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Data-Based Education Service Quality Improvement Management in the Digital Era

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Abstract

This research examines the role of strategic management, program evaluation, and educational planning in formulating a relevant educational vision in the digital era and improving the quality of educational services through data-driven decision-making. The method used is a bibliographic study by searching the literature through leading academic databases, using keywords such as strategic management, educational program evaluation, and data-driven decision making. The selected literature meets the criteria of scientific quality and up-to-dateness, primarily focusing on publications of the last five years. The relevant literature is then analyzed thematically to identify key concepts, underlying theories, and findings that can be adopted in Indonesia's education context. The study results show that Indonesia's education sector faces various strategic challenges, including education planning that has not fully considered technological dynamics and labor market demands. This research emphasizes the importance of implementing adaptive strategic management, participatory program evaluation, and data-driven planning to formulate a contextual educational vision in the digital era. These three approaches are crucial in improving the quality of inclusive, relevant, and sustainable education services in Indonesia. Further research can be conducted field studies to test the effectiveness of implementing data-based management in certain educational units.

Keywords Digital Era; Educational Development Planning; Strategic Management

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1. INTRODUCTION

Education is a sector that plays an important