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DEVELOPMENT OF BIG DATA INFORMATION TOWARD QUALITY EDUCATION

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Abstract:
The era of Industrial Revolution 4.0 stimulates the application of big data in various sectors, including education, to support better decision-making and improve service quality. At the Vocational High School (SMK) level, big data has great potential to help schools adapt to changing industry needs, especially regarding graduates who are competent in technology and information. This research aims to examine the implementation and development of big data information systems at Nurul Jadid Vocational School to improve the quality of education. This research uses a qualitative case study approach, collecting data through observation, interviews, and documentation. The research results show that applying big data at Nurul Jadid Vocational School supports improving the quality of education by making it easier to manage student and teacher data, monitor learning achievements, and develop student competencies. This research produces findings: a). Digitalization and Management of Academic Data at Nurul Jadid Vocational School b) Collaboration with other industries c). Nurul Jadid Vocational School Digital Library. It is hoped that this research will become a reference for other vocational education institutions that wish to utilize big data technology to improve the quality of education.

Keywords: *Big Data Information, Quality Education, Nurul Jadid Vocational School*

INTRODUCTION

Advances in technology and information have penetrated various aspects of life, including in the field of education (Alenezi, 2023; Pangestuti et al., 2024; Rahmatullah et al., 2022) Technological developments have changed the way of education in Indonesia, such as the use of QR Codes, web libraries, E-learning, Quipper Platform, Zoom, and Google Classroom in the learning process, as well as the transition from paper-based exams to computer-based exams (Henik, 2024). The era of industrial revolution 4.0 will be continued with the Society 5.0 era which marks the future of modern society, providing significant new challenges for the world of education (Suardana, 2023; Zubairi, 2023)

One of the technological innovations that continues to develop is big data, which has great potential to improve the quality of education (Berliana et al., 2024; Ogundipe, 2024). Through big data, it is possible to collect and analyze data on a large scale from various sources, producing insights that can support more precise and effective decision making (Sulistyawati & Munawir, 2024). In the world of education, the application of big data plays an important role in improving the quality of learning, school management, and monitoring student performance (Kusumawati, 2024). There are still many shortages and mismatches of human resource skills with the demands of the world of work (Widyaiswara & Rusmulyani, 2021). This shortage and mismatch of skills is caused by developments in science and technology which gradually change systems and

equipment.

Nurul Jadid Vocational School faces problems in effectively integrating big data systems to support improving the quality of education. Currently, the collection, management and analysis of data related to student performance, industry needs and education management is still done manually, thus hampering data-based decision making. The potential of big data that can be used to develop strategic policies, personalize learning, and align the curriculum with the needs of the world of work has not been utilized optimally. Therefore, Nurul Jadid Vocational School always upgrades the skills of its teaching staff, students and staff so that they can overcome the shortcomings that hinder Nurul Jadid Vocational School's efforts to provide quality education that is in line with the demands of the times and market needs.

Previous research shows that the application of big data technology encourages data-based decision making as the key to improving educational outcomes in the digital era with various challenges of rapid change, skills needs in the job market and the lack of teachers who meet qualifications and competency standards (Sari et al., 2023). Research by Akrami et al., (2024) states that the effective use of big data can support the implementation of digital-based learning, especially in terms of mapping student needs, however obstacles such as lack of technical training for teaching staff and budget limitations are often the main obstacles. This research is to fill the existing gap by exploring the development of big data information towards quality education which is still less explored in previous literature.

This research aims to answer how to develop big data information towards quality education? Through analyzing the role of big data, this paper seeks to identify its benefits in personalizing learning, management efficiency, and aligning the curriculum with the needs of the world of work. This paper aims to explore the challenges faced, such as low technological literacy among educators, as well as providing strategic recommendations for optimizing big data systems to support quality and competitive education.

The novelty of this journal lies in its approach which connects big data with vocational education at Nurul Jadid Vocational School. This journal offers a new perspective on how the application of big data can improve the quality of education at the vocational school level, with a focus on personalizing learning and improving data-based education management. In addition, this journal highlights the unique challenges faced by vocational education institutions, such as technological competence among educators. This research contributes to the wider literature regarding the digitalization of education in Indonesia, as well as opening up opportunities for educational institutions to adopt big data technology to increase competitiveness and curriculum relevance to existing industry needs.

