Implementation of Strategic Planning in Vocational High Schools to Address the Challenges of the Industrial Revolution 4.0

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Abstrak: This study examines implementation of strategic planning in Vocational High Schools (SMK). In facing challenges of Industrial Revolution 4.0 the research focuses on 11 principals. Additionally, 22 teachers from SMKs in Special Region of Yogyakarta (DIY) are involved. Utilizing quantitative methodology results reveal intriguing patterns. School principals develop strategic plans. They actively involve teachers. Parents and industry stakeholders participate. A significant emphasis is placed on the use of technology. This enhances effectiveness. Efficiency of SMK management is also improved. Evidence shows integration of digital technologies. Online learning platforms are noted. These are seen in the schools' operations and educational processes. The study highlights the critical role of collaborative and tech-driven approaches. This prepares vocational schools to meet demands of the evolving industrial landscape.
Keywords: Strategic Planning, Vocational High Schools, Industrial Revolution 4.0

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INTRODUCTION

The Industrial Revolution 4. 0, which is characterized by convergence digital, physical, and biological realities, is an innovative age that offers a paradigm shift in various spheres of human life, including learning (Gaol & Suprihatin, 2020). This revolution is taking place with the help of sophisticating technologies like AI, robotics, IoT, and big data analytics that in turn disrupt industries and the human capital needed to support them. In this regard, Vocational High Schools have the centrality in grooming students for the corporate world whereby the forging of job market complexity and demand for technology and innovation is ever on the rise (Subiyantoro et al., 2023). Taylor based strategies for change within these institutions are important for the purpose of repositioning education for applicability within the context of Industry 4. As of today, it is at 0 and it provide learners with skills and knowledge tailored with the modern requirements.

For many decades, vocational education has aimed at student training continually, providing them with specific vocational skills and practical knowledge necessary to satisfy demand in the respective occupational fields. However, the greater expansion of technology and the complications of introducing information technology into industry have provoked a shift in 2 paradigm of vocational education (Sulistianingsih, 2023). Education delivered through vocational schools today has to include technical skills upgrades but also address other competencies necessary in the society such as IT literacy, and problem-solving skills among other qualities. It is required to develop a skilled workforce that can operate in the context of automation, exchange of data, and usage of cyber-physical systems. The phenomenon of 'Industry 4.0' has brought the following issues into focus in the current generation (Mamad, 2018). The vocational education must adopt a more comprehensive model one that incorporates technical vocational skills as well as other skills such as interpersonal skills and digital literacy skills (Saripudin et al., 2021). This integration helps in eliminating the have been left without proper training in the

technological aspect as they graduate with competency in their preferred trades. It is for these intricate needs that vocational education requires strategic planning (Hoppe et al., 2011); vocational schools hence sit at the forefront of preparing students for the future workforce.

Therefore strategic planning in vocational education means that it must follow a structured pattern in formulating its goals, actions and resource implications for specific achievement of results (Mahardhika & Raharja, 2023). For vocational schools, strategic planning is essential for several reasons: Market Needs: Through development of strategic plans, the curriculum and the training programs provided in the vocational schools are made to match the current and growing market requirements (Ministry of Education, 2020). This alignment which is a reality in many universities is very important in improving the employment of the graduates and to meet the requirement of the market. Integration of Technology: In case the industries make use of digital technologies in the process of their work, it is important for vocational schools to incorporate these technologies in their learning process (Taylor, 2021) (Haleem et al., 2022). It proves helpful in implementing digital resources, learning platforms, and new forms and approaches to work, which improve the quality of education. Stakeholder Engagement: The management of the diverse stakeholders is central during the formulation of effective strategies thus the need to involve teachers, parents, players in industries, and policymakers. This kind of collaboration is ideal when developing and implementing strategic plans because it covers all angles and ideas from all parties. Continuous Improvement: The fact that Industry 4.0 evolves constantly stems from its dependence on the fourth industrial revolution. This implies that there should always be a culture of embracing change in vocational schools (Spöttl & Windelband, 2021). Strategic planning is especially useful to support constant assessment and improvement of educational programs needed to continue meeting the populace's educational requirements.

