Analysis of Innovative and Adaptive Higher Education Curriculum Development to Education 5.0 Based Challenges in Indonesia

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Abstract. This study comprehensively analyzes the evolving landscape of higher education curriculum development in response to the advent of Education 5.0 in Indonesia. Recognizing the seismic shifts prompted by digital transformation and the Fourth Industrial Revolution, the research identifies the imperative to realign educational frameworks to foster twnet-first-century competencies and technological integration and enhance lecturers' capabilities. This research aims to analyze the development of an innovative and adaptive higher education curriculum to the challenges based on Education 5.0 in Indonesia. Through a qualitative methodology encompassing case studies of three Indonesian universities that have pioneered innovative and adaptive curricula, the investigation sheds light on the strategic orientations and methods employed. Core informants and supporting informant data were amassed through interviews, observations, and documentary analysis involving key stakeholders: universities, industry, government and community representatives. Employing the Miles and Huberman model for data analysis, the findings underscore the necessity for curricula that not only imbibe technological advancements orienting toward twenty-first-century competencies but also integrate technology, humanities and local wisdom in learning prioritize flexibility, learner personalization and stakeholder collaboration in curriculum development and execution.

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Furthermore, the study highlights the critical role of continuous evaluation and accreditation in upholding curriculum quality and credibility. Collectively, these insights contribute to delineating a framework for higher education curricula that are equipped to meet the demands of Education 5.0, thereby serving as a beacon for curriculum developers, policymakers and educational practitioners aiming to navigate the complexities of contemporary educational dynamics.

1. Introduction

Education 5.0 is a term used to describe an educational paradigm that focuses on developing twenty-first-century skills, such as creativity, collaboration, communication, critical thinking and character, by utilizing advanced digital technologies, such as artificial intelligence, Internet of Things, Big Data, cloud computing, and augmented reality (González et al., 2022; Rusman et al., 2023). Education 5.0 is expected to produce graduates who are ready to face the challenges and opportunities in the era of the Fourth Industrial Revolution (4IR), which is characterized by rapid, complex, and uncertain changes in various fields of life, including the current hostile and favorable challenges of AI (Rymarczyk, 2020).

The precipitous advancement of AI in recent years has heralded significant transformations across various sectors, including Education (Yu, 2024). While AI technologies offer unprecedented opportunities for enhancing learning environments and operational efficiencies, they concurrently present substantial challenges (Dwivedi et al., 2021). One of the most pressing concerns is the displacement of human roles by AI tools, leading to a diminished engagement of individuals in real and tangible activities (Caporusso, 2023). This phenomenon raises questions about the future of work and the skills and competencies that need to be nurtured within the educational sphere to prepare individuals for a rapidly evolving digital world.

Recognizing these developments, this research aims to delve into the existing problems and gaps within the educational field, particularly in the context of higher education curriculum development in Indonesia (Hutahaean et al., 2022). The advent of AI and its implications necessitates a reevaluation of educational frameworks to ensure they remain relevant and capable of equipping students with the skills required in the digital age (Gill et al., 2022). However, a notable need exists for a clear framework or model in the literature that addresses the need for curricula to adapt to technological advancements and innovatively foster critical competencies among students.

This study seeks to fill this gap by proposing a model for an innovative and adaptive curriculum responsive to the challenges posed by the digital revolution, including integrating AI in educational settings. By examining the design and implementation of such curricula in selected Indonesian universities, this research

contributes to a deeper understanding of how higher Education can evolve to meet the needs of students in the twenty-first century. Moreover, it underscores the importance of curriculum development processes that are methodically sound and aligned with contemporary educational demands and challenges, setting the stage for a discussion on the methodological aspects in the subsequent section.

A critical aspect of Education 5.0 is the curriculum, a plan and arrangement regarding the objectives, content, learning materials and methods used as guidelines for organizing learning activities to achieve specific educational goals (Rapanta et al., 2020). The higher education curriculum, as one of the levels of education that plays a role in producing quality, relevant and competitive human resources, must be able to adapt and innovate according to the challenges and needs that exist in the Education 5.0 era (Darmaji et al., 2019; Tavares et al., 2023).

This study aims to analyze the development of an innovative and adaptive higher education curriculum to the challenges based on Education 5.0 in Indonesia. This research uses a qualitative descriptive method with three core informants, namely three universities in Indonesia that have implemented an innovative and adaptive curriculum, namely University A, University B and University C, and three supporting informants, namely three stakeholders related to the higher education curriculum, namely industry, government and society. The data analyzed came from interviews, observations and documentation conducted on informants.

This research is expected to contribute to developing a higher education curriculum informed by the challenges and opportunities in the era of Education 5.0 and provide information and inspiration for researchers, practitioners and policymakers interested in the higher education curriculum in Indonesia.

