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Research paper

Transformation of Digital Media Technology through Innovative Management: A New Perspective of Vocational High Schools in Industrial Revolution 4.0

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ABSTRACT

Background: The Industrial Revolution 4.0 has introduced significant challenges and opportunities for digital transformation in education, particularly in Vocational High Schools (VHS) in the Special Region of Yogyakarta (DIY). This transformation requires innovative management practices to integrate technology effectively into vocational education while addressing professional development and resource allocation challenges.

Methods: This study employed a mixed-methods approach, collecting data from 34 VHS teachers in DIY. The data were analyzed to identify key factors influencing the success of digital transformation, including leadership vision, resource allocation, professional development, teacher collaboration, and regular evaluations.

Results: The findings indicate that a clear leadership vision significantly supports technology integration in vocational education, bolstered by adequate resource allocation and regular training programs. Teacher collaboration emerged as a critical factor for successful technology adoption, although areas such as professional development and training enhancement were identified as needing improvement. Leadership support and periodic evaluations were also recognized as essential for sustaining progress.

Conclusion: Strengthening professional development programs, fostering teacher collaboration, and optimizing leadership support are crucial to achieving effective digital transformation in Vocational High Schools in DIY during the Industrial Revolution 4.0 era.

INTRODUCTION

In the Industrial Revolution 4.0 era, digital technology is rapidly evolving and becoming a crucial factor in various aspects of life, including education (Lase, 2019) (Hastutiningsih, et al.

2024). The Industrial Revolution 4.0 is characterized by the emergence of new technologies such as artificial intelligence, the Internet of Things (IoT), big data, and robotics, which have transformed the way we live, work, and learn. These technologies are not only changing the industrial sector but also significantly impacting the education sector, forcing educational institutions to adapt to rapid changes.

Vocational High Schools play an important role in Indonesia's education system. Vocational High Schools aim to produce skilled and job-ready workers with practical abilities that meet industry needs. However, to achieve this goal in the digital era, Vocational High Schools face significant challenges in adapting their curriculum and teaching methods to the latest technological developments (Barliana et al., 2020). A relevant curriculum and innovative teaching methods are required to ensure that students not only gain theoretical knowledge but also practical skills applicable to an increasingly technology-based workforce (Hastutiningsih et al., 2022).

Digital media transformation in education involves not only the use of technology in the learning process but also the integration of technology in school management and the development of competencies for both teachers and students (Sych et al., 2021) (Timotheou et al., 2023). This encompasses various aspects, from the use of educational software and online learning platforms to the implementation of technology-based school management systems. Digital transformation also includes the development of adequate technological infrastructure (Chen, L., K.Ramli, 2023), professional training and development for teachers (Kahraman & Bicen, 2022) (Maimun & Hakim, 2021), and adaptation to new, more interactive, technology-based teaching methods (Klopov et al., 2023) (Direstu Amalia, Adha Febriansyah, 2023).

However, many Vocational High Schools still face various obstacles in effectively implementing digital transformation (Kovalchuk et al., 2022) (Aramyan & Krivopuskov, 2021). These obstacles include limited technological infrastructure (Mulyana, 2023), inadequate training and understanding of new technologies by teachers (Cheng & Wang, 2023), and a lack of policy (Gupta, 2018) and funding support from the government (Chen et al., 2021). Additionally, resistance to change and innovation is a significant barrier in this process. Some of the challenges faced include: Limited Technological Infrastructure (Pambayun et al., 2020): Many Vocational High Schools still lack adequate technological infrastructure, such as fast and stable internet access, sufficient computers for all students, and up-to-date educational software. Inadequate Training and Understanding by Teachers (Prawiro, 2019): Teachers play a key role in the learning process. However, many teachers still lack an understanding of new technologies and how to integrate them into the learning process. Adequate professional training and development are needed to address this issue. Lack of Policy and Funding Support (Pradipta et al., 2021): Digital transformation requires strong policy support from the government as well as adequate funding. Many Vocational High Schools still struggle to obtain such support from both central and regional governments. Resistance to Change and Innovation (Kikelomo Oluwalola, 2015): Change always faces resistance, whether from students, teachers, or school management. Building a culture that supports innovation, and change is crucial to overcoming this resistance.

