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Digital Transformation for Sustainable Higher Education in India: A Bibliometric and Thematic Analysis with Faculty Implications

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Abstract

Higher education in India is increasingly being shaped by digital transformation, influencing institutional processes, teaching, learning, administration, and the use of new technologies. Higher education institutions are also expected to support sustainable development through long-term educational quality, institutional innovation, inclusive education, and efficient use of resources. However, current research is scattered across faculty-related concerns, national policies, digital transformation, sustainable higher education, and emerging technologies, with limited integration of these components in the Indian context. This study examines the development of research on digital transformation for sustainable higher education in India through bibliometric and thematic analysis. A dataset of 58 sources was analysed based on publication trends and seven thematic areas: sustainable higher education, digital transformation, national policies, digital technologies, faculty readiness and digital competence, faculty performance and well-being, and bibliometric research. The findings indicate increasing interest in digital trans-formation and emerging technologies, but also reveal limited integration between institutional sustainability, digital transformation, and faculty outcomes. The study highlights faculty readiness, digital competence, workload, and well-being as important considerations for long-term sustainable digital transformation. The findings provide a structured overview of the existing literature and identify areas for future research in Indian higher education.

Keywords: *Digital Transformation, Sustainable Higher Education, Indian Higher Education, Faculty Digital Competence, Digital Technologies, Faculty Well-being, Bibliometric Analysis.*

Introduction

Digital transformation is becoming more significant as higher education is integrating it into the teaching-learning process and other institutional tasks. Digital transformation does not just mean adopting a technology but also involves changes in teaching and pedagogy, institutional strategies, organizational processes, and practices. There have been several studies on this topic. The literature covers studies that focus on different dimensions and examine areas such as digital learning, ICT integration, organizational transformation, and emerging technologies from different perspectives, such as technological, pedagogical, organizational, and strategic. Because digital transformation is being studied from so many angles, the resulting literature sits scattered across disciplines — useful in pieces, but hard to read as a whole. It isn't obvious from the existing studies alone what the dominant themes are, where the gaps lie, or which direction the field is heading. Mapping this literature systematically, through bibliometric and thematic analysis, is what this study sets out to do.

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India has gradually incorporated digital transformation in higher education by using digital platforms for technology-enabled education. NEP 2020 has recognized technology as an important element for teaching, learning, and other institution related tasks. Indian HE is undergoing a broader digital transition, increasingly encompassing online/hybrid education, digital learning, ICT infrastructure, emerging technologies, and other digital resources. Given the scale and diversity of HE systems, there has not been uniformity across all institutions. The institutions vary in infrastructure, resources, technological acceptance and capabilities; therefore, these differences shape both benefits and challenges.

Sustainable higher education extends beyond environmental concerns; it involves institutions' ability to sustain long-term development, quality, innovation, and accessibility. Digital technologies can support flexibility and accessibility in teaching and learning processes. In institutions, digital transformation can improve adaptability to new technology and resilience, which helps in innovation and brings changes in the process of education delivery. Sustainable Development Goal 4 focuses on quality education and long-term development, and these can be achieved by digital transformation through innovation, flexibility, adaptability, and other opportunities. However, sustainable transformation does not depend only on institutions and technologies used; the role of faculty members is equally important.

Since the faculty members are directly involved in the teaching -learning process and other institutional tasks, they play a crucial role in the implementation of digital transformation in HE. As HE increases the use of technology, faculty members should be competent in using digital tools effectively in academic practices. Existing research reveals that digital competence in faculty is beyond technological skills and covers pedagogical knowledge production, information processing, and engagement in digital settings. However, adoption of digital transformation does not depend only on individual readiness or competence; factors such as availability, institutional support, and other conditions also affect the adoption process. The increasing use of technology can also change work in academia, leading to new expectations and challenges for faculty members. The consequences of digital transformation go beyond just adopting the technology; it includes factors such as workload, burnout, long-term viability, and work-life balance.

