Transformation from University 1.0 to University 5.0: The Strategic Options for Higher Education Development in Bangladesh

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Abstract

The evolution of higher education from University 1.0 to University 5.0 reflects the dynamic interplay between societal needs, technological advancements, and global challenges. This review explores the historical progression of universities in Bangladesh, analyzing how each phase addressed shifting demands from the teaching-centric model of University 1.0 to the human-centered, ethically driven framework of University 5.0. The paper examines the current state of higher education, highlighting systemic challenges such as resource constraints, skill mismatches, and disparities in quality between urban and rural institutions. Drawing on global best practices and local contexts, the review outlines strategic pathways for transitioning Bangladeshi universities toward the University 5.0 model. Key recommendations include fostering industry-academia collaborations, integrating sustainability into education, modernizing curricula with emerging technologies, and enhancing global competitiveness. This transformation is vital to position Bangladesh's higher education system as a catalyst for sustainable development, innovation, and inclusive growth, ensuring its alignment with global educational trends and national priorities.

Keywords

University 1.0 to 5.0, Sustainable Development, Technological Integration, Inclusive Education, Bangladesh

1. Introduction and Research Questions

The transformation of higher education reflects the ever-evolving needs of society, responding to changing economic, social, and technological contexts. Historically, universities have served as centers of knowledge, primarily focused on teaching and learning (Ahmad et al., 2023). Over time, however, they have evolved into more complex institutions that play multifaceted roles in society. Today, higher education institutions are not only tasked with preparing individuals for professional careers but are also expected to contribute to societal development, foster innovation, and address global challenges (Carayannis & Morawska, 2023; Azevedo et al., 2023). This evolution can be traced through different phases, each of which reflects a shift in societal expectations and the demands placed on universities (Babkin, et al., 2024). For expected changes and sustainability in the universities, it is foremost to apply the systems approach and integrated developmental strategies in all the relevant systems of operations, fostering the fulfillment of societal expectations (Bhuiyan, Imam, & Rahman, 2004).

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The journey from University 1.0 to University 5.0 illustrates this transformation. University 1.0 represents the traditional university model, characterized by a focus on teaching classical knowledge with little regard for practical applications (Carayannis & Morawska, 2023). As the world entered the industrial age and later the information age, universities began to expand their roles to include research and the commercialization of knowledge, which led to the emergence of University 2.0 and University 3.0. In these phases, universities became involved in industry collaboration, generating applied knowledge that was directly linked to economic growth and technological advancement (Hashimet al., 2024). University 4.0, the most recent phase, has seen the integration of digital technologies into the academic environment, including the use of artificial intelligence, big data, and online learning platforms (Aladyshkin et al., 2023). This phase has redefined education, making it more flexible, accessible, and tailored to individual needs.

However, the current global challenges, such as climate change, income inequality, technological disruption, and the growing need for sustainable development, have further accelerated the need for a new model of higher education. Adaptability to the changes has immense necessity to make the higher education model vibrant, market-oriented, and pragmatic (Bhuiyan, Ahmed, & Molla, 2009). The University 5.0 model is emerging in response to these challenges (Valentini, 2010). It goes beyond just technological integration and aims to balance innovation with ethical responsibility, focusing on creating a more sustainable, inclusive, and human-centered approach to education (Boehm, 2018). University 5.0 integrates the concept of Society 5.0, which envisions a harmonious future where digital and physical worlds coexist and work together for the greater good of society (Hasegawa, 2020; Tani, 2021). This model emphasizes the role of universities in solving global issues, fostering sustainable development, and ensuring that technological advances benefit all segments of society.

In Bangladesh, higher education plays a pivotal role in the nation's socio-economic development. With its rapidly growing youth population, the country faces both an opportunity and a challenge. On one hand, this demographic provides a unique opportunity to harness the potential of its young people through education (Azevedo et al., 2023). On the other hand, without significant reforms, the existing higher education system risks lagging behind global educational trends, hindering the country's competitiveness in the global knowledge economy (Apriliyanti, 2022). The mismatch between the skills produced by universities and the labor market demands has been a long-standing challenge in Bangladesh. Moreover, the gap between industry needs and academic offerings further exacerbates these issues, limiting the potential for economic growth. Bangladesh's need for a robust, adaptive, and forward-thinking higher education system is more urgent than ever. The University 5.0 model offers a potential framework for transforming the higher education system, ensuring it is aligned with global educational trends and national development priorities (Carayannis & Morawska, 2023). By integrating sustainability, innovation, and inclusivity into the core functions of higher education, universities can not only meet the needs of the labor market but also contribute to solving pressing societal problems such as poverty, environmental degradation, and inequality (Aladyshkin et al., 2023).

However, despite growing global discussions on the evolution toward University 5.0, there remains a notable literature gap regarding how this framework can be contextualized for developing countries such as Bangladesh. Existing studies primarily focus on technological adaptation or policy challenges in isolation, but comprehensive analyses outlining strategic pathways for a national transition to University 5.0 are absent in the existing literature. This gap highlights the need for a holistic review that connects global trends with the specific realities of

Bangladesh's higher education landscape. Therefore, this study aims to address the following research questions:

1. How has the university model evolved from University 1.0 to University 5.0 in response to global societal and technological changes?
2. What systemic gaps and challenges currently characterize higher education in Bangladesh?
3. What strategic options can support Bangladesh's transition toward the University 5.0 model?

To address these research questions, the present paper explores the historical progression of universities from University 1.0 to 5.0, analyzing how each phase addressed societal needs and adapted to technological changes. It examines the present condition of higher education in Bangladesh, highlighting the gaps that need to be addressed to align with the University 5.0 framework. By identifying strategic pathways for reform, this paper aims to offer a comprehensive roadmap for the transformation of higher education in Bangladesh, enabling it to become a key driver of innovation, economic development, and sustainable growth. In exploring this topic, the article is structured as a conceptual and narrative review. It synthesizes global literature on university evolution, analyzes policy-relevant issues within the Bangladeshi context, and develops a theoretically informed set of strategic recommendations.

The study offers comparative perspectives informed by international higher education reforms and formulates policy-oriented directions specifically tailored to the Bangladeshi context. Collectively, these contributions establish the review as a strategic roadmap aligned with the principles of the University 5.0 model, thereby supporting future reforms aimed at fostering a more innovative, inclusive, and sustainable higher education system. Furthermore, the review provides actionable recommendations for policymakers, educational leaders, and industry stakeholders to shape the future of higher education in Bangladesh, ensuring that it becomes not only globally competitive but also equitable, inclusive, and aligned with long-term national development priorities.

