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PERSPECTIVE ARTICLE

ARTIFICIAL INTELLIGENCE AND DIGITAL TRANSFORMATION IN INDIAN HIGHER EDUCATION: OPPORTUNITIES, CHALLENGES, AND IMPLICATIONS FOR SOCIO-ECONOMIC DEVELOPMENT

Inteligência Artificial e Transformação
Digital no Ensino Superior Indiano:
Oportunidades, Desafios e Implicações para
o Desenvolvimento Socioeconômico

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ABSTRACT | Background: Artificial intelligence (AI) is becoming an important part of digital transformation in higher education. Unlike earlier forms of digitalization that mainly focused on providing online information and services, AI can support learning, academic work, administration and research through data-based and automated applications. In India, this development is taking place alongside policies aimed at improving digital education, technological skills and human-capital development. **Objective:** This paper examines the role of AI as an advanced stage of digital transformation in Indian higher education. It also discusses how AI-supported changes in higher education may contribute to human-capital formation and, in the longer term, to socio-economic development. **Methods:** The study uses an integrative review of peer-reviewed literature and relevant policy documents published mainly between 2019 and 2026. Sources include research on AI in higher education, generative AI, AI literacy and digital transformation, along with UNESCO guidance, India's National Education Policy 2020 and recent IndiaAI initiatives. The literature was reviewed under six themes: access and personalization, teaching and academic work, assessment and academic integrity, AI literacy and employability, inclusion and inequality, and governance. **Results:** The review shows that AI can support personalized learning, faculty work, research activities, administrative processes and the development of AI-related skills. However, these benefits depend on institutional preparedness and responsible use. Problems related to unequal access, faculty readiness, data privacy, algorithmic bias, academic integrity and excessive reliance on automated outputs may limit the benefits of AI. **Conclusion:** The paper proposes a human-centred pathway connecting digital infrastructure, AI capability, educational transformation, human-capital formation and socio-economic development. It argues that AI adoption in Indian higher education should



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focus not only on technology but also on institutional capacity, faculty development, student AI literacy, equitable access and responsible governance.

Keywords | Artificial Intelligence; Digital Transformation; Higher Education; AI Literacy; Human Capital; India; Socio-Economic Development; Generative AI.

RESUMO | Contexto: A inteligência artificial (IA) está se tornando uma parte importante da transformação digital no ensino superior. Diferentemente das formas anteriores de digitalização, que se concentravam principalmente na oferta de informações e serviços on-line, a IA pode apoiar a aprendizagem, o trabalho acadêmico, a administração e a pesquisa por meio de aplicações baseadas em dados e processos automatizados. Na Índia, esse desenvolvimento ocorre paralelamente a políticas voltadas para a melhoria da educação digital, das competências tecnológicas e do desenvolvimento do capital humano. **Objetivo:** Este artigo examina o papel da IA como uma etapa avançada da transformação digital no ensino superior indiano. Também discute como as mudanças apoiadas pela IA no ensino superior podem contribuir para a formação de capital humano e, a longo prazo, para o desenvolvimento socioeconômico. **Métodos:** O estudo utiliza uma revisão integrativa da literatura acadêmica revisada por pares e de documentos relevantes de políticas públicas publicados principalmente entre 2019 e 2026. As fontes incluem pesquisas sobre IA no ensino superior, IA generativa, alfabetização em IA e transformação digital, além das orientações da UNESCO, da Política Nacional de Educação da Índia de 2020 e de iniciativas recentes da IndiaAI. A literatura foi analisada em seis temas: acesso e personalização, ensino e trabalho acadêmico, avaliação e integridade acadêmica, alfabetização em IA e empregabilidade, inclusão e desigualdade, e governança. **Resultados:** A revisão mostra que a IA pode apoiar a aprendizagem personalizada, o trabalho docente, as atividades de pesquisa, os processos administrativos e o desenvolvimento de competências relacionadas à IA. No entanto, esses benefícios dependem da preparação institucional e do uso responsável da tecnologia. Problemas relacionados ao acesso desigual, à preparação dos docentes, à privacidade dos dados, ao viés algorítmico, à integridade acadêmica e à dependência excessiva de resultados automatizados podem limitar os benefícios da IA. **Conclusão:** O artigo propõe uma abordagem centrada no ser humano que conecta infraestrutura digital, capacidade de IA, transformação educacional, formação de capital humano e desenvolvimento socioeconômico. Argumenta-se que a adoção da IA no ensino superior indiano deve considerar não apenas a tecnologia, mas também a capacidade institucional, o desenvolvimento dos docentes, a alfabetização dos estudantes em IA, o acesso equitativo e a governança responsável.

Palavras-chave | Inteligência Artificial; Transformação Digital; Ensino Superior; Alfabetização em IA; Capital Humano; Índia; Desenvolvimento Socioeconômico; IA Generativa.

