

Reconceptualizing Higher Education Preparedness for Industry 5.0: Insights from a Structured Literature Review

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ABSTRACT

The rise of Industry 5.0 has moved the trajectory of industrial transformation from technology efficiency to human-centricity, sustainability and resilience. This paradigm change poses major difficulties and opportunities for higher education institutions (HEIs) which are increasingly expected to educate future-ready graduates with technical, ethical and multidisciplinary competencies. While there is increasing academic interest in Industry 5.0, the existing research on higher education preparedness is fragmented, with a majority of the studies focusing on digital readiness and technical adoption, but neglecting the wider institutional factors. To fill this gap, the current study reports a comprehensive literature evaluation synthesizing and integrating the extant knowledge on higher education preparedness for Industry 5.0. Relevant material between 2018 and 2025 was thoroughly found and examined from key academic databases and policy sources. Thematic synthesis yielded six core dimensions of preparedness: technological and digital preparedness, human capital and faculty readiness, curriculum and pedagogical transformation, organizational and leadership readiness, industry-academia collaboration, and institutional and policy support. This study proposes a multidimensional conceptual framework drawing from Human Capital Theory, Sociotechnical Systems Theory, Dynamic Capability Theory, and Institutional Theory that redefines preparedness as an integrated institutional capability rather than a set of separate readiness indicators. The approach also situates these factors within the Indian higher education setting and highlights how policy environments, institutional diversity and resource restrictions influence readiness outcomes. This study contributes to the burgeoning discourse on Industry 5.0 by giving a holistic view of the transition of higher education and setting a framework for future empirical research, policy formulation, and institutional strategy creation.

INTRODUCTION

The accelerating pace of technical change, and increasing socio-economic complexity, have encouraged scholars and policy-makers to revisit the link between industrial change and social institutions. In particular, higher education institutions are expected to adapt increasingly pro-actively to transformations in industrial paradigms by connecting skill creation, knowledge production and institutional governance to developing socio-technical demands. To further comprehend the significance of Industry 5.0 for higher education preparedness, it is important to first contextualize this paradigm within the broader historical arc of industrial development. Accordingly, the next subsection examines the growth of industrial revolutions and the impact of each stage on production methods, labour relations and educational focus, which has led to the emergence of Industry 5.0.

1.1 Industrial Paradigms Evolution and Industry 5.0 Emergence

Industrial development has passed through numerous paradigms, each changing the character of production processes, worker relations and skill requirements. The Fourth Industrial Revolution (Industry 4.0) was a major transformation, integrating digital technologies such as cyber-physical systems, artificial intelligence (AI), the Internet of Things (IoT), and big data analytics into industrial processes with the main goal of improving

efficiency, productivity, and automation (Kagermann, Wahlster, & Helbig, 2013). Industry 4.0 has delivered significant technological and economic gains, but at the same time has exposed serious flaws in labor dislocation, ethical governance of intelligent systems and environmental sustainability (Xu, Lu, Vogel-Heuser, & Wang, 2021).

To overcome these constraints, Industry 5.0 has been proposed as a complementary and corrective paradigm (Mourtzis et al., 2022). In contrast to its predecessor, Industry 5.0 foregrounds clearly human-centricity, sustainability and resilience as essential principles directing industrial and societal transformation (Breque, De Nul, & Petridis, 2021). Industry 5.0 is about a meaningful partnership between humans and machines, where new technologies are developed to support human creativity, judgement and well-being, not primarily automation at the expense of human involvement. This move is a part of a broader realization that technology progress has to be connected to the provision of social value and long-term resilience for society. (Briken et al., 2023)

Industry 5.0 as a strategic vision has been formalized mostly by policy institutions, especially in the European Union. The European Commission's conceptualization of Industry 5.0 redefines the competitiveness of the industry in terms of social responsibility and sustainability in addition to economic performance (Breque et al., 2021). This normative perspective also distinguishes Industry 5.0 from past industrial paradigms and increases its applicability outside the production realm to encompass education, governance and social institutions.

1.2 Higher Education Systems Implications of Industry 5.0

The shift to Industry 5.0 has major consequences for higher education institutions (HEIs) that are crucial in building future-ready human capital. Traditionally universities have been seen as suppliers of technically proficient graduates at the point to suit the needs of industry. Nevertheless, Industry 5.0 requires a broader educational mandate that combines technical proficiency with transversal characteristics such as ethical reasoning, adaptability, creativity, emotional intelligence, and systems thinking (Nahavandi, 2019; Romero, Stahre, Taisch, & Wuest, 2022).

In this paradigm, HEIs are called to be not just training facilities, but also actors of socio-technical transformation, promoting responsible innovation and sustainable development. (Carayannis and Morawska-Jancelewicz, 2022). This expectation requires changes at several levels of higher education, including curriculum design, pedagogical techniques, faculty competencies, organizational structures, and engagement with business and society (OECD, 2021). Consequently, the notion of preparation has become increasingly relevant in higher education research, showing how strategically, structurally, and pedagogically prepared institutions are to respond to the Industry 5.0-driven transitions.

However, while the Industry 5.0 discourse is becoming increasingly prominent, the existing higher education literature is still firmly embedded in Industry 4.0-oriented frameworks and mainly focuses on digital skills, smart classrooms and technology adoption (Fischer, Imgrund, Janiesch, & Winkelmann, 2020). While these characteristics are still significant, they do not represent the whole picture of readiness under a paradigm that clearly emphasizes human-centric and sustainability-oriented objectives. This means that basic areas like leadership preparedness, organizational culture, ethical governance and policy coherence are often overlooked.

1.3 Gaps in Existing Literature on Higher Education Readiness

A review of existing studies identifies three main gaps in the literature on higher education preparedness for Industry 5.0. First, the literature is conceptually fragmented, with preparedness described in terms of single variables such as digital readiness, employability skills or curriculum innovation, rather than in terms of integrated conceptual frameworks. The fragmentation decreases the chance to comprehend the interaction of multiple institutional elements in supporting or constraining the Industry 5.0 transformation.