2. Methodology

This study follows a conceptual and narrative review approach to examine the evolution of universities from University 1.0 to University 5.0 and explore strategic pathways for higher education development in Bangladesh. The primary aim is to synthesize global and local literature on university transformation, technological integration, and societal roles to inform policy and practice.

2.1. Search Strategy

A systematic literature search was conducted using Google Scholar as the main database, selected for its wide coverage of scholarly articles, theses, books, and conference papers across multiple disciplines. The search strategy involved using key terms related to university evolution, higher education reform, University 5.0, digital transformation, sustainability, and challenges in Bangladeshi higher education. Boolean operators such as AND and OR were applied to combine search terms effectively. Filters were applied to prioritize recent publications, generally from the last 15 years. Additionally, reference lists of pivotal publications were reviewed to identify further relevant sources.

2.2. Inclusion and Exclusion Criteria

The selection of studies for this review was guided by clearly defined inclusion and exclusion criteria to ensure relevance, rigor, and focus.

Inclusion criteria for selected studies comprised:
- Peer-reviewed academic publications or authoritative policy documents
- Focus on higher education evolution, technology integration, societal relevance, or sustainability
- Specific insights into developing countries or contexts similar to Bangladesh
- Publications within the last 15 years to ensure contemporary relevance

Studies were excluded if they met any of the following conditions:
- Non-academic or opinion-based articles lacking empirical or theoretical support
- Studies unrelated to higher education or the thematic focus of this review
- Publications without accessible full texts for thorough evaluation

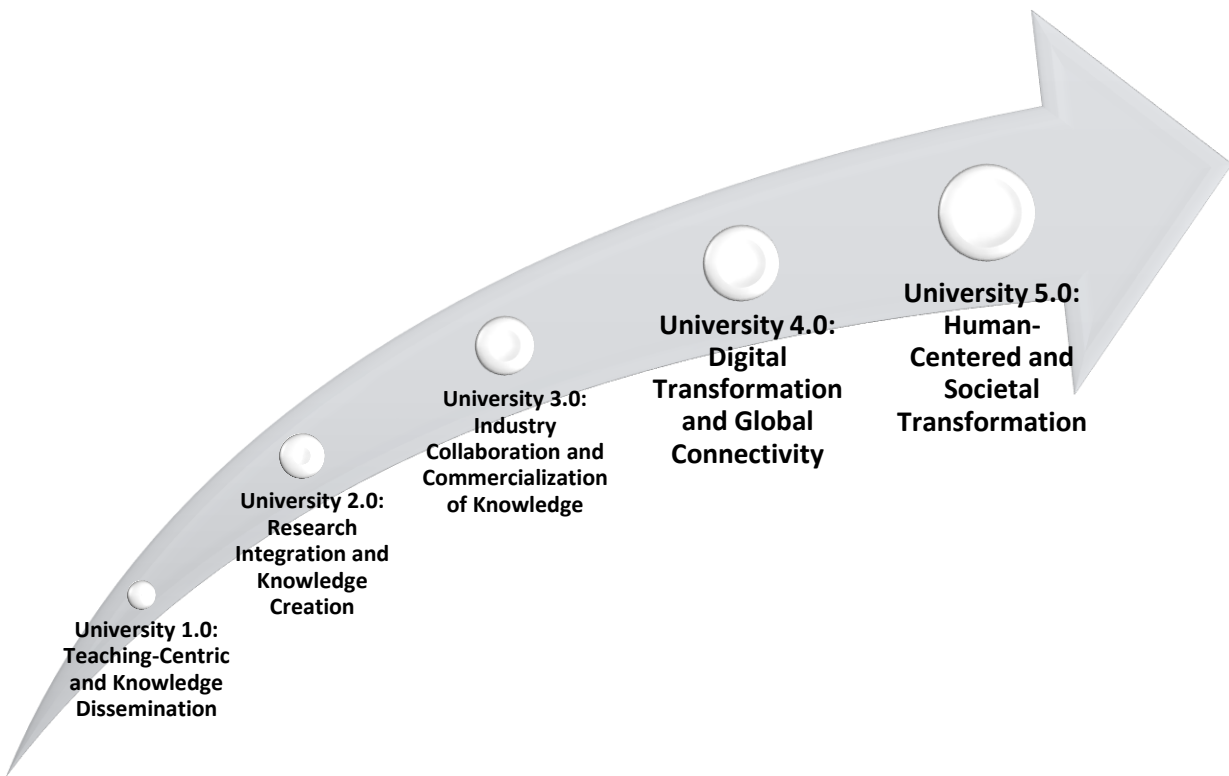### *2.3. Data Sources and Analysis*

Literature identified through Google Scholar was critically reviewed and thematically analyzed to identify patterns, gaps, and strategic options for transition toward University 5.0. The systems approach guided integration of technological, societal, and policy-related dimensions into the analysis, ensuring a holistic understanding of higher education transformation.

This comprehensive methodology provides clear insight into how literature was searched, selected, and analyzed to support robust conclusions about higher education development in Bangladesh aligned with the University 5.0 model. It will help readers assess the validity and thoroughness of the review.

3. Historical Evolution from University 1.0 to 5.0

The evolution of universities over time reflects the broader shifts in societal expectations, technological advancements, and the changing demands of the global economy. This progression, from University 1.0 to University 5.0 shows how universities have expanded their roles from purely educational institutions to powerful engines of innovation, social change, and sustainable development (Apriliyanti, 2022). Each phase in this historical journey reflects a distinct transformation in how universities function and engage with their communities and the world. As universities continue to evolve, they must embrace the ideals of University 5.0, ensuring that education serves not just economic and technological goals but also the broader social and ethical imperatives of the future.

Figure 1: Historical Review from University 1.0 to 5.0

University 5.0:
Human-
Centered and
Societal
Transformation

University 4.0:
Digital
Transformation
and Global
Connectivity

University 3.0:
Industry
Collaboration and
Commercialization
of Knowledge

University 2.0:
Research
Integration and
Knowledge
Creation

University 1.0:
Teaching-Centric
and Knowledge
Dissemination

Source: Developed by the authors based on the literature review

3.1. University 1.0: Teaching-Centric and Knowledge Dissemination

In the earliest phase, referred to as University 1.0, the focus was predominantly on teaching. The university's role was essentially to disseminate established knowledge through lectures without significant emphasis on research or innovation (Boehm, 2018). Education was seen as a means of transmitting classical knowledge, often confined to traditional academic disciplines such as philosophy, theology, and the sciences. This model was primarily lecture-based, and students were expected to absorb and memorize information from authoritative texts. The impact of University 1.0 was profound in terms of laying the intellectual groundwork for higher education, yet its capacity to address the practical challenges of society was limited (Valentini, 2010). Universities primarily fostered intellectual engagement but had a minimal influence on societal or economic development. This model, although foundational, was increasingly seen as inadequate for meeting the demands of a rapidly changing world, particularly as industrialization began to require more specialized and applied forms of knowledge.