INTRODUCTION

Digital transformation in higher education is no longer limited to converting printed records or classroom materials into digital formats. Universities and colleges are increasingly using learning-management systems, cloud-based platforms, learning analytics, digital research tools and other data-driven technologies in their academic and administrative activities. More recently, artificial intelligence (AI), including generative AI (GenAI), adaptive learning systems, intelligent tutoring and automated feedback tools, has added another dimension to this process. AI is different from many earlier digital technologies because it can analyse information, identify patterns, generate content and provide responses based on user inputs. Its growing use therefore has implications not only for the tools used by educational institutions but also for the way teaching, learning, research and academic work are organized.

This development is particularly important for India. The country has been expanding digital access in education while also preparing students for a labour market increasingly influenced



by automation, data and artificial intelligence. The National Education Policy (NEP) 2020 gives considerable attention to the use of technology for improving access, equity and quality in education. It also encourages research and education in emerging areas, including artificial intelligence, machine learning and multidisciplinary fields combining AI with other disciplines (Ministry of Education, 2020). Subsequent initiatives associated with the NEP, including the National Digital Education Architecture and the National Education Technology Forum, further indicate the growing role of technology in the Indian education system (Ministry of Education, 2025; Shabbir & Porwal, 2025). For higher education, this shift creates both an opportunity to improve existing educational processes and a need to prepare students for an increasingly technology-oriented economy.

India's AI policy environment has also expanded in recent years. The IndiaAI Mission includes initiatives related to AI education, skills and research, while AIKosh provides access to datasets, models, tools and use cases intended to support students, researchers and other users. These developments indicate that AI is being considered not merely as an emerging technology but as a broader ecosystem involving skills, research, infrastructure and applications (IndiaAI, 2026a, 2026b). Higher-education institutions consequently have an important role to play in developing the knowledge and capabilities needed to participate in this changing economic environment.

The expansion of AI, however, should not be equated with automatic improvement in educational outcomes. The benefits of AI depend on how the technology is introduced, who has access to it and whether institutions have the capacity to use it appropriately. UNESCO has emphasized the importance of human agency, inclusion, equity, cultural and linguistic diversity, privacy and responsible governance in the use of AI in education (Miao et al., 2021; Miao & Holmes, 2023). The need for institutional preparedness is also evident from UNESCO's global survey, which reported that fewer than 10% of the surveyed schools and universities had formal guidance on generative AI (UNESCO, 2023a). This suggests that the rapid availability of AI tools has, in many cases, developed faster than institutional policies and practices for their responsible use.

The academic literature presents a similarly mixed picture. AI-based applications have been associated with opportunities for personalized learning, feedback, administration and other forms of academic support. At the same time, research in higher education has pointed to limited pedagogical integration and the need to give greater attention to educators and educational contexts rather than focusing only on technological capabilities (Chen et al., 2020; Zawacki-Richter et al., 2019). The emergence of generative AI has added further questions concerning academic integrity, assessment, reliability of AI-generated information and the preparedness of institutions and teachers (Lee et al., 2024; Tlili et al., 2023). In the Indian context, recent research has also started to examine AI literacy in higher education in relation to the broader vision of Viksit Bharat 2047 (Rehman et al., 2025). However, there is still scope for a broader conceptual discussion that connects AI-enabled changes in higher education with digital transformation, human-capital development and socio-economic outcomes. Recent studies also suggest that AI readiness is becoming an important issue for both students and educators. Research on higher education has examined the development of AI literacy among students and the preparedness of teachers to use AI in teaching, while studies from the Global South have highlighted students' growing engagement with generative AI as well as the challenges associated with its use (Lintner, 2024; Baidoo-Anu et al., 2024).



Against this background, the present paper examines AI as an emerging layer of digital transformation in Indian higher education. Rather than treating AI adoption simply as the introduction of new technological tools, the paper considers the institutional and human capabilities required to convert AI adoption into meaningful educational outcomes. It focuses on three questions: **(1)** How does AI extend the meaning of digital transformation in Indian higher education? **(2)** What opportunities and challenges does AI-enabled transformation create for students, faculty and institutions? and **(3)** Through what mechanisms can responsible AI adoption contribute to human-capital formation and wider socio-economic development?

The paper addresses these questions through an integrative review of relevant literature and policy documents. The discussion first examines the transition from digitalization to digital transformation and reviews major applications and challenges associated with AI in higher education. It then considers the Indian policy and institutional context before developing a conceptual pathway linking **digital infrastructure, AI capability, educational transformation, human-capital formation and socio-economic development**. The paper concludes by discussing the implications of this framework for higher-education institutions and policymakers in India.

LITERATURE REVIEW

From Digitalization to Digital Transformation

The use of digital technologies in education has developed considerably over time. Earlier efforts were largely concerned with making information and services available in digital form through online repositories, learning-management systems and electronic administrative processes. With wider use of digital platforms and data, the focus has gradually moved toward changes in teaching practices, institutional processes and decision-making. In this broader sense, digital transformation involves changes in how educational institutions operate and deliver their academic and administrative functions. The growing use of artificial intelligence (AI) adds a further dimension to this process because AI systems can analyse data, identify patterns, generate content, automate selected tasks and provide outputs based on user requirements (Porwal & Shabbir, 2026).

