

Adaptation Strategies for Indonesian Islamic Higher Education Facing the Industrial Revolution Big Data and Omics Era

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Abstract:

The advent of Industrial Revolution 4.0 and 5.0 has precipitated substantial changes across myriad fields, including higher education. These developments have been particularly pronounced in America, Europe, the United Kingdom, China, and Asia. Islamic universities, in particular, confront distinctive challenges in adapting to technological advancements such as Big Data and Omics (in the health sector) following the emergence of the novel Coronavirus, while concurrently upholding Islamic principles within the educational curriculum. This article aims to examine adaptation strategies that can be implemented by Indonesian Islamic universities in facing this digital transformation era. Using a literature review approach and conceptual analysis, this article explores the integration of Big Data technology to support data-based decision-making, the development of Omics-based research in biotechnology and health, and curriculum development efforts that combine technology and Islamic values. The results of this study demonstrate that the successful adaptation of Islamic higher education in Indonesia is contingent upon the enhancement of collaboration between academia, industry, and the community, the improvement of digital literacy among faculty and students, and the promotion of policies that demonstrate responsiveness to technological developments. In conclusion, Islamic higher education should aspire to a proactive role in the integration of modern technology with Islamic values, with the objective of creating a more relevant and internationally competitive educational ecosystem.

Keywords: *Indonesian Islamic Higher Education, Industrial revolution, Big data, Omics era*

INTRODUCTION

The advent of the Industrial Revolution 4.0 has precipitated profound transformations across diverse domains of human existence, encompassing higher education. This transformation is marked by the proliferation of digital technologies, automation, and the pervasive adoption of smart technology (Schwab, 2016). Consequently, higher education institutions, charged with the responsibility of cultivating highly skilled professionals, are compelled to adapt to these technological advancements. Islamic universities in Indonesia, as integral components of the national education system, confront distinctive challenges.

They are obligated to ensure that the adaptation process remains congruent with the Islamic values that serve as the fundamental foundation of their educational curriculum. In the era of the Industrial Revolution 4.0, technologies such as Big Data and Omics have become pivotal drivers of change. Big Data, as defined by Hashem et al., refers to the ability to collect, process, and analyze data on a large scale to generate strategic insights that can be applied in various fields, including education (Hashem et al., 2015).

Concurrently, the field of Omics, comprising genomics, proteomics, and metabolomics, has emerged as a pivotal instrument in scientific research, particularly within the domains of biotechnology and health (Subramanian et al., 2020). In the context of Islamic higher education, the integration of these technologies offers significant opportunities to enhance the quality of education and research. However, the integration of these technologies necessitates a strategic and value-based approach. Islamic higher education in Indonesia faces several challenges in adopting Industrial Revolution 4.0 technologies. A significant challenge confronting this endeavor is the dearth of adequate technological infrastructure. Numerous Indonesian Islamic universities lack adequate access to contemporary hardware and software.

The digital divide between institutions in urban centres and remote regions further exacerbates these challenges. Institutions in these regions frequently encounter challenges in accessing reliable and high-speed internet, which directly impacts their capacity to incorporate technology into learning and research. In regard to Big Data management, Islamic universities frequently lack the necessary infrastructure and tools to analyze data on a large scale. Consequently, they are unable to capitalize on data for strategic decision-making. The challenges posed by the Omics field are further compounded by its multidisciplinary nature. Omics necessitates interdisciplinary collaboration among various scientific domains, including biology, chemistry, and data science.

Despite the numerous challenges confronting them, Islamic universities in Indonesia possess significant potential to adapt to the prevailing circumstances of the Industrial Revolution 4.0, the prevalence of Big Data, and the imperative of Omics. One such opportunity is the development of a technology-based curriculum. The integration of technology into the curriculum can facilitate the development of competencies that align with the demands of the contemporary workforce (Schwab, 2017). For instance, the incorporation of courses on data analytics or bioinformatics can provide students with the practical skills necessary for working with Big Data and Omics. Collaboration with industry constitutes an additional pivotal strategy. Islamic universities can collaborate with technology companies to develop relevant training, research, and community service programs. This collaboration offers two key benefits: it provides practical benefits for students, and it enhances the institution's reputation at national and international levels. Furthermore, Islamic universities can leverage research funding opportunities from government and private institutions to develop technological infrastructure and Omics-based research projects. The distinctive Islamic values that define these institutions can serve as a competitive advantage in the contemporary technological era. The application of Islamic values, such as justice, sustainability, and social responsibility, in technology management can ensure that the innovations produced provide maximum benefits to society (Fanani, 2015).