Second, the empirical and conceptual literature suffers from a geographical bias towards rich economies where higher education systems tend to enjoy strong infrastructure, consistent funding and developed innovation ecosystems.(2023). Alharbi. However, the relevance of such findings to developing and emerging countries is

questionable, because of disparities in institutional capability, governance structures and policy contexts (Tilak, 2020).

Third, there is limited fusion of policy-oriented ideas with academic research; Policy documents increasingly call for human-centric, multidisciplinary education aligned with Industry 5.0 principles, but scholarly work has not yet comprehensively integrated these policy orientations into conceptual models of higher education readiness. Such a gap undermines the practical usefulness of existing research to institutional leaders and policymakers.

These gaps point to the necessity for a systematic and comprehensive study to synthesize different strands of literature, identify essential elements of readiness, and contextualize them within unique country settings.

1.4 Context of Higher Education in India

The Indian higher education system is an interesting domain to study Industry 5.0 preparation. India has one of the biggest higher education systems in the world, with a huge range of institutions from prestigious research universities to resource-poor institutes. This variety provides opportunities and challenges for creating linkages between higher education and new industrial paradigms (Agarwal, 2018).

Recent legislative measures, particularly the National Education legislative (NEP) 2020, represent a strategic attempt to modernize Indian higher education through emphasis on transdisciplinary learning, flexibility, digital integration, and innovation-driven governance (Government of India, 2020). These revisions significantly connect with the ideals of Industry 5.0, although the extent to

The academic literature has not been properly explored as to which Indian HEIs are conceptually and institutionally ready to undertake these reforms.

This synthesis needs to take into account structural and institutional limits. Therefore, making sense of readiness in the Indian context involves a synthesis that spans global Industry 5.0 rhetoric, higher education philosophy, and national policy frameworks.

1.5. Objectives and Contribution of this Study

The present study provides a comprehensive evaluation of global literature on higher education preparedness for Industry 5.0 to address the highlighted shortcomings. Consistent with the disciplined approach of high-quality review and design-oriented studies, the study carefully organises current research, combines conceptual and policy perspectives, and develops theory through synthesis rather than description.

The particular aims of this review are:

1. **Analyse and synthesise major conceptualisations of Industry 5.0** pertinent to higher education systems;
2. **Identify and classify the key characteristics of higher education preparation** emerging from the global scholarly and policy literature; and
3. **Develop a conceptual framework** to contextualise Industry 5.0 preparation in the Indian higher education system and to influence future research and policy discussions.

The study, therefore, contributes to the developing Industry 5.0 literature by providing a systematic, multi-dimensional, and context-sensitive understanding of higher education readiness, thereby addressing theoretical fragmentation and contextual blind spots.

REVIEW OF LITERATURE

The literature review is the analytical heart of this work, to synthesise existing theoretical, conceptual, empirical, and policy-oriented research on Industry 5.0 and the preparation of higher education. The literature is scattered across disciplines, including manufacturing systems, management, education, sustainability and public policy,

due to the emergent nature of Industry 5.0. Thus, the present review follows a structured and theory-driven approach by synthesising several streams of literature to build a coherent vision of how higher education institutions (HEIs) might equip themselves for Industry 5.0.

The part is structured into four interrelated sub-sections. First, it discusses the development of industrial paradigms and their effects on higher education. Second, it describes the major theoretical lenses that underpin higher education readiness. Third, it synthesises major conceptualisations of Industry 5.0 with relevance for education. Finally, a thematic review of higher education preparedness is provided, accompanied by several synthesis tables.

2.1 The Evolution of Industrial Paradigms and The Transformation of Higher Education

upheavals in industry have been characterised by upheavals in labour markets, organizational structures and educational systems. In the Industry 3.0 era, higher education was primarily aimed at equipping graduates with technical skills to operate automated and information-based systems. The arrival of Industry 4.0 further increased the role of digitalization, cyber-physical systems, artificial intelligence (AI) and data-driven decision-making (Kagermann, Wahlster, & Helbig, 2013).

However, Industry 4.0 has come under increasing criticism for its technology-centric orientation leading to employment polarisation, skill mismatches, ethical problems and environmental deterioration (Autor, 2015; Xu et al., 2021). These constraints have led to the emergence of Industry 5.0, which rethinks industrial advancement by putting human-centricity, sustainability, and resilience at the core of socio-technical systems (Breque, De Nul, & Petridis, 2021).

Higher education institutions are not only suppliers of technically skilled workers in Industry 5.0. Rather, they are intended to revolutionize the development of holistic human skills, ethical thinking, multidisciplinary problem solving and socially responsible innovation. This paradigm shift needs a fundamental re-thinking of higher education preparedness.

Table 1. Evolution of Industrial Paradigms and Implications for Higher Education

Industrial paradigm	Core characteristics	Dominant skill focus	Role of higher education	Key references
Industry 3.0	Automation, IT systems	Technical and operational skills	Training for automated systems	Autor (2015)
Industry 4.0	CPS, AI, IoT, big data	Digital and analytical skills	Smart education and digital readiness	Kagermann et al. (2013); Fischer et al. (2020)
Industry 5.0	Human-centric, sustainable, resilient systems	Hybrid skills (technical + ethical + creative)	Holistic capability development	Breque et al. (2021); Nahavandi (2019)

2.2 Theoretical Frameworks of Readiness for Higher Education

Theoretical perspectives are needed to understand higher education preparedness for Industry 5.0. The research shows that no single theory can account for the complexity of institutional transition brought about by socio-technical development. Complementary theoretical lenses from economics, organisational studies and systems theory are best conceptualised for readiness.

Human Capital Theory (Becker, 1964) presents the basic explanation of how education increases production and employability through the development of skills. This paradigm is influential yet limited to explain ethical, social and sustainability-oriented outcomes highlighted in Industry 5.0.