Digital transformation in HE has been analyzed in the existing literature from multiple perspectives, including sustainability, digital competence, technology adoption, and faculty-related outcomes. However, the studies focus on individual aspects rather than on their interconnections. In Indian HE, existing studies have focused on faculty readiness, digital competence, technology adoption, and online teaching. Sustainability and faculty-related outcomes have also drawn growing attention. However, there is still limited understanding of how these streams intersect to embrace digital transformation and sustainable higher education in India, specifically in terms of faculty members. Hence, a bibliometric and thematic analysis of the research field can offer a prospect of how far the research domain has developed, which manuscripts have triggered such a trend, what themes have been explored, what research foci are emerging, and how digital transformation, sustainability, and faculty interlink. Therefore, the current study aims to explore the research field on sustainable higher education through a bibliometric and thematic analysis of the literature with a specific focus on faculty members. The research will provide a comprehensive understanding of the research field, the main themes, and research clusters, as well as highlight some opportunities for future research and implications for universities and faculty members in India.

Methodology

- **Data Source and Search Strategy**

The literature for this study was collected from Google Scholar. Google Scholar has broad multidisciplinary coverage and includes conference papers, journal articles, and other sources, which was considered suitable as the research topic combines digital transformation, HE, sustainability, and faculty-related research. No restriction was placed on the publication time period, since the study focused on how the research field developed over time. The research is organized around seven thematic areas: Sustainable HE in India, Digital transformation in Indian HE, National Policies driving Sustainable digital transformation, digital technologies enabling sustainable HE, faculty readiness and digital competence, faculty performance and well-being, bibliometric studies in education and sustainability. To search for relevant literature themes, different keyword combinations were used, such as "digital transformation" AND "higher education" AND India, "faculty digital competence" AND "higher education", among others. These keywords were refined during the search based on the relevance of the results obtained.

- **Selection Criteria**

All the papers were selected on the basis of their relevance to the objective of the study. The articles had to address one or more of the following key areas: digital transformation, sustainability, higher education, faculty performance and well-being, faculty readiness and digital competence, and technology adoption. Preference was given to peer-reviewed journal articles and other conference papers. The quality of the source of the paper was considered before actually including it. Where government and institutional reports offered pertinent information about Indian higher education policies and digital transformation projects—such as those from the Ministry of Education, UGC, and AISHE—were also taken into consideration. The final dataset did not include sources that were not pertinent to the research topic or that did not offer enough institutional or scholarly value.

- **Final Dataset**

The final dataset consists of 58 sources, selected according to the above-mentioned criteria. The dataset is organized into seven thematic areas: sustainable higher education, digital transformation, national policy initiatives, digital technologies, faculty readiness and digital competence, faculty performance and well-being, and bibliometric research. The dataset was dominated by journal articles, with relevant conference papers and selected government and institutional reports. Some sources spanned more than one thematic area. The literature was categorised by its relevance to the identified themes. The final dataset was then used for the bibliometric and thematic analysis.

- **Analytical Approach**

A combination of bibliometric and thematic analysis was used in the study to examine the literature selected. The selected sources were examined on the basis of publication year, journal, and other bibliographic data required for understanding the research landscape.

A thematic analysis was conducted to identify the primary areas of the selected literature. Each source was examined for key findings, research gaps, technology studied, and future scope.

A structured literature matrix was created from the bibliographic details, and Microsoft Excel was used for analysis. This hands-on method was deemed suitable considering the size of the dataset and the research's focus on descriptive rather than network-based analysis, rather than relying on specialized bibliometric tools like VOSviewer or Biblioshiny. The findings were then combined to assess the faculty-related effects, research trends, and growth areas of digital transformation for sustainable higher education in India.