3.2. University 2.0: Research Integration and Knowledge Creation

The transition to University 2.0 marked a critical shift, where universities began integrating research into their educational missions. This phase saw the rise of the modern research university, where teaching and research were no longer seen as separate endeavors (Feldmann, 2014). Instead, the generation of new knowledge through academic inquiry became a central function of universities (Valentini, 2010). This shift was particularly significant in the late 19th and early 20th

centuries when institutions like Humboldt University in Berlin pioneered the model of combining rigorous academic research with high-level teaching (Apriliyanti, 2022). University 2.0 became a breeding ground for scientific discoveries and technological advancements. Universities began to foster an environment where knowledge creation through research became a cornerstone of their identity (Carayannis & Morawska, 2023). This period also witnessed the emergence of graduate programs, where students were encouraged to contribute to the expansion of human knowledge through independent research. The direct impact of this phase was seen in the accelerating pace of technological and scientific progress, which became increasingly important to industrial and economic growth.

3.3. University 3.0: Industry Collaboration and Commercialization of Knowledge
With the advent of University 3.0, the relationship between universities and industries began to deepen. This phase saw universities actively engaging in partnerships with industries, particularly in sectors such as technology, engineering, and health sciences (Boehm, 2018). The emphasis shifted from pure academic research to the commercialization of knowledge, with universities playing an active role in the creation of intellectual property, patents, and spin-off companies (Torres & Delgado, 2024). The emergence of incubators, innovation labs, and technology transfer offices marked a new phase in university development (Keats & Schmidt, 2007). These initiatives were designed to bridge the gap between academic research and practical application, ensuring that academic findings could be translated into tangible products, services, or processes (Dai et al., 2023). The increased focus on entrepreneurship and innovation within the academic environment also led to the development of new programs aimed at cultivating entrepreneurial skills among students (Rocha et al., 2022). As universities began contributing directly to economic development, they became essential hubs in the knowledge economy, impacting job creation, technological progress, and global competitiveness. Thus university will play the catalytic role by making collaboration with the industries and conducting basic, applied and commercial research simultaneously and developing enterprising spirit among the students (Mamun, Bhuiyan, Rab, & Islam, 2000).

3.4. University 4.0: Digital Transformation and Global Connectivity
University 4.0 represents the digital transformation of higher education. In this phase, universities began to integrate digital technologies, including artificial intelligence (AI), big data, and the Internet of Things (IoT), into their core operations. The introduction of smart campuses, online learning platforms, and personalized education solutions marked the beginning of a new era in education (Aladyshkin et al., 2023). One of the most significant developments during this phase was the widespread adoption of online learning and the rise of MOOCs (Massive Open Online Courses), which democratized access to higher education by enabling students from around the world to engage with academic content remotely (Ülker & Otrar, 2024). AI and data analytics allowed for more tailored learning experiences, catering to the individual needs and abilities of students. This increased accessibility, coupled with the flexibility of online education, made higher education more inclusive and adaptable to the demands of a globalized, digitally connected world. Furthermore, University 4.0 saw the growth of global academic collaborations, with universities forming networks across borders to address global challenges such as climate change, pandemics, and technological disruption (Wessels & van Wyk, 2022). The digital era also allowed universities to engage with a wider audience, transcending geographic boundaries and providing education to individuals in remote or underserved regions.

3.5. University 5.0: Human-Centered and Societal Transformation

University 5.0 marks the most recent and visionary phase of university evolution. It is characterized by a human-centered approach that integrates ethics, sustainability, and technology in a way that addresses the pressing challenges of the 21st century. In this model, universities play a transformative role in society, contributing not only to economic growth but also to social well-being and environmental sustainability (Carayannis & Morawska, 2023). Aligned with the concept of Society 5.0, which envisions a future where human well-being is balanced with technological progress, University 5.0 focuses on using education and research to tackle global issues such as inequality, climate change, and the Sustainable Development Goals (SDGs) (Lantada, 2022). Universities in this phase are not just centers of knowledge but are active agents of societal change, fostering innovation that is not only technological but also ethical and inclusive. In addition to fostering academic excellence, University 5.0 emphasizes the development of social, emotional, and ethical competencies (GAGNIDZE, 2023). It recognizes the importance of preparing students to become responsible global citizens who can navigate the complexities of a rapidly changing world (Alharbi, 2023). This phase represents a shift from technology-driven progress to a more holistic approach that ensures that advancements in fields like AI, robotics, and biotechnology serve humanity in a sustainable and ethical manner. Innovations covering multidisciplinary approaches and addressing through the multiplicity of problems of the society through incremental and fundamental changes suffices towards the societal transformation and adaptability (Bhuiyan, Molla, & Alam, 2021).

4. Present Condition of Higher Education in Bangladesh

The higher education system in Bangladesh faces a series of challenges that are common in many developing nations. The system remains predominantly teaching-focused, with institutions largely adhering to the University 2.0 framework, where research and knowledge creation are still not fully integrated into the educational structure (Hossain, 2024). While some universities have started to embrace research activities and industry collaborations, these efforts are still in their nascent stages, signaling the beginning of a transition towards a more advanced University 3.0 model. The higher education sector in Bangladesh is at a critical stage, balancing between strengths and significant challenges (Islam, 2022). While progress has been made in terms of expanding access to education and integrating digital learning platforms, the system remains hindered by limited research capacity, inadequate resources, and global competitiveness. To transition towards a more sustainable and globally competitive model, there is a need for strategic reforms that focus on strengthening research, fostering industry collaboration, and ensuring equitable access to quality education across the country (Babkin, et al., 2024).

One of the notable strengths of Bangladesh's higher education sector is the increasing number of both public and private universities, which cater to the rapidly growing demand for higher education (Latif et al, 2021). Over the past few decades, the government and private sector have heavily invested in expanding the higher education landscape, resulting in a wider range of educational institutions across the country (Alam & Sadik, 2020). These institutions help to meet the educational needs of an increasingly educated population. In response to the challenges posed by the COVID-19 pandemic, many universities in Bangladesh adopted online education platforms. This shift, although unevenly implemented, was an important step toward modernizing the education system (Chowdhury et al., 2022). It has provided students with more flexible learning opportunities, enabling them to continue their studies remotely, especially in urban areas where

internet access is more reliable. The pandemic has highlighted the potential of digital education tools, though further infrastructure and training are required to fully harness their potential.