The literature on AI in education shows that these capabilities can be applied across several areas of higher education. Chen et al. (2020) identify administration, instruction and learning among the major areas in which AI has been applied and discuss the potential of adaptive systems to tailor educational content to individual learners. Similarly, Zawacki-Richter et al. (2019), in their systematic review of AI applications in higher education, identify research on profiling and prediction, assessment and evaluation, adaptive systems and intelligent tutoring. At the same time, their review points to the relatively limited representation of educators in the research literature. This observation is important because the introduction of AI into an institution is not only a technical issue. Its value also depends on how teachers use these systems, how they fit into existing pedagogical practices and whether they improve students' learning experiences and outcomes. Recent research also suggests that the institutional use of generative AI is becoming an important part of this transformation. A comparative analysis of university policies across different



regions found that institutions are increasingly addressing AI through academic integrity, teaching and learning, equity, and the definition of responsibilities for students, faculty and administrators (Jin et al., 2025).

From this perspective, AI-enabled digital transformation can be viewed as a gradual development rather than a single technological change. At an initial stage, institutions digitize information, records and services. A subsequent stage involves connecting digital platforms and using data across different institutional functions. AI can extend this process by introducing capabilities such as prediction, personalization, automation and content generation. The contribution of these capabilities to socio-economic development, however, depends on whether they result in meaningful improvements in learning, skills, innovation and participation in the digital economy. Technology alone does not establish such an outcome.

AI in Higher Education: Opportunities

One of the frequently discussed applications of AI in higher education is the personalization of learning. AI-based systems can adjust learning materials, feedback or the pace of instruction according to information available about individual learners. This may be particularly useful in large and diverse higher-education systems, where providing individualized academic support to every student can be difficult. AI tools can also be used for formative assessment, question generation, language assistance, feedback and learning analytics. These applications suggest that AI can supplement conventional teaching practices when it is used for appropriate educational purposes.

AI also has implications for the work of teachers and other academic staff. Generative AI, for example, can assist with developing teaching materials, generating examples, summarizing information, exploring ideas and preparing alternative assessment activities. Such uses are better understood as forms of academic support rather than as substitutes for teachers. Teaching involves interpretation, communication, mentoring and contextual judgment, and these aspects cannot be adequately represented by automated outputs alone. Evidence from educators also suggests that meaningful adoption requires institutional support and professional development so that teachers can understand both the possibilities and limitations of AI tools (Lee et al., 2024). This issue is also reflected in recent research on AI readiness among educators. Kohnke et al. (2025), for example, found that future educators recognized the potential of AI for improving teaching and personalized learning but also expressed concerns about over-reliance on AI and the loss of the human element. The study further pointed to the importance of training and institutional support for developing AI literacy.

The potential applications extend beyond classroom teaching. AI can support administrative activities through document processing, student-service systems, chatbots and data-informed planning. In research, AI-based tools can assist with literature discovery, coding, data processing and the organization of information. If used appropriately, such applications may reduce time spent on repetitive activities and allow academic staff to focus more on teaching, research and other tasks requiring professional judgment. AI literacy should therefore be understood as a broader capability rather than simply the ability to operate an AI tool. A systematic review of AI literacy



measures found substantial variation in how AI literacy is defined and assessed across learners and teachers, suggesting that the concept includes several dimensions of knowledge and capability (Lintner, 2024). Recent studies further suggest that AI literacy is related to students' confidence in using AI and the quality of their AI-supported work, while broader research connects AI literacy with lifelong learning and adaptation to technological change (Bećirović et al., 2025; Polat, 2025).

Another important area is the development of AI literacy among students. In an economy in which AI is becoming increasingly common, digital competence may need to extend beyond the ability to operate conventional digital tools. Students may also need to evaluate AI-generated information, recognize limitations and biases, protect personal data and use AI tools responsibly. These capabilities are increasingly relevant to employability because graduates are likely to encounter AI-supported systems in a range of professional settings. In the Indian context, Rehman et al. (2025) connect AI literacy in higher education with the broader vision of Viksit Bharat 2047, highlighting the importance of preparing learners for an increasingly AI-oriented environment.

Risks and Challenges

The growing use of AI in higher education also raises concerns that need to be considered alongside its potential benefits. Academic integrity has become particularly important with the spread of generative AI because such systems can produce written responses and other forms of content with relatively little effort from the user. The issue, however, extends beyond whether students use AI to complete assignments. It also concerns whether existing assessment methods continue to provide a reliable indication of students' reasoning, originality, application of knowledge and actual learning. For this reason, institutions may need to reconsider assessment practices and give greater attention, where appropriate, to process-based, project-oriented, oral and context-specific forms of evaluation. Privacy and data governance represent another area of concern. AI systems may rely on information relating to students, teachers and institutional activities. This raises questions about how data are collected, stored and used, as well as who has access to them and for what purposes. UNESCO's guidance on AI in education emphasizes the importance of data protection and human-centred governance (Miao & Holmes, 2023). In addition, algorithmic bias can become a concern when AI systems are developed or evaluated using datasets that do not adequately represent different social, linguistic or cultural groups. Access is another important consideration in the Indian context. Students who have reliable internet connectivity, suitable devices, paid access to advanced AI tools and stronger digital skills may be able to benefit more from AI than those who lack these resources. As a result, differences in digital access can also become differences in access to AI-supported educational opportunities. India's considerable regional, socio-economic and linguistic diversity makes this issue particularly relevant when considering the broader implications of AI in higher education. There is also a concern that excessive reliance on AI may affect students' independent thinking. When learners use AI to perform tasks that require them to reason, analyse or solve problems themselves, the technology may reduce rather than strengthen the intended learning process. AI is therefore more useful when it supports students' thinking rather than replacing it. UNESCO's human-centred approach similarly emphasizes the