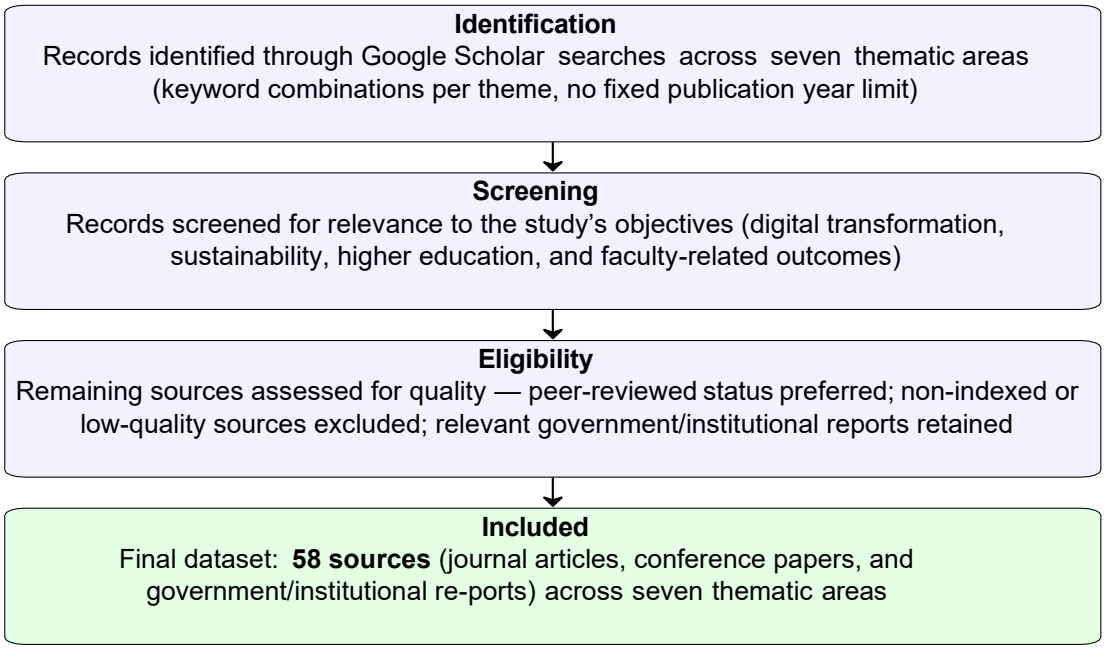


Figure 1: Literature selection process

Results and Analysis

- **Publication Trend**

A study of the publication patterns was carried out in order to examine how scholarly work on transformation sustainable higher education and issues relating to faculty has changed over time. Of the 58 items making up the dataset 55 had identifiable publication years; the other three—namely the conference-proceedings preprint and the AISHE reference portal—did not have assigned publication dates and were therefore left out of the analysis. The dataset shows little publication activity before 2020 with only a few contributions being recorded in both 2010 and 2015 after which there was a steady rise in the number of publications. From 2020 onwards the frequency of publications increased from three per year in 2020 and 2021 to six in 2022 and seven in 2023. The greatest number of publications took place in 2024, 2025 and 2026 with 10, 13 and 11 papers being produced in those years thus indicating continuous scholarly involvement, with this topic in recent times.

Table 1: Number of Papers by Publication Year

Year	Number of Papers
2010	1
2015	1
2020	3
2021	3
2022	6
2023	7
2024	10
2025	13
2026	11

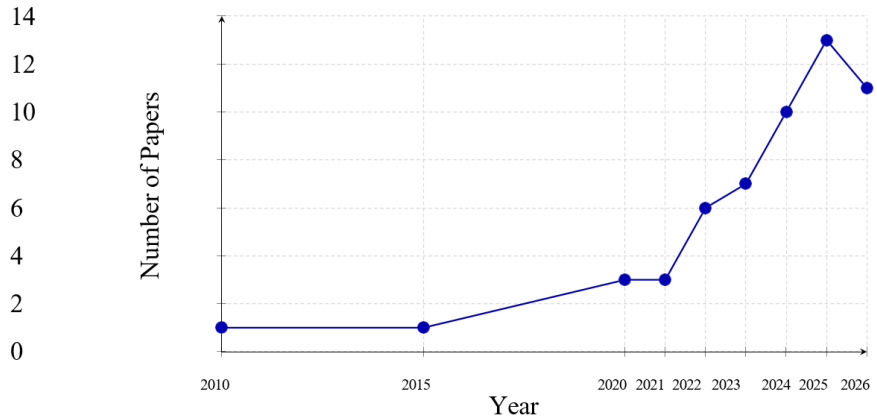


Figure 2: Publication trend by year

- **Distribution of Publications by Journal/Source and Document Type**

The literature selected for this study was gathered from sources, including journals, conference proceedings, and other publications. How the literature is spread across these sources is shown below. This distribution highlights the scope of the study, which looks at digital transformation and sustainable higher education as interconnected topics. The selected works cover areas such as education, digital technologies, sustainability, management, and faculty.

The search was not limited to one journal or publication type. In fact, out of the 54 journals and sources identified, only four journals—Frontiers in Education, Frontiers in Psychology, Discover Sustainability and Education, and Information Technologies—each contributed two papers. All the rest contributed one paper each. While most of the documents came from journals, some were found in conference proceedings. A few came from government and institutional sources. These government and institutional sources were especially useful because they provided details about transformation initiatives in higher education in India.