Innovative management is key to addressing these challenges and driving digital transformation in Vocational High Schools. Innovative management involves creative and adaptive approaches to integrating technology, improving learning quality, and optimizing

resource management. This approach also includes developing an organizational culture that supports continuous innovation and learning. Some innovative management strategies that can be applied in Vocational High Schools include: Development of Technological Infrastructure (Aryani & Siahaan, 2020): Improving access to and the quality of technological infrastructure in schools, such as internet networks, computers, and educational software. Professional Training and Development for Teachers: Organizing training and workshops to enhance teachers' understanding and skills in using technology in teaching. Development of Technology-Based Curriculum (OECD, 2016): Adjusting the curriculum to the latest technological developments and industry needs, and integrating the use of technology into the learning process. Policy and Funding Support (Surya Patria et al., 2024): Advocating for policy and funding support from the government to support digital transformation in Vocational High Schools. Building a Culture of Innovation: Creating a school environment that supports innovation and change, and encourages collaboration among students, teachers, and school management.

A new perspective of Vocational High Schools in the era of the Industrial Revolution 4.0 aims to understand how innovative management practices can effectively support digital transformation. This research will explore various innovative management strategies and models that have been implemented, analyze the successes and challenges faced, and provide recommendations for better implementation in the future. Some aspects to be explored in this case study include Analysis of Technology Implementation in Vocational High Schools: Identifying what technologies have been implemented in Vocational High Schools and how these technologies are used in the learning and school management processes. Innovative Management Strategies Applied: Exploring the innovative management strategies that have been applied by Vocational High Schools, including teacher training, curriculum development, and technology infrastructure management. Successes and Challenges in Digital Transformation: Analyzing factors contributing to the successes and challenges faced in the digital transformation process in Vocational High Schools. Recommendations for Improvement: Providing recommendations based on research findings to improve the implementation of digital transformation in Vocational High Schools in the future.

Thus, this research is expected to make a significant contribution to improving the quality of education in Vocational High Schools through the application of innovative management in technology integration. This is crucial to ensuring that Vocational High School graduates have skills relevant to industry needs and can compete in an increasingly competitive and technology-based job market. Digital transformation in Vocational High Schools will not only enhance the quality of education but also prepare young generations to face the challenges and opportunities of the Industrial Revolution 4.0 era.

METHODS

This research uses a mixed-methods approach to explore innovative management practices in digital transformation at Vocational High Schools in the Special Region of Yogyakarta in the era of the Industrial Revolution 4.0. Involving 34 teachers from public and private Vocational High Schools, this study combines quantitative and qualitative approaches. The quantitative phase involves distributing questionnaires to measure teachers' perceptions and experiences regarding technology use and innovative management, while the qualitative phase includes in-depth interviews to gain deeper insights into challenges and strategies

implemented. Quantitative data analysis uses descriptive and inferential statistics with SPSS software, while qualitative data is analyzed thematically. The validity and reliability of the research are ensured through expert reviews, instrument trials, and data triangulation. This research aims to provide a comprehensive and in-depth picture of innovative management practices and offer recommendations to improve the quality of education in Vocational High Schools in the digital era.

RESULTS AND DISCUSSION

1. Leadership and Vision

The leadership team has a clear vision for technology integration in vocational education.

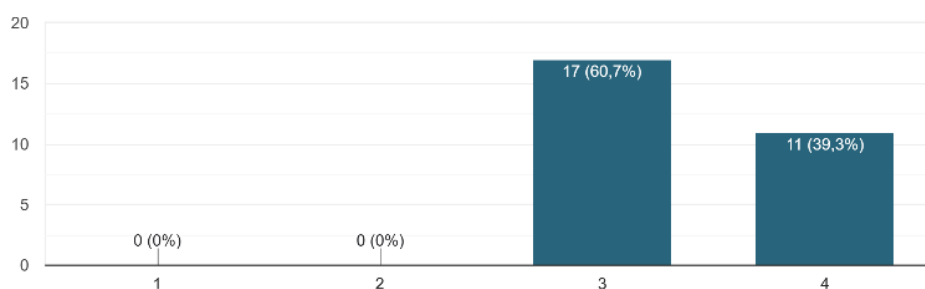


Figure 1. The leadership team's vision for technology integration

One important aspect of digital transformation in Vocational High Schools is strong leadership and a clear vision from the school's leadership team. Based on data collected from 34 public and private Vocational High School teachers in the Special Region of Yogyakarta (DIY), there is a positive indication regarding the clarity of the leadership's vision for integrating technology in vocational education. The research results show that the majority of respondents feel that the leadership team in their schools has a clear vision for technology integration. As many as 60.7% of respondents agreed, while 39.3% strongly agreed with this statement. No respondents answered neutral, disagreed, or strongly disagreed, indicating that the leadership vision in the surveyed schools is generally well understood by teachers.