2. Literature Review
2.1 Education 5.0
Education 5.0 represents an educational paradigm focusing on developing 21st-century skills by leveraging advanced digital technologies (N. Rane et al., 2023). These skills include creativity, collaboration, communication, critical thinking and character development (Thornhill-Miller et al., 2023). The integration of artificial intelligence, the Internet of Things, Big Data, cloud computing and augmented reality plays a pivotal role in shaping Education 5.0 (Rane, 2023). The goal is to produce graduates who are well-prepared to navigate the challenges and opportunities of the 4IR, characterized by rapid and complex changes across various domains (Bikse et al., 2022; Ramnund-Mansingh & Reddy, 2021).

Education 5.0 has several characteristics, namely:
1) It is oriented toward learning outcomes that positively impact individuals, society and the environment, not just the learning process oriented toward grades or certificates (Rusilowati & Wahyudi, 2020).
2) It requires the integration of technology, humanities and local wisdom in learning to produce graduates who have balanced technical, social, and cultural skills (Ratana-Ubol & Henschke, 2015; Sumiati et al., 2020). Education 5.0 seeks to balance technical knowledge with social and cultural

understanding. It encourages the integration of technology, humanities and local wisdom into the learning process (Jamaludin et al., 2020).

3) It provides flexibility and personalization in the learning process to adapt to each individual's needs, interests, learning styles and the conditions and situations in the environment (Lamya et al., 2020; Peng et al., 2019).

4) It involves collaboration between parties with the same interests and goals in education, such as universities, industry, government and society, with mutual contributions, support and benefits (Rybnicek & Königsgruber, 2019).

5) It aims to improve the quality and capacity of educators as facilitators, inspirers and true learners who can support, motivate and inspire students in the teaching and learning process, research, community service and self-development (Blašková et al., 2014; Vadivel et al., 2021).

6) Outcome-Oriented Learning: Education 5.0 emphasizes learning outcomes that positively impact individuals, society and the environment. It goes beyond grades or certificates, focusing on holistic development (Saidi et al., 2023).

While existing literature provides insights into Education 5.0, there still needs to be a more precise identification of arguments related to the adaptive, innovative and challenging nature of curricula. Our research reviews previous empirical studies to address this gap, examining their methods, results and conclusions. By outlining these gaps, we aim to contribute to the ongoing discourse on curriculum development. Combining the research questions addressed in this study is essential. Therefore, constructing feasible research questions becomes imperative to demonstrate the relevance of our study and its ability to achieve its objectives.

2.2 Higher Education Curriculum

The curriculum is a plan and arrangement regarding the objectives, content, and learning materials and the methods used as guidelines for organizing learning activities to achieve specific educational goals (Zuo & Wang, 2021). The higher education curriculum, as one of the levels of education that plays a role in producing quality, relevant and competitive human resources, must be able to adapt and innovate according to the challenges and needs that exist in the era of Education 5.0 (Rusman et al., 2023; Tavares et al., 2023).

The higher education curriculum has several components, namely:

1) Objectives are statements of what higher education aims to achieve regarding knowledge, skills, attitudes and values (Serva Tuju et al., 2022; Wagenaar, 2014).

2) Content is the material or substance delivered in higher education, whether in the form of courses, modules, projects, or other activities relevant to the field of study (Barrot, 2023; Mateus et al., 2019).

3) Methods are the means or techniques used in higher education, whether in terms of delivery, interaction or evaluation, by the set objectives and content (Barrot, 2023).

4) Media are tools or means used in higher education, whether in the form of books, slides, videos, audio, or digital technology that can support the teaching and learning process (Nicolaou et al., 2019; Zuo & Wang, 2021).

5) Evaluation is the process of measuring or assessing the performance or results achieved by higher education, whether in the form of tests, quizzes, assignments, portfolios or observations, which can provide feedback or input for improvement and improvement (Zuo & Wang, 2021).

2.3 Innovative and Adaptive Higher Education Curriculum Development

Curriculum development is the process of planning, implementing and evaluating the curriculum, which involves various related parties, such as educators, students, industry, government and society, to improve the quality, relevance and impact of education (Khan & Law, 2015). Innovative and adaptive higher education curriculum development is a curriculum development process that can produce a curriculum that is by the challenges and opportunities that exist in the Education 5.0 era, using a creative, flexible, and collaborative approach (Carayannis et al., 2022; Legi et al., 2023; Tierney & Lanford, 2016).

The development of an innovative and adaptive higher education curriculum has several steps, namely:

1) Needs analysis is the process of identifying and analyzing the needs and demands that exist in the world of work and society, as well as the development of science and technology, which is the basis for determining the objectives and content of the curriculum (El-Sabagh, 2021).

2) Curriculum design, which is the process of designing and compiling a curriculum, considers various aspects, such as the university's vision, mission, goals, quality standards set by the government, industry, society and available resources and facilities. Curriculum design also incorporates the principles of an innovative and adaptive curriculum, namely orientation to twenty-first-century competencies, integration between technology, humanities and local wisdom, flexibility and personalization, collaboration, and accountability (Serva Tuju et al., 2022; Stojadinovic et al., 2021).