Table 1: Opportunities and Challenges of Higher Education in Bangladesh to Adopt University 5.0

Opportunities	Challenges
❖ An increasing number of both public and private universities.	❖ Limited global competitiveness of Bangladeshi universities.
❖ Over the past few decades, the government and private sector have heavily invested in expanding the higher education landscape	❖ Few universities in Bangladesh rank internationally, with the majority struggling to meet global standards
❖ Many universities in Bangladesh have adopted online education platforms.	❖ The lack of adequate resources and funding for academic research.
❖ Rapidly growing demand for higher education	❖ The gap between the skills acquired by graduates and those demanded by the rapidly evolving job market.
	❖ Lack of collaboration with industry.

Source: Developed by the authors based on the literature review

Despite these strengths, the higher education system in Bangladesh faces significant weaknesses. One of the most pressing issues is the limited global competitiveness of Bangladeshi universities. Few universities in Bangladesh rank internationally, with the majority struggling to meet global standards in terms of academic quality, research output, and institutional reputation (Sayed & Chowdhury, 2017). This lack of global recognition is a major barrier to attracting international students, fostering global collaborations, and promoting academic excellence on the world stage. Another critical weakness is the lack of adequate resources for research. Funding for academic research is insufficient, and the necessary infrastructure for cutting-edge research is often inadequate (Lantada, 2022). This resource gap severely hampers the ability of universities to conduct high-quality research that can contribute to both academic knowledge and societal development. In addition, there is a noticeable gap between the skills acquired by graduates and those demanded by the rapidly evolving global job market. Many graduates struggle to secure employment in international industries due to insufficient practical skills, poor alignment with industry needs, and a lack of emphasis on entrepreneurship (Siddique, 2019).

Furthermore, there is a significant disparity in the quality of education offered by universities in urban versus rural areas. Universities in major cities like Dhaka often have better resources, faculty, and research facilities compared to their counterparts in more rural regions (Hafizullah, 2019). This inequality in educational quality exacerbates existing socio-economic disparities and limits opportunities for students outside urban centers. Rural institutions often face challenges such as outdated curricula, lack of modern teaching facilities, and limited access to global research networks, which hinder their ability to provide students with competitive skills.
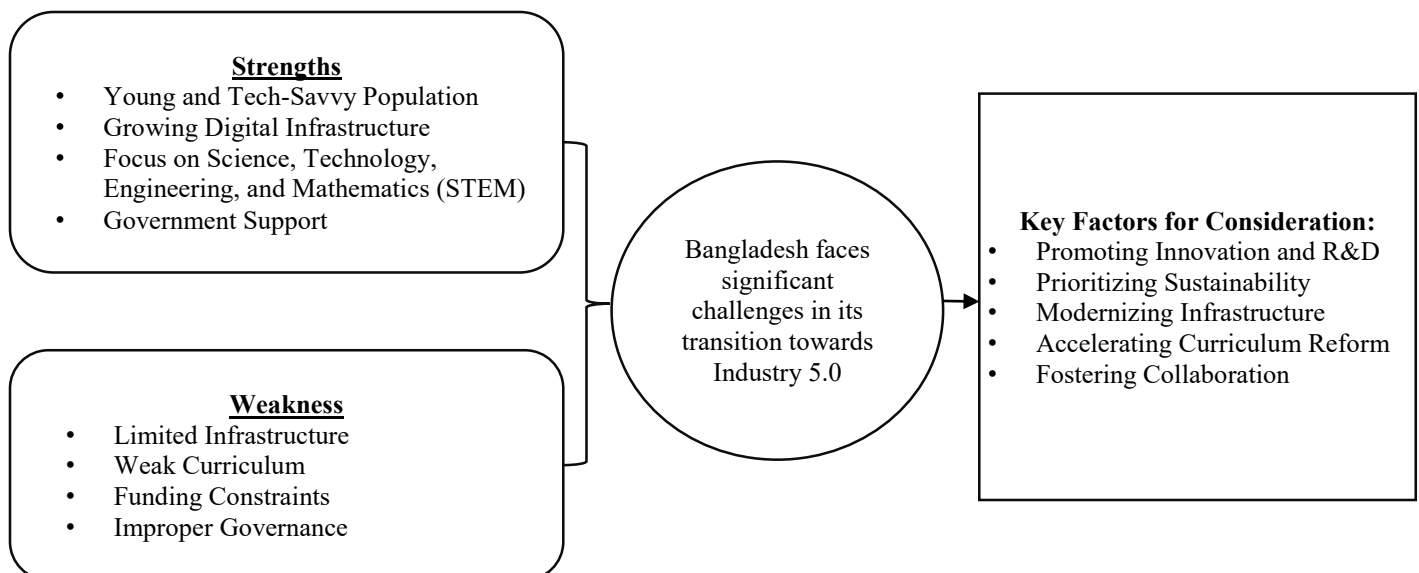
5. Pathways for Bangladesh's Universities for Transition Towards University 5.0

The transition to University 5.0 for Bangladesh's universities necessitates a multifaceted approach that aligns with both global advancements and the specific needs of the country. This shift involves modernizing curricula by integrating cutting-edge technologies such as Artificial Intelligence (AI), data science, cybersecurity, and other emerging fields, as emphasized in the National Education Policy 2010 (Wessels & van Wyk, 2022). This policy underscores the importance of Information and Communication Technology (ICT) in education, aiming to equip students with the digital skills required for a rapidly evolving world. Moreover, fostering interdisciplinary learning has become a cornerstone of this transformation. The "Integrated Sciences" program at the University of Dhaka serves as a prime example, promoting collaboration across various disciplines to provide a holistic education that meets modern demands (Saharuddin & Fatarib, 2022). Universities should actively seek partnerships with industries to provide experiential learning opportunities through internships, research projects, and collaborative ventures. The success of institutions like Daffodil International University highlights the significance of such initiatives in preparing students for real-world challenges.

Pedagogically, the adoption of blended learning models is crucial. These models combine traditional face-to-face instruction with online platforms and digital resources, supporting a more flexible and personalized learning experience (Verma et al, 2023). The "Digital Bangladesh" initiative serves as a testament to the government's commitment to integrating digital solutions into educational frameworks, ensuring that students are equipped with the necessary technological proficiency (Lantada, 2022). Furthermore, research within these universities should be interdisciplinary, focusing on national and global challenges such as climate change, poverty alleviation, and sustainability. Initiatives like the "Vision 2041" document emphasize the need for innovative solutions to address these pressing issues. Establishing technology transfer mechanisms, such as Innovation and Technology Parks, alongside innovation hubs modeled after successful global examples like Silicon Valley, are essential to catalyze research and development activities.