The application of big data in vocational education offers possibilities for development in improving teaching effectiveness and curriculum relevance to industry needs (Wang, 2024; Wu, 2024; Zhang, 2024). The use of big data at Nurul Jadid Vocational School includes managing student data, evaluating learning achievements, QR Codes, digital libraries, mapping learning needs, as well as monitoring the development of student competencies regarding student performance, learning patterns, and abilities that need to be developed. This not only enables personalization of learning, but also increases efficiency in data management and educational program planning. The implementation of big data will encourage education that is more adaptive and responsive to industrial developments, which in turn can increase students' competitiveness in the job market.

RESEARCH METHODS

This research uses a qualitative method with a case study type exploring the development of big data information in supporting quality education at Nurul Jadid Vocational School. In this study, the researcher was an active data collector and instrument in an effort to collect data in the field (Karunarathna et al., 2024; Schlemitz & Mezhuyev, 2024). The data collection method in this research uses three techniques, namely observation, interviews and documentation, however, in-depth interviews are preferred to explore in depth, to find out what informants think based on their perspective on the themes raised.

This qualitative research produces descriptive data which aims to understand what is happening through a general description and increase understanding regarding the development of big data information. School principals, teachers and students are informants for the various data collected. Data was collected through observation, interviews and documentation. Observations were used to see the application of big data information development at Nurul Jadid Vocational School. Interviews with school principals, teachers and students will explore their perspectives on how the development of big data information leads to quality education. Documentation was analyzed to support research findings.

RESULTS AND DISCUSSION

Big data is a very important technology in the world of education, enabling the collection, analysis and visualization of big data to support more focused and efficient learning (Oktaviarosa, 2024; Theodorakopoulos et al., 2024). The Indonesian Ministry of Communication and Information defines Big Data as a collection of very large and complex data, which is generated through digital activities such as social media, e-commerce and other technology-based applications (Haryanto, 2024). Big Data provides great opportunities to support data-based decision making.

Nurul Jadid Vocational School, as an Islamic boarding school-based educational institution, has utilized big data to synchronize learning programs with industry needs (Mundir et al., 2022; Mundiri et al., 2021). Based on the guidelines and policies of the Ministry of Education, Culture, Research and Technology (Kemendikbudristek), vocational high schools are expected to function as vocational-based educational institutions that are relevant to industry needs (Avana et al., 2023). By implementing the link and match policy, project-based learning methods (Project-Based Learning), digital transformation, as well as superior programs such as the Vocational School Center of Excellence (SMK PK), it is hoped that Vocational Schools can produce graduates who are ready to face the world of work, innovative, and in line with demands. global industry (Suhendi et al., 2023). Policy from the Ministry of Education and Culture emphasizes that vocational schools are not just educational institutions, but also as centers for developing skills that are relevant to modern progress (Maula et al., 2021). Based on the results of the development of a Big Data-based information system at Nurul Jadid Vocational School, it can be seen that there has been a significant increase in learning accessibility and efficiency as follows:

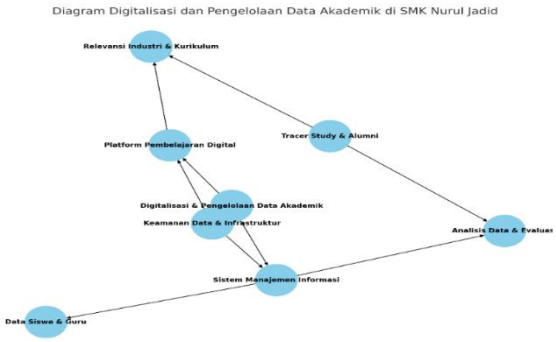
Digitalization and Management of Academic Data at Nurul Jadid Vocational School

Digitalization and Management of Academic Data is the process of transforming academic data into digital format which is managed through an integrated information system to support administrative efficiency and data-based decision making. This process includes managing data on students, teachers, curriculum, and alumni tracer studies which are used to monitor educational developments in real-time. With this implementation, Nurul Jadid Vocational School is able to improve the quality of educational services, provide easier access to information, and ensure the relevance of the curriculum to the needs of the Industrial Revolution 4.0 era.