The overarching objective of this study is to enhance the capacity of Islamic universities to compete on a global scale while preserving their Islamic identity and values. The research is expected to make significant contributions in several domains. Primarily,

the findings of this study can serve as a valuable reference for policymakers in Islamic universities, assisting them in the formulation of effective adaptation strategies. Secondly, it is anticipated that this article will motivate Islamic universities to become more proactive in contributing to national development through technological innovation and multidisciplinary research. Thirdly, the study is anticipated to stimulate further research in the domain of higher education, particularly concerning the integration of technology and Islamic values. In the context of the Industrial Revolution 4.0, Big Data, and Omics, Islamic universities in Indonesia are charged with the responsibility to transform into more adaptive and innovative institutions.

This research underscores the significance of a collaborative approach to surmounting the technology gap. Collaborative strategies, encompassing not only the industrial sector but also international institutions, are instrumental in augmenting research and teaching capacity. Furthermore, the active role of students as agents of change in the technological era should be strengthened through the development of technology-based entrepreneurship programs that are in accordance with Islamic principles. By adopting these measures, Islamic universities can not only effectively address the challenges posed by the Industrial Revolution 4.0, but also exert a substantial positive influence on the broader community.

DISCUSSION

Technology of Education as an Approach

To develop effective adaptation strategies for Indonesian Islamic higher education in the face of the Industrial Revolution, Big Data, and Omics, a comprehensive methodology must be employed that integrates insights from various academic perspectives. The Fourth Industrial Revolution (4IR) necessitates that higher education institutions (HEIs) actively engage with innovation and societal needs, moving beyond traditional educational paradigms to produce graduates equipped for contemporary challenges. Digital transformation is crucial, involving the integration of digital technologies to enhance institutional operations and educational delivery, thereby expanding access to lifelong learning and eliminating traditional barriers. Islamic education, with its historical emphasis on progress and transformation, must reorient its educational goals to align with humanistic values and societal needs, fostering moral character and adaptability in students (Qurtuby, 2021).

The adoption of Information and Communication Technology (ICT) is imperative for HEIs to secure a competitive advantage in the knowledge-based economy, suggesting a phased implementation of an institution-wide ICT strategy (Hartono et al., 2023). Furthermore, the integration of Big Data and learning analytics can significantly enhance educational outcomes by providing insights into student learning patterns and institutional performance. Adaptive administration strategies, which emphasize flexibility and responsiveness to change, can be applied to manage the complexities of integrating new technologies and methodologies in educational settings. Additionally, the curriculum must be restructured to incorporate modern technological competencies, such as those required in the "big data intelligent mobile cloud" environment, ensuring that graduates possess the skills demanded by the evolving job market (Hongjun et al., 2014). By synthesizing these approaches, Indonesian Islamic higher education can develop a robust framework that not only preserves its core values but also embraces the technological advancements of the modern era, thereby positioning itself as a leader in educational innovation and societal development. Integrating digital transformation into the educational framework of Islamic

higher education institutions requires a multifaceted approach that balances technological advancements with traditional Islamic values.

The development of a technology-based management model is crucial for expanding educational access, particularly in remote areas, and improving the quality of education through interactive and collaborative learning innovations. However, challenges such as limited infrastructure, digital literacy among educators, and resistance to change must be addressed. Continuous professional development for educators is vital to enhance their digital competencies and ensure they can effectively integrate technology into their teaching practices. Moreover, the integration of Islamic ethical and moral values into digital learning environments is essential to prepare students for ethical challenges in the digital era, ensuring that they are not only technologically competent but also grounded in Islamic teachings. Strategic planning and adaptability are key to overcoming these challenges, with a focus on personalized learning, inter-institutional collaboration, and the development of inclusive policies to bridge the digital divide (Gutiérrez-Rivera et al., 2012). By leveraging digital technologies effectively, Islamic higher education institutions can foster an inclusive, equitable, and innovative educational environment that aligns with both modern educational practices and Islamic values.