Figure 2: Key factors for addressing challenges and opportunities for transition towards University 5.0
Source: Developed by the authors based on the literature review

Strengths
- Young and Tech-Savvy Population
- Growing Digital Infrastructure
- Focus on Science, Technology, Engineering, and Mathematics (STEM)
- Government Support

Weakness
- Limited Infrastructure
- Weak Curriculum
- Funding Constraints
- Improper Governance

Bangladesh faces significant challenges in its transition towards Industry 5.0

Key Factors for Consideration:
- Promoting Innovation and R&D
- Prioritizing Sustainability
- Modernizing Infrastructure
- Accelerating Curriculum Reform
- Fostering Collaboration

Investing in digital infrastructure is another critical aspect of this transition. Enhancing research facilities, upgrading campuses to support sustainable development, and aligning with the Sustainable Development Goals (SDGs) are imperative steps for building resilient educational institutions. These efforts ensure that universities not only meet current educational needs but also contribute to the nation's broader socio-economic development. Lastly, empowering university leadership through academic freedom policies and fostering strong collaboration between universities, industries, and the government through public-private partnerships is essential for effective governance (Tekavc & Presker, 2023). Quality assurance frameworks will play a vital role in maintaining accountability and improving the overall quality of education and research. By adopting these strategies, Bangladeshi universities can move towards a future where they are not only competitive on a global scale but also catalysts for sustainable national progress.

6. Industry-Academia Collaboration as a Strategic Option for Higher Education Development

Collaboration between industrial sectors and higher education institutions is a pivotal factor in transforming universities from teaching and research-focused models (University 1.0 and 2.0) to more advanced frameworks like University 3.0 and beyond. Such partnerships enable universities to better align their outputs with industry needs, foster innovation and contribute directly to economic development (Ülker & Otrar, 2024). However, in the context of Bangladesh, these collaborations are still in their infancy, often hampered by systemic challenges, including a lack of trust between academia and industry, insufficient policy incentives, and a disconnect in mutual objectives. For Bangladesh to successfully transition its universities to advanced models such as University 3.0 and beyond, robust collaboration with industrial sectors is essential (Wessels & van Wyk, 2022). Aligning educational programs with industry needs, fostering the commercialization of research, and expanding experiential learning opportunities can significantly enhance the relevance and impact of higher education. By learning from global best practices and adapting them to the local context, Bangladesh can create a higher education system that drives innovation, supports economic growth, and prepares students to thrive in the global knowledge economy.

There are several domains where collaborative efforts between universities and industries can significantly enhance the higher education sector (Tekavc & Presker, 2023). One critical area is skill development. Many graduates in Bangladesh face challenges in meeting the skill requirements of modern industries. Industry-designed curricula, developed in partnership with universities, can bridge this gap by ensuring that education systems are aligned with market demands. Such curricula should emphasize practical skills, critical thinking, and adaptability, equipping graduates to succeed in an increasingly dynamic job market. Another area ripe for collaboration is research commercialization. Although academic research has been growing in Bangladesh, its translation into commercially viable products and services remains limited. Joint ventures between universities and industries can serve as a bridge, enabling the transfer of knowledge from academic labs to marketable innovations. This is particularly relevant in sectors such as renewable energy, biotechnology, and ICT, where innovative research can generate significant economic and social benefits. Internship programs represent a third area of collaboration (Rosak-Szyrocka et al, 2022). Practical, hands-on learning experiences allow students to apply their academic knowledge in real-world scenarios, thereby improving their employability. Industries can play a critical role in this regard by offering internships and apprenticeship opportunities, creating a pipeline of skilled workers who are well-prepared for the workforce (Mudin, 2018).

Figure 3: Industry-Academia Collaboration Process
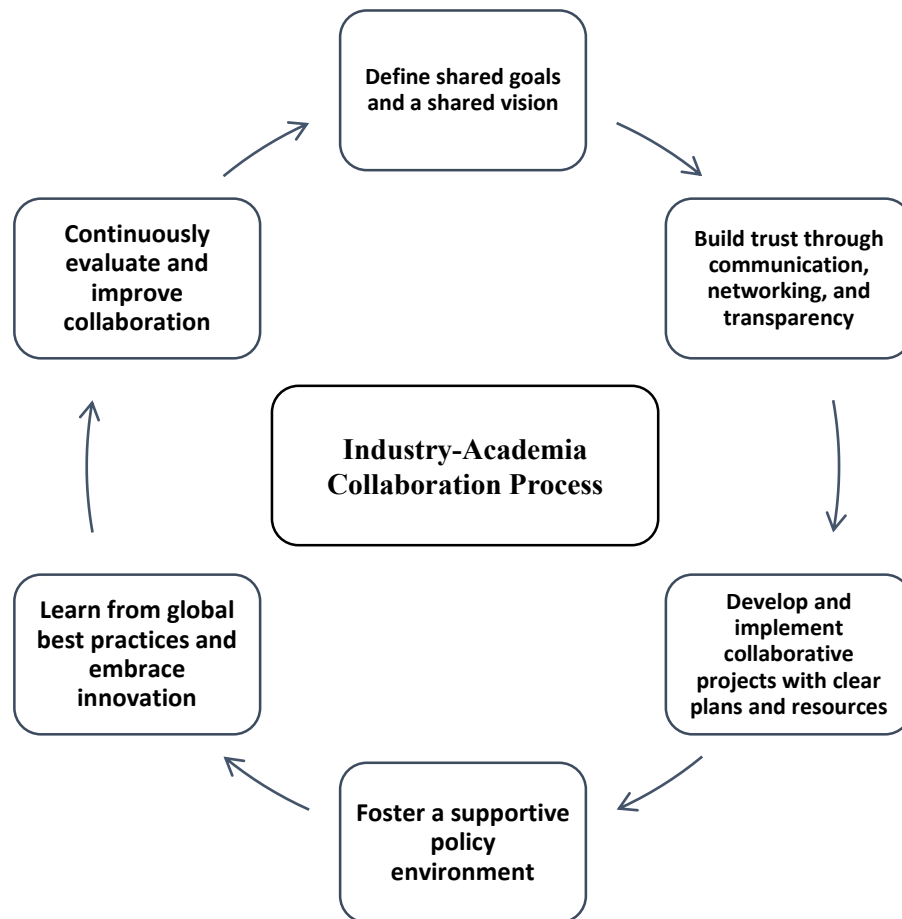
Source: Developed by the authors based on the literature review

Successful models of industry-academia collaboration from other countries provide valuable insights for Bangladesh. For example, Germany's dual education system integrates academic learning with practical training in industries (Hashimet al., 2024). In this system, students alternate between university courses and on-the-job training, ensuring they acquire both theoretical knowledge and practical expertise. This model has been highly effective in reducing skill gaps and improving employment outcomes for graduates (Ahmad et al., 2023). Similarly, South Korea's technology hubs, such as the Seoul Digital Complex, exemplify how collaborative ecosystems can drive innovation. These hubs facilitate interactions between academia, industry, and government, promoting the commercialization of research and the development of cutting-edge technologies. Such initiatives not only enhance the global competitiveness of South Korean industries but also foster an entrepreneurial culture within universities.