Another way to understand the nature of the selected literature is by looking at the types of documents. Out of the 58 documents collected, 53 were journal articles, 2 were conference papers, and 3 were government or institutional reports. The data show that journal articles make up the largest portion and represent the main body of scholarly work. Conference papers, though fewer in number, reflect the research directions. The inclusion of government and institutional reports helped add context about policies, trends, and programs in the countries studied.

Table 2 below shows how the selected literature is distributed by document type.

This distribution gives a picture of the publication landscape. In the following sections, this information will be used to carry out an analysis of the literature.

Table 2: Distribution of Selected Publications by Document Type

Document Type	Number of Sources
Journal articles	53
Conference papers	2
Government/ institutional reports	3
Total	**58**

- **Thematic Analysis**

Before looking more closely at specific topics, Table 3 and Figure 4 show how the 58 sources are distributed across seven topics. Some sources cover multiple topics, so the total number exceeds the actual number of unique sources in the dataset.

Table 3: Distribution of Selected Literature Across the Seven Thematic Areas

Theme	Thematic Area	Number of Papers
1	Sustainable Higher Education in India	6
2	Digital Transformation in Indian Higher Education	8
3	National Policies Driving Sustainable Digital Transformation	4
4	Digital Technologies Enabling Sustainable Higher Education	14
5	Faculty Readiness and Digital Competence	8
6	Faculty Performance and Well-being	9
7	Bibliometric Studies in Education and Sustainability	8

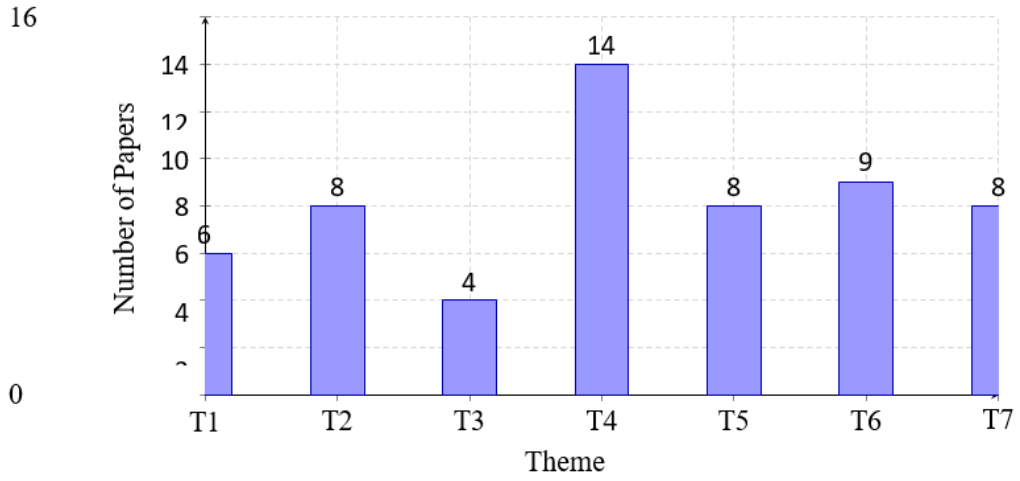


Figure 3: Distribution of Literature Across the Seven Thematic Areas

- **Sustainable Higher Education in India**

The literature on sustainable higher education in India focuses on integrating sustainability into the higher education system through its various components, including curriculum, manage-ment,

pedagogy, research, campus and community culture, and stakeholders. Chhokar (2010) assessed the state of education for sustainable development (ESD) in India through national policies, institutional higher education programs, curricular innovations and community initiatives. The study highlights the need to integrate sustainability into higher education, particularly in university programs, and highlights a number of challenges in implementing ESD, such as poor interdisciplinary communication, traditional modes of assessment, lack of institutional capacity, insufficient resources and inadequate staff qualifications.

Similarly, Bantanur et al (2015) explored the sustainability aspect in higher education institutions in India. This article proposed that the concept of sustainable development should be promoted and implemented in all aspects of organizational operations, including education, research, teaching, and university campuses, and should not be seen as a separate environmental initiative. The researchers concluded that the lack of coordinated efforts, lack of stakeholder participation and comprehensive sustainability assessment poses significant challenges to the sustainable development of India's higher education sector.

One of the major limitations of this literature is that these studies far predate the digital education initiatives and rapid development of new technologies in Indian higher education. These articles do not consider the extent to which digitization, e-learning, artificial intelligence, digital skills and other technologies can contribute to sustainable higher education.

