in contemporary research settings.

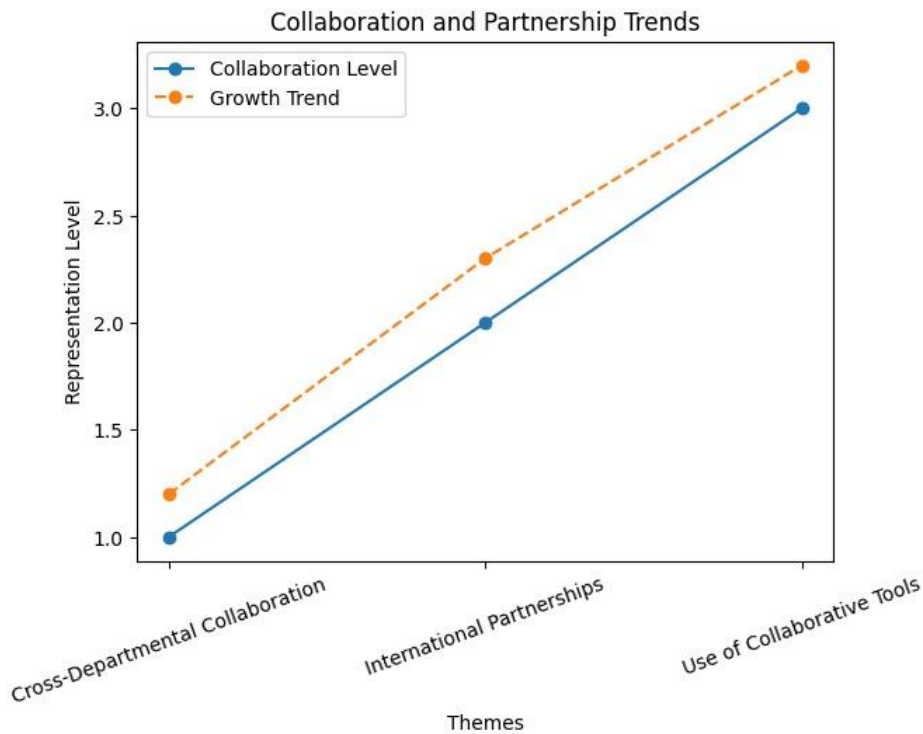


Figure 3. Themes of Research Collaboration

Knowledge Dissemination and Impact

The analysis identified three major themes: repository usage, open-access publishing, and research visibility.

Table 4. Themes of Knowledge Dissemination and Impact

Theme	Description
Repository Usage	Use of institutional digital repositories
Open Access Publications	Engagement with open-access publishing
Research Visibility	Perceived impact and reach of research

The results revealed that the use of repositories was very common, and the faculty was active in institutional platforms to share and archive research outputs. These archives enhanced access and sharing of knowledge. The open-access publishing theme showed a medium level of engagement. Although the participants saw it as important in enhancing research reach, it was hampered by factors like publication costs and institutional guidance. Digital dissemination led to enhanced research visibility with faculty citing more, reaching more audiences and greater academic acknowledgement. The use of digital tools, indexes and analytics were listed as some of the major contributors to this heightened impact.