The case study of the DIY, stands as particularly relevant for source of understanding the organizational planning of VH schools in relation to Industry 4.0. DIY has a long history in education; a wide choice of vocational learning opportunities; and a dynamic industrial base. The focus on education and improvements in learning environment in the region presents the suitable area of study about how vocational schools are coping with the transitional changes that Industry 4. 0. Vocational High School in Yogyakarta, there is available wide range of the technical and vocational courses, which are aimed at such sectors of economy as manufacturing, information technology, hospitality, or creative industries. The educational institutions of the region are known for their focus on quality education, more practical training, and ties with the industry more so. By sampling 11 principals and 22 teachers from DIY vocational schools, this research draws a holistic viewpoint on the integral planning stimuli in these organizations.

The process of evolving towards Industry 4.0. On the one hand, challenges the role and function of Vocational High Schools and seems to threaten their sustainability (Subarno & Dewi, 2019). It opens up opportunities for Vocational High Schools to reposition themselves and perhaps rebrand themselves. On the positive side, it can be argued that due to the constantly growing rate of the development of technologies the educational institutions may often struggle to convey the updates in the industry and the novelties. This challenge is further exacerbated by the fact that introducing and implementing technology-infused pedagogical practices, new equipment and materials, developing teachers' technological pedagogical content knowledge and redesigning the curriculum require significant resources and radical changes (Sudarto, 2023). Industry 4.0 disruption and automation through integrated systems where there is a seamless flow of ideas and data between individuals, machines, systems and organizations. It could lead to a

large extent to a qualification improvement of vocationally oriented education. What is more, the use of ICTs in vocational schools will enable the development of enhanced learning environments, increase administrative effectiveness and provide enhanced learning environments for learners (Ghavifekr & Rosdy, 2015).

An emerging issue of concern when it comes to vocational schools is the need to adapt to the new complex and highly technological industrial world also referred to as Industry 4.0 (H et al., 2024). Finally, it relates to the inability to integrate new technologies into existing frameworks for education. This integration means teachers and students need to learn how to use hardware and software in addition to the purchasing of hardware and software. Moreover, it also brings transformations in the teaching-learning processes as learning is expanding to online and hybrid modalities (Bernauer et al., 2024). Another challenge is related to the matching of VET programs with the needs of economies in the constantly changing environment. Due to technological innovations in the job market, the skills that are accredited to various positions are dynamically transformed hence, the vocational school should always review its curriculum so that the qualified candidates can fit into the new workplace (Santosa & Dwi, 2018). This alignment can only be achieved by working hand in hand with industry some players, constant review of the curriculum offered and integration of industry standards and certification into the curriculum offered. However, considering these challenges that are hinged on the advancement in technology, there are numerous benefits that Industry 4. 0 are substantial. This paper also identifies areas of how technology may be used to improve vocational education by making it more engaging, flexible, and open. An online learning environment, virtual labs or simulation tools that offer students a practical experience by presenting them with actual scenarios will enhance student understanding to develop better practical abilities in laboratories and real businesses, creating a competitive advantage in job markets.

In line with such goals, the study aims at enriching the knowledge on issues of: Thus, the study aims at offering insights into the strategic planning practice among vocational education institutions as well as their brief preparedness to tackle the prospects and challenges of the Industrial Revolution 4. 0. The Industrial Revolution 4. 0 is not easy to say that 0 could be seen as containing both positive and negative aspects for vocational education. The case also shows that Vocational High Schools require to integrate incremental changes into their strategic management processes so that they can create solutions that will support the shift of the needs of industries and students for technology-based workplaces. Stakeholder engagement and the digitization transition are integral factors of strategic planning and management. Thus, this research aims to examine the detailed information regarding the strategic planning practices of vocational schools in the Special Region of Yogyakarta with specific reference to the extent of stakeholder participation and technology incorporation. The manuscript of this study will help policymakers, teachers, and other stakeholders to understand better how to assist students attain the learning outcomes needed for a future-proof vocational education sector.

RESEARCH METHOD

The current study uses a quantitative research approach to understand how Vocational High Schools in the Special Region of Yogyakarta (DIY) have prepared to manage the impacts of Industrial Revolution 4.0, involving only 11 principals and 22 teachers. Primary data is gathered through an online and offline survey instrument created from valid literature and piloted to identify areas such as stakeholder management, technology utilization, and strategic planning efficiency. The process used in collecting the data is the administration of questionnaires to the selected participants, after explaining to them the purpose of the study, explaining that the participants' responses would be kept confidential, obtaining informed consent from the participants, and ensuring the

completeness and consistency of the collected data. Qualitative data be collected and analyzed by using quantitative approach and Statistical Package for the Social Sciences (SPSS) to conduct statistical analysis involving Descriptive method where frequency table and percentage, mean and standard deviation measures participant demographic information and key variable while Inferential method by using two sample T test and one way ANOVA to provide respondent difference based on demographic factors and correlation & regression where stakeholder involvement, integration of technology and strategic planning outcome differ from each Other factors that are ethical in nature include the anonymity of the participants, their participation was voluntary, and perhaps seeking an approval from an ethics committee.