This constraint is overcome by Sociotechnical Systems Theory, which emphasizes the combined optimization of social and technical subsystems, a feature consistent with the human-centric approach of Industry 5.0 (Trist & Bamforth, 1951). The Dynamic Capability Theory also describes how institutions create preparation through sensing changes in the environment, seizing opportunities, and reorganizing resources to promote resilience (Teece, 2007).

The Stakeholder Theory and the Institutional Theory are used to further the analysis, emphasizing the role of external actors, regulatory settings, and normative constraints on the change of higher education (Freeman, 1984; DiMaggio & Powell, 1983).

Table 2. Key Theoretical Lenses Relevant to Industry 5.0 and Higher Education Preparedness

Theory	Core proposition	Relevance to preparedness	Key references
Human Capital Theory	Skills enhance productivity	Explains employability focus	Becker (1964)
Sociotechnical Systems Theory	Joint social-technical optimisation	Supports human-machine collaboration	Trist & Bamforth (1951)
Dynamic Capability Theory	Adaptation and resilience	Explains institutional preparedness	Teece (2007)
Stakeholder Theory	Multi-actor value creation	Frames industry-academia linkages	Freeman (1984)
Institutional Theory	Response to regulatory pressures	Explains policy-driven reforms	DiMaggio & Powell (1983)

2.3 Conceptualisations of Industry 5.0 and Their Relevance to Higher Education

Industry 5.0 has been conceptualised from different perspectives including human-machine collaboration, sustainability and ethical governance (Huang et al., 2022). Nahavandi (2019) defines Industry 5.0 as a human-centric approach that brings back human creativity and decision making in highly automated settings. Xu et al. (2021) present Industry 5.0 as an evolutionary extension of Industry 4.0 and not as a radical rupture.

Policy-oriented conceptualisations, especially those presented by the European Commission, see Industry 5.0 as a normative framework that merges economic competitiveness with social well-being and environmental responsibility (Breque et al., 2021). These conceptualisations together point to the insufficiency of restricted technological interpretations and justify the relevance of Industry 5.0 for education systems.

Table 3. Key Definitions of Industry 5.0 in the Literature

Author(s)	Conceptual focus	Human-centricity	Sustainability	Educational relevance
Nahavandi (2019)	Human-machine collaboration	High	Moderate	Hybrid skill development
Xu et al. (2021)	Evolutionary paradigm	Moderate	Low	Transition from Industry 4.0 skills
Breque et al. (2021)	Policy and societal value	High	High	Curriculum and governance reform
Romero et al. (2022)	System architecture	High	Moderate	Learning system design
Longo et al. (2023)	Ethical engineering	High	High	Ethics and sustainability education

2.4 Thematic Review of Industry 5.0 Higher Education Readiness

Based on systematic analysis, the literature on higher education preparedness for Industry 5.0 can be categorized into six major themes, which encapsulate how preparedness has been conceptualised and operationalised across studies. These concepts are interrelated, and together they constitute institutional readiness.

Table 4. Thematic Classification of Higher Education Preparedness Literature

Theme	Focus of studies	Representative literature	Identified gaps
Technological preparedness	Digital infrastructure, AI, LMS	Fischer et al. (2020); Romero et al. (2022)	Overemphasis on technology
Human capital development	Future skills, faculty readiness	OECD (2021); Nahavandi (2019)	Limited strategic integration
Curriculum transformation	Interdisciplinary and experiential learning	Jackson (2016)	Weak institutionalisation
Leadership and governance	Strategic vision and culture	Marginson (2018)	Limited empirical validation
Industry–academia collaboration	Employability and innovation	Freeman (1984); OECD (2021)	Transactional partnerships
Policy and institutional support	Regulation and funding	NEP 2020; Tilak (2020)	Implementation challenges

2.4.1 Technology And Digitization Readiness

Technological preparedness is the most studied dimension in the literature. Studies reveal that digital infrastructure, smart learning environment and AI-enabled platforms are important enablers of change (Fischer et al., 2020; Ahmad et al., 2023).

However, Industry 5.0 repositions technology as an enabling mechanism rather than an end in itself. Thus, a conceptual gap emerges in extant research. (EDUCAUSE, 2024).

2.4.2 Human Capital and Faculty Readiness

Industry 5.0 is concerned with human talents like innovation, flexibility and moral reasoning. Faculty preparation is a major predictor of preparedness but is empirically underexplored, particularly in developing economies (OECD, 2021).

2.4.3 Curriculum and Pedagogical Change

Curriculum reform literature recommends models of transdisciplinary and experiential learning. However, most of the research are conceptual and there is limited evidence of large-scale institutional adoption (Jackson, 2016).

2.4.4 Organizational, Policy And Ecosystem Perspectives

Leadership vision, governance agility and policy alignment are highly influential in readiness. Although the ideas of Industry 5.0 are in harmony with the NEP 2020 in India, there are implementation gaps that exist (Tilak, 2020).

2.5 Synthesis And Research Gaps

The literature review shows that Industry 5.0 higher education readiness is multi-dimensional, systemic and context-dependent. The existing research is dominated by the technological and skills dimensions, while the organizational and ethical and policy elements are inadequately connected. Also, there is little empirical evidence for developing economies, especially India.

The gaps give a solid argument for establishing a conceptual framework that combines global knowledge while accounting for national institutional realities.

RESEARCH METHODOLOGY: PROTOCOL FOR SYSTEMATIC REVIEW

This section covers the methodological approach used for a systematic review and synthesis of the available research on higher education preparedness for Industry 5.0. The topic is transdisciplinary and emergent, hence a clear and well-defined review methodology is needed to assure the analytical rigour, replicability and credibility of the findings.

This section outlines the research design, literature sources, search strategy, inclusion and exclusion criteria and analytical methodologies applied to find, screen and synthesise relevant studies. The study thoroughly details the review process and, as such, adheres to best practices in structured review research and enhances the validity of the conceptual framework presented in the following parts.