3) Curriculum implementation is the process of implementing the curriculum using methods and media that follow its objectives and content. It involves collaboration between universities, industry and society as partners, clients or beneficiaries. Curriculum implementation must consider effectiveness, efficiency, and sustainability principles and conduct regular and systematic monitoring and supervision (Stojadinovic et al., 2021; Supriyoko et al., 2022).

4) Curriculum evaluation is the process of assessing and measuring the performance or results achieved by the curriculum, both in terms of quality, relevance and impact, using instruments or tools that are valid, reliable and accurate and by making the necessary improvements and enhancements. Curriculum evaluation must be carried out by taking into account the principles of objectivity, transparency and accountability and by involving various parties who have interests and responsibilities for the curriculum, such as educators, students, industry, government and society (Hutahaean et al., 2022; Japee & Oza, 2021; Woods, 1988; Yazçayır & Selvi, 2020)

2.4 The Integration of Artificial Intelligence (AI)

Integrating AI into educational paradigms represents a transformative shift, necessitating a reevaluation of existing curricular frameworks to ensure they align with the competencies required in the digital age (Abraham & Abraham Jackson,

2024). This literature review elaborates on the theoretical and conceptual underpinnings crucial for understanding innovative and adaptive curriculum development dynamics in the face of technological advancements, drawing extensively on the insights from leading scholars in the field (Abulibdeh et al., 2024).

Central to this discussion is the work of Mahmud and Wong (2022), who articulate the importance of developing curricula that are not only technologically integrated but also foster critical thinking, creativity and adaptability among students. Similarly, Parker et al. (2024) emphasize the role of AI in reshaping educational practices, highlighting the potential for enhanced personalized learning experiences. However, these advancements also bring forth challenges, including the risk of obsolescence of traditional educational models and the need for educators to acquire new pedagogical skills.

A detailed examination of empirical studies reveals varied approaches to integrating AI technologies within higher education. For instance, Bozkurt et al. (2021) employed a mixed-methods approach to assess the impact of AI-based tools on learning outcomes, finding significant improvements in student engagement and understanding. Conversely, Ouyang and Jiao (2021) conducted a longitudinal study that pointed to the challenges of implementing AI solutions, such as technical difficulties and resistance from faculty members.

Despite these insights, a gap persists in the literature regarding comprehensive curriculum development models that are innovative in incorporating AI and adaptive to the evolving educational landscape (Zawacki-Richter et al., 2019). This gap underscores the necessity for research that interrogates the efficacy of such models and explores their implementation across diverse educational contexts.

Addressing this need, the present study formulates research questions to investigate the design, implementation and outcomes of innovative and adaptive curricula in Indonesian universities. These answers to these questions shed light on how such curricula can prepare students for the challenges and opportunities of the digital age, thereby contributing to the broader discourse on educational innovation in the context of AI integration.

3. Research Methodology
In this study, researchers used a qualitative research method with a case-study approach. According to Sugiyono (2019), qualitative research methods are research methods that produce descriptive data in the form of written or spoken words from people and observable behavior. According to Yin et al. (2018), a case study is a research strategy that studies a phenomenon in depth in a natural context, using various sources of evidence. The researcher chose a qualitative research method with a case study approach because the researcher wanted to analyze the development of an innovative and adaptive higher education curriculum to the challenges based on Education 5.0 in Indonesia by describing, explaining and understanding the phenomenon holistically and

comprehensively, by considering various related aspects, such as context, process, results and impact (Creswell, 2017).

This research adopts a qualitative case-study approach, strategically chosen for its effectiveness in exploring complex phenomena within their real-life contexts. Contrary to the conflation between research design and approach initially observed, this clarification delineates the case study as the research strategy employed to gain in-depth insights into implementing innovative and adaptive curricula in Indonesian universities in response to the challenges posed by Education 5.0.

Case Study Selection and Rationale. The selection of three Indonesian universities for this study was grounded in purposive sampling. These institutions were identified based on their proactive initiatives in curriculum development to address the evolving educational demands. To ensure a rigorous selection process, criteria were established, including documented evidence of curriculum innovation and adaptability, recognition for educational excellence and willingness to participate in the study. This approach mitigates the potential bias of convenience sampling by prioritizing relevance and representativeness over mere accessibility.

In this study, researchers determined three universities in Indonesia that had implemented an innovative and adaptive curriculum to the challenges based on Education 5.0, as the case under study. The three universities are University A, University B and University C. Researchers selected the three universities based on purposive sampling criteria, a sampling technique with specific considerations that are dictated by the research objectives (Miles et al., 2018; Sugiyono, 2019). The criteria used by researchers are as follows:

1) The college has implemented a curriculum that is innovative and adaptive to the challenges of Education 5.0, as indicated by curriculum documents, academic guidelines or other relevant evidence.
2) These universities have a good reputation nationally and internationally, as indicated by their rankings, accreditation or awards.
3) These universities are willing and cooperative to become informants and provide the data researchers need.