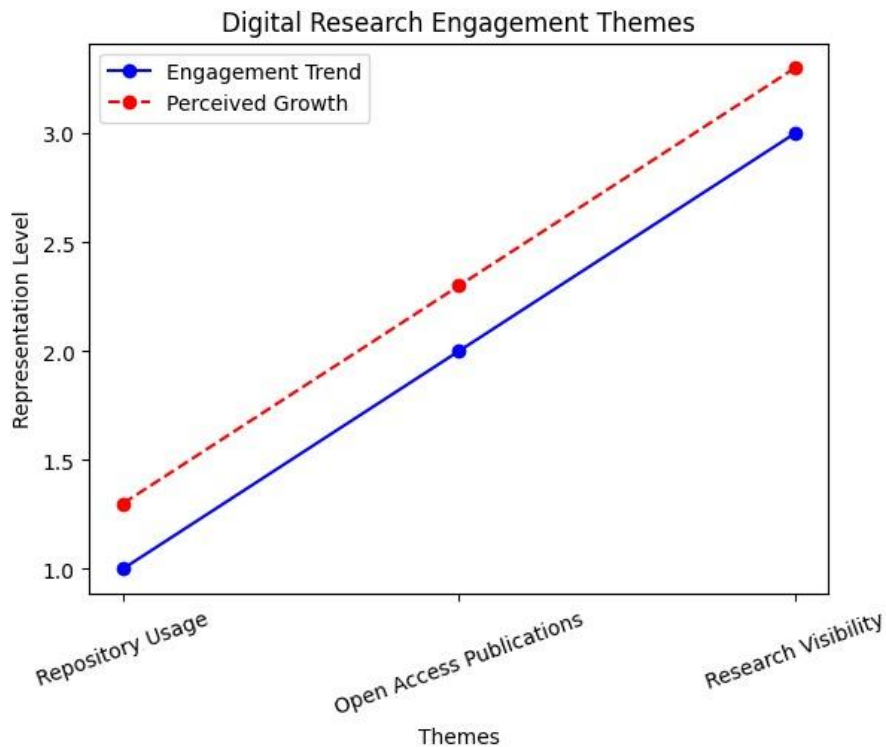


Figure 4. Themes of Knowledge Dissemination and Impact

Discussion

The results of this research have revealed that digital change had a substantial impact on the functions of the faculty, research practices, and production of institutional knowledge in the higher education. More engaged and more self-reported digital self-efficacy members of the faculty had higher research outputs and were more likely to innovate in their scholarly work, which is consistent with current findings of a strong correlation between digital engagement and academic productivity (Alshehri and Drew, 2024; Ifinedo, 2025). This implied that digital transformation was not merely an infrastructural upgrade but a trigger to transform individual research processes and quality of output.

At the organisational level, those institutions that matched digital strategies with definite research goals had more consistent digital ecologies and better knowledge production results. The digital visions in these universities were expressed in a way that they included infrastructure, training, and performance incentives, which reinforced earlier research that strategic alignment increases the effectiveness of digital transformation (Ghobadi and Aurum, 2024; Bouncken et al., 2025). Universities that did not have cohesive digital strategies had poor digital activities, which restricted the influence of digital platforms in the collaborative research capabilities.

Another aspect of organisational culture, which was outlined in the study, was the digital transformation that reinstated the meaning of collaboration and cross-disciplinary research. Digital platforms were associated with better access to global research networks and shared resources by faculty, which is also reflective of larger trends where digitalisation facilitates global research connectivity, interdisciplinary research, and cross-border coauthorship (Tsai et al., 2024; Matarazzo et al., 2025). The developments helped to increase the flow of knowledge, the dissemination of results, and involvement in international scholarship.

The study found out that there were still barriers that moderated the benefits of digital transformation. Digital literacy variability, a lack of access to powerful digital tools, and change resistance continued to be widespread, minimising the consistency of departmental impact. This was in line with the recent literature that suggested that the digital gap in institutions is usually the result of unequal access to the resources, as well as the lack of professional development which resulted in inconsistent adoption of digital research practices (Rodríguez WARRANTIES and Meseguer WARRANTIES Artola, 2024; Papa et al., 2025).

The discussion highlighted the importance of the fact that, although digital transformation has contributed to the increased productivity of research and dissemination of knowledge, the success of the transformation hinged on the long-term investment in human capital, strategic leadership, and supportive policies. Universities that instilled continuous training, digital incentives, and digital maturity tracking were more aligned to capitalize on digital technologies to bring greater research impact (Ainin et al., 2024; Papadopoulou and Charitonos, 2025). This affirmed that digital transformation should be understood as an ongoing institutional change process, not a one-off technological adoption.

Conclusion

The analysis has found that digital transformation in universities was a multidimensional and context-specific process which transformed knowledge production in terms of technological, human, and organisational factors. The results showed that digital infrastructure was a powerful support of changing, allowing to access more sophisticated tools, data systems, and collaborative platforms. Nonetheless, the success of these technological investments was largely dependent on the support provided by institutions in incorporating them in research practices. The support systems of research found to be disproportionately used by various departments, which means that the availability of the research support systems was not a guarantee of effectiveness without organized implementation and institutional direction. The research also found out that digital competence and engagement of the faculty were critical factors in determining the consequences of digital transformation. Although a significant portion of the faculty actively interacted with the digital platforms and saw the value of the tools in increasing efficiency and collaboration in research, access to the tools by way of skills and training showed disparities, leading to uneven adoption of the tools into research processes. Correspondingly, the alignment of institutional strategies became one of the main constraints since the absence of coherent communication of digital objectives and cohesive policies decreased the aggregate influence of digital efforts. The results also revealed that digital platforms enabled collaboration and sharing of knowledge that enhanced research visibility and access to international academic networks albeit with barriers like a lack of support, institutional silos, and resources. Throughout, digital transformation was not only about technology, but about sustained organisational change, strategic orientation, and capacity development, to successfully improve knowledge production in higher education.

Recommendations

It was advised that universities enact extensive digital literacy initiatives that address the faculty and administrative personnel and promote technology adoption. To promote genuine and strategic directions towards digital transformation, leadership development initiatives were proposed. It was recommended that institutions invest in a combination of digital platforms that would enable collaboration, knowledge sharing, and international networking. Open-access publications, repository use, cross-departmental initiatives were encouraged to recommend the maximum visibility and impact of research. Ongoing tracking of digital maturity and adoption performance was stressed to keep up with institutional research goals.

Future Directions

It was suggested that future studies should investigate long-term effects of digital transformation on knowledge production, as well as comparative research studies across different geographic regions. Research into the interaction between digital infrastructure, leadership, and faculty innovation capacity were proposed to optimize institutional strategies. Also, further research may determine how new technologies, including AI-based collaborative tools, can be effective in increasing research productivity and cross-border relationships. Researching how faculty views and experience have changed over the years would offer more insight into maintaining digital transformation in higher education.

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