3.1 Research Design and Justification

This study employs a structured literature review approach to carefully review and synthesise the available studies on higher education preparedness for Industry 5.0. A systematic review is particularly pertinent in emerging, conceptually fragmented research areas where a range of theoretical and policy contributions tend to mask integrated empirical findings. Unlike narrative or traditional literature reviews, a structured review follows a transparent and replicable approach, thus increasing methodological rigour, analytical consistency, and scholarly credibility (Snyder, 2019; Corvello et al., 2022).

The selection of this methodology is in line with the aim of the study, which is not to statistically collect facts, but to integrate, classify and reinterpret scattered knowledge to build a conceptually grounded theoretical framework. This approach is similar to the methodological clarity and procedural transparency shown in excellent studies published in *The TQM Journal*, where the methodical organization of research processes increases theoretical and practical contributions.

3.2 Scope of Review and Literature Sources

This review covers high quality and relevant literature in a comprehensive way, using peer-reviewed journal articles and authoritative policy papers. The academic sources were mostly collected from Scopus and Web of Science databases as they contain thoroughly reviewed publications on education, management, technology, sustainability, and industrial studies. As a complement, we also employed Google Scholar to uncover relevant studies, early conceptual work, and policy documents that are not well covered by the conventional databases.

Finally, apart from academic literature, policy and institutional reports released by the European Commission, OECD and the Government of India were intentionally included given their major role in driving the Industry 5.0 rhetoric and higher education reform agendas. The presence of policy literature is particularly essential in Industry 5.0 research, which is highly normative and policy-driven in nature (Breque et al., 2021).

The temporal scope of the review is mostly between 2018 and 2025, which is the period when Industry 5.0 became prominent in academic and policy discussions. Previous studies that were connected to Industry 4.0 were considered if they provided conceptual grounding or transitional insights relevant to Industry 5.0-oriented preparedness.

3.3 Strategy for Search and Selection of Keywords

A rigorous iterative search method was applied to find relevant publications. The initial keywords were based on the initial scoping of research on Industry 5.0 and higher education, and were adjusted further to enhance relevance and coverage. The final search strings were combinations of the following keywords:

- Industry 5.0·Human-centered industry

- Transformation of higher education
- Preparedness for university
- Organizational readiness
- Future talents
- Curriculum innovation
- Faculty preparedness
- Education systems that are sustainable and robust

Keywords were combined using Boolean operators (AND, OR), and truncation was used when applicable to include variances in terminology. In addition, backward and forward citation tracking was performed by evaluating reference lists and citation networks of major articles to locate further relevant studies. This iterative procedure minimised omission of influential contributions and increased robustness of the review.

3.4 Inclusion and Exclusion Criteria

The screening method used explicit inclusion and exclusion criteria to maintain analytical focus and conceptual relevance.

Inclusion criteria:

1. Studies on Industry 5.0 or paradigms after Industry 4.0;
2. Research on higher education institutions, universities or tertiary education systems;
3. Conceptual, empirical or policy-relevant studies on preparedness, readiness, capability, or institutional change;
4. Publications in peer-reviewed journals or credible institutional reports.

Exclusion conditions

1. Studies that are purely technical or engineering in nature with no education relevance;
2. Studies conducted only in vocational or secondary education with no relevance to higher education;
3. Opinion pieces or commentaries that have no scholarly or policy basis.

This screening approach ensured that the final corpus of literature was relevant in theory and rigorous in method.

3.5 Review Protocol and Screening Process

A multi-stage screening strategy guided the review process to increase transparency and replicability. First, the retrieved documents were evaluated for their relevance to the title. Thereafter, abstracts were screened for inclusion criterion compliance. Finally, full-text screening was undertaken to ascertain conceptual relevance and contribution to analysis.

At the first stage, duplicate records were removed. Disagreements over inclusion were resolved by iteratively assessing study aims, theoretical relevance, and addition to the discourse on readiness. This last collection of research provided the analytical underpinning for the thematic synthesis in the Literature Review section.

To provide methodological clarity, the review methodology is summarized in Table 5 according to best standards in structured review research.

Table 5. Structured Review Protocol

Review component	Description
Review design	Structured literature review
Databases	Scopus, Web of Science, Google Scholar
Time period	2018–2025

Keywords	Industry 5.0, higher education, preparedness, readiness, skills, curriculum
Document types	Journal articles, policy and institutional reports
Screening stages	Title → Abstract → Full text
Inclusion focus	Industry 5.0 and higher education preparedness
Exclusion focus	Purely technical Industry 4.0 studies
Final outcome	Thematic synthesis and conceptual framework

3.6 Thematic Synthesis and Analytical Approach

The selected papers were examined by means of thematic synthesis, a fitting method of integrating disparate literature across disciplines (Braun & Clarke, 2006). Themes were not analysed as separate categories, rather the analysis sought conceptual linkages and interdependencies across the institutional, human, technological and policy dimensions of readiness.

These higher order themes were developed by iterative coding and frequent comparison, and then inspired the thematic framework of the Literature Review (Section 2). Special attention was paid to the identification of underexplored regions, inconsistencies in conceptualisation and contextual blind spots, especially in relation to developing and rising economies.

3.7 Contextualisation to the Indian Higher Education System

The review has a global scope but the synthesis is specifically grounded in the context of Indian higher education. Contextualisation was informed by existing scholarship on Indian higher education reforms, institutional problems and governance structures and policy papers such as the National Education Policy 2020 (Agarwal, 2018; Government of India, 2020; Tilak, 2020).

This contextual attention also helps to guarantee that the conceptual framework elaborated in the next section is theoretically sound and institutionally relevant, making it more useful for scholars, policymakers, and higher education leaders.

DEVELOPMENT OF THE CONCEPTUAL FRAMEWORK

Based on the knowledge obtained by the systematic literature research and the methodical synthesis in the preceding sections, this section is aimed at elaborating a conceptual framework for higher education preparedness in the light of Industry 5.0. Given the fragmented nature of previous research and the lack of an integrated explanatory model, there is a need to systematically organise and connect the important readiness elements highlighted in the literature. Hence, this section synthesizes the theoretical perspectives and empirical findings to develop an integrated conceptual framework that reflects the multi-dimensional and systemic nature of preparedness, while being sensitive to the institutional realities of higher education systems, particularly in the Indian context.