In this study, researchers used source triangulation techniques to collect data. Source triangulation is a data collection technique using various sources to obtain more complete, valid, and reliable data (Bonello & Meehan, 2019; Miles et al., 2018). The data sources used by researchers were as follows:

1) Core informants, namely the three universities that were the cases studied, were represented by officials or staff responsible for curriculum development, such as rectors, deans, heads of study programs or curriculum coordinators. These core informants provided data on the universities' curriculum development regarding process, results and impact. To ascertain the successful integration of innovative and adaptive curricula, we selected three universities based on the following criteria:
   a. Orientation Toward Education 5.0 Challenges: Universities that explicitly addressed the challenges posed by Education 5.0 in their

curriculum development. These universities demonstrated a proactive approach to aligning their curricula with the demands of the twenty-first-century (Munikwa & Mapara, 2022).

  b. Evidence of Implementation: We verified that these universities had implemented innovative and adaptive curricula through interviews, observations and documentation. The evidence included curriculum documents, faculty interviews, and classroom observations (Gale et al., 2020).

  c. Representativeness: While we acknowledge that other institutions may also embrace similar actions, we focused on these three universities as representative cases. We aimed to provide insights into the process of curriculum development, its impact and outcomes within the context of Education 5.0 (Gürdür Broo et al., 2022).

2) Supporting informants, namely three stakeholders related to the higher education curriculum, namely industry, government and society, were represented by representatives or people who had links or interests with the higher education curriculum, such as directors, managers, employees, officials, activists, or academics (Aleixo et al., 2018). These supporting informants provided data on their perceptions, expectations and responses to the curriculum developed by higher education institutions in terms of quality, relevance and impact.

3) Various documents related to the higher education curriculum were obtained from universities, industry, government and society, such as curriculum documents, academic guidelines, research reports, accreditation reports, articles, news or social media. These documents provide data that supports, complements or compares data obtained from informants.

Data Collection and Instruments. Data were collected through semi-structured interviews, observations and document analysis. The interview guides, observation checklists, and document analysis frameworks were meticulously developed to ensure comprehensive coverage of the study's focal points, including the curriculum development process, the integration of innovative and adaptive elements, and the outcomes of such initiatives.

An interview is a data collection technique involving direct conversations with informants, face-to-face or through other communication media, such as telephone, email or social media, using pre-prepared questions. Observation is a data collection technique that directly observes the object, situation or behavior under study or through recording media, such as photos, videos or audio.. Document analysis is a data collection technique used to search, collect, and analyze documents related to the problem under study (Creswell, 2017; Sugiyono, 2019).

Our data sources include:

1) Interviews: We conducted face-to-face interviews with core informants (university representatives) and supporting informants (industry, government and society). Interviews were conducted face-to-face and online, depending on the participants' availability and preferences. This flexibility ensured a higher participation rate and accommodated the informants'

diverse schedules. The interviews aimed to gather insights into the universities' curriculum development processes, challenges faced and strategies employed. Supporting informants, such as industry partners and educational policymakers, were also engaged to understand the broader impact and reception of the curricular innovations.

2) Observations: Classroom observations allowed us to witness the implementation of the curricula. We observed interactions between lecturers and students, teaching methods and student engagement.

3) Documentation: Curriculum documents, policy guidelines and relevant materials provided essential information. These documents helped us understand the formal aspects of curriculum design and implementation.

Data Management and Analysis. Data management involves organizing, categorizing, and thematizing the collected data (Miles et al., 2018). We ensured objectivity, transparency and accountability throughout the process.

In this study, researchers used the Miles and Huberman model data analysis technique, consisting of three stages: data reduction, data presentation, and conclusion drawing (Miles et al., 2018). Data reduction simplifies, organizes and selects data relevant to research objectives using coding, categorization or thematization techniques. Data presentation is the process of organizing and structuring data that has been reduced into a form that is easy to understand and interpret using techniques such as tables, diagrams, graphs or narratives. Concluding is the process of interpreting and making meaning from the data that has been presented using techniques such as comparison, triangulation, or verification (Creswell, 2017).

All collected data were managed using NVivo software to facilitate organized storage, coding and analysis. This software enabled the efficient handling of diverse data sources and supported the thematic analysis to identify patterns and insights related to the study objectives (Bonello & Meehan, 2019).

Validity and Reliability. To ensure the reliability and validity of the research instruments, a pilot test was conducted with a small group of educational experts not included in the main study (Karmilla et al., 2016). Feedback from this pilot test led to refinements in the interview questions and observation criteria. Additionally, triangulation of data sources was employed to cross-verify information and enhance the study's credibility.

Instruments and Validity.

1. Interview Instruments: We developed interview guides tailored to each informant group (core and supporting). The questions covered curriculum development, challenges, stakeholder collaboration and impact assessment.

2. Observation Instruments: We used structured observation forms to record classroom dynamics, teaching methods and student participation.

3. Document Analysis: We systematically reviewed curriculum documents, ensuring consistency and alignment with Education 5.0 principles.

Ethical Considerations. The institutional review board approved the research, and all participants provided informed consent. The anonymity and confidentiality of the participants' responses were strictly maintained throughout the research process.

