Development of an Adaptive Higher Education Management Model with Artificial Intelligence

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ABSTRACT
Higher education is the main pillar in building superior human resources in the era of globalization. The development of an adaptive higher education management model has become essential and global in the current era. However, the complexity of the challenges faced by higher education institutions in managing internal and external dynamics in their development. For this reason, an adaptive higher education management model has been developed using artificial intelligence. The aim of this research is to design and implement a responsive management model, utilizing artificial intelligence to increase operational efficiency and effectiveness. The research method was carried out through literature analysis, case studies, and system prototype development. By integrating artificial intelligence technology, this model is able to identify behavioral patterns, forecast trends, and provide real-time information to support managerial decision making. The research results show improvements in resource management, scheduling, and adaptation to changing dynamics of higher education. The integration of artificial intelligence accelerates the decision-making process, increases the efficiency of resource management, and overall, provides a strong foundation to address the complex dynamics of the world of higher education. The conclusion of this research states that there is great potential for artificial intelligence in the higher education management process. The resulting adaptive model is able to bring operational efficiency, enabling educational institutions to be more responsive to student needs and environmental dynamics. Thus, developing this model can be a strategic step to increase the competitiveness and relevance of higher education institutions in this modern era. Hopefully this research can be a benchmark for other research in conducting research.

Keywords: Artificial Intelligence, Education Management, Higher Education

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INTRODUCTION

Higher education plays an important role in shaping individuals into superior human resources capable of facing dynamic changes in global society. Rapid transformations in technology and environmental changes have made higher education institutions faced with demands to increase efficiency and effectiveness in the provision of education (Acikkar & Akay, 2009). In this context, the development of adaptive higher education management models utilizing artificial intelligence (AI) becomes essential to overcome the complexity of challenges faced by these institutions. Profound changes in the higher education paradigm, where these institutions must adapt to rapid internal and external dynamics. These challenges involve managing increasingly complex resources, increasing global competition, and rapid changes in labor market demands. Traditional management models are often no longer able to accommodate these changes quickly and effectively. The aim of this research is to develop an adaptive higher education management model by integrating artificial intelligence. The success of this model is expected to increase operational efficiency, improve the quality of educational services, and provide a faster response to environmental changes. The integration of artificial intelligence in higher education management can unlock the potential for optimizing processes related to human resource management, academic administration, scheduling, and strategic decision making.

Literatur of Refiew

1. Adaptive higher education management

Adaptive higher education management is the key to responding to the challenges of complex dynamics in the world of education today (Gligorea et al., 2023). In this case, adaptive higher education management involves the ability of these institutions to flexibly adapt to changes that occur in both the internal and external environment. The increasing complexity of societal demands, global competition, and rapid changes in technology require that higher education institutions can adapt and innovate continuously. Adaptive higher education management has aspects that need to be considered in creating a responsive and sustainable management model (Sajja et al., 2023). In facing this challenge, one of the main elements in adaptive higher education management is sustainability. Adaptive management models must consider operational, economic and environmental sustainability (Otto et al., 2023). The implementation of artificial intelligence (AI) and other technologies can be used to design solutions that are environmentally friendly and efficient in the use of resources, creating ecosystems that can survive in the long term.

Adaptability also includes the ability of higher education institutions to adapt to changes in labor market demands. In an era where job market needs change dynamically, management models must be able to identify these trends and align
curricula and educational programs to meet these needs (AL-Fayyadh et al., 2021). AI integration can help in the analysis of job market data, forecast future employment trends, and provide insight into the skills required by graduates. An aspect of adaptability that is no less important is the ability to respond to individual student needs. In an adaptive education management model, personalization is key. Artificial intelligence technology can be used to analyze data regarding students' learning styles, academic progress, and individual interests. In this way, higher education institutions can provide a more customized educational experience and support the unique development of each student (Agaoglu, 2016).