importance of maintaining human agency in the use of AI for education (Miao & Holmes, 2023). For higher-education institutions, the challenge is consequently to establish conditions under which AI can provide useful academic support while maintaining educational objectives, human judgment and student responsibility. Recent empirical evidence shows why this concern is important. A study of Australian university students found that more than one-third of respondents had used chatbots to assist with assessments, while students did not always view such use as a violation of academic integrity (Gruenhagen et al., 2024). This suggests that institutions need clearer expectations about acceptable AI use rather than relying only on prohibition. AI Assessment Scale similarly argues for assessment approaches that make the permitted role of AI explicit and retain a clear focus on the learning outcomes being assessed (Furze et al., 2024).

Theoretical Foundations

The proposed framework draws on Human Capital Theory and the Technology Organization Environment (TOE) framework. Human Capital Theory views education and skills as investments that improve individual capabilities and contribute to economic development (Schultz, 1961; Becker, 1964). In this context, AI literacy and related digital skills can be considered emerging components of human capital, helping students develop capabilities relevant to an increasingly AI-oriented labour market. The TOE framework explains technology adoption through technological, organizational and environmental conditions (Tornatzky & Fleischer, 1990). For higher-education institutions, these conditions include digital infrastructure, faculty readiness, institutional policies, resources and the wider policy environment. Thus, access to AI tools alone may not lead to meaningful educational outcomes.

Together, these perspectives support the pathway proposed in this study: digital infrastructure and AI capability can facilitate educational transformation, which may strengthen human capital and contribute to socio-economic development when supported by institutional readiness and responsible governance.

INDIAN HIGHER EDUCATION IN THE AI-DRIVEN DIGITAL TRANSFORMATION

India's transformation in higher education is closely connected with the country's wider expansion of digital infrastructure and technology-enabled services. Digital public infrastructure, online learning platforms, digital payments, digital identity systems, internet connectivity and technology-based public services have become increasingly important in everyday social and economic activities. Higher-education institutions are part of this process in two ways. They use digital systems in their own academic and administrative work, while also preparing graduates who will work with and contribute to a digital economy.

The **National Education Policy (NEP) 2020** provides an important policy basis for the use of technology in education. The policy gives attention to technology as a means of improving access, equity and quality and identifies areas such as artificial intelligence and machine learning among the emerging fields for which appropriately trained professionals will be required (Ministry of



Education, 2020). Its emphasis on multidisciplinary education and research is also relevant to the development of an “AI + X” approach. Under such an approach, AI-related knowledge can be combined with disciplines such as commerce, management, economics, education, health, agriculture and law rather than being treated only as a specialized technical field.

The **IndiaAI Mission** represents a further development in this policy environment. IndiaAI identifies FutureSkills as an area supporting AI education, research and practical applications and has also introduced fellowship support for doctoral research related to AI. The AIKosh initiative provides access to datasets, models, tools and use cases for students, researchers and other users. Together, these initiatives indicate that AI capability is being developed through several interconnected areas, including skills, research, infrastructure and practical applications (IndiaAI, 2026a, 2026b).

The availability of national initiatives, however, does not mean that all higher-education institutions are equally prepared to use AI. An institution may already have learning-management systems, online course materials and other digital facilities while still having limited capacity to deal with generative AI. For example, faculty members may require training, students may have limited AI literacy, existing assessment practices may not be designed for widespread AI use, and institutional procedures for data governance may still be developing. **Digital maturity and AI readiness should therefore be considered related but distinct capabilities.** An institution can be relatively advanced in digital adoption without necessarily being ready for the pedagogical, ethical and organizational changes associated with AI.

Table 1. Dimensions of AI-enabled digital transformation in Indian higher education

Dimension	Examples	Potential contribution
Digital infrastructure	Connectivity, cloud platforms, LMS, digital repositories and computational access	Creates the technical foundation for AI-enabled services
Pedagogical transformation	Adaptive learning, intelligent tutoring, feedback, content generation and learning analytics	Can improve personalization and instructional support
Faculty transformation	AI-assisted preparation, research support, assessment redesign and professional development	Augments academic work while preserving human judgment
Student capability	AI literacy, prompt literacy, critical evaluation, digital ethics and employability skills	Strengthens human capital for an AI-intensive economy
Institutional transformation	AI governance, data systems, administrative automation and strategic planning	Improves efficiency and evidence-informed decision-making
Societal transformation	Inclusion, accessibility, lifelong learning, innovation and digital participation	Connects higher education to wider socio-economic development

Source: Compiled by Authors

METHODOLOGY

This study uses an integrative review of research literature and policy documents. This approach is suitable for a perspective article because the purpose of the study is to bring together existing evidence and policy developments rather than to estimate the causal effect of AI adoption.