Building a big data-based system requires time, effort and careful planning. Strong infrastructure, reliable cybersecurity and competent human resources are the keys to success. With this combination, systems can be designed to be not only reliable but also safe and efficient. AH, (2024). Digitalization and management of academic data at Nurul Jadid Vocational School is an effort made to utilize information technology in managing educational data. We changed the manual system to digital to record student, teacher, curriculum and learning outcomes data. With this system, all information is managed in an integrated platform so that it is easy to access, more accurate, and can be used to make strategic decisions. Nurul Jadid Vocational School also uses QR Code-based attendance to record teacher attendance digitally. This system is developed further by donating it to other institutions or even selling it. The aim is to promote technological innovation owned by Nurul Jadid Vocational School, as well as show that the school is

capable of producing technological systems that are useful for other educational institutions (AH, 2024).

Researchers interpret that digitalization and management of academic data at Nurul Jadid Vocational School is a strategic step to improve the quality of education through the use of integrated technology. With this system, schools can manage student, teacher and curriculum data efficiently and carry out data analysis for evidence-based decision making. This supports transparency, makes it easier to access information, and ensures the relevance of education to the needs of the world of work. Although challenges such as technological adaptation and data security need to be overcome, this effort reflects SMK Nurul Jadid's commitment to creating innovative and quality education.



The diagram above illustrates the relationship between various elements in Digitalization and Academic Data Management at Nurul Jadid Vocational School. This diagram shows the relationship between various aspects such as the use of information management systems, digital learning platforms, student and teacher data management, data analysis, industry relevance to the curriculum, as well as the importance of data security and the infrastructure that supports this process. All of these elements are interconnected to improve the quality of education in the digital era.

Collaboration with other industries

Big Data Collaboration with Other Industries at Nurul Jadid Vocational School refers to the synergy between data managed at the school and various industrial sectors to improve the quality of education and the relevance of the curriculum to the needs of the world of work. Through the use of big data, Nurul Jadid Vocational School can collect and analyze data related to student achievement, industry trends, and specific skills requirements required by the labor market. This collaboration allows schools to update and adapt the curriculum according to industrial developments, as well as providing opportunities for students to gain practical experience, internships or projects directly related to the industrial sector. In this way, Nurul Jadid Vocational School graduates are better prepared to face the challenges and demands of the ever-growing job market.

Nurul Jadid Vocational School has collaborated in the field of big data with PT Universal Big Data (UBIG). Through a memorandum of understanding (MoU), this partnership covers various programs, including curriculum synchronization, industry-based training, internships for teachers and students, competency certification, and introduction to industrial class concepts. One of the innovations introduced in this collaboration is NOBOX.AI, a new product from UBIG designed to support education and technology-based industries. This collaboration aims to prepare Nurul Jadid Vocational School students to be more competent and ready to face the challenges of the world of work in the digital era. AH, (2024)

The collaboration between Nurul Jadid Vocational School and PT Universal Big Data (UBIG) in the field of big data through a memorandum of understanding (MoU) shows a real effort to improve students' skills so they are ready to face the challenges of the world of work in the digital era. Through programs such as curriculum synchronization, industry-based training and internships, as well as NOBOX.AI product innovation, students and teachers are given direct access to the latest technology relevant

to industry needs. This collaboration strengthens integration between education and industry, ensuring that Nurul Jadid Vocational School graduates not only have the appropriate technical skills, but are also ready to compete in a job market that is increasingly influenced by big data and technology.