4.1 Requirement of a Conceptual Framework

One of the important contributions of the structured literature evaluation is the lack of an integrated framework to explain higher education readiness for Industry 5.0 holistically and contextually. Current research focuses on a discrete element of preparedness, e.g., digital readiness, future skills or curriculum reform, but often does not acknowledge the interconnectedness of these elements. Such fragmentation impairs both the development of theory and its practical utility especially in complicated systems of higher education.

Conceptual frameworks are crucial in review-based research since they synthesize dispersed knowledge, elucidate the connections between conceptions, and inform future empirical investigations (Jabareen, 2009). This is particularly true for Industry 5.0 where a conceptual framework is needed due to the normative orientation of the paradigm as well as the focus on human-centricity, sustainability and resilience. This study thus develops a multi-dimensional conceptual framework including worldwide theoretical insights yet attentive to institutional peculiarities of the Indian higher education system.

4.2 Theoretical Foundations for the Framework

The suggested framework is based on several theoretical views uncovered through the literature review. The emphasis on skill development and employability is based on Human Capital Theory, while the foundations of human–technology interaction in educational settings are based on Sociotechnical Systems Theory. Dynamic Capability Theory outlines the preparation development of higher education institutions by continual sensing, adapting, and reconfiguring resources (Teece, 2007). A supplementary background for readiness is provided by Institutional Theory which examines regulatory pressures, policy mandates and normative expectations affecting higher education systems (DiMaggio & Powell, 1983).

The framework integrates various theoretical lenses to move beyond reductionist models and conceptualize readiness as a systemic institutional competency rather than a static set of qualities. This theoretical integration is consistent with the ideas of Industry 5.0 and directly responds to gaps in the literature

4.3 Core Preparedness Dimensions Identification

Based on the thematic synthesis described in Section 2, six essential elements of higher education readiness for Industry 5.0 were identified. The dimensions recur throughout conceptual, empirical and policy-oriented studies and together define the width of institutional preparation necessary within the Industry 5.0 paradigm.(Brückner et al 2026)

1. Digital and Technological Readiness

This dimension is about availability and effective use of digital infrastructure, AI-enabled learning platforms, data analytics and smart administrative tools.

However, in line with Industry 5.0 concepts, technology is seen as a means to facilitate human-centric results rather than an end in itself (Romero et al., 2022).

2. Faculty and Human Capital Preparedness

Faculty competencies lie at the core of human-centricity in readiness. This dimension includes ongoing professional development, pedagogical flexibility, ethical consciousness, and the capacity to constructively incorporate technology into teaching and learning (OECD, 2021).

3. Pedagogical and Curriculum Change

Industry 5.0 needs curriculum that promote interdisciplinary learning, innovation, problem-solving and sustainability-oriented thinking. This dimension measures the extent to which institutions transition from discipline-based, content-laden curriculum to flexible and experiential learning models (Jackson, 2016).

4. Organizational & Leadership Readiness

Leadership vision, governance flexibility and institutional culture have a great impact on preparation. This dimension includes strategic alignment, decision-making autonomy, and the existence of a supportive organizational atmosphere that encourages innovation and experimentation (Marginson, 2018).

5. Industry-Academia Collaboration and Engagement with Ecosystems

Preparedness is not limited to institutions but also includes industry, government and society. In Industry 5.0, these partnerships are anticipated to be value-driven and socially responsible rather than transactional (Freeman, 1984).

6. Institutional and Policy Support

Regulatory frameworks, financial systems and national education policies influence institutional preparation. The coherence between institutional efforts and policy contexts is especially crucial in developing countries when structural restrictions are strong (Tilak, 2020).

4.4 Conceptual Framework Structure

The suggested conceptual framework considers higher education preparedness for Industry 5.0 as a second-order construct, which is produced through the interaction of the six preparedness aspects outlined above. The paradigm conceptualizes preparedness as not separate aspects but an interrelated and dynamic capacity, where shortfalls in one dimension may impede overall preparedness.

The core of the framework is an Industry 5.0 orientation, which is defined by human-centricity, sustainability and resilience. Together, the elements of readiness allow HEIs to match their institutional activities with this attitude. The paradigm explicitly incorporates the role of contextual factors, especially the national policy climate and institutional variability, in shaping the manifestation of preparation across higher education institutions.

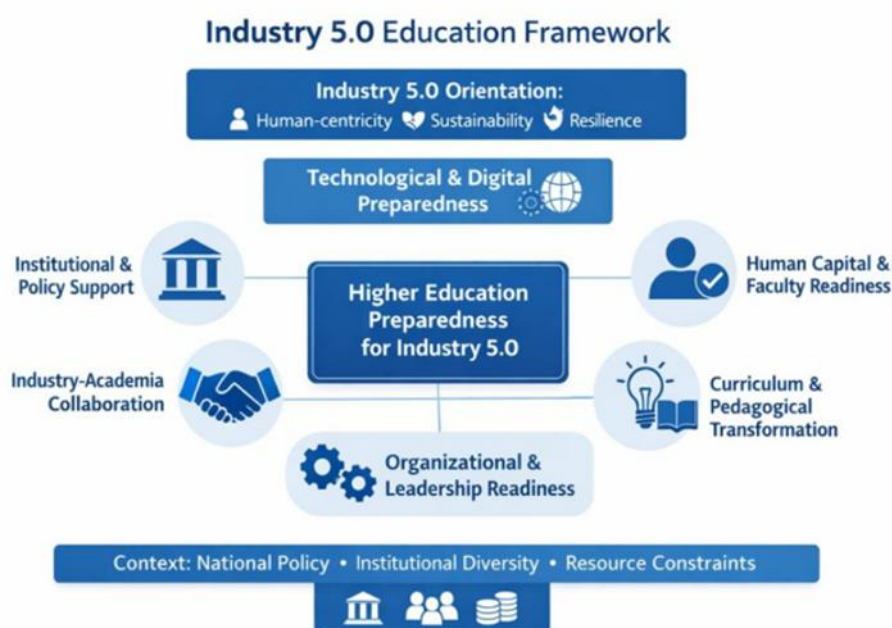
Table 6. Dimensions of Higher Education Preparedness for Industry 5.0