The review is used to examine how AI-enabled digital transformation may affect higher education in India and how these changes can be related to human-capital formation and wider socio-economic development.

The sources considered in the review fall into three broad groups. The first includes policy and guidance documents issued by UNESCO, the Government of India and IndiaAI. The second comprises peer-reviewed studies dealing with AI in education and higher education, generative AI, AI literacy and digital transformation. The third includes recent India-focused research concerning higher education and preparedness for AI. Publications from **2019 to 2026** were given priority, while earlier or foundational studies were retained where they were useful for establishing the conceptual background of the discussion.

The analysis followed a thematic approach. The selected literature and policy documents were examined for recurring issues relating to the opportunities associated with AI, institutional preparedness, potential risks and possible socio-economic implications. These issues were then organized into six broad areas: **(i) access and personalization, (ii) teaching and academic work, (iii) assessment and academic integrity, (iv) AI literacy and employability, (v) inclusion and inequality, and (vi) governance and responsible AI**. The themes were subsequently considered in relation to a human-capital pathway through which changes in higher education may influence skills, employability, productivity, innovation and participation in the digital economy.

No primary data were collected from students, faculty members or higher-education institutions for this study. The paper therefore does not attempt to measure the prevalence or extent of AI adoption among Indian students or faculty. Its findings should instead be understood as a conceptual synthesis of existing research and policy evidence. This approach is consistent with the purpose of the article, which is to develop an explanatory framework rather than to provide statistical estimates of AI adoption or its effects.

Analytical Propositions

The themes identified through the review provide the basis for four propositions. These propositions are intended to guide future empirical research rather than to represent statistically tested hypotheses.

- **P1:** AI-enabled digital transformation can improve personalization, accessibility and responsiveness in higher education when adequate digital infrastructure and human support are available.
- **P2:** AI literacy and faculty readiness can help translate AI adoption into meaningful educational outcomes and improved employability.
- **P3:** Institutional readiness and responsible governance can influence whether AI adoption produces positive educational and socio-economic outcomes.
- **P4:** Equitable access to AI infrastructure, skills and support is important for ensuring that AI-enabled higher education contributes to inclusive socio-economic development rather than widening existing inequalities.



RESULTS AND DISCUSSION

AI changes the meaning of digital transformation

The review suggests that AI represents an important extension of digital transformation in higher education. Earlier forms of digitalization mainly improved access to information and online services, whereas AI can add capabilities such as prediction, personalization, content generation and automation. As a result, universities can move from simply providing digital content towards using digital systems that respond to learner needs and support institutional decision-making. AI transformation affects several functions of higher-education institutions at the same time. Katsamakos et al. (2024), using a systems approach, show that AI can influence teaching, research, administration and student employability, while also creating challenges related to academic integrity and changing labour-market requirements. This supports the view that AI adoption should be considered as part of wider institutional transformation rather than as the introduction of an individual technology. However, the transition is not automatically beneficial. AI systems depend on the quality of data, institutional objectives and the way they are integrated into existing practices. A university may automate a process without improving its underlying quality. The important issue is therefore not how many AI tools an institution uses, but whether their use produces meaningful improvements in teaching, learning, research and institutional performance. For this reason, AI readiness should be understood in terms of **capability and institutional purpose**, rather than technology adoption alone. This also supports the framework proposed in this study, in which digital infrastructure and AI capability are treated as starting conditions for educational transformation rather than as direct determinants of socio-economic development.

Personalization and learning support

Personalized learning is one of the areas in which AI has considerable potential. Intelligent tutoring systems, recommendation tools, adaptive learning materials and automated formative feedback can provide students with additional academic support and help identify areas in which further learning may be required. This possibility is particularly relevant to large higher-education systems, where teachers may not always have sufficient time to provide individualized assistance to every student. Previous reviews have identified adaptive systems and personalization among the important areas of AI application in education (Chen et al., 2020; Zawacki-Richter et al., 2019). Recent empirical evidence suggests that AI-supported personalized learning can improve student engagement and academic outcomes when learning pathways are adapted to individual needs (Naseer et al., 2024).

At the same time, algorithmic personalization should not be treated as equivalent to individualized education. AI systems can identify patterns in learner behaviour, but they cannot fully understand the social, emotional and contextual factors that may explain those patterns. Teachers continue to play an important role in interpreting student needs, providing motivation and mentoring, and making judgments that require contextual understanding. AI is therefore more appropriately viewed as a support for teaching and learning rather than a replacement for the



teacher. Recent evidence also indicates that students' engagement with generative AI differs across academic disciplines, suggesting that AI-supported learning should take account of disciplinary context and learner needs (Qu et al., 2024).