Future research can therefore explore the link between digital transformation and sustainable higher education in India, focusing on the impact of digital technologies, faculty skills, insti-tutional readiness and sustainability-related indicators. Other studies could also be carried out in different typologies of higher education establishments in order to assess the contribution of the last chance measures identified to sustainable higher education.

- **Digital Transformation in Indian Higher Education**

The literature presented revolves around the concept of digital transformation, which is increas-ingly being used in various sectors of higher education in India. Academic papers and books on EdTech and online education have documented a significant increase in the adoption and use of digital technologies in the wake of the coronavirus disease (COVID-19) pandemic and the National Education Policy (NEP) 2020. Critical areas of academic and institutional research on the topic include e-learning, blended learning, online education, digital learning platforms, educational technology, and technology-enhanced learning.

One of the key findings is that digital transformation goes beyond the adoption of individual technologies. Higher education research is seeing changes in teaching and learning practices, forms of assessment, management, user experience, and institutional processes. A bibliographic and systematic review of 408 studies listed in Scopus identified three main areas: Digital technologies in teaching, learning, assessment, and management. User experience. and social inclusion. Other studies have also highlighted the need to move from emergency online learning to long-term organizational digital transformation.

The Indian literature has also identified a number of challenges, including infrastructural issues, the digital divide, faculty readiness, institutional capacity, and other issues related to scaling up. The Indian literature includes an extensive range of studies on Indian EdTech and online education, which have proliferated significantly in recent years, but they have primarily focused on technological adoption and online education, rather than institutional transformation.

An important gap is the limited integration of digital transformation with sustainable higher education in India. Current studies offer limited evidence on the digital maturity level of institutions, their digital resilience, sustainability results, faculty well-being, and the long-term consequences of such digital transformation. Still, several vital studies are global, not concentrated on India-specific trends.

The subsequent investigations can be initiated to explore the aspects of institutional-level digital transformation in the field of Indian higher education, such as digital maturity, infrastructure, inclusion, sustainability, and faculty readiness. Additionally, future studies should be conducted to assess how emerging technologies and national initiatives (e.g., NEP 2020) can promote far-reaching digital transformation.

- **National Policies Driving Sustainable Digital Transformation**

The literature emphasizes the role that national policies and initiatives can play in sustainable and technical higher education in India. Chokar (2010) examined education for sustainable development from the perspective of national policies, university programs, and training initia-tives, but recognized limitations in terms of institutional capacity, resources, interdisciplinary skills, and teacher preparation.

The recent literature includes NEP 2020, Digital India, SWAYAM, NPTEL, DIKSHA, and Academic Credit Bank (ABC) as the innovative initiatives and approaches that have made significant contributions to India's digital education ecosystem. These include a growing number of digital educational resources, online flexible learning methods, and technology-enabled pedagogy. However, the literature also revealed that the adoption of these initiatives and programs may be hampered by infrastructural, digital, institutional, and teacher-related challenges.

An important research limitation is that the sustainability policies and digitalization initiatives are viewed as separate entities. It is evident that previous sustainability studies were conducted before actual digitalization initiatives took place, and recent studies explore the process of transitioning towards a digital platform, not the specific Indian policies to support institutional-level sustainable digital transformation.

Further research is needed to uncover how national educational institution policies impact institutional implementation levels, including how NEP 2020 and digital learning initiatives in various higher education institutions in India impact digital maturity, faculty preparation, inclusivity, quality of education, and sustainability.

- **Digital Technologies Enabling Sustainable Higher Education**

The literature focuses on artificial intelligence (AI), machine learning, the Internet of Things (IoT), blockchain, cloud computing, learning analytics, and immersive technologies such as virtual reality (VR), augmented reality (AR), and extended reality (XR), which are considered key innovations to transform digital education environments. According to Trinh Thi Phuong et al. (2023), an extensive search of 1,329 publications in the Scopus database shows that Industry 4.0 technologies and technology-enhanced learning models have become prominent educational themes to enable flexible learning, personalization, data-driven decision-making, and technology-assisted learning and management processes.

Recent studies have also investigated new emerging fields in artificial intelligence and sustainability in education, including extensive literature on artificial intelligence in education, sustainable education, and learning technologies. Metaverse research also highlights VR, AR, and XR as key innovative learning technologies.

However, much of the literature is global and technical in nature, with little attention to institutional-level sustainability, digital maturity, and regional ecosystem issues in Indian higher education. Further research is needed to assess the impact of new technologies on educational quality, inclusion, sustainability, and digital transformation in the institutional and national context of India.