Leadership with a clear vision tends to be more effective in inspiring and mobilizing school resources, including teacher support, to effectively integrate technology into the teaching and learning process. A strong leadership vision also plays a role in overcoming resistance to change that often arises in the digital transformation process. With a clear vision and effective communication, the leadership team can help teachers and students understand the benefits of using technology, reducing fear or uncertainty, and encouraging wider acceptance and involvement in this process. Overall, these findings suggest that most teachers in public and private Vocational High Schools in DIY feel supported by a leadership team that has a clear vision regarding technology integration. This is a positive indication that there is a strong foundation for further implementation of digital transformation initiatives in these schools. However, this clarity of vision needs to be followed by concrete actions and continuous support to achieve the desired digital transformation goals.

Support from school principals is also demonstrated through communication regarding the importance of technology integration (67.9%). Strong leadership support is crucial in

facilitating innovation and change in educational institutions. Supportive leadership will help create an environment conducive to experimenting with and applying new technologies. This also includes providing the necessary resources, training for teachers, and policies that encourage the use of technology in teaching and school management. This positive perception indicates that most teachers feel the commitment from school leaders in supporting technology integration, which is a good sign for the sustainability and success of digital transformation in their schools. However, attention needs to be given to the minority of respondents who feel less supported, as they may face specific challenges or obstacles that need to be addressed.

With strong leadership support, Vocational High Schools are expected to continue to encourage innovation and effective technology integration, which in turn will improve the quality of education and the relevance of the curriculum to industry needs in the era of the Industrial Revolution 4.0. A strong leadership commitment to innovative practices in technology integration (92.9%) shows that most teachers feel the leadership in their schools supports the use of technology in the learning process and school management. A strong leadership commitment is crucial for the successful implementation of digital transformation initiatives. This support is manifested in concrete actions such as resource allocation, teacher training, and policy creation that encourage the use of technology.

Based on these findings, most teachers feel that the leadership in their schools has a strong commitment to supporting technology integration. This is a positive indication of the sustainability and success of digital transformation initiatives in these schools. However, for teachers who feel less supported, efforts need to be made to understand the obstacles they face and to provide the necessary support.

Strong leadership commitment to technology integration will help create a conducive environment for experimenting with and applying new technologies, ultimately improving the quality of education and the relevance of the curriculum to industry needs in the era of the Industrial Revolution 4.0.

2. Professional Development

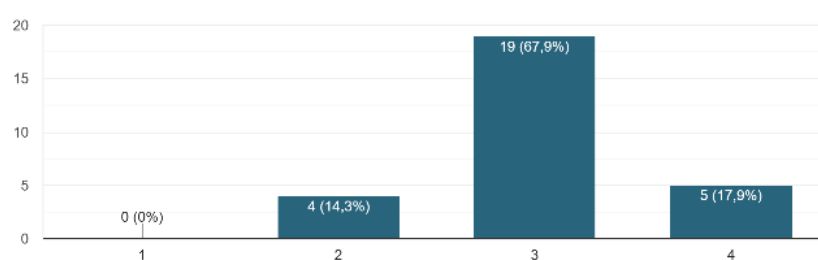


Figure 2. Regular training sessions for teachers using technology

Most respondents (85.8%) feel that regular training sessions on new technology are provided for them, with 67.9% agreeing and 17.9% strongly agreeing. This indicates that the majority of teachers feel they receive adequate training on new technology relevant to their teaching. Regular and quality training on new technology is essential to ensure that teachers can effectively implement the technology in their teaching. With the majority of teachers feeling they receive adequate training this suggests that Vocational High Schools in DIY are generally on the right track in supporting the development of technological competencies for their teachers. However, the presence of some teachers who feel the training is still lacking indicates that there

is room for improvement. Increasing the frequency of training, enriching training materials, and ensuring training is tailored to the specific needs of teachers can help address this issue. Schools can increase the frequency of training and ensure that training materials are always up-to-date with the latest technological developments and provide training tailored to the specific needs of each teacher or department to ensure relevance and effectiveness. By enhancing the existing training, it is expected that Vocational High School teachers will be more prepared and competent in utilizing technology in the learning process, thereby improving the quality of education and student readiness to meet the demands of the digital age workforce.