Faculty augmentation and changing academic work

The use of AI is also likely to influence the everyday work of academic staff. Generative AI can assist teachers with preparing learning materials, developing examples, organizing information and exploring possible assessment activities. These uses may reduce some routine workload and allow faculty members to devote more time to activities that require academic judgment. Evidence from educators also points to the need for institutional support and professional development if AI is to be integrated meaningfully into teaching (Lee et al., 2024). AI literacy similarly suggests that teachers need both confidence and institutional support to use generative AI effectively. A 2025 study of higher-education educators identified AI literacy as an important factor in the development of AI-supported teaching practices (Ayyoub et al., 2025).

This change also creates new responsibilities for teachers. Faculty members may increasingly need to check AI-generated information, explain its limitations to students, redesign assessments and establish appropriate boundaries for AI use. The teacher's role may therefore become less focused on the transmission of information alone and more concerned with guiding learning, evaluating evidence and developing students' ability to think critically about information generated with AI assistance.

AI literacy as a component of human capital

The relationship between AI and socio-economic development becomes clearer when AI literacy is considered as part of human-capital development. Graduates who can use AI tools appropriately, assess the reliability of their outputs, interpret data, protect sensitive information and recognize ethical limitations may be better prepared for workplaces where AI-supported systems are becoming more common. This does not mean that all students need advanced programming skills. The level and type of AI competence required will differ across academic disciplines and occupational roles.

India's emphasis on multidisciplinary education provides an opportunity to develop these capabilities across fields. Students of commerce, for example, may benefit from AI-supported analytics and financial-technology applications, while management students may require skills related to AI-assisted decision-making. Students in the social sciences may need stronger data and algorithmic literacy, whereas students preparing for careers in education may require competencies related to the pedagogical use of AI. The broader objective is to develop graduates who can work effectively with AI while retaining the ability to evaluate and question its outputs.

Recent Indian research has similarly highlighted the relevance of AI literacy to higher education and the longer-term objective of Viksit Bharat 2047 (Rehman et al., 2025). The present paper extends this discussion by placing AI literacy within a wider pathway connecting digital transformation,



educational change and human-capital formation. AI literacy and readiness are not uniform across students, with demographic differences potentially shaping perceived benefits, challenges and preparedness for generative AI (Maxwell et al., 2025).

Inclusion, language and the digital divide

AI also has the potential to improve access to education through translation, accessibility features, conversational interfaces and adaptive forms of learning support. These applications may be particularly useful for students who face linguistic, physical or other barriers to conventional educational resources. At the same time, access to AI is not evenly distributed. Students with reliable connectivity, suitable devices, stronger digital skills and access to advanced paid tools may be in a better position to benefit from AI than students without these resources.

The issue is especially relevant in India because higher education serves students from diverse linguistic, regional and socio-economic backgrounds. UNESCO has also warned that AI systems can reproduce cultural and linguistic imbalances when the data and design processes do not adequately represent different groups (Miao & Holmes, 2023). Consequently, an inclusive AI strategy requires more than providing internet access. Institutions also need to consider device availability, affordability of AI services, multilingual resources, accessibility and the digital capabilities of both students and faculty. Recent studies from the Global South further show that the adoption and use of generative AI are shaped by local educational and socio-cultural conditions. Evidence from Ghana and Nigeria highlights student engagement and socio-cultural influences on AI use in higher education (Baidoo-Anu et al., 2024; Essien et al., 2024). Research from Sri Lanka similarly identifies institutional barriers and opportunities associated with generative AI adoption (Henadirage & Gunarathne, 2025). The importance of AI literacy for inclusive and diverse higher-education environments, reinforcing the need to consider learner differences when implementing AI-supported education (Arranz-García et al., 2026).

Governance, academic integrity and trust

Governance is a common issue across almost all areas of AI adoption in higher education. Institutions need clear policies concerning acceptable AI use, disclosure, assessment, authorship, privacy and the handling of institutional and student data. UNESCO's guidance places particular emphasis on human-centred approaches that protect privacy, human agency and inclusion (Miao & Holmes, 2023). Academic integrity policies also need to respond to the changing assessment environment. A complete prohibition of AI may be difficult to maintain when such tools are widely available, while unrestricted use can weaken the ability of assessment to demonstrate individual learning. Institutions can instead clarify when AI use is acceptable and require students to acknowledge or explain its use where appropriate. Assessment methods that include drafts, oral explanations, contextual application, reflection and evidence-based reasoning may also provide greater scope for evaluating students' own understanding. Transparency is equally important for building trust. Students and faculty should have a reasonable understanding of when AI systems



are being used, what type of information they process and how their outputs should be interpreted. The limited availability of formal institutional guidance reported by UNESCO indicates that many educational institutions are still developing appropriate responses to the rapid growth of generative AI (UNESCO, 2023). Recent evidence from higher education also shows that students' use of generative AI has raised questions about acceptable academic assistance, assessment practices and academic integrity (Johnston et al., 2024).