While global examples offer valuable lessons, their successful adaptation requires addressing the unique challenges of Bangladesh's higher education and industrial sectors. Policymakers must prioritize creating frameworks and incentives for industry-academia collaboration. For instance, tax incentives or grants could encourage industries to invest in university research and development. Universities, on their part, need to establish dedicated liaison offices to facilitate communication and collaboration with industry partners. Moreover, it is essential to address disparities in institutional quality and resource availability. Urban universities often have better

access to infrastructure and industry networks, leaving rural institutions at a disadvantage. Collaborative models must be inclusive, ensuring equitable participation and benefits for universities across different regions of the country.

7. Proposed Theoretical Framework of University 5.0 for Bangladesh

The framework for University 5.0 showcases the interconnected structure of its five foundational pillars: Personalized Learning, Technology-Powered Education, Experiential Learning and Upskilling, Sustainability and Social Responsibility, and Global Collaboration. These pillars, supported by diverse contributors, create a cohesive and dynamic ecosystem that addresses the needs of a rapidly changing global landscape. Together, they redefine the traditional university model, emphasizing adaptability, inclusivity, and innovation to build a future-ready educational institution. Each pillar is distinct yet interconnected, playing a critical role in fostering a collaborative, technologically advanced, and socially responsible academic environment.

Figure 4: Framework for Industry 5.0
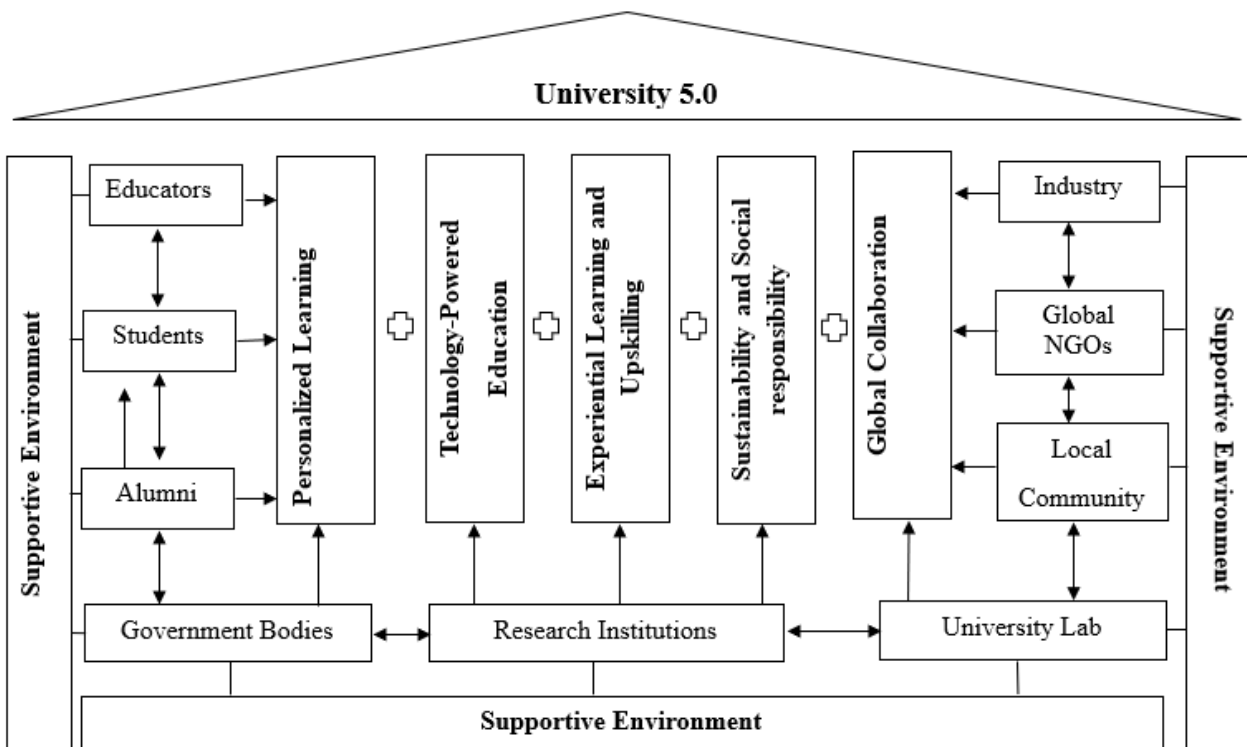
Source: Developed by the authors based on the literature review

7.1. Pillar 1: Personalized Learning

The first pillar, Personalized Learning, centers on creating tailored educational experiences that accommodate individual student needs, learning paces, and career goals. Key contributors to this pillar include educators, who design flexible and adaptive curricula, and students, whose feedback informs these personalized approaches (Alharbi, 2023). Alumni play an essential role by mentoring current students and sharing industry insights, while government bodies provide the necessary support through policies, funding, and oversight. This pillar ensures that learning is not a one-size-fits-all model but rather an adaptive system that evolves to meet the diverse needs of learners in various contexts.

7.2. Pillar-2: Technology-Powered Education
Technology-Powered Education, the second pillar, leverages cutting-edge advancements in educational technology to transform the way knowledge is delivered and acquired. Research institutions serve as the backbone of this pillar, driving innovation in areas such as artificial intelligence-powered adaptive learning systems, virtual and augmented reality classrooms, and blockchain for secure credentialing. These technologies enhance the accessibility, efficiency, and effectiveness of education, making it more inclusive and global in reach. By incorporating technology, universities can break traditional barriers, providing high-quality education to students worldwide and ensuring equitable opportunities for all.

7.3. Pillar-3: Experiential Learning and Upskilling
The third pillar, Experiential Learning and Upskilling, bridges the gap between theoretical knowledge and its practical application. This pillar emphasizes hands-on experiences such as internships, real-world projects, and industry partnerships, which equip students with the skills and competencies needed to thrive in an ever-changing job market. Research institutions play a central role by facilitating collaborations between universities and industries, enabling students to gain valuable insights and practical expertise (Ahmad et al., 2023). This focus on experiential learning not only enhances employability but also fosters lifelong learning and adaptability, which are crucial in today's fast-evolving professional landscape.