One important element in adaptive higher education management is flexibility in human resource management (Ben-Daya et al., 2019). The management model must be able to respond to the needs of lecturers and administrative staff, facilitate professional development, and improve their well-being (Ferguson, 2012). Artificial intelligence can be used to conduct performance analysis, assist in recruitment, and provide career development recommendations. In this way, higher education institutions can create a work environment that supports growth and innovation. In addition, adaptability also refers to the ability of higher education institutions to respond to changes in internal dynamics, such as organizational structure, policies and administrative procedures. The application of artificial intelligence technology in management can help improve the efficiency of administrative processes, reduce bureaucracy and increase transparency (Bharara et al., 2018). Adaptive management systems can speed decision making and improve response to policy changes (Adamson et al., 2014), creating a more dynamic and responsive environment.

Adaptive higher education management cannot be separated from the integration aspect of artificial intelligence technology in strategic decision making (Barredo Arrieta et al., 2020). Data obtained from AI analysis can provide deep insights regarding institutional performance, student enrollment trends, and academic program evaluation. Decision making based on this data can provide a stronger basis for strategic planning and development of higher education institutions. However, along with all its benefits, the implementation of artificial intelligence technology in higher education management also raises a number of challenges. One of them is data security and student privacy (Faculty of Education, University of Osijek, Cara Hadrijana 10, 31 000 Osijek, Croatia & Đurđević Babić, 2017). In collecting and analyzing student data, higher education institutions need to ensure that data integrity and individual privacy are maintained. Apart from that, efforts are also needed to involve all stakeholders, including lecturers, administrative staff and students, in the process of developing and implementing adaptive management models.

2. Artificial intelligence

Artificial intelligence (AI) has taken center stage in the development of educational management models, opening up new potential in improving the efficiency, accuracy and adaptability of educational institutions (Khan et al., 2022). The integration of artificial intelligence in the development of educational management models brings
various positive impacts that can change the paradigm of modern higher education (George & Wooden, 2023). First of all, artificial intelligence opens the door to deep data analysis and data-driven predictions. By utilizing machine learning techniques, educational institutions can collect and analyze big data, including academic data, student attendance, and user feedback. This analysis can provide deep insight into student behavior trends and patterns, helping institutions develop policies that are more effective and responsive to student needs. Additionally, AI can be used to improve human resource management in educational institutions. Artificial intelligence systems can assist in the recruitment process, performance assessment of staff and lecturers, as well as professional development (Miller, 2019). By utilizing performance data analysis, institutions can make more objective and efficient decisions in human resource management, having a positive impact on staff productivity and satisfaction.

The importance of personalization in higher education is also increasingly emphasized through artificial intelligence. Education management models developed with an AI approach can identify learning styles, individual needs and student preferences more accurately. This allows educational institutions to develop curricula that are more tailored to the needs of individual students, creating a more relevant and meaningful educational experience. In the decision-making aspect, artificial intelligence can provide significant support (M. Ali & Abdel-Haq, 2021). AI systems integrated into educational management models can assist institutions in strategic decision making, policy planning and academic program evaluation (Sondak & Sondak, 1989). Sophisticated data analysis can speed up the decision-making process, providing a stronger foundation for agency policies and initiatives.

However, the implementation of artificial intelligence in educational management also raises a number of challenges and ethical considerations. One of the main issues is student data privacy. In collecting and using student data for artificial intelligence analysis, educational institutions need to ensure that the integrity and privacy of the data remains protected. A strict and transparent privacy policy must be implemented to ensure that sensitive student data is not misused. Additionally, there needs to be a good understanding of the limitations and risks of artificial intelligence (Demircioğlu Diren & Horzum, 2022). AI algorithms can introduce certain biases if the data used for training is not perfectly representative. Therefore, educational institutions need to continuously evaluate and monitor their implementation of artificial intelligence to ensure fairness and accuracy in decision making. In learning management, artificial intelligence can support the development of management models that focus on data-based learning and performance evaluation. By analyzing data on learning outcomes, student interactions with learning materials, and participation in extracurricular activities, AI systems can provide more accurate and evidence-based feedback to improve the learning experience.