3. Resource Allocation

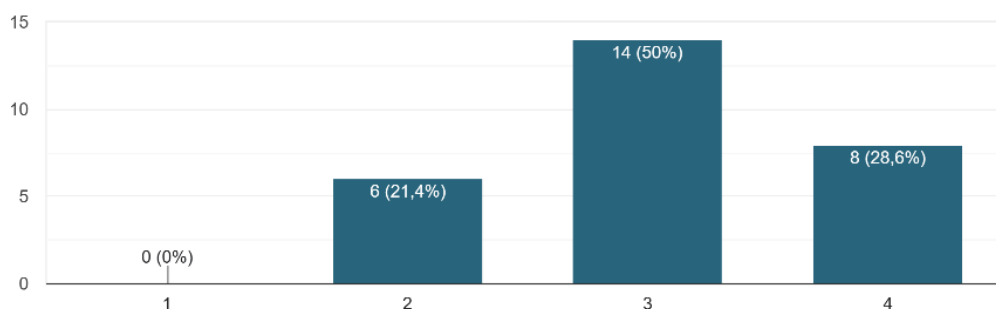


Figure 3. Adequate funding is allocated for technology integration

Many respondents (78.6%) feel that the funding allocated for technology integration in Vocational High Schools is sufficient to very sufficient (options 3 and 4). Only a small portion feels the funding is inadequate (21.4%), and none feel it is very inadequate. This indicates that in the context of digital media technology transformation in Vocational High Schools, funding is generally considered supportive. Funding: The allocation of funding for technology integration in Vocational High Schools is deemed adequate by the majority of respondents. This supports the success of efforts in the digital media technology transformation in Vocational High Schools. Institutions are investing in the latest technology and infrastructure (57.1%). This encourages the availability of sufficient technological resources for teachers and students (53.6%), and the effective integration of technology into the curriculum (85.7%) feel that technology has been integrated into the curriculum sufficiently to very effectively. This indicates that many respondents believe that innovative management has successfully integrated technology into the curriculum in Vocational High Schools, in line with the goals of the Industrial Revolution 4.0.

This integration is also evidenced by the collaboration among teachers to develop technology-integrated lesson plans, with 92.7% reporting such collaboration. Students are encouraged to use technology as part of their learning activities, with 92.8% reporting such encouragement. The majority of respondents feel that students in Vocational High Schools are encouraged to use technology as part of their learning activities. This indicates that the encouragement for technology use is good and effective. A small portion who feels the encouragement is inadequate (7.1%) can indicate that there is room for improvement, although overall the perception of this encouragement is very positive. This supports the research objective on the transformation of digital media technology through innovative management in Vocational High Schools in the era of the Industrial Revolution 4.0, showing that the encouragement for the use of technology in learning is quite good.

4. Monitoring and Evaluation

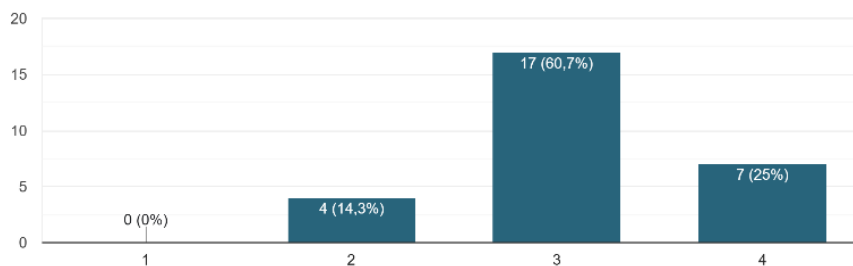


Figure 4. Technology Effectiveness Evaluation Matrix

Many respondents (60.7% or 17 respondents) feel that the established metrics are adequate. This indicates that most respondents consider the current metrics sufficient for assessing the effectiveness of technology integration. From this data, it can be concluded that the majority of respondents (85.7%) feel that the metrics set to evaluate the effectiveness of technology integration in Vocational High Schools are sufficient to very adequate (options 3 and 4). No respondents felt that there were no metrics at all, and only 14.3% felt that the metrics were inadequate.