4. Research Results and Discussion

In this section, researchers present and discuss the results obtained from the data analysis that has been carried out using qualitative descriptive methods. The results were arranged around the following research questions:

1) How can we develop an innovative and adaptive higher education curriculum that meets the challenges based on Education 5.0 in Indonesia?
2) What factors influence the development of an innovative and adaptive higher education curriculum to the challenges based on education 5.0 in Indonesia?
3) How does developing an innovative and adaptive higher education curriculum impact the challenges of education-based 5.0 in Indonesia?

Curriculum oriented toward twenty-first century competencies, namely creativity, critical thinking, communication and collaboration. These competencies are needed to face the challenges and opportunities in the era of globalization and digitalization, which demand the ability to adapt, innovate and collaborate in the world of work and society. A higher education curriculum oriented toward twenty-first-century competencies must provide opportunities and facilities for students to develop their creativity regarding ideas, products and processes. A higher education curriculum oriented toward twenty-first-century competencies must also provide opportunities and facilities for students to solve existing problems, both theoretical and practical problems, using various methods and approaches. A higher education curriculum oriented toward twenty-first-century competencies must also provide opportunities and facilities for students to collaborate with fellow students, lecturers and other parties, both on and off campus, using various media and platforms that support communication and cooperation. A higher education curriculum oriented toward twenty-first-century competencies must also provide opportunities and facilities for students to communicate effectively using various languages and styles, both orally and in writing.

The interviews with the core informants showed that the three universities had implemented a twenty-first-century competency-oriented curriculum differently. University A developed a project-based curriculum, where students were assigned projects related to their field of study, using various learning resources, including technology. The projects were aimed at demonstrating students' creativity, problem-solving, collaboration and communication, both in the process and the outcome. University B developed a problem-based curriculum, where students were given real problems relevant to their field of study, using various methods and approaches, including technology. These problems challenged students' critical, analytical and reflective thinking and require effective

collaboration and communication. University C developed a portfolio-based curriculum, where students could create portfolios that reflected their twenty-first-century competencies using various products and processes, including technology. These portfolios demonstrated students' creativity, problem-solving, collaboration and communication in individual and group form.

The results of interviews with supporting informants show that the three stakeholders, namely industry, government and society, appreciated the need for a curriculum oriented toward twenty-first-century competencies because of the needs and demands of the times consider it. Industry said that graduates who have twenty-first-century competencies will be more adaptable, innovative and collaborative in an increasingly complex and competitive world of work. The government said that graduates with twenty-first-century competencies will be better able to contribute to social, cultural and economic development using various media and platforms that support communication and cooperation. Society says that graduates with twenty-first-century competencies will be more sensitive to global and local issues and responsible for the environment and humanity.

Twenty-first-century competencies. Universities emphasize competencies such as creativity, critical thinking, communication and collaboration. These competencies are essential for graduates to thrive in a globalized, digitalized world, where adaptability, innovation and collaboration are paramount.

Integrate technology, humanities and local wisdom in learning. Technology is a learning tool and resource that can support the teaching and learning process in terms of efficiency, effectiveness and affordability. Humanities is the study of humans, whether in terms of culture, history, philosophy or art. Local wisdom derives from the community's culture and traditions. These three aspects complement and enrich each other to improve the quality of education and graduates. The higher education curriculum that integrates technology, humanities and local wisdom must utilize various existing technologies, such as the internet, computers, smartphones, tablets and others, to support the teaching and learning process synchronously and asynchronously. The higher education curriculum integrating technology, humanities and local wisdom must also utilize various online learning resources, such as e-books, e-journals, videos, podcasts and others, to support the teaching and learning process independently and in groups. The higher education curriculum that integrates technology, humanities and local wisdom must also be able to teach and apply humanities and local wisdom, both in the scientific, professional and expertise fields, by appreciating and respecting the differences and uniqueness of each.

The interviews with the core informants showed that the three universities had implemented a curriculum that integrated technology, humanities and local wisdom differently. University A developed a technology-based curriculum (hybrid), where part of the learning process was carried out online, using various applications and platforms, such as Google Classroom, Zoom, YouTube and others. University A also developed a humanities-based curriculum, where students were given courses related to the humanities, such as philosophy,

history, culture and art. University A also developed a local wisdom-based curriculum, where students were given courses related to local wisdom, such as regional languages, customs and environmental wisdom.

University B developed a humanities-based curriculum, where students were given courses related to the humanities, such as ethics, psychology, sociology and anthropology. University B also developed a technology-based curriculum, where students were given technology-related courses, such as informatics, engineering and design. University B also developed a local wisdom-based curriculum, where students were given courses related to local wisdom, such as religion, culture and art.

University C developed a local wisdom-based curriculum, where students were given courses related to local wisdom, such as character education and entrepreneurship citizenship. University C also developed a technology-based curriculum, where students were given technology-related courses, such as communication, media and information. University C also developed a humanities-based curriculum, where students were given courses related to the humanities, such as literature, language and culture.