Table 2. Opportunities, risks and institutional responses

Area	Opportunity	Major Risk	Institutional Response
Personalized learning	Adaptive support and feedback	Over-reliance; inaccurate recommendations	Human oversight and continuous evaluation
Faculty augmentation	Reduced routine workload; teaching support	Deskilling; inappropriate automation	Faculty training and clear responsibility
Generative AI	Content development; tutoring; research assistance	Hallucinations; plagiarism; assessment disruption	Disclosure, verification and assessment redesign
AI literacy	Employability; critical digital capability	Unequal skill development	Curriculum integration and faculty development
Inclusion	Accessibility; translation; flexible learning support	Digital and linguistic inequality	Affordable access and multilingual resources
Data-driven governance	Better planning and student support	Privacy, surveillance and algorithmic bias	Data governance, transparency and impact assessment

Source: Compiled by Authors

The findings of the review indicate that AI should not be viewed as a direct or automatic source of socio-economic development. Its contribution is more likely to occur through a series of changes within educational institutions and among the people who use them. The proposed framework therefore connects technological capacity with educational transformation and, subsequently, with human-capital development. The pathway begins with the **digital foundation**, which includes connectivity, digital platforms, data systems and access to computing resources. These resources provide the basic conditions required for the use of more advanced technologies. The next stage is **AI capability**, which includes access to appropriate AI tools as well as faculty competence, student AI literacy and institutional technical capacity. AI capability can then support **educational transformation** through applications such as personalized learning, academic support, improved assessment practices, research assistance and administrative efficiency. These changes can contribute to **human-capital formation** by strengthening students' digital competence, critical thinking, adaptability and employability. In the longer term, these capabilities may contribute to **socio-economic value** through productivity, innovation, entrepreneurship, workforce adaptability and wider participation in the digital economy. Two conditions operate across this pathway. The first is **institutional readiness**, which includes leadership, infrastructure, faculty development, organizational policies and institutional culture. The second is **responsible AI governance**, covering privacy, transparency, fairness, academic integrity and human oversight. The presence of these conditions can influence whether technological capabilities are converted into meaningful educational outcomes.

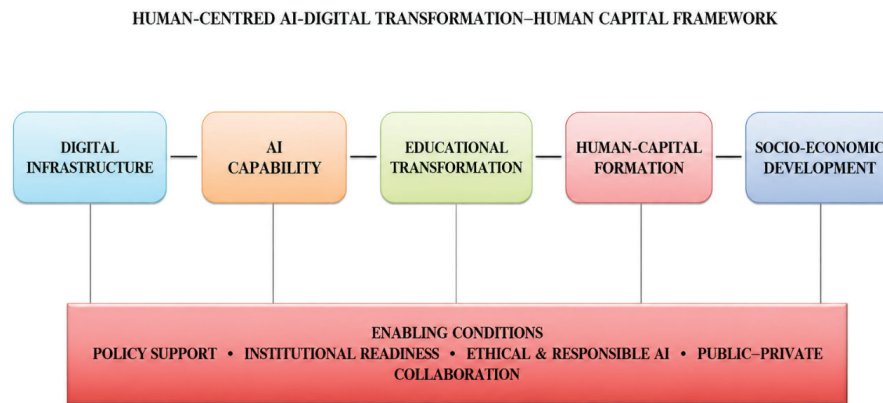


Figure 1. Proposed Human-Centred AI–Digital Transformation–Human Capital pathway

Source: Developed by Authors

Table 3. Digital Transformation and Socio-Economic Development

Stage	Core mechanism	Expected outcome
1. Digital foundation	Connectivity, platforms, data and compute	Access and digital capacity
2. AI capability	AI tools, skills, faculty readiness and institutional capacity	Ability to use AI meaningfully
3. Educational transformation	Personalization, augmentation, analytics and redesigned assessment	Improved educational processes
4. Human capital	AI literacy, critical thinking, adaptability and employability	Future-ready graduates
5. Socio-economic value	Productivity, innovation, entrepreneurship and inclusion	Broader development outcomes

Source: Compiled by Authors based on the conceptual synthesis of this study

The framework shifts attention from **technology adoption to capability development**. This interpretation is consistent with Human Capital Theory, which links education and skills with productive capabilities, and with the TOE perspective, which highlights the technological, organizational and environmental conditions affecting technology adoption (Becker, 1964; Schultz, 1961; Tornatzky & Fleischer, 1990). India's growing investment in digital infrastructure and AI initiatives creates an important foundation, but the educational value of these investments will depend on whether institutions and their users have the capacity to use the technology effectively. Higher-education institutions therefore have a dual role. They need to make appropriate use of AI within their own academic and administrative activities while also preparing students to work responsibly in an economy in which AI is likely to become increasingly common. This interpretation is consistent with UNESCO's human-centred approach, which emphasizes the role of AI in supporting teachers, learners and researchers while maintaining human agency (Miao & Holmes, 2023). It also addresses an issue identified in earlier higher-education research: AI research has often concentrated on technological applications, while the perspectives and roles of educators have received comparatively less attention (Zawacki-Richter et al., 2019). The Indian context adds an important dimension to this discussion because institutions differ considerably in terms of resources, infrastructure and student backgrounds. An AI strategy that is feasible for a well-resourced metropolitan university may not be equally suitable for a rural or resource-constrained