Dimension	Description	Key literature
Technological preparedness	Digital infrastructure and human-centred technology use	Fischer et al. (2020); Romero et al. (2022)
Human capital readiness	Faculty skills, adaptability, ethical awareness	OECD (2021); Nahavandi (2019)
Curriculum transformation	Interdisciplinary, experiential learning	Jackson (2016)
Organizational readiness	Leadership, governance, institutional culture	Marginson (2018)
Industry–academia collaboration	Ecosystem engagement and value creation	Freeman (1984); OECD (2021)
Policy and institutional support	Regulatory alignment and funding	NEP 2020; Tilak (2020)

4.5 Description Of The Conceptual Framework

At the outer level, the framework positions higher education institutions in a broader **policy and socio-economic environment**, taking into account contextual limitations and enablers. At the institutional level, readiness components together empower HEIs to generate Industry 5.0-oriented results, such as human-centric skill building, sustainable innovation, and institutional resilience.

Figure 1. Conceptual Framework of Higher Education Preparedness for Industry 5.0



4.6 Contributions and Utility of the Framework

The conceptual framework put out has three significant contributions. First, it contributes to the scholarship on Industry 5.0 by explicitly incorporating higher education, a subject that has been mostly studied from industrial and technological perspectives. Second, it contributes to theory in higher education by reconceptualising preparedness as a multidimensional institutional competency rather than as a set of separate ready indicators. Third, by placing in context the study fills an important empirical and conceptual void in the existing literature, the framework in Indian higher education system,

The framework also provides a basis for future empirical study, providing clearly delineated features that may be operationalised using quantitative or qualitative methodologies. The framework offers a diagnostic tool for policy makers and institutional leaders to assess readiness deficiencies and guide strategic solutions.

DISCUSSIONS

The aim of this part is not to repeat the examined research but to interpret and contextualise the findings of the structured literature review and the proposed conceptual framework. The discussion locates higher education preparedness for Industry 5.0 in the broader theoretical debates, compares the findings with existing Industry 4.0-oriented literature, and highlights implications for the Indian higher education system, building on the six dimensions of preparedness identified in Section 2 and operationalised in Section 4.

5.1 A Systemic Perspective On Higher Education Readiness

A key takeaway from this assessment is that a holistic understanding of higher education readiness for Industry 5.0 cannot be gained by considering individual readiness indicators such as digital infrastructure or employability results. Preparedness, on the other hand, is a systemic institutional competence that is a function of the interaction of technological, human, organizational, collaborative and policy-related characteristics. This interpretation is in line with Dynamic Capability Theory, which emphasizes that organizational readiness is not based on static resources but by the ability to integrate, reconfigure and align resources in the face of environmental change (Teece, 2007). Preparedness in the Industry 5.0 context refers to the institution's potential to reconcile technological advancement with human-centred and sustainability-oriented goals. For instance, if a university's faculty is not ready or its governance structure is not flexible, then investments in digital infrastructure or curricular innovation may be less beneficial.

This systemic perspective is a striking departure from much of the current higher education literature that tends to consider readiness as a linear or additive construct. By

On the other hand, the suggested framework underlines the relevance of interdependencies and complementarities and reinforces the case for holistic institutional initiatives.

5.2 Expanding The Research On Industry 4.0 And Higher Education

A major contribution of this research is the broadening and reorganisation of higher education research that has been based on Industry 4.0 concepts. Previous research has primarily concentrated on digital transformation, smart classrooms, and technology-enabled learning environments (Fischer et al., 2020). Although these contributions are still relevant, they are not enough to capture the normative and human-centric perspective of Industry 5.0.

The results of this review imply qualitatively different expectations of higher education institutions under Industry 5.0. These include integrating ethical reasoning, sustainability literacy, and social responsibility into institutional missions and instructional processes. In this regard, Industry 5.0 is not only an extension of Industry 4.0, but also reorients the goals of transformation, turning the focus from efficiency and automation to the creation of societal value.

This divergence is especially relevant for scholars of higher education, as it calls into question the ongoing use

of technology-centered frameworks and makes a case for the inclusion of socio-technical and institutional theories. This study's contribution is to synthesize different perspectives, providing a more comprehensive understanding of higher education transition in advanced industrial paradigms.

5.3 Human-Centricity and the Importance of Faculty Preparedness

The analysis identifies human capital and faculty readiness as major factors of higher education preparedness in line with the concepts of Industry 5.0. Technology offers new tools for teaching and learning, but the faculty are still the key agents of change in education. Their educational capacity, their ethical awareness and their adaptability influence the interpretation and use of technologies in institutional environments.

However, the literature still shows a tendency to conceptualize faculty development as an operational or support function, rather than as a strategic competence. This observation is consistent with past critiques of higher education reform which point to technology investments often outweigh investment in human development (OECD, 2021). This imbalance is aggravated by the Industry 5.0 paradigm which clearly prioritizes human well-being and autonomy.

This approach thus moves faculty preparation from the margins to a central factor of preparedness, in support of the claim that lasting change is contingent upon continuing professional development, institutional support, and participatory governance frameworks.

5.4 Curriculum Transformation Beyond Employability Narratives

Another important finding is the evolving importance of curricular transformation in Industry 5.0. The higher education literature often discusses curricular change in terms of employability and labour market alignment (Jackson, 2016). Employability is still crucial but Industry 5.0 adds ethical literacy, sustainability awareness and systems thinking to curriculum goals.

The results show that Industry 5.0-oriented curriculum should evolve from discipline-based, content-driven to integrated, experiential learning models. But the literature also points to a gap between conceptual advocacy and institutional execution. There is little evidence of scalable or persistent curricular transformation, especially in resource-constrained situations (Lantada, 2020).