This shows that, in general, there is good recognition of the presence and adequacy of metrics to assess the effectiveness of technology integration. This is important to support the research objectives regarding the transformation of digital media technology through innovative management in Vocational High Schools in the era of the Industrial Revolution 4.0. Adequate metrics allow for proper evaluation and continuous improvement in efforts to integrate technology. Routine evaluations are conducted to improve the use of technology in the classroom (57.1%). Additionally, feedback from students and teachers is used to enhance technology integration practices (96.4%). This indicates that in the context of digital media technology transformation through innovative management in Vocational High Schools in the era of the Industrial Revolution 4.0, there is widespread recognition of the importance of and the use of feedback from students and teachers. This reflects a responsive and participatory management approach, which supports the successful integration of technology in Vocational High Schools.

5. Innovation and Experimentation

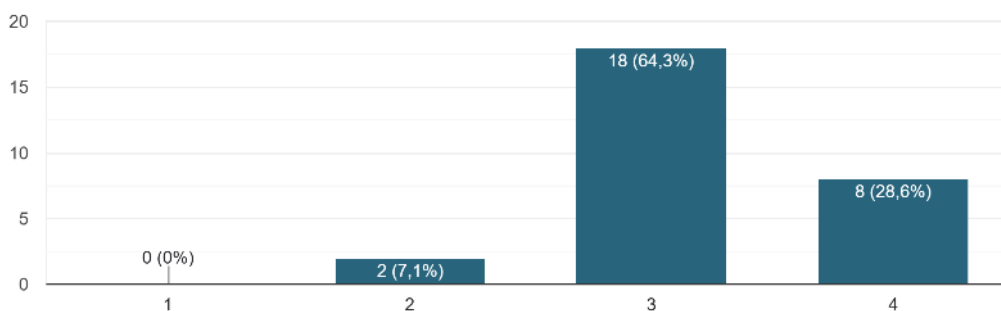


Figure 5. Culture of Innovation and Experimentation

From the data, it can be concluded that many respondents (92.9%) feel that the institution encourages a culture of innovation and experimentation with new technology to a high to very high degree (options 3 and 4). No respondents felt that the institution does not encourage a culture of innovation at all (option 1), and only a small portion (7.1%) felt that this encouragement is lacking. This indicates that overall, the perception of the institution's encouragement for innovation and experimentation with new technology is positive.

This encouragement is crucial in the context of research on the transformation of digital media technology through innovative management in Vocational High School in the era of the Industrial Revolution 4.0, as a culture of innovation and experimentation is one of the key factors in the successful integration of technology and adaptation to rapid technological changes. Vocational High Schools also receive support for pilot projects to test new technological approaches and for technology integration by teachers, as indicated by 57.1% of respondents. This is a positive indication that teacher collaboration is considered important and has been implemented well by most respondent.

Strong collaboration among teachers is a crucial factor in the successful integration of technology. This means that most teachers work together, share knowledge and resources, and support each other in using new technology in the classroom. Strong collaboration among teachers for integrating technology is likely to have a positive impact on the learning process. It can improve the quality of teaching, enable the application of more innovative teaching methods, and help overcome challenges that may arise from the use of technology. Strong collaboration also reflects a supportive and collaborative school culture.

This indicates that the school has created an environment where teachers feel comfortable working together and sharing ideas, which is essential for innovation and improving the quality of education. With strong collaboration among teachers for integrating technology, we can conclude that there is a supportive and innovative environment at the Vocational High Schools. This is a positive indicator for the success of digital media technology transformation through innovative management in the era of the Industrial Revolution 4.0. This collaboration not only enhances the effectiveness of technology integration but also contributes to the professional development of teachers and the overall quality of education.

This is supported by Vocational High Schools building partnerships with technology companies for resources and support (64.3%) and community stakeholders being involved in the technology integration process (46.4%).

CONCLUSION

This research provides valuable insights into the innovative management practices supporting digital transformation in Vocational High Schools in the Special Region of Yogyakarta (DIY) during the Industrial Revolution 4.0 era. The findings suggest that strong leadership with a clear vision, resource allocation, regular training for teachers, and teacher collaboration are crucial factors in the successful implementation of digital transformation initiatives. Despite the positive findings, there are still challenges that need to be addressed, including limited technological infrastructure, inadequate training and understanding of new technologies by teachers, and a lack of policy and funding support from the government. Schools should continue to build on their strengths and address these challenges to ensure the successful implementation of digital transformation initiatives in Vocational High Schools. Overall, this

research highlights the importance of innovative management practices in supporting digital transformation in Vocational High Schools. By fostering a culture of collaboration, providing continuous professional development opportunities, and ensuring strong leadership support, schools can effectively integrate technology into their teaching practices and improve the quality of education in the digital era.

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