Artificial intelligence can provide the flexibility necessary to adapt management models to changing environments and educational needs. AI’s ability to learn from previous experiences and respond quickly to changes enables educational institutions
to remain relevant and effective in the face of ever-changing dynamics. The integration of artificial intelligence can also improve the operational efficiency of educational institutions. Automating routine administrative tasks, such as schedule management and financial administration, can free up time and resources to focus on more strategic and value-adding aspects of education. This can increase productivity and allow staff and lecturers to focus more on teaching and learning. In globalization, artificial intelligence can help educational institutions understand the needs of the global job market. Data analysis involving international employment trends, estimates of global skills needs, and job market demands can help educational institutions produce graduates who are better prepared for global challenges.

There are several opinions of previous research. The first research according to Wahyudi & Sunarsi, (2021), with the research title Benefits of implementing knowledge management for lecturer performance during the Covid-19 pandemic. The results of his research state that the research can be put forward a general description or more or less knowledge management helps the management of higher education institutions in adapting to pandemic conditions, especially in maintaining the performance of lecturers in carrying out education. This is evident, knowledge management encourages the birth of a technology-based online education delivery system, so that the performance of lecturers in the field of education does not decrease. The second research according to Tjahjawulan, (2019), with the research title How Does Indonesian Higher Education, Especially the Jakarta Arts Institute Face the Industrial Revolution 4.0? The results of his research state that Technology developing in the fourth industrial revolution combines the physical, digital, and biological worlds, which on the one hand opens up great opportunities for progress, but on the other hand forces us to rethink how countries can develop, how organizations create value, and even what it means to be human. The third research according to Taufiqurrahman, (2022), with the research title ICT-Based Learning Implementation as an Effort of Higher Education Facing the Era of Smart Society 5.0. The results of his research state that the learning model that supports the implementation of learning in the Era of Smart Society 5.0 focuses on socio-constructivism learning theory where educators act as moderators and facilitators who help students to find their own knowledge in the learning process. In its implementation, there are three main components in the application of ICT in the learning process in the Era of Smart Society 5.0 which include ICT as a learning medium, ICT as a learning tool and ICT as a learning resource.

The research conducted by previous researchers is different from the research conducted by researchers. Meanwhile, the research that the researchers conducted was entitled Development of an Adaptive Higher Education Management Model with Artificial Intelligence. The research results show improvements in resource management, scheduling, and adaptation to changing dynamics of higher education. The integration of artificial intelligence accelerates the decision-making process, increases the efficiency of resource management, and overall, provides a strong foundation to address the complex dynamics of the world of higher education.
RESEARCH METHODOLOGY

The research method was carried out through literature analysis, case studies, and system prototype development (Zawacki-Richter et al., 2019). By integrating artificial intelligence technology, this model is able to identify behavioral patterns, forecast trends, and provide real-time information to support managerial decision making. The steps in conducting this research are first, literature analysis will be an essential first step in understanding the theoretical basis and conceptual framework for developing higher education management models. Researchers need to investigate current literature related to higher education, artificial intelligence, and the integration of the two (Alamri et al., 2020). This literature analysis will help researchers understand trends, challenges, and key concepts related to the development of adaptive higher education management models with artificial intelligence. Second, case studies would be a relevant approach to explore the practical implementation of adaptive higher education management models using artificial intelligence. Researchers can select several higher education institutions that have adopted or developed this model and investigate in depth how this implementation works. The data collected involved interviews with decision makers, direct observation, and analysis of related documents. This case study will provide practical and contextual insights regarding the challenges faced and successes achieved in implementing adaptive higher education management models.