Remarks towards Higher Educational Technology

The integration of digital transformation into the educational framework of Islamic higher education institutions can be effectively achieved by leveraging several key results from the broader landscape of digital innovation in higher education. Firstly, the transformative use of digital technologies can enhance flexibility and enrich academic processes, as demonstrated by the University Network for Education with Technology, which emphasizes the development of digital competence and the alignment of educational outcomes with sectoral requirements. This aligns with the broader understanding that digital transformation involves a cultural shift that encourages experimentation and adaptation, thereby expanding access to education beyond traditional constraints of time and space. Furthermore, the integration of digital media and ICTs can facilitate the virtualization of educational processes, allowing for the preservation and dissemination of knowledge in more dynamic and accessible formats (Amaro et al., 2022).

This is particularly relevant for Islamic higher education, where the ethical considerations of digital communication and teaching strategies can be informed by Islamic perspectives, ensuring that digital transformation aligns with cultural and religious values. Additionally, the concept of digital agency, which focuses on the interplay between humans and digital artifacts, can be harnessed to engage students more effectively and improve educational quality, thereby fostering a transformative educational environment that prioritizes human interests. By adopting these strategies, Islamic higher education institutions can not only enhance their operational performance but also ensure that their educational offerings remain relevant and aligned with the evolving demands of the digital age. This approach not only empowers educators and students alike but also cultivates a sense of responsibility towards ethical digital practices that reflect the core values of Islamic teachings. This commitment to ethical digital practices can lead to the development of curricula that emphasize critical thinking, creativity, and collaboration, essential skills for navigating the complexities of the modern world (Murillo, 2021).

To foster digital agency among students in Islamic higher education and improve their engagement and learning outcomes, several strategies can be implemented, drawing insights from the provided academic papers. Firstly, integrating digital technologies into the

curriculum is essential, as it allows for the creation of learning-friendly environments that enhance student engagement and empowerment. This can be achieved by adopting platforms like Moodle, which have been shown to positively impact student motivation and engagement through interactive and adaptive learning experiences. Additionally, the transformative use of digital technologies should be encouraged, promoting flexibility and enriching academic processes through student-centered pedagogical strategies that facilitate active participation and knowledge construction. It is also crucial to consider the sociomaterial aspects of student engagement, recognizing that interactions with digital resources are complex and socially situated, which requires a nuanced understanding of these dynamics to effectively engage students. Furthermore, fostering digital literacy and competence among students and educators is vital, aligning educational practices with the demands of the digital age and preparing students for future job markets (Digital Transformation and Disruption of Higher Education, 2022)

Finally, the digital transformation of higher education should be approached holistically, integrating digital technologies into all areas of institutional operations to improve performance and expand access to lifelong learning opportunities. By implementing these strategies, Islamic higher education institutions can enhance digital agency, leading to improved student engagement and learning outcomes.

Big Data and Development of Science Cluster in Indonesian Islamic Higher Education

Big Data significantly influences the development of Science Clusters at PTKIN (Perguruan Tinggi Keagamaan Islam Negeri) in Indonesia by enhancing the capacity for research and innovation through improved data processing and analysis capabilities. The integration of Big Data technologies facilitates the creation of research-intensive clusters (RICs), which rely heavily on research and development (R&D) to drive innovation and competitiveness. These clusters benefit from the proximity to universities and R&D institutes, fostering strong network relations that enhance knowledge exchange and human resource development (Saublens et al., 2008). The use of Big Data in these clusters allows for the efficient processing of large volumes of data, which is crucial for developing intelligent systems and making accurate predictions in various domains, including science and technology. Furthermore, Big Data technologies such as Hadoop and Spark enable the handling of high-velocity and high-variety data, which are essential for fast data applications and the Internet of Things, thereby supporting the dynamic needs of science clusters.