7.4. Pillar-4: Sustainability and Social Responsibility
Sustainability and Social Responsibility, the fourth pillar, addresses the growing need for universities to contribute to solving global environmental and social challenges. This pillar integrates the efforts of university labs, which act as hubs for innovation and research on sustainable practices, and local communities, which provide real-world contexts for implementing solutions. By aligning education with global sustainability goals, such as the United Nations' Sustainable Development Goals (SDGs), universities ensure that students are not only equipped with knowledge but also with a sense of responsibility toward creating a better world. This pillar emphasizes the importance of ethical practices, environmental stewardship, and community engagement in shaping future leaders (Babkin, et al., 2024).

7.5. Pillar-5: Global Collaboration
Finally, Global Collaboration, the fifth pillar, fosters partnerships across industries, global NGOs, local communities, and university labs. This pillar emphasizes the importance of cross-border cooperation in addressing shared challenges and advancing collective knowledge. Industries provide critical funding, internships, and insights into global market demands, while global NGOs

facilitate cultural exchange, fund collaborative research, and advocate for inclusive education. Local communities play a pivotal role by implementing global ideas at the grassroots level, ensuring relevance and tangible impact. University labs bridge the gap between global research and local application, fostering innovation and addressing challenges collaboratively.

The framework emphasizes the interconnections between these pillars, showcasing their synergistic relationship. For instance, Personalized Learning is enhanced through the integration of Technology-Powered Education, which creates adaptive and data-driven learning environments. Similarly, Experiential Learning and Upskilling often rely on technological tools and global collaboration to provide students with meaningful, real-world opportunities. Furthermore, sustainability initiatives are supported by experiential learning projects and global partnerships, ensuring a holistic approach to addressing environmental and social issues. These connections demonstrate that the pillars are not standalone entities but interdependent components that collectively strengthen the University 5.0 model. This holistic framework represents the vision of University 5.0 as a dynamic and integrated educational system, equipping students to navigate complex global challenges with innovative, ethical, and sustainable solutions. By fostering collaboration across disciplines, leveraging technology, and emphasizing social responsibility, University 5.0 redefines higher education to meet the demands of a rapidly evolving world.

8. Conclusion

The progression from University 1.0 to University 5.0 encapsulates the dynamic evolution of higher education in response to the shifting demands of society, technology, and the global economy. Each phase represents a critical transformation, from the traditional focus on teaching and knowledge dissemination to the current emphasis on integrating ethics, sustainability, and advanced technology. University 5.0 reflects the culmination of these changes, offering a human-centered approach that leverages innovation to address complex global challenges. For Bangladesh, the path toward adopting the University 5.0 framework is both a necessity and an opportunity. The country's higher education sector stands at a critical juncture, where addressing systemic challenges such as resource constraints, skill mismatches, and unequal access can unlock its potential as a driver of sustainable development. Transitioning to University 5.0 will require strategic interventions, including fostering industry-academia collaborations, enhancing research and innovation ecosystems, and ensuring equitable quality across institutions.

This transformation demands a collaborative effort from policymakers, educators, and industrial leaders. Government policies must incentivize innovation and partnerships, universities must prioritize adaptability and inclusivity, and industries should actively engage in shaping curricula and research agendas. With concerted action, Bangladesh's higher education system can evolve into a globally competitive force that not only meets the needs of its citizens but also contributes to solving pressing global challenges. Through this, Bangladesh can position itself as a key player in the global knowledge economy, ensuring a sustainable and inclusive future.

References

Akturk, C., Talan, T., & Cerasi, C. C. (2022, September). Education 4.0 and university 4.0 from society 5.0 perspective. *2022 12th International conference on advanced computer information technologies (ACIT)* (pp. 577–582). IEEE.

Aladyshkin, I. V., Kulik, S. V., Odinokaya, M. A., Safonova, A. S., & Kalmykova, S. V. (2020, May). Development of electronic information and educational environment of the

university 4.0 and prospects of integration of engineering education and humanities. *Proceedings of the Conference "Integrating Engineering Education and Humanities for Global Intercultural Perspectives"* (pp. 659–671). Springer International Publishing.

Alharbi, A. M. (2023). Implementation of Education 5.0 in developed and developing countries: A comparative study. *Creative Education, 14*(5), 914–942.

Apriliyanti, M. (2022). Challenges of the industrial revolution era 1.0 to 5.0: University digital library in Indonesia. *Library Philosophy and Practice*, 1–17.

Azevedo, G., Tavares, M. C., Bastos, M. A., Vale, J., & Bandeira, A. M. (2023, June). Universities in era 5.0: The future accountant. *2023 18th Iberian Conference on Information Systems and Technologies (CISTI)* (pp. 1–7). IEEE.

Babkin, A., Batukova, L., Bagdasaryan, L., Mikhailov, P., & Karimov, D. (2024). The concept of a university's scientific and educational mechanism with elements of Industry 5.0. *E3S Web of Conferences, 531*, 05023. https://doi.org/10.1051/e3sconf/202453105023

Bhuiyan, B. A., Ahmmed, K., & Molla, S. (2009). A theoretical framework for quality assurance in higher education in Bangladesh. *Journal of Business, Society and Science, 1*(1), 27–51.

Bhuiyan, B. A., Imam, M. O., & Rahman, M. A. (2004). System approach to education management: Focusing on the quality dimensions in business education of Bangladesh. In *Business Education with focus on Faculty Development, Quality Assurance, Curriculum and Pedagogy* (pp. 6–21).

Bhuiyan, B. A., Molla, M. S., & Alam, M. (2021). Managing innovation in technical education: Revisiting the developmental strategies of Politeknik Brunei. *arXiv preprint arXiv:2111.02850*.

Boehm, C. (2018). University 1.0 to 3.0: Towards creative interfaces between the university and the knowledge economy.

Carayannis, E. G., & Morawska, J. (2023). Digital and green twins of Industry & Society 5.0: The role of universities. *The Elgar Companion to Digital Transformation, Artificial Intelligence and Innovation in the Economy, Society and Democracy* (pp. 166–202). Edward Elgar Publishing.

Carayannis, E. G., & Morawska, J. (2023). University and education 5.0 for emerging trends, policies and practices in the concept of industry 5.0 and society 5.0. *Industry 5.0: Creative and Innovative Organizations* (pp. 1–25). Springer International Publishing.

Dai, H., Chanphong, S., & Howattanakul, S. (2023). The effectiveness of decentralized autonomous organization for university in the web 3.0 era. *Journal of Roi Kaensarn Academi, 8*(8), 122–140.

Efimov, V., & Lapteva, A. (2017). University 4.0: Philosophical analysis. *ICERI2017 Proceedings* (pp. 589–596). IATED.

Eskinat, A., & Teker, S. (2023). University 5.0: Fact or dream? 47th International Conference on Education, Social Sciences, Humanities & Business Management.