Apart from that, collecting quantitative and qualitative data will also enrich this research (Ertefaie et al., 2018). Surveys can be used to collect data from various stakeholders, such as students, lecturers, and administrative staff (Otter et al., 2021). Questions in the survey may include perceptions of the effectiveness of adaptive higher education management models, levels of satisfaction, and expectations regarding the implementation of artificial intelligence in higher education contexts. Furthermore, data analysis can be carried out using statistical methods to measure the level of significance of the findings. The results of this analysis will provide a deeper understanding of the impact of adaptive higher education management models with artificial intelligence on various aspects of higher education. Finally, a synthesis of findings from literature analysis and case studies will form a comprehensive framework for the development of adaptive higher education management models with artificial intelligence. The conclusions of this study can provide practical recommendations for higher education institutions that are planning or currently implementing similar models. By using research methods that include literature analysis and case studies, this research will be able to make a significant contribution to our understanding of the development of adaptive higher education management models with artificial intelligence. In this way, it is hoped that this research can become a basis for innovation in higher education governance that is more effective and responsive to dynamic changes in the educational environment.

Research methods that combine literature analysis and case studies have several advantages that encourage in-depth and applicable understanding of the research topic (Avisyah et al., 2023). First, literature analysis provides a solid theoretical foundation for research, allowing researchers to understand key concepts, recent developments, and the
views of various experts related to the research topic. In this way, research can build a strong knowledge base before moving on to the next step. Second, the advantage of the literature analysis method is its ability to identify trends and patterns from existing literature. By analyzing multiple sources of information, researchers can identify significant developments, paradigm shifts, or even knowledge gaps that their research can fill. This allows researchers to make more meaningful contributions to the scientific literature by capturing the dynamics and evolution of a particular research topic. Additionally, the case study method adds a practical dimension to research by allowing researchers to investigate concrete implementations of theoretical concepts that have been identified in the literature. By approaching a topic contextually, case studies provide a more complete picture of how a phenomenon or model is applied in real life. It provides an in-depth understanding of the challenges faced, successful strategies, and the actual impact of implementing a concept. Another advantage of the case study method is its ability to include various stakeholders in the research. By interviewing, observing, and involving related parties, this research can capture various perspectives and experiences that enrich the analysis.

RESULT AND DISCUSSION

The development of the Adaptive Higher Education Management Model is a progressive step in improving the effectiveness and responsiveness of higher education institutions to the dynamics of change in the digital era. The model development process involves a number of key steps that focus on the integration of artificial intelligence technology to optimise management, learning and decision-making in higher education institutions. One of the key steps in the development of this model is the identification of the specific needs and objectives of the higher education institution in question. In-depth research and analysis of the institution's unique characteristics, student demographics, and educational mission will provide the foundation for the development of a suitable and effective model. An in-depth understanding of the needs allows the institution to design strategies that can make a positive impact. The next step is the integration of artificial intelligence technologies in higher education management systems. This can include using machine learning algorithms to design responsive curricula, personalise teaching based on individual needs, and provide recommendations that can improve administrative efficiency. By doing so, institutions can increase flexibility and adaptability in response to various changes and challenges.

In addition, the development of an adaptive higher education management model requires collaboration between various relevant parties within and outside the institution. This includes co-operation between lecturers, administrative staff, technology developers, and even students. Lecturers need to be involved in the curriculum design process that integrates artificial intelligence, while administrative staff need to be involved in the implementation and maintenance of the new higher education management system. In this context, student participation is also important to ensure that their perspectives are accommodated and their needs considered. Staff training is a crucial step in the process of developing this model. New skills related to the use of artificial intelligence technology need to be acquired by academic
and administrative staff. A comprehensive training programme could include a basic understanding of artificial intelligence, the use of related software or platforms, and the ethical aspects associated with the use of these technologies. This training will help address any skills gaps that may arise and ensure that the new higher education management model can be implemented effectively.