The clustering of industries, supported by Big Data, also promotes agglomeration economies, which are vital for the growth of manufacturing sectors in Indonesia. These economies enhance the competitiveness of clusters by facilitating inter- and intra-industry knowledge spillovers, which are crucial for transitioning towards knowledge-based production. Additionally, the economic and business models of the data industry, as outlined in the literature, provide a framework for understanding how data-driven productivity can be harnessed to serve societal needs, further supporting the development of science clusters. Overall, Big Data acts as a catalyst for innovation and competitiveness in science clusters at PTKIN by enabling advanced data analytics, fostering collaboration, and supporting the transition to knowledge-based economies.

Big Data technologies significantly contribute to the formation and effectiveness of research-intensive clusters (RICs) in Indonesia by enhancing knowledge management, innovation, and competitiveness. These technologies facilitate the efficient management

and analysis of large datasets, which are crucial for RICs that rely heavily on research and development (R&D) for innovation and competitiveness. In the context of Indonesian research clusters, Big Data enables the integration and analysis of diverse data sources, fostering collaboration between universities, enterprises, and public research organizations. This integration is vital for creating strong network relations that promote knowledge exchange and human resource development (Saublens et al., 2008). Furthermore, Big Data technologies improve the informatization of university research management, enhancing work efficiency and enabling collaborative research environments.

This is particularly relevant in Indonesia, where the development of human capital and technologically advanced industries is crucial for fostering a competitive and innovative environment. The application of Big Data in these clusters supports the management of complex data, enabling advanced analytics and decision-making processes that drive innovation and sustainability. Additionally, Big Data technologies support the development of smart enterprises by leveraging cloud computing, IoT, and other digital technologies, which are essential for the dynamic and interconnected nature of RICs. These technologies also facilitate the creation of smart sustainable cities, which are integral to the broader ecosystem in which these clusters operate, by providing data-driven insights for urban planning and sustainability initiatives. Overall, Big Data technologies play a pivotal role in enhancing the effectiveness of research-intensive clusters in Indonesia by enabling sophisticated data management, fostering innovation, and supporting sustainable development practices.

Integration Big Data into Science Cluster Concerning Humanities Study and its Development

The integration of Big Data into the science cluster concerning humanities studies represents a transformative development, as it allows for the synthesis of vast amounts of historical and cultural data, thereby enhancing the analytical capabilities of researchers in these fields. The Seshat: Global History Databank exemplifies this integration by providing a structured repository of historical data that enables the testing of theories about social complexity and cultural evolution, which were previously difficult to analyze due to the scattered nature of historical information (Schilling & Bozic, 2014). The application of Big Data in the humanities is further enriched by the use of digital tools and methodologies, such as Geographic Information Systems (GIS), which facilitate the spatial and temporal analysis of cultural phenomena, thereby offering new insights into the interactions between place, space, and time. Moreover, the digital humanities have embraced computational methods to model complex cultural processes and disseminate scholarly information, thus broadening the scope of research and collaboration across disciplines (Bock, 2012).

The integration of Big Data also necessitates robust research infrastructures, as highlighted by the European Science Foundation's emphasis on the need for strategic directions and partnerships to support digital humanities research (Makarow et al., 2011). Despite the challenges of data heterogeneity and quality, as noted in the context of Big Data integration, the potential for linking and fusing diverse data sources holds promise for advancing humanities scholarship (Lin et al., 2023). Furthermore, the intersection of digital technologies with cultural studies, as explored in various case studies, underscores the potential for innovative research methodologies that leverage social media, digital images, and 3D scanning to enhance the study of culture and history. Ultimately, the integration of Big Data into humanities research not only enriches the analytical toolkit available to

scholars but also fosters a more interdisciplinary approach that bridges the gap between the sciences and the humanities.