college. National and institutional policies should therefore recognize differences in institutional capacity. In some settings, improving connectivity and basic digital literacy may need to precede the introduction of more advanced AI applications. The link between AI-enabled education and socio-economic development should also be interpreted as an indirect relationship. AI adoption within universities does not itself constitute economic growth. Its potential contribution arises through improvements in human capital, employability, innovation and labour-market adaptability. This distinction is important because it prevents the discussion from treating technological adoption as an economic outcome in itself. The connection with the Viksit Bharat 2047 vision further highlights the importance of developing human resources capable of participating in an AI-oriented economy (Rehman et al., 2025). Overall, the review does not support either an entirely optimistic or entirely negative view of AI in higher education. The outcomes are likely to depend on institutional decisions, the quality of implementation, access to resources, pedagogical practices and governance arrangements. This conditional perspective provides a basis for further empirical research into which forms of AI adoption produce meaningful educational and socio-economic benefits in the Indian context.

IMPLICATIONS FOR THEORY AND PRACTICE

Theoretical implications

- The paper extends digital-transformation thinking in higher education by treating AI as a capability layer that can add prediction, personalization, generation and automation to existing digital infrastructure.
- The proposed framework connects educational technology with human-capital formation, providing a conceptual bridge between digital transformation and socio-economic development.
- The framework emphasizes institutional readiness and responsible governance as enabling conditions, challenging purely technology-centred models of AI adoption.

Practical implications for higher-education institutions

- Develop institution-wide AI policies covering acceptable use, disclosure, assessment, privacy and academic integrity.
- Invest in continuous faculty development so teachers can evaluate and pedagogically integrate AI rather than merely learn tool operation.
- Embed AI literacy across disciplines, with discipline-specific applications rather than a one-size-fits-all curriculum.
- Use AI first for high-value augmentation and student support, while maintaining human responsibility for high-stakes academic decisions.



- Create mechanisms for monitoring unequal access to AI tools and provide support for disadvantaged learners.
- Establish transparent processes for evaluating AI systems for accuracy, bias, privacy, accessibility and educational value before large-scale adoption.

Policy implications

- Align AI-in-education initiatives with the access, equity and quality objectives of NEP 2020.
- Support affordable access to AI infrastructure and learning resources across institutions and regions.
- Develop national and institutional AI competency frameworks that cover technical, critical, ethical and socio-emotional dimensions.
- Encourage interdisciplinary research on AI and education involving education, commerce, social sciences, computer science and policy scholars.
- Promote responsible AI governance that protects privacy, human agency and linguistic and cultural diversity.

Limitations and Future Research

This paper has several limitations. First, it is a conceptual study and does not provide primary empirical evidence on AI adoption or educational outcomes among Indian students, faculty or institutions. The review is integrative rather than a PRISMA-based systematic review with exhaustive database screening, as its purpose is to synthesize relevant literature and policy evidence and develop a conceptual framework. The evidence base is also predominantly English-language, which may have limited the inclusion of relevant studies published in other languages. In addition, two cited studies are previous publications by the authors (Shabbir & Porwal, 2025; Porwal & Shabbir, 2026). Although these studies were included because of their direct relevance to the topic, their use may introduce some self-citation bias; this was addressed by drawing on a broader body of independent literature. Further, some theoretical perspectives used in the framework originate mainly from the Global North and may not fully reflect India's institutional, linguistic and socio-economic diversity. Finally, the review does not include direct voices or primary data from students and faculty. Future research should therefore empirically test the proposed propositions using student, faculty and institutional data, with particular attention to AI literacy, faculty readiness, learning outcomes and differences across institutional and socio-economic contexts.

CONCLUSION

Artificial intelligence is becoming an important part of digital transformation in Indian higher education. Its applications can support personalized learning, faculty work, research, administration and the development of AI-related skills among students. The review also shows that these



benefits depend on institutional capacity and responsible implementation. Issues such as data privacy, algorithmic bias, academic integrity, unequal access and limited faculty preparedness need to be addressed alongside AI adoption. The **Human-Centred AI-Digital Transformation-Human Capital framework** proposed in this study connects digital infrastructure and AI capability with educational transformation and human-capital development. Institutional readiness and responsible governance are important conditions throughout this pathway. For India, AI-enabled higher education can contribute to employability, innovation and broader socio-economic development when technological adoption is accompanied by faculty development, AI literacy, equitable access and appropriate institutional policies. AI-enabled higher education can become part of India's broader socio-economic transformation when technological adoption is accompanied by investment in human capabilities, institutional readiness and responsible governance.

Artificial Intelligence (AI)

ChatGPT (OpenAI) was used during the preparation of the manuscript for language refinement, structural assistance and improving the resolution of the conceptual figure. QuillBot Citation Generator was used to assist with APA 7th edition reference formatting. All AI-assisted content was reviewed and edited by the authors. The authors independently verified the substantive claims, interpretations and references and take full responsibility for the final manuscript.

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