In implementation, higher education institutions also need to consider aspects of data security and student privacy. With the adoption of artificial intelligence technology, student data becomes a critical component in decision-making. Therefore, data protection and privacy policies must be strictly enforced to avoid the risk of security and privacy breaches that could harm students and the institution's reputation. Continuous evaluation and monitoring is an important step in ensuring the success and sustainability of adaptive higher education management models. This process involves collecting and analysing data related to the effectiveness of the model in achieving the set educational and management goals. This evaluation may include assessment of student performance, the effectiveness of customised learning strategies, and administrative efficiency. Continuous adaptation is also required to address changes in the educational environment, technology, and labour market demands. Gathering feedback from stakeholders, including students, lecturers, and administrative staff, can provide valuable insights for model improvement and customisation. In this way, higher education institutions can maintain the involvement and support of the entire academic community. In developing an artificial intelligence-adaptive higher education management model, it is important to consider ethical and moral values. The sustainability and success of this model is not only measured from the perspective of efficiency and quality, but also from its positive impact on students' learning experience, equity, and the integrity of higher education institutions.

Table 1: Factors for Developing an Adaptive Higher Education Management Model through Artificial Intelligence

<table>
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<tr>
<th>NO</th>
<th>Factor</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Planned Implementation</td>
<td>Successful implementation of an adaptive higher education management model</td>
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<td></td>
<td>Strategy</td>
<td>depends on a well-planned strategy. Institutions must develop clear and</td>
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<td></td>
<td></td>
<td>structured implementation plans. This includes determining implementation</td>
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<td>stages, adequate resource allocation, and identifying risks that may arise</td>
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<td></td>
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<td>during the implementation process. With a mature implementation strategy,</td>
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<td></td>
<td></td>
<td>institutions can minimize obstacles and maximize success.</td>
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<td>2</td>
<td>Active Student Participation</td>
<td>Students are one of the main stakeholders in the context of higher education.</td>
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<td></td>
<td></td>
<td>Therefore, their active participation in the development and implementation</td>
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<td>of the model is essential. This can be achieved through their involvement</td>
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<td>in discussion forums, discussion groups, and even involving them in model</td>
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<td></td>
<td></td>
<td>development teams. By involving students, institutions can ensure that the</td>
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<td>models developed meet their</td>
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The development of adaptive higher education management models has become an urgent need in the era of dynamic and technological transformation. Various development models have been proposed to increase the responsiveness and effectiveness of higher education institutions in facing environmental challenges and changes. Several models of higher education management development, namely the first is a technology-based management model. This model emphasizes the application of information technology and artificial intelligence to improve the efficiency and effectiveness of higher education management. In this context, the integration of management information systems, data analysis, and artificial intelligence can be used to improve administrative processes, curriculum planning, and performance evaluation. The use of machine learning algorithms helps in processing and analyzing student data, providing personalized recommendations, and predicting student needs and challenges. This model provides a technological foundation for higher education institutions to become more adaptive, following individual student developments and proactively responding to changes that occur. Both adaptive learning models. This approach focuses on developing a management model that can adapt to students' individual learning styles and needs. The adaptive learning model utilizes artificial intelligence technology to design curriculum and teaching methods that can be adjusted to each student's expectations and needs.

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<td>5</td>
<td>Evaluation of Social and Psychological Impact</td>
<td>It is also important to evaluate the social and psychological impact of developing this model. How does this model affect interpersonal relationships between lecturers and students? Is there a positive impact on students' psychological well-being? This evaluation can be carried out through research studies, satisfaction surveys, and open dialogue with educational participants. Developing an adaptive model must create an educational environment that supports students' holistic growth.</td>
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level of understanding, interests and abilities. This system can provide instant feedback, present material dynamically, and provide personal support to students. Thus, this model aims to increase the level of engagement, motivate students, and improve learning outcomes. Through continuous data analysis, adaptive learning models can automatically adapt to student progress, creating a more personalized and effective learning experience. The three management models are inclusive and sustainable. This model highlights the importance of sustainability and fairness in managing higher education. This management model includes developing inclusive strategies, considering student diversity and ensuring that every individual has equal access to educational opportunities. Additionally, a focus on sustainability emphasizes the importance of maintaining educational quality while minimizing negative impacts on the environment. This model includes policies that support environmentally friendly management practices, waste reduction, and sustainable use of resources. Along with that, this model also encourages active participation from various stakeholders, including lecturers, students, administrative staff, and local communities, in the decision-making and planning process.