Nurul Jadid Vocational School has established a strategic collaboration with PT Universal Big Data to integrate big data technology in the management of education and learning. This collaboration includes technical training for teachers and students, development of big data-based information systems, and optimization of academic data management to improve the quality of education. This partnership is expected to not only support the digitalization of education at Nurul Jadid Vocational School but also prepare graduates with relevant technological skills to meet the demands of modern industry

Digital Library of Nurul Jadid Vocational School

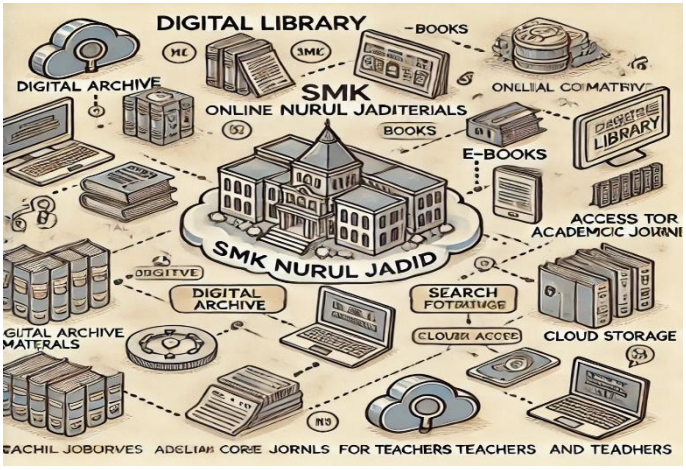
The web library at SMK Nurul Jadid is a digital platform that provides students, teachers and school staff with access to various educational resources online, including books, journals, articles and other learning materials in digital format. By utilizing information technology and Big Data, this library enables efficient collection management, easier and faster information retrieval, and the provision of learning materials that are interactive and relevant to the curriculum. This web library aims to support a more flexible learning process, facilitate students in accessing the necessary knowledge, and improve much-needed information technology skills.

Nurul Jadid Vocational School is currently developing a web-based library information system. This project involved various teams with different roles. For example, there are those who work on the front-end and back-end, as well as the overall system design. Students from the RPL (Software Engineering) department collaborated with the multimedia team on this project to produce a better system. This web-based library has several features, one of which is: a book return feature, a mini menu, and a print feature. The book return feature allows users to manage book return transactions online, while the mini menu functions to make system navigation easier. The print feature, on the other hand, allows users to print certain information, such as book details or transaction reports. A.H., (2024).

According to researchers, web-based libraries are a very important innovation in the world of education, because they facilitate access to various digital sources of information, allowing students and teachers to access learning materials anytime and anywhere. By utilizing technology and Big Data, this library not only provides easy

information retrieval, but also allows personalization in providing recommendations for relevant materials.

This image illustrates the Digital Library concept at Nurul Jadid Vocational School, which is designed to support technology-based learning. The main components of this digital library include digital archives containing teaching materials, e-books, and



access to industry resources relevant to vocational programs at schools. The results of implementing this web-based library system also include an intelligent search feature that provides recommendations for relevant materials, as well as ease in managing book returns and borrowing online. In addition, there are also online materials that facilitate independent learning for students, as well as data storage and computing services carried out on remote servers to facilitate access to information quickly and efficiently. With this system, both students and teachers can access teaching materials easily so that they can improve the quality of the learning process at Nurul Jadid Vocational School.

The long-term strategy carried out by Nurul Jadid Vocational School to ensure that the Big Data system remains relevant and develops according to the needs of the times is to carry out Upskilling and reskilling as HR development which aims to increase the competency and relevance of the workforce in an era that is constantly changing, especially in the midst of transformation. digital and automation.

CONCLUSION

This research emphasizes the importance of developing big data-based information in supporting quality education at Nurul Jadid Vocational School. The main findings include digitalization and efficient management of academic data, such as QR Code-based attendance, student assessments, and integrated performance analysis. Apart from that, Nurul Jadid Vocational School's collaboration with various industries, one of which is PT. Universal Big Data has increased the relevance of student learning to the needs of the world of work. The presence of a digital library is also a significant step in expanding student and teacher access to learning resources, as well as increasing digital literacy in the school environment.

This paper provides scientific contributions that are relevant to today's educational challenges, especially through technological collaboration in the learning process. Big data-based data management at Nurul Jadid Vocational School shows a digital transformation model that can be an inspiration for other vocational schools. However, this research has limitations, such as coverage that only focuses on one institution, data that is not yet longitudinal, and digital infrastructure challenges. Nevertheless, this research is an important stepping stone for further exploration of the application of big data in sustainable and inclusive vocational education.

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