Technology Integration (Research Questions-RQ1): The study revealed that all three universities had proactively integrated technological advancements into their curricula, aligning with global digital transformation trends. Data from interviews underscored significant enhancements in digital literacy among students and faculty alike; a sentiment echoed in the observed classroom practices where digital tools were actively employed to facilitate learning. Documentation from University A revealed a structured framework for embedding digital competencies across disciplines, illustrating a strategic approach to technology integration.

Incorporation of Humanities and Local Wisdom (RQ2): Analysis of curriculum documents and faculty interviews highlighted a conscious effort to blend humanities and local cultural insights into the curriculum. Observations confirmed that courses included modules focused on local wisdom, aiming to foster a deeper connection between students and their cultural heritage while developing critical thinking skills. This approach has been praised for its potential to cultivate well-rounded graduates equipped to navigate the complexities of the global and local contexts.

Challenges and Opportunities (RQ3): Interviews with university leaders and faculty revealed various challenges, from infrastructural limitations to staff resistance to change. However, these challenges were counterbalanced by opportunities, including stronger industry-academia partnerships and an enriched student educational experience. Documentation and observations supported these findings, showcasing instances where universities successfully navigated obstacles to innovate curricula.

Discussion in Light of Previous Research The findings from this study resonate with existing literature that emphasizes the importance of technological fluency in modern education. However, the novel integration of local wisdom and humanities significantly contributes to the discourse on adaptive curricula. This dual focus addresses a critical gap in existing research, as highlighted by Abidoye et al. (2024), who call for a more holistic approach to curriculum development in the digital age.

The challenges identified align with those documented by Ali (2020), who also notes resistance to technological integration in higher education. However, this study extends the conversation by identifying clear pathways through which institutions have turned challenges into opportunities for curriculum enhancement.

Integration of Technology, Humanities and Local Wisdom. Curricula incorporate technology to enhance learning experiences. Humanities courses provide a broader perspective, fostering empathy, cultural understanding and ethical reasoning. Local wisdom is integrated to preserve cultural heritage and address societal needs.

3) Flexibility and personalization in the learning process.
Flexibility is the ability to adapt to student's needs, interests, learning styles and the conditions and situations in the environment. Personalization is the ability to provide learning experiences based on students' characteristics, potential, goals and the development of science and technology. A flexible and personalized higher education curriculum must provide choices and variations in the learning process regarding material, methods, media and evaluation. A flexible and personalized higher education curriculum must also be able to provide appropriate and relevant feedback and guidance for students, both individually and in groups.

Interviews with core informants showed that the three universities had implemented flexible and personalized curricula differently. University A developed a project-based curriculum where students could choose project topics, sources and methods that suited their interests, goals, conditions and situations. University A also developed a portfolio-based curriculum, where students could choose products and processes that matched their characteristics and potential, as well as the development of science and technology. University B developed a problem-based curriculum where students could choose problems, approaches and solutions that suited their interests and goals, as well as existing conditions and situations. University B also developed a competency-based curriculum, where students could choose competencies that aligned with their characteristics and potential and the development of science and technology. University C developed a curriculum based on learning independence, where students could choose courses, sources and media that fit their interests and goals and existing conditions and situations. University C also developed a curriculum based on campus freedom, where students could choose activities, places and times according to their characteristics and potential, as well as the development of science and technology.

The results of interviews with supporting informants showed that all three stakeholders, namely industry, government and society, supported a flexible and personalized curriculum, as it was considered to improve the quality and relevance of higher education. Industry said that graduates who followed a flexible and personalized curriculum would have more skills needed in the world of work, such as adaptation, innovation and collaboration. The government said that graduates who followed a flexible and personalized curriculum would have more knowledge needed by society, such as citizenship, entrepreneurship and humanity. The community said that graduates who followed a flexible and personalized curriculum would have more attitudes and values needed by the environment, such as tolerance, empathy and responsibility.

Flexibility and Personalization. Curricula offered flexibility, allowing students to tailor their learning paths. Personalization ensured that individual needs, interests and aspirations are met.

4) Collaboration between universities, industry and the community in curriculum development and implementation.

Collaboration is cooperation by various parties with the same interests and goals by providing mutual contributions, support and benefits. Higher education, industry and society are three parties that have an essential role in higher education, both as organizers, users and beneficiaries. A collaborative higher education curriculum must involve universities, industry and the community in curriculum development in terms of identification, formulation, implementation and evaluation. A collaborative higher education curriculum must also benefit higher education, industry and society by improving quality, relevance and impact.

The interviews with the core informants showed that the three universities had implemented a collaborative curriculum differently. University A developed a project-based curriculum where students could undertake projects related to their field of study by working with industry, government or the community as partners, clients or beneficiaries. University A also developed a portfolio-based curriculum, where students can demonstrate products and processes related to their twenty-first-century competencies by working with industry, government or the community as givers, assessors or users. University B developed problem-based curricula where students could solve real problems relevant to their field of study by working with industry, government or the community as sources, mentors or solutions. University B also developed a competency-based curriculum, where students could develop competencies required by the economy and society by working with industry, government or society as trainers, mentors or partners. University C developed a learning independence-based curriculum, where students could choose courses that suited their interests and goals by working with industry, government or society as providers, facilitators or inspirers. University C also developed a curriculum based on campus freedom, where students could carry out activities that suited their characteristics and potential by working with industry, government or society as partners, sponsors or reinforcers.