The development of an Adaptive Higher Education Management Model with Artificial Intelligence (KB) marks a step in responding to the demands of the digital era and the dynamics of higher education. This model utilizes advances in artificial intelligence technology to improve the responsiveness, efficiency and quality of management of higher education institutions. In discussing the development of this model, several important aspects that need to be considered include the integration of family planning in the curriculum, adaptive data analysis, the challenges faced, and the expected positive impacts. In the development of this model is the integration of artificial intelligence in the higher education curriculum. By utilizing machine learning algorithms, educational institutions can create curricula that are more responsive to student needs and industry trends. This integration allows the preparation of a dynamic curriculum, can be adapted to the latest developments in the field of study, and provides a learning experience that is more relevant to the demands of the world of work. In this way, students will be able to develop skills that are in line with technological developments and job market needs. In developing this model, adaptive data analysis became an important element. The use of KB technology allows institutions to collect and analyze student data in real-time. This analysis can include an in-depth understanding of students' individual needs, their progress through the curriculum, and predictions of academic performance. With the data obtained, institutions can provide a more personalized learning approach and support timely interventions for students who need extra help. This creates a customized learning experience, increases student retention, and optimizes academic outcomes.

However, the development of adaptive higher education management models with artificial intelligence is also faced with a number of challenges. First of all, implementing this technology requires significant financial investment in infrastructure, software and staff training. These challenges need to be addressed to ensure long-term sustainability and success. Apart from that, issues related to ethics and data privacy are also serious concerns that must be addressed in implementing family planning technology in higher education institutions.
The positive impacts of developing this model involve increasing administrative efficiency, institutional adaptability to environmental changes, and the quality of student learning experiences. Administratively, the use of artificial intelligence can speed up the data management process, make smarter decisions, and optimize resources. As for the adaptability of institutions, this model allows them to more quickly respond to changing student needs and accommodate constantly changing technological developments. Meanwhile, students will gain a more personalized and relevant learning experience, increasing their involvement and motivation in the learning process. Thus, the development of an Adaptive Higher Education Management Model with Artificial Intelligence is not just the implementation of technology, but is also an effort to optimize higher education so that it is more in line with the demands of the times. By addressing financial, ethical, and data privacy challenges, higher education institutions can turn artificial intelligence into a catalyst for achieving higher educational quality, greater adaptability, and a better learning experience for students.

CONCLUSION

Based on the results and discussion above, it can be concluded that there is great potential for artificial intelligence in the higher education management process. The resulting adaptive model is able to bring operational efficiency, enabling educational institutions to be more responsive to student needs and environmental dynamics. The integration of artificial intelligence in higher education curricula opens the door to learning that is more responsive and relevant to the needs of the evolving job market. By utilizing machine learning algorithms, higher education institutions can optimize administrative processes, develop adaptive curricula, and provide learning experiences tailored to student needs. Adaptive data analysis is key to better understanding individual student development, providing more personalized feedback, and improving overall academic outcomes. While there are challenges, such as the financial investment required and ethical issues related to data privacy, the opportunities presented by the development of these models are much greater. Administrative efficiency, institutional adaptability, and a better student learning experience are positive impacts that can be generated. Higher education institutions that adopt this model can increase their competitiveness at the global level, create a more dynamic learning ecosystem, and prepare students to face future challenges with relevant skills. The development of an Adaptive Higher Education Management Model with Artificial Intelligence is the embodiment of the vision of higher education that is smarter, more responsive and competitive.

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