RESULTS AND DISCUSSION

As for the method of research, this section features the results and discussion regarding the data collected from the questionnaires distributed to 11 principals and 22 teachers at the Vocational High Schools (SMKs) in the Special Region of Yogyakarta (DIY). These issues relate to understanding the strategic planning processes and methodologies, identification of the appropriate stakeholders to involve, management of digital opportunities and threats, and the roles and significance of vocational programs in the contemporary context.
Strategic Planning and Technological Application

1.a. Have you developed a school strategic plan that accommodates technological advancements and Industry 4.0 developments?
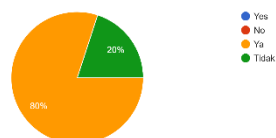30 jawaban

Chart 1. School Strategic Planning
The first research question that is sought to be answered in this study is the current state of strategic planning among vocational schools, given the emergence of new

technology as well as the challenges defining Industry 4. 0. Although the survey results demonstrate that 80% of the respondents (both principals and teachers) have prepared strategic plan that can facilitate these technological advancements, only 20% of them responded that they have not. With such a high percentage of schools having placed efforts into strategic planning, there is a clear indication of an understanding and willingness to incorporate technological change into the educational systems. A stakeholder's input in the planning process is very vital to ensuring that the kind of plans that are developed are efficient. Responses highlighted various methods of stakeholder involvement, including: Responses highlighted various methods of stakeholder involvement, including: This involves involving all the stakeholders, and enlightening them on planning activities and feed in. It is necessary to request suggestions from the industry to meet the demands of modern times. Building planning teams; and having group's deliberations. Improving the relevant curricula to reflect industry realities. The use of technology in case management and other approaches to collaborative planning.
This method of planning is important in supporting the collaboration undertaken in strategy formulation so that the plans developed will satisfy the various needs of the educational commune and organizations.
Use of Digital Technologies in Learning Plans

c. Does the learning plan already include the use of digital technology and online learning platforms?
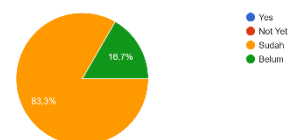30 jawaban

Chart 2. Technologies and learning platform
The second concern analyzed is: Are the learning plans written with an aim of incorporating the e-learning technologies and online learning tools? This trend is displayed in Figure 2, which indicates the

current rate of bed availability at 83.3% of the respondents stated that they have incorporated these technologies into their learning plans, while 16.7% indicated otherwise. This depicts a high level of adoption of digital resources in the delivery and acquisition of knowledge which is an appropriate preparation for the future world which is dominated by technologies.

The incorporation of digital tools and technology as well as online platforms do not only improve the educational outcomes of students but also contribute to better management of the SMKs educational systems. Such schools, therefore, have a better chance of preparing their students for the existing and future economy by offering them the proper skills and information.

Relevance of Vocational Programs to Industry Needs

Another critical area explored is the relevance of vocational programs to current industry needs. The responses reveal that most respondents believe their programs are relevant, with some noting the need for periodic adjustments to stay aligned with industry changes. Specific comments included:

• The use of industry-standard software, such as AutoCAD and SketchUp, although curriculum updates are shifting towards more advanced tools like BIM.

• Continuous support and curriculum synchronization with industry requirements.

• The need for better facilities to fully meet industry standards.

• The role of practical industry experiences, such as internships (PKL), in bridging the gap between education and industry.

Overall, the findings indicate that while there is a general alignment of vocational programs with industry needs, ongoing efforts are required to maintain and enhance this relevance. This includes regular updates to curricula, improvements in facilities, and closer collaboration with industry partners.