Integrating Big Data into the humanities within the context of PTKIN (Perguruan Tinggi Keagamaan Islam Negeri) in Indonesia can draw valuable insights from established models like HASTS at MIT and CDH at Cambridge. The integration of Big Data in humanities studies offers a transformative potential by enabling the analysis of large datasets to uncover patterns and trends that were previously inaccessible. For instance, the use of digital tools in humanities allows for the exploration of cultural heritage and historical data, providing new perspectives and enhancing public engagement in the field. The concept of "distant reading," as discussed by Martínez-Gamboa, exemplifies how computational tools can analyze literary texts to identify thematic and semantic patterns, thus broadening the scope of literary analysis (Martínez-Gamboa, 2016). In Indonesia, the integration of Big Data in higher education, as explored by Indriyani et al., involves creating a comprehensive data ecosystem that includes diverse data sources such as academic histories and demographic profiles. This approach facilitates the identification of student clusters and the development of targeted interventions to improve educational outcomes (Indriyani et al., 2019).

The integration of Big Data into humanities studies at PTKIN Indonesia can significantly enhance the analysis of cultural heritage by leveraging advanced digital technologies and methodologies. Big Data analytics offers powerful tools for processing and interpreting vast amounts of cultural data, which can be sourced from diverse repositories such as museums, libraries, and digital archives ("Big Data Analytics for Cultural Heritage," 2023). The application of a digital technology 4.0 framework, as proposed by Hasibuan et al., can facilitate the preservation and utilization of Indonesia's cultural and natural heritage by integrating data from various structured and unstructured sources (Hasibuan et al., 2022). This approach not only aids in the conservation of cultural wealth but also supports its use in tourism and national character building. Furthermore, Big Data enables the analysis of temporal and spatial characteristics of cultural artifacts, revealing patterns of continuity, aggregation, and migration across different historical periods and regions. This can provide deeper insights into the cultural dynamics and historical narratives of Indonesia. The use of cloud-based systems for managing multi-type data ensures efficient data collection, storage, and retrieval, which is crucial for sustainable cultural heritage management.

Additionally, the integration of Big Data with semantic web technologies can enhance the documentation, classification, and dissemination of cultural heritage, making it more accessible and engaging for both researchers and the public. This digital transformation in the humanities not only enriches academic research but also fosters public engagement and education, thereby amplifying the cultural, social, and economic impacts of heritage initiatives. By adopting these advanced methodologies, PTKIN Indonesia can play a pivotal role in preserving and promoting the nation's rich cultural heritage in the digital age. The interdisciplinary approach to data science education significantly enhances the understanding of big data in the humanities within Islamic Higher Education in Indonesia by integrating diverse academic perspectives and methodologies. This approach is crucial as it merges STEM and humanities perspectives, fostering a more inclusive and comprehensive educational framework that enhances students' data acumen and ethical awareness.

In the context of Islamic education, this interdisciplinary strategy is particularly beneficial as it addresses the socio-political, historical, and cultural complexities inherent in Islamic studies, promoting innovative and critical thinking. The integration of big data into Islamic education is seen as a response to the challenges posed by the technological advancements of the industrial revolution 4.0, which includes artificial intelligence and the internet of things. By adopting a cross-disciplinary pedagogy, students from various disciplines can collaborate more effectively, bridging the gap between technical and non-technical fields and enhancing the ability to solve complex big data problems. Furthermore, the implementation of digital humanities in State Islamic University libraries in Indonesia highlights the potential for these institutions to become research hubs, although challenges such as inadequate facilities and limited strategic programs remain (Hasibuan et al., 2022). The interdisciplinary approach not only enriches the educational experience by incorporating diverse fields such as sociology, anthropology, and history but also prepares students for the contemporary marketplace by equipping them with valuable data analysis skills.

This comprehensive educational model aligns with the broader trend of integrating data science into various domains, thereby transforming educational practices and enhancing the understanding of big data in the humanities. Overall, the interdisciplinary approach in Islamic Higher Education in Indonesia fosters a richer and more nuanced understanding of big data, enabling students to engage with complex datasets and derive meaningful insights that are relevant to both their academic and professional pursuits. The incorporation of big data into Islamic education addresses the challenges posed by technological advancements in the industrial revolution 4.0 by enhancing educational practices and aligning them with modern technological demands. Big data plays a crucial role in improving the performance and behavior factors of learning, optimizing the storage of educational data, updating the education system, and integrating into the curriculum, thereby making Islamic education more responsive to globalization's challenges.