The results of interviews with supporting informants show that the three stakeholders, namely industry, government and society, participate in the collaborative curriculum in different ways. The industry said they participated in the collaborative curriculum by providing inputs, resources and opportunities for universities and students and getting qualified, relevant and work-ready graduates. The government said they participated in a collaborative curriculum by providing policies, regulations, and support for university students and graduates who contributed, were competitive and had integrity. The community said they participated in a collaborative curriculum by providing problems, challenges, and solutions for universities and students and getting graduates who were helpful, innovative and responsible.

Collaboration Across Stakeholders. Universities collaborated with industry and society to co-create relevant curricula. Industry input ensures alignment with workforce demands, while societal perspectives enrich curriculum content.

5) Improving the quality and capacity of lecturers as facilitators, inspirers and true learners.

Quality is the level of excellence or perfection someone or something possesses, which various indicators or criteria can measure. Capacity is the ability or potential possessed by someone or something, which can be developed in various ways or strategies. Lecturers are teaching staff tasked with organizing higher education in terms of planning, implementation and evaluation. Lecturers are also tasked with conducting research, community service and self-development. An innovative and adaptive higher education curriculum that meets the challenges based on Education 5.0 must improve the quality and capacity of lecturers in terms of knowledge, skills, attitudes and values. An innovative and adaptive higher education curriculum to the challenges based on Education 5.0 must also be able to increase the role of lecturers as facilitators, inspirers and true learners who can support, motivate and inspire students in the teaching and learning process research, community service and self-development.

The interviews with the core informants showed that the three universities had implemented innovative and adaptive curricula to the challenges of Education 5.0 in different ways. University A developed a project-based curriculum where lecturers act as facilitators, providing guidance, direction and feedback to students in carrying out projects. Lecturers serve as sources of inspiration for students, offering examples, ideas, and suggestions to aid in project creation. Moreover, they embody the spirit of lifelong learning, constantly enhancing their expertise through research, publications, and training. At University B, a problem-based curriculum has been implemented, wherein lecturers function as facilitators, guiding students by presenting problems, methods, and resources for problem-solving. They also serve as motivators, presenting challenges, questions, and solutions to students as they tackle these problems. Additionally, they remain committed to their own ongoing intellectual growth, fostering critical, analytical, and reflective thinking through continued research, publications, and seminar participation. Meanwhile, University C adopts a curriculum emphasizing learning independence, with lecturers acting as facilitators to provide students with choice, variety, and flexibility in selecting courses and activities. They also

serve as mentors, offering motivation, encouragement, and guidance to students as they explore their interests, talents, and potential. Like their counterparts at University B, these lecturers are dedicated to their own development, striving for independence, diversity, and excellence through ongoing research, publications, and community engagement.

The results of interviews with supporting informants show that the three stakeholders, namely industry, government and society, appreciate an innovative and adaptive curriculum to the challenges based on Education 5.0 because it is considered to improve the quality and capacity of lecturers, as well as the role of lecturers as facilitators, inspirers and true learners. The industry said that lecturers who have high quality and capacity, as well as the role of facilitators, inspirers and true learners, will be able to produce qualified, relevant and work-ready graduates. The government says that lecturers who have high quality and capacity and act as facilitators, inspirers and true learners will be able to produce graduates who contribute, are competitive and have integrity. The community says that lecturers who have high quality and capacity and act as facilitators, inspirers and true learners will be able to produce graduates who are helpful, instrumental and responsible.

6) Improved curriculum accountability and credibility through continuous evaluation and accreditation.

Accountability is the responsibility held by a person or institution to explain, report and account for the performance or results achieved. Credibility is the trust or reputation that a person or institution has for the performance or results achieved. A curriculum is a plan and arrangement regarding the objectives, content, learning materials and methods used as guidelines for organizing learning activities to achieve specific educational goals. Evaluation is collecting and processing information to assess performance or results achieved. Accreditation is a formal recognition given by an authorized institution to a person or institution that meets specific quality standards. An accountable and credible higher education curriculum must demonstrate performance or results in terms of quality standards established by government, industry and society. An accountable and credible higher education curriculum must also be able to undergo a continuous evaluation and accreditation process, both internally and externally, to ensure its quality, relevance and impact.