Discussion

The study highlights several key points in the strategic planning and implementation processes at vocational schools in DIY:

1. High Adoption of Strategic Planning for Technology Integration: The study provides a comprehensive analysis of strategic planning and implementation processes in vocational schools located in the Special Region of Yogyakarta (DIY), focusing on several pivotal aspects. Firstly, it underscores the widespread adoption of strategic planning aimed at integrating technology within educational frameworks. A significant majority of vocational schools have embraced strategic plans that specifically cater to technological advancements, indicating a proactive approach in preparing students for the evolving demands of Industry 4.0. This strategic foresight not only demonstrates a commitment to enhancing educational quality but also ensures that graduates are equipped with the requisite skills and competencies needed to thrive in modern industries. By aligning educational strategies with technological trends, these schools are effectively bridging the gap between theoretical knowledge and practical application, thereby enhancing student employability and readiness for the future job market. Moreover, the integration of technology within strategic planning processes serves as a cornerstone for adapting educational methodologies to contemporary needs. Schools that have implemented such plans are better positioned to leverage digital tools and platforms, enriching the teaching and learning experiences. This integration extends beyond mere adoption of hardware and software; it encompasses a holistic approach to curriculum development, instructional methods, and administrative practices. By leveraging digital technologies, vocational schools not only enhance instructional delivery but also foster a more dynamic and engaging learning environment. Students benefit from interactive learning modules, virtual simulations, and access to online resources that supplement traditional classroom instruction, thereby enhancing their digital literacy and problem-solving

abilities crucial for navigating today's interconnected world. Furthermore, the proactive stance towards technology integration underscores a broader commitment to educational excellence and relevance. By anticipating and incorporating technological advancements into strategic planning, vocational schools in DIY are paving the way for educational innovation and continuous improvement. This strategic approach enables institutions to stay abreast of industry trends and employer expectations, ensuring that educational outcomes remain aligned with the evolving demands of the global marketplace. As industries increasingly prioritize digital skills and technological proficiency, vocational schools play a pivotal role in preparing students to meet these demands, thereby enhancing their competitiveness and career prospects upon graduation. In conclusion, the study's findings highlight the pivotal role of strategic planning in fostering technology integration within vocational schools in DIY. The high adoption rates of strategic plans tailored to technological advancements reflect a forward-thinking educational strategy aimed at enhancing student preparedness for the challenges and opportunities of Industry 4.0. Moving forward, continued emphasis on strategic planning and technology integration will be essential to sustaining educational relevance, fostering innovation, and ensuring that vocational education remains a cornerstone of economic development and workforce readiness in the region and beyond.

2. Collaborative Stakeholder Involvement: Effective strategic planning involves the active participation of various stakeholders, including teachers, parents, and industry representatives. Collaborative stakeholder involvement is pivotal in effective strategic planning within vocational schools in the Special Region of Yogyakarta (DIY). This inclusive approach ensures that the development and implementation of strategic plans benefit from diverse perspectives and expertise. Engaging teachers, parents, and industry

representatives in the planning process fosters a holistic understanding of educational needs and industry requirements. Teachers provide valuable insights into pedagogical methods and curriculum design, ensuring that educational strategies align with instructional goals and student learning outcomes. Parents, as primary stakeholders, contribute insights into community expectations and student support needs, enriching the planning process with considerations for holistic student development. Moreover, the involvement of industry representatives brings practical relevance to vocational education by aligning curriculum with current industry trends and demands. Their input ensures that graduates possess the skills and competencies required for successful integration into the workforce. This collaborative effort not only enhances the quality and relevance of educational programs but also strengthens partnerships between vocational schools and industry stakeholders, fostering mutual understanding and support. By embracing collaborative stakeholder involvement in strategic planning, vocational schools in DIY cultivate a shared vision for educational excellence and student success. This participatory approach promotes transparency, accountability, and responsiveness to evolving educational and workforce needs. It empowers stakeholders to contribute meaningfully to decision-making processes, ensuring that strategic plans are adaptive, inclusive, and reflective of the broader community's aspirations for educational outcomes and societal development.

3. Integration of Digital Technologies: The integration of digital technologies and online learning platforms represents a pivotal advancement in vocational education within the Special Region of Yogyakarta (DIY). A notable number of schools have enthusiastically embraced these technological tools, significantly enhancing both the teaching and learning experiences. This integration extends beyond mere

adoption; it fosters a dynamic educational environment where students can engage with interactive learning modules, virtual simulations, and a wealth of online resources. Such initiatives not only augment traditional classroom instruction but also cultivate essential digital literacy skills crucial for success in a technology-driven society. By leveraging digital technologies, vocational schools are better equipped to prepare students for the challenges and opportunities presented by a digitalized world. These technologies facilitate personalized learning experiences tailored to individual student needs, thereby promoting deeper understanding and retention of subject matter. Moreover, digital platforms enable seamless communication and collaboration among students, teachers, and industry partners, fostering a more integrated approach to vocational education. Furthermore, the integration of digital tools enhances administrative efficiency within schools, streamlining tasks such as grading, attendance tracking, and resource management. This efficiency not only reduces administrative burdens but also allows educators to devote more time and attention to student learning and development. Additionally, by incorporating industry-standard software and digital learning resources, vocational schools ensure that graduates possess the technical competencies sought after by employers, thereby enhancing their employability and career prospects.