- **Faculty Readiness and Digital Competence**

The literature emphasizes the need to develop teachers' digital skills and their willingness to use technology as a prerequisite for its successful integration into educational practice. Srivastava and Dangwal (2021) found that only 8.44% of higher education teachers demonstrate an advanced level of digital skills, with 47.56% of respondents corresponding to an intermediate level and 44% remaining at an elementary level. The study identified technical, information management, pedagogical, and digital components of digital competency.

Similarly, research activities define digital competency in terms of a multidimensional construct comprising technical, educational, ethical, communication, and information management skills. According to the survey of university professors in India, the overall e-learning readiness score was 3.74/5, implying that they are relatively prepared to adopt e-learning opportunities but require improvement to achieve sufficient qualification of the workforce.

Furthermore, these studies rely on analyzes of factors related to one or the other (technology or skills) and provide limited evidence on the relationship between technology and skills and academic performance, well-being, technostress, and digital transformation in long-term educational contexts. Future research could explore the role of digital skill development, institutional support, AI readiness, professional growth, and digital maturity in different higher education contexts in India.

- **Faculty Performance and Well-being**

According to the literature reviewed, digital transformation can have both positive and negative impacts on teacher productivity and well-being. Digitization has a positive relationship with academic performance. However, during the COVID-19 transition period, increased use of digital technology was positively correlated with increased workload, time pressure, work-family conflict, increased work-family boundaries, psychological distress, and decreased teaching effectiveness among faculty in Indian higher education institutions.

While other studies have demonstrated that technology acceptance is affected by perceived usefulness, ease of use, and organizational support little existing research explores the long term impact on faculty outcomes as opposed to adoption behavior.

A major gap in research is that no single study has paid attention to the correlations between components of academic performance such as use of digital technology, teacher effectiveness, perceived work-life balance, technostress, burnout, and well-being. Additionally, many articles seek to explore specific aspects related to the COVID-19 pandemic or the use of specific technologies. Therefore, future research should attempt to clarify the impact of digital technologies on teachers' academic performance over time, paying attention to issues such as technological stress, workload, boundary management, institutional support, and the importance of technology use for well-being.

- **Bibliometric Studies in Education and Sustainability**

Bibliometric studies are increasingly used to analyze trends and patterns in the research fields of digital transformation, higher education, and sustainable development. Most articles revealed an increase in related publications and new topics, collaborations, and knowledge structures. The article focused on aspects of digital higher education such as digital learning, artificial intelligence, digital capabilities, sustainability, and new technologies. However, most bibliographic reviews are conducted on a global scale or within a specific technology or education field. To consider the Indian context, further bibliometric research on digital transformation in higher education and sustainability is needed, covering these three pillars: education, transformation, and people, and examining their relationship and impact on educators.

- **Integrated/Cross-theme Analysis**

The thematic analysis revealed that the literature on sustainable digital transformation in higher education is interdisciplinary in nature. National policies and digital initiatives provide the contextual backdrop against which digital transformation occurs, and new technologies such as artificial intelligence, learning analytics, cloud computing, and immersive technologies enable the pedagogical, didactic, and institutional changes that constitute digital transformation. The analysis further established that faculty readiness and digital capabilities are crucial for sustainable technology integration, while digital transformation has the potential to reshape faculty workload, boundaries, stress, and impact. These affect the potential for sustainable digital transformation at the institutional level and thus constitute a key focus area in the research. Therefore, based on the literature, a conceptual understanding emerges: policy support → digital transformation → introduction of new technologies → teacher preparation → teacher outcomes → sustainable higher education. Although the literature focuses on each of these dimensions separately, there is a need to conceptualize the linkages between them at the institutional level in the context of higher education in India.