The interviews with the core informants show that the three universities have implemented an accountable and credible curriculum differently. University A developed a project-based curriculum, where student performance or outcomes were assessed based on the projects they created, using clear, objective and transparent indicators or criteria. University A also developed a portfolio-based curriculum, where students' performance or outcomes were assessed based on the portfolios they submitted, using clear, objective and transparent indicators or criteria. University A also undergoes a continuous evaluation and accreditation process, both internally and externally, using valid, reliable and accurate instruments or tools. University B developed a problem-based curriculum, where student performance or outcomes are assessed based on the problems they solve, using clear, objective and transparent indicators or criteria. University B also

developed a competency-based curriculum, where student performance or outcomes were assessed based on their competencies, using clear, objective and transparent indicators or criteria. University B also undergoes a continuous evaluation and accreditation process, both internally and externally, using valid, reliable and accurate instruments or tools. University C developed a learning independence-based curriculum, where student performance or outcomes were assessed based on their chosen courses and activities, using clear, objective and transparent indicators or criteria. University C also developed a curriculum based on campus freedom, where student performance or outcomes were assessed based on their activities, using clear, objective and transparent indicators or criteria. University C also undergoes a continuous evaluation and accreditation process, both internally and externally, using valid, reliable and accurate instruments or tools.

The results of interviews with supporting informants show that all three stakeholders, namely industry, government and society, appreciate an accountable and credible curriculum because it is considered to ensure the quality, relevance and impact of higher education. The industry said that an accountable and credible curriculum would be able to produce graduates who had delivered performance or results in terms of quality standards set by the industry, both in terms of knowledge, skills and attitudes. The government said that an accountable and credible curriculum would be able to produce graduates who had delivered performance or results in terms of the quality standards set by the government, both in terms of competence, achievement and integrity. The community said that an accountable and credible curriculum would be able to produce graduates who had delivered performance or results according to the quality standards set by the community, both in terms of benefits, roles and responsibilities.

7) Factors Influencing Curriculum Development

Several factors shape the development of innovative and adaptive higher education curricula:
a. Vision, Mission and Goals. Universities' strategic direction influences curriculum design, and precise alignment with Education 5.0 principles drives curriculum innovation.
b. World of Work and Society Demands. Curricula respond to industry needs, preparing graduates for real-world challenges. Societal expectations drive curriculum relevance and impact.
c. Science and Technology Advancements. Curricula adapt to technological shifts, integrating digital literacy and emerging fields. Science and technology developments inform curriculum content and methodologies.
d. Government Policies and Regulations. National policies guide curriculum development. Compliance with quality standards ensures accountability and credibility.

8) Interpretation of Findings
a. Accountable and Credible Curricula. Universities demonstrate accountability and credibility through transparent assessment methods. University A's project-based and portfolio-based assessments exemplify this

approach. Continuous evaluation and accreditation maintain quality standards.

b. Collaboration Yields Impactful Curricula. Collaboration between universities, industry and society fosters curriculum relevance. Industry emphasizes skills, while society values attitudes and values. University B's problem-based and competency-based approaches reflect this collaboration.

c. Challenges and Opportunities. Challenges include balancing technology integration with humanities and local wisdom. Opportunities lie in personalized learning and interdisciplinary approaches.

5. Conclusion

Based on the results of the research and discussion, it can be concluded that:

1) The development of an innovative and adaptive higher education curriculum to address the challenges of Education 5.0 in Indonesia is conducted through various approaches. These include orienting students towards twenty-first-century competencies; integrating technology, humanities, and local wisdom in learning; offering flexibility and personalization in the learning process; fostering collaboration between universities, industry, and society in curriculum preparation and implementation; enhancing the quality and capacity of lecturers as facilitators, inspirers, and lifelong learners; and enhancing curriculum accountability and credibility through continuous evaluation and accreditation.

2) Factors that influence the development of an innovative and adaptive higher education curriculum to the challenges based on Education 5.0 in Indonesia are the vision, mission and goals of higher education, the needs and demands of the world of work and society, the development of science and technology, government policies and regulations and available resources and facilities.

3) The impact of developing an innovative and adaptive higher education curriculum to the challenges based on Education 5.0 in Indonesia is to improve the quality, relevance and impact of higher education for universities, students, graduates, lecturers, industry, government and society.

6. Recommendations

Based on the conclusions that have been described, the researchers provide the following recommendations:

1) Universities must continue to innovate and adapt in the development of higher education curricula, taking into account the challenges and opportunities that exist in the education 5.0 era, and referring to the quality standards set by the government, industry and society.

2) Universities must continue to improve cooperation and communication with industry, government and society, to develop and implement a higher education curriculum that is by the needs and demands of the world of work and society, as well as providing benefits and contributions to social, cultural and economic development.

3) Universities must continue to improve the quality and capacity of lecturers, both in terms of knowledge, skills, attitudes and values, as well as the role of lecturers as facilitators, inspirers and true learners who can support, motivate

and inspire students in the teaching and learning process, research, community service and self-development.

4) Universities must undergo a continuous evaluation and accreditation process, both internally and externally, using valid, reliable and accurate instruments or tools to ensure the quality, relevance and impact of the higher education curriculum and to make necessary improvements and enhancements.

5) Future researchers interested in conducting research related to this topic can develop this research using different methods, more informants or broader variables to get more comprehensive and in-depth results.

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