This gap underscores the significance of connecting curricular change to organizational readiness and policy backing, rather than viewing it as a stand-alone educational endeavour. This interconnectedness is explicitly captured in the conceptual framework, giving a more accurate description of transformation processes

5.5 Organisational Leadership, Governance and Institutional Culture

The research highlights the crucial role of organizational leadership and governance in defining the trajectory of preparation. The adoption of Industry 5.0 initiatives might be symbolic or incorporated meaningfully in institutional practices depending on the institutional culture, strategic coherence and leadership vision (Marginson, 2018).

From an Institutional Theory perspective, higher education institutions are subject to complex regulatory and normative influences that can lead to isomorphic behaviour rather than actual transformation (DiMaggio & Powell, 1983). Challenges of the Industry 5.0 paradigm this inclination by demanding context-sensitive and value-driven change, rather than universal conformity.

The results indicate that leadership structures that allow for experimentation, interdisciplinary collaboration, and stakeholder engagement promote preparedness. Conversely, transformation can be hindered by restrictive governance models and risk-averse cultures, including in highly advanced institutions.

5.6 Academia-Industry Collaboration and Ecosystem Alignment

Industry-academia partnership is a key, although under-theorised dimension of readiness. Partnerships are often suggested as a means of improving employability and innovation, but the evidence suggests that many

collaborations are transactional and short-term. Industry 5.0 extends the scope of collaboration by emphasizing socially responsible innovation and shared value generation (Freeman, 1984).

This broader view is reflected in the proposed framework, which conceptualizes ecosystem interaction as a strategic facet of preparedness, rather than an ancillary activity. The move has significant ramifications for how institutions of higher education structure collaborations, evaluate outcomes and align incentives.

5.7 Contextual Implications for the Indian Higher Education System

In the Indian higher education context, Industry 5.0 readiness presents both challenges and opportunities. Though national policy initiatives like the National Education Policy 2020 are conceptually aligned with Industry 5.0 principles, the evaluation brings up substantial differences in institutional capability, governance autonomy, and resource availability (Tilak, 2020).

The paradigm created in this study provides a lens to explain these variances, highlighting the contextual moderation in which national policies interact with institutional factors to shape preparedness outcomes. This perspective moves beyond deficit narratives and recognizes the range of routes to readiness in big, diversified higher education institutions.

5.8 Summary of Major Discussion Insights

In conclusion, the discussion gives rise to three broad insights. First, higher education readiness to Industry 5.0 is essentially systemic and multi-dimensional and requires alignment across a variety of institutional sectors. Second, Industry 5.0 involves normative expectations that radically change the goals of the restructuring of higher education. Third, context sensitivity, especially in developing economies, is critical in translating global paradigms into real institutional transformation.

The current results underline both the theoretical and practical importance of the suggested conceptual framework, opening the way to discuss policy and management implications in the next section.

IMPLICATIONS

The findings of this systematic review and the conceptual framework produced in this study have substantial implications for theory development, policy in higher education and institutional practice. Differently from the Industry 4.0-related talks focusing on technology advancement, the industry 5.0 paradigm requires a broader and more integrated definition of preparation, which matches technological progress with human-centric and sustainability-oriented objectives. The following implications therefore reflect this wider perspective and highlight the importance of the study for a number of stakeholder groups.

6.1 Theoretical Implications

Theoretically, this work contributes in numerous crucial ways to the expanding body of knowledge on Industry 5.0 and higher education. First, the study explicitly integrates higher education into Industry 5.0 discourse, extending a literature that has so far been dominated by manufacturing, engineering and industrial systems viewpoints. This integration responds to recent calls for broadening the domain of Industry 5.0 beyond production-centric areas and acknowledging the role of social institutions in allowing sustainable and human-centric transformation.

Second, the study reconceptualizes higher education preparedness as a multidimensional and systemic institutional capacity rather than a collection of discrete markers of readiness. The proposed framework, by integrating insights from Human Capital Theory, Sociotechnical Systems Theory, Dynamic Capability Theory, and Institutional Theory, provides a more robust explanatory model for understanding how higher education institutions respond to paradigm-level change. This theoretical integration pushes forward preparedness research by stressing the interdependencies between the technological, human, organizational, and policy elements.

Third, the framework makes a theoretical contribution to the higher education field by moving the analytical

focus away from outcome-related indicators (e.g. employability or digital uptake) towards process-related competences that enable ongoing transformation. This change is particularly crucial in the Industry 5.0 era in which flexibility, ethical leadership and robustness are as important as technological proficiency. Drawing attention to these aspects, the study adds to conceptual discussions on institutional transformation and organizational preparation in higher education.

Finally, the study contributes to the development of context-sensitive theory by situating the worldwide Industry 5.0 literature in the Indian higher education system. It highlights the mediation of global paradigms through national policy contexts, institutional variety and resource restrictions and thereby addresses the underrepresentation of emerging economies in research on both Industry 5.0 and higher education.

6.2 Policy Implications

The conclusions of this review have important significance for higher education policy makers at national and system level. The study findings show that policy articulation is not enough for institutional readiness, even while policy frameworks like National Education Policy 2020 show conceptual congruence with Industry 5.0 concepts. Effective readiness requires policy support that is coordinated and sustained across various dimensions including finance, governance change, faculty development and industry engagement. An important policy aspect is the requirement for coordinated policy design. Investments in digital infrastructure must be matched by simultaneous investments in human capital development, curriculum flexibility and leadership competence. Fragmented policy interventions or those technology-first may lead to the consolidation of the limits associated with the Industry 4.0-focused approaches to transformation.

Second, governments should value institutional variety and resist one-size-fits-all regulations. The conceptual framework presented in this study reveals that readiness paths differ across institutions according to size, mission, governance structure, and regional environment. Adaptive and varied policy instruments are thus more likely than uniform compliance measures to increase resilience and inclusiveness.

Third, the Industry 5.0 focus on sustainability and human-centricity suggests that higher education policy must openly integrate ethical, social and environmental goals into assessment and accreditation systems. Shifting away from narrow performance measures can help align institutional incentives with broader societal aims.