The integration of technology, including big data, into Islamic education is essential for developing 21st-century competencies and digital skills, which are necessary to overcome cultural backwardness and negative stigmas associated with Islamic education. Furthermore, the use of big data and other technologies such as AI and IoT in Islamic educational institutions can enhance learning effectiveness and student engagement through e-learning platforms and mobile applications, thus enriching learning resources and supporting contemporary teaching methods. This technological integration also supports the development of digital competencies among educators and students, ensuring that Islamic education remains relevant and adaptive to technological changes.

Additionally, the incorporation of big data facilitates the development of innovative curricula that align with Islamic values while addressing the challenges of limited resources and resistance to change. By leveraging big data, Islamic education can also improve its outreach and visibility through modern marketing strategies, thereby enhancing its appeal in a competitive educational environment. Overall, the strategic use of big data in Islamic education not only addresses the immediate challenges of the industrial revolution 4.0 but also paves the way for sustainable and inclusive educational innovation that preserves cultural identity while embracing technological advancements. Big data plays a significant role in fostering digital competencies among educators and students in the context of Islamic education by enhancing personalized learning experiences and supporting informed decision-making.

The integration of big data analytics in educational settings allows for the customization of learning materials and activities to meet individual student needs, as demonstrated by the use of algorithms to track student progress and emotional responses in real-time, enabling teachers to adjust their teaching strategies accordingly. This personalized approach is further supported by learning analytics, which provides insights into student performance and engagement, helping educators identify at-risk students and tailor interventions to improve learning outcomes. In higher education, big data and learning analytics are utilized to develop educational data science frameworks that enhance the teaching-learning process and facilitate administrative tasks (“Advances in Artificial Intelligence and Statistical Techniques with Applications to Health and Education,” 2023). The application of big data in education also extends to the development of digital pedagogy, where educators are equipped with the skills to effectively integrate digital technologies into their teaching practices, thereby preparing students for the digital age.

Adapting Curriculum in Big Data and Omics Discourse

Adapting curricula to address the growing demands of big data and omics involves integrating interdisciplinary approaches and updating educational frameworks to equip students with the necessary skills. The shortage of big data professionals is partly due to the narrow focus of current educational programs, which lack an interdisciplinary approach. This gap can be bridged by developing curricula that incorporate data analytics skills across various academic majors, thus producing more versatile professionals (Nwokeji & Bego, 2022). In bioinformatics, the adaptation of curricula to include competencies in biological, computational, and statistical areas is crucial, as these fields increasingly rely on big data to understand complex biological systems. Proposed courses should focus on these competencies to meet the demands of the era. The use of big data in education also allows for adaptive teaching, where learning analytics and educational data mining can tailor educational content to individual student needs, enhancing learning outcomes.

A qualitative study highlights the importance of integrating computational literacy, multidisciplinary approaches, and critical analysis into big data curricula, emphasizing the need for reflective learning as a pedagogical approach. Practical experience with big data infrastructure, such as cloud-based platforms, is essential for students to adapt to workplace demands, as demonstrated by courses developed under the EDISON Data Science Framework (Demchenko et al., 2019; Jin et al., 2022). The construction of a scientific curriculum system in data science and big data technology, as seen in Chengdu University, emphasizes the alignment of educational content with industry needs and engineering education requirements (Jin et al., 2022). In engineering education, modular curricula that address gaps in data management knowledge are being developed to better prepare students for big data challenges.

An interdisciplinary curriculum design model can facilitate the creation of programs that produce students with deep knowledge in multiple disciplines, addressing the shortage of skilled professionals in big data analytics. The curriculum reform at Tianjin Sino-German University of Applied Sciences exemplifies the integration of big data technologies into educational frameworks, enhancing teaching and learning outcomes while addressing infrastructural challenges. Finally, the development of effective big data curricula at institutions like the University of Amsterdam involves defining course structures based on a comprehensive body of knowledge, ensuring that both online and campus education meet the evolving demands of big data and data-intensive science. To effectively prepare students for careers in big data and omics, interdisciplinary approaches in curricula should

integrate foundational knowledge from mathematics, statistics, and computational science, as these are crucial for understanding data science frameworks and methodologies. Incorporating machine learning and data analysis techniques is essential, as these skills are pivotal in various domains such as biostatistics, bioinformatics, and social sciences.