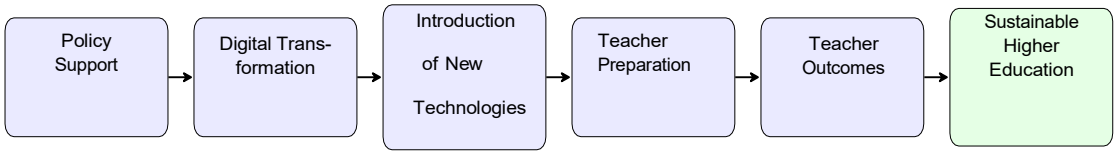


Figure 4: Conceptual chain linking the seven themes: from policy support to sustainable higher education

- **Faculty Implications**

The results suggest that faculty play a key role in sustainable digital transformation of higher education. This transformation requires faculty members to acquire digital, technological, pedagogical, and information-management skills and resources. The results show that digital transformation has the potential to change the way teachers work. On the other hand, the use of technology can increase

teachers' flexibility, allowing them to introduce new teaching methods and better meet challenges. On the other hand, technology could create more work and more challenges to a healthy work-life balance, thus having an impact on faculty's well-being. Technology-enabled sustainable transformation of higher education should, therefore, consider the faculty work process and well-being, besides new technologies and institutional-enabling capacities. For educational institutions, this means investing in faculty development by providing the necessary technology tools and resources, managing workloads, and creating supportive organizational environments that allow faculty to manage their activities. In addition, teachers must prepare for new technologies such as artificial intelligence. Overall, faculty skills and well-being must be considered in the long-term digital transformation of higher education.

Table 4: Synthesis of literature themes and their implications for faculty

Literature Theme	Implication for Faculty
Sustainable Higher Education in India	Faculty are central to embedding sustainability across curriculum, pedagogy, and institutional practice, not as a separate initiative.
Digital Transformation in Indian HE	Faculty must operate within institutions undergoing broader digital transition, often without institutional readiness matching the pace of change.
National Policies Driving Digital Transformation	Faculty roles and expectations shift as national initiatives (NEP 2020, Digital India, SWAYAM) are implemented at the institutional level.
Digital Technologies Enabling Sustainable HE	Faculty need to adapt to emerging technologies (AI, learning analytics, immersive tools) as they are introduced into teaching and management.
Faculty Readiness and Digital Competence	Faculty require technical, pedagogical, information-management, and ethical dig-ital competencies, which require ongoing development.
Faculty Performance and Well-being	Increased technology use is linked to higher work-load, technostress, and work-life boundary challenges alongside potential gains in flexibility.
Bibliometric Studies in Education and Sustainability	Highlights the need for India-specific, faculty-centered research connecting digital transformation and sustainability outcomes.

Discussion

The results show that research on the relationship between digital transformation and sustainable higher education is on the rise, especially since the COVID-19 pandemic. However, from a literature review perspective, published works are fragmented regarding digital technology, sustainability, institutional reforms, and teacher-related issues applied to the Indian higher education system. The results also showed that while technology is an essential element in achieving sustainable digital transformation, national policies, institutional sustainability, infrastructure and teachers' digital skills need to be considered. Additionally, the impact of technology on teacher workload and well-being requires close attention. The findings of this study therefore highlighted the importance of an integrated approach to understanding sustainable digital transformation through the linkages between national policies, technology, institutional sustainability, faculty capacity and well-being, with a focus on higher education in India. This study provides a theoretical framework for further research on sustainable digital transformation in higher education.

Research Gaps and Future Research Directions

The review highlights several areas of concern. First, while the literature explores the themes of digital transformation and sustainability, these topics are considered separately and there is a lack of emphasis on their intersection in the context of the Indian HE sectors. Second, while either technology adoption or online learning is emphasized in the literature, it is clear that not enough attention has been paid to broader digital transformation and its associated sustainability outcomes. Third, the literature has paid little attention to teacher preparedness, digital competency, workload, health status, and related long-term effects.

Future research efforts may explore digital transformation at the organizational level, considering factors such as digital maturity, infrastructure, inclusion, sustainability, and faculty preparation. Additionally, the impact of NEP 2020 and new technologies such as AI should be studied in more detail. Longitudinal and cross-sectional comparative studies covering different categories of higher education institutions in India can be an excellent way to achieve the research objectives and contribute to digital transformation research.

Conclusion

This study examined the evolving research on sustainable higher education transformation in India. A thematic analysis of 58 sources was used. As a result, we have seen an increasing number of people interested in change, new technologies, sustainability and teacher-related issues, especially in recent years. Research is still extensive and there are few connections between organizational sustainability, digital transformation, and teacher outcomes.

This study highlights that the use of new technologies alone is not sufficient for sustainable transformation. Policy support, institutional preparedness, appropriate technology, teacher digital skills, and health status all need to be considered together. The findings also suggest that India- and institution-specific research is needed to see how sustainable digital transformation occurs over time.

Overall, this study provides an overview of existing research and highlights opportunities for further research on sustainable digital transformation in Indian higher education.

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