6.3 Implications for Leadership and Institutional Practice in Higher Education

The findings underline that for higher education leaders and institutional decision-makers the readiness for Industry 5.0 should be handled as a strategic transformation rather than a technology upgrade. Leadership is fundamental for crafting a human-centred vision, aligning institutional priorities and establishing organisational cultures that encourage collaboration, experimentation and continual learning.

The conceptual framework is a useful tool for the self-assessment of institutions, helping HEIs to identify strengths and weaknesses across readiness aspects. In particular, institutions should strive for coherence among projects, such that technological investments, curricular reforms, faculty development programs, and external partnerships enhance rather than undermine each other.

One of the key areas for institutional action is faculty development. Faculty training should not be an afterthought but rather a part of ongoing professional development efforts that are integrated with strategic initiatives, as faculty preparedness is a fundamental aspect of person-centered education.

In resource-constrained situations such as many Indian HEIs, the approach notes that strategic integration may be more important than expansion. Small, well-aligned programs with leadership commitment and stakeholder participation are more likely to lead to sustained preparedness outcomes than large size but fragmented interventions.

6.4 Implications for the Academia-Industry-Society Collaboration

The Industry 5.0 paradigm extends the scope of industry-academia partnership beyond employability and

technology transfer to include joint value creation and social responsibility. The conclusions of this research imply that HEIs should re-think the aims, governance structures and evaluation systems of their external relationships.

Industry 5.0 is less about simply transactional agreements and more about collaborations that link educational aims with sustainability concerns, ethical innovation and engagement with the community. Policymakers and institutional leaders can help develop such collaborations through designing incentive systems that promote long-term participation and diversified outcomes.

6.5 Summary of Implications

In summary, the results of this research support the notion that higher education preparedness for Industry 5.0 requires comprehensive, human-centric, and context-sensitive approaches. Theoretical development, policy efficacy, and institutional practice are closely linked, and progress in one sphere requires congruence in others. The study provides a basis for better knowledgeable decisions and future research by spelling out these relationships.

CONCLUSION AND FUTURE RESEARCH DIRECTIONS

This final section consolidates the main findings from the structured literature review, conceptual framework and discussion sections and positions the overall contribution of this study in the wider debate on Industry 5.0 and the transformation of higher education. In this part we summarize the key conclusions and discuss the contributions and limits of the study and sketch interesting avenues of future work. In thus way it closes the study, while noting potential for further academic research in this nascent topic.

7.1 Conclusions

The transition to Industry 5.0 is a fundamental reorientation of the industrial and socioeconomic development from technology-driven efficiency towards human-centricity, sustainability and resilience. Higher education institutions have an important role to play in this changing setting in defining the information, skills and values needed to underpin responsible and inclusive development. However, the state of research on higher education is still fragmented, largely driven by technology-oriented approaches and inadequate sensitivity to contextual factors.

To address this gap, this paper conducted a structured literature analysis to synthesize global academic and policy-oriented research on higher education preparedness for Industry 5.0. By integrating several theoretical views and carefully arranging the existing material, the study reconceptualised preparedness as a multidimensional and systemic institutional competency rather than as a set of separate readiness indicators. The resulting

The conceptual framework identifies six interconnected elements of preparedness such as technical readiness, human capital and faculty readiness, curriculum and pedagogical transformation, organizational and leadership readiness, industry–academia partnership, and institutional and policy support.

Thereby, the study contributes to both Industry 5.0 scholarship and higher education research by situating this framework in the Indian higher education setting, especially by addressing the underrepresentation of emerging economies in extant literature. The findings underline the need of congruence across institutional domains and sensitivity to contextual constraints for effective readiness, and the need for comprehensive and integrative approaches to higher education change.

7.2 Theoretical and Practical Contributions

This work makes several important contributions. It theoretically contributes to Industry 5.0 discourses by explicitly including higher education as a key institutional player, widening the analytical scope of a literature

that has been largely dominated by industrial and technological viewpoints. It also adds to theory in higher education by providing a holistic conceptualisation of readiness from many theoretical lenses.

From a practical aspect, the suggested framework offers a diagnostic and strategic tool for policymakers and institutional leaders to identify readiness gaps and plan coherent solutions. The framework's emphasis on human-centred and sustainability-oriented dimensions connects higher education reform to larger social goals, beyond narrow performance indicators.

7.3 Limitations of the Study

While the study gives significant information, some limitations should be noted. First, as with any organized review, the conclusions are necessarily limited by the breadth and quality of the current literature. The inclusion criteria were strict and it is possible that some important studies, especially recent or context-specific studies, may not have been included. Second, the conceptual framework suggested in this study has not been experimentally validated, thereby restricting judgments on causal correlations across readiness dimensions.

7.4 Future Research Directions

Limitations of this study provide some intriguing avenues for future research. The first challenge is the lack of empirical confirmation of the suggested conceptual framework. Future research could use quantitative tools, such as structural equation modeling or multi-level analysis, to investigate the links between aspects of preparation and their effects on educational and institutional outcomes.

Second, cross-national and comparative research can expand the framework by exploring how readiness is manifested in various higher education systems. This kind of research would help to separate context-specific mechanisms from generalisable principles and in so doing add robustness to theory building.

Third, longitudinal study approaches are needed for the dynamic and evolving nature of readiness. Transformation in line with Industry 5.0 is a time-evolving process that is driven by legislative reform, technological development and societal challenges. Longitudinal studies can shed more light on the development of preparedness trajectories and the construction of institutional resilience.

Fourth, future research may examine micro-level processes and actors such as teacher agency, leadership cognition, and student engagement. The combination of insights from organisational behaviour and educational psychology might help to better understand how institutional preparation transfers into everyday practices of teaching and learning.

Finally, there is room for more study on the ethical, social and sustainability outcomes in higher education, both conceptually and methodologically. The development of reliable indicators for these characteristics will enable a more thorough measurement and close the gap between empirical research and the normative bases of Industry 5.0.

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