The curriculum should also emphasize the integration of data science with domain-specific knowledge, such as bioinformatics and computational biology, to address complex problems in genomics and medical applications. This can be achieved by including courses that cover data modeling, management, and the use of distributed computing to interface physical and cyber worlds, which are critical for handling large-scale data in omics. Furthermore, the curriculum should offer practical, hands-on experiences with big data tools and frameworks, such as Hadoop, Spark, and NoSQL databases, to equip students with the skills needed for real-time data processing and analysis. Additionally, fostering an understanding of causal inference and its application in genomic and imaging data analysis can enhance students' ability to conduct deep causal analysis, moving beyond traditional association studies. By integrating these interdisciplinary approaches, Indonesian Islamic Higher Education can better prepare students for the evolving demands of careers in big data and omics, ensuring they possess both the technical skills and domain-specific knowledge necessary for success in this rapidly growing field.

CONCLUSION

As the final remarks, the integration of Big Data and Omics into Indonesian Islamic higher education represents a critical opportunity for these institutions to adapt to the demands of the Industrial Revolution 4.0 and 5.0. As Islamic universities navigate the complexities of technological advancements while upholding their foundational values, it becomes essential to develop comprehensive adaptation strategies. The findings from this research highlight that successful adaptation hinges on several key factors: enhancing collaboration among academia, industry, and the community; improving digital literacy among faculty and students; and fostering policies that respond effectively to technological changes. By prioritizing these strategies, Islamic higher education can not only strengthen its educational framework but also ensure its relevance and competitiveness on a global scale. Furthermore, the proactive integration of modern technology with Islamic principles can lead to the creation of a more innovative and inclusive educational ecosystem. This research underscores the importance of a holistic approach that balances technological advancement with the preservation of cultural and religious values, ultimately positioning Indonesian Islamic universities as leaders in educational innovation and societal development in the digital age.

While the integration of Big Data and Omics into Indonesian Islamic higher education presents potential benefits, it is crucial to recognize the significant challenges that may hinder this process. The emphasis on adapting to the Industrial Revolution 4.0 and 5.0 can lead to an over-reliance on technology, potentially compromising the core Islamic values that these institutions uphold. The pressure to align with global technological trends might overshadow the need for a curriculum that prioritizes ethical considerations and moral education, which are fundamental to Islamic teachings. Moreover, the assertion that collaboration between academia, industry, and the community is vital may not always yield positive outcomes. Such partnerships can sometimes prioritize commercial interests over educational integrity, leading to a dilution of Islamic principles in favor of market-driven agendas. The potential for conflict between profit motives and the foundational values of Islamic education raises concerns about the integrity of the educational environment.

Additionally, the notion that enhancing digital literacy among faculty and students will automatically lead to successful adaptation overlooks the complexities of the digital divide in Indonesia. Many Islamic universities, particularly those in remote areas, face significant infrastructural challenges, including limited access to high-speed internet and modern technological resources. This disparity can exacerbate existing inequalities and hinder the overall effectiveness of digital integration efforts. Furthermore, the proposed integration of technology into the curriculum, while potentially beneficial, may lead to an overemphasis on technical skills at the expense of critical thinking and creativity. The focus on data analytics and bioinformatics could inadvertently marginalize other essential disciplines within the humanities and social sciences, which are equally important for a well-rounded education.

In conclusion, while the integration of Big Data and Omics into Indonesian Islamic higher education presents opportunities for innovation and modernization, it is imperative to critically assess the potential risks and challenges, especially aligning into Humanities studies. The pursuit of technological advancement should not come at the cost of compromising Islamic values, educational integrity, and equitable access to resources. A more cautious and balanced approach is necessary to ensure that the educational ecosystem remains true to its foundational principles while navigating the complexities of the digital age.

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