In conclusion, the integration of digital technologies and online learning platforms represents a transformative shift in vocational education at schools in DIY. This strategic adoption not only enriches educational experiences but also equips students with essential skills for success in a digital age. Moving forward, sustained investment in technology integration will be essential to further enhance educational outcomes, foster innovation, and meet the evolving needs of students and industries alike.

4. Alignment with Industry Needs:

Alignment with industry needs represents a critical aspect of vocational education, where programs strive to meet contemporary industry standards. The study reveals that vocational programs generally align well with current industry requirements. However, to maintain this alignment, continuous efforts are necessary to ensure that curricula and facilities remain up-to-date with rapid industry developments. Practical experiences, notably internships, are pivotal in bridging the gap between classroom learning and real-world industry demands. These experiences provide students with hands-on exposure to industry practices, enhancing their skills and employability upon graduation.

The integration of industry-relevant content into vocational curricula ensures that students are equipped with the latest knowledge and skills sought by employers. This alignment not only enhances the educational experience but also strengthens partnerships between vocational schools and industry stakeholders. Collaboration with industry leaders enables schools to adapt their programs to emerging trends and technologies, ensuring graduates are well-prepared for the dynamic job market. Continuous feedback mechanisms and regular curriculum reviews are essential to maintaining this alignment, ensuring that vocational education remains responsive to evolving industry needs and societal expectations.

5. Challenges and Opportunities: Despite facing challenges like inadequate facilities and the necessity for curriculum updates, vocational education in DIY presents significant opportunities for continuous enhancement and innovation, primarily driven by strategic planning and stakeholder engagement. The challenges underscore the need for ongoing investment and development in infrastructure to meet industry standards fully. Improving facilities would not only elevate educational quality but also ensure that students receive practical, hands-on training essential for their future careers. Moreover, the

commitment to strategic planning offers opportunities for curriculum refinement to align more closely with industry demands. By involving stakeholders such as educators, industry professionals, and policymakers in the planning process, vocational schools can tailor educational programs to meet current and emerging workforce needs effectively. This collaborative approach fosters innovation in teaching methodologies and curriculum design, ensuring that graduates are well-equipped with relevant skills and knowledge.

Furthermore, strategic planning encourages the integration of new technologies and teaching methods into vocational education. Embracing digital tools and online platforms enhances learning experiences, making education more engaging and effective. It also prepares students to navigate a digitalized work environment, thereby improving their employability and career readiness. In conclusion, while challenges like facility limitations and curriculum updates exist, strategic planning and stakeholder involvement present valuable opportunities for advancing vocational education in DIY. By addressing these challenges through collaborative efforts and innovative strategies, vocational schools can ensure continuous improvement and relevance, thereby better preparing students for successful careers in evolving industries. In conclusion, the study underscores the importance of strategic planning, stakeholder collaboration, and the integration of digital technologies in enhancing the relevance and effectiveness of vocational education in the era of Industry 4.0. The insights gained can inform policymakers, educators, and industry stakeholders in their efforts to develop a future-ready vocational education system.

CONCLUSION

In conclusion, the findings from this study provide valuable insights into the state of vocational education at vocational school in the Special Region of Yogyakarta, particularly concerning strategic planning, technology integration, and alignment with industry needs. The high adoption rate of strategic planning for technology integration underscores a proactive approach among schools in preparing students for Industry 4.0. Engaging stakeholders, including educators and industry representatives, in the planning process ensures that these strategies are well-informed and comprehensive, catering to diverse educational and industry requirements. Moreover, the substantial incorporation of digital technologies into learning plans not only enhances teaching methods but also equips students with essential skills for a digital economy, highlighting the critical role of technology in educational management and student preparedness.

Furthermore, the study reveals that while vocational programs generally align with industry needs, ongoing efforts are essential to maintain this relevance. Regular curriculum updates and improvements in facilities are identified as crucial areas for development, alongside fostering practical industry experiences like internships. Despite challenges such as resource limitations, the commitment to collaborative strategic planning presents opportunities for innovation and improvement in vocational education. Overall, these findings emphasize the significance of strategic foresight, stakeholder engagement, and technological integration in shaping a robust vocational education system that effectively meets the demands of modern industries and prepares students for successful careers.

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