Feldmann, B. (2014). Two decades of e-learning in distance teaching: From Web 1.0 to Web 2.0 at the University of Hagen. *Learning Technology for Education in Cloud, MOOC and Big Data* (pp. 163–172). Springer International Publishing.

Gueye, M. L., & Exposito, E. (2020, October). University 4.0: The Industry 4.0 paradigm applied to education. *IX Congreso Nacional de Tecnologías en la Educación*.

Halili, S. H., Sulaiman, S., Sulaiman, H., & Razak, R. (2021, February). Embracing industrial revolution 4.0 in universities. *IOP Conference Series: Materials Science and Engineering, 1088*, 012111. https://doi.org/10.1088/1757-899X/1088/1/012111

Hashim, M. A. M., Tlemsani, I., Mason-Jones, R., Matthews, R., & Ndrecaj, V. (2024). Higher education via the lens of Industry 5.0: Strategy and perspective. *Social Sciences & Humanities Open, 9*, 100828. https://doi.org/10.1016/j.ssaho.2023.100828

Hossain, R. (2024). Adopting Industry 4.0: A strategic solution for transforming Smart Bangladesh: Prospective connections, opportunities, and challenges. *Pakistan Journal of Life and Social Sciences, 22*(1), 3304–3323.

Hutahaean, B., Telaumbanua, S., Tamba, L., Hutabarat, R. G. N., & Sumani, S. (2024). Analysis of innovative and adaptive higher education curriculum development to Education 5.0-based challenges in Indonesia. *International Journal of Learning, Teaching and Educational Research, 23*(4), 76–98.

Islam, M. N. (2022). Readiness assessment of public university in Bangladesh for education 4.0: A case study of Shahjalal University of Science and Technology–Sylhet, Bangladesh. *Khulna University Studies*, 775–787.

Jugembayeva, B., Murzagaliyeva, A., & Revalde, G. (2022). Pedagogical model for raising students' readiness for the transition to University 4.0. *Sustainability, 14*(15), 8970.

Karre, H., Hammer, M., Kleindienst, M., & Ramsauer, C. (2017). Transition towards an Industry 4.0 state of the LeanLab at Graz University of Technology. *Procedia Manufacturing, 9*, 206–213.

Keats, D., & Schmidt, J. P. (2007). The genesis and emergence of Education 3.0 in higher education and its potential for Africa. *First Monday, 12*(3).

Kudakwashe, K., Simbarashe, M., & Taurai, M. (2020). Challenges of working towards the implementation of Education 5.0 in Zimbabwean universities: A case of Chinhoyi University of Technology (CUT).

Lantada, A. D. (2022). Engineering education 5.0: Strategies for a successful transformative project-based learning. *Insights Into Global Engineering Education After the Birth of Industry 5.0*. IntechOpen.

Latif, W. B., Pervin, K., & Karim, M. (2021). The impact of the Fourth Industrial Age (I4.0) on higher education (HE4.0): In the perspective of Bangladesh. *International Journal of Education and Social Science Research, 4*(5).

Lose, T., & Jack, L. (2024). Satisfaction of academics with leadership, creativity, innovation and organisational performance at a university 5.0 work environment. *The Business and Management Review, 15*(1), 116–126.

Mamun, M., Bhuiyan, B. A., Rab, A., & Islam, M. (2000). Promoting entrepreneurship through technological development: A proposed model for developing countries. D. Sinha & B. Prasad (Eds.), *Advantage South Asia: Opportunities and challenges for management development*. AMDISA.

Mourtzis, D., Angelopoulos, J., & Panopoulos, N. (2023). Metaverse and blockchain in education for collaborative product-service system (PSS) design towards University 5.0. *Procedia CIRP, 119*, 456–461.

Mudin, D. K. D. (2018). Industrial Revolution 4.0: Role of universities. *Borneo Journal of Medical Sciences, 12*(1), 1–7.

Ozols, A., Sarkane, E. G., & Avotins, V. (2024, June). Innovation ecosystem university model as a new generation 5.0 model. *ISPIM Innovation Symposium* (pp. 1–16). ISPIM.

Panizzon, M., & Barcellos, P. F. P. (2020). Critical success factors of the university of the future in a Society 5.0: A maturity model. *World Futures Review, 12*(4), 410–426.

Rachmawati, I., Multisari, W., Triyono, T., Simon, I. M., & da Costa, A. (2021). Prevalence of academic resilience of social science students in facing the Industry 5.0 era. *International Journal of Evaluation and Research in Education, 10*(2), 676–683.

Rocha, Á., Gonçalves, M. J. A., da Silva, A. F., Teixeira, S., & Silva, R. (2022). Leadership challenges in the context of University 4.0: A thematic synthesis literature review. *Computational and Mathematical Organization Theory*, 1–33.

Rosak-Szyrocka, J., Apostu, S. A., Ali Turi, J., & Tanveer, A. (2022). University 4.0 sustainable development in the way of Society 5.0. *Sustainability, 14*(23), 16043.

Saharuddin, D., & Fatarib, H. (2022, December). The role of universities in the community economy era of the Community Concept 5.0. *The 4th International Conference on University Community Engagement (ICON-UCE 2022)* (Vol. 4, pp. 394–401).

Shahidi Hamedani, S., Aslam, S., Mundher Oraibi, B. A., Wah, Y. B., & Shahidi Hamedani, S. (2024). Transitioning towards tomorrow's workforce: Education 5.0 in the landscape of Society 5.0—a systematic literature review. *Education Sciences, 14*(10), 1041.

Tekavc, J., & Presker, R. (2023). Pilot projects of the University of Maribor for a green and resilient transition to Society 5.0. *Journal of Sustainability Perspectives*, 386–389.

Torres, F. J. Á., & Delgado, J. E. R. (2024). University 3.0: Entrepreneurship education and socio-digital skills (SDS). *Transition to a Safe Anthropocene in the Asia-Pacific: Sustainability, Climate Action, and Green Technology, 39*, 55.

Ülker, N., & Otrar, M. (2024). University 4.0 essentials: Influence of Industry 4.0 on higher education. *Industry and Higher Education*.

Valentini, E. (2010). E-university, Web 1.0 and 2.0: Guidelines to integrate technology-enhanced learning in university environments. *Journal of e-Learning and Knowledge Society, 6*(1), 103–108.

Verma, P., Arora, N., Ahmed, E., & Agarwal, V. (2023). Routing towards Education 5.0 via sustainable technology empowerment: Potential challenges to academicians in universities. *Journal of Statistics and Management Systems, 26*(7), 1759–1775.

Wessels, L., & van Wyk, J. A. (2022). University 4.0: A conceptual model for South African universities and the Fourth Industrial Revolution. *Africa and the Fourth Industrial Revolution: Curse or Cure?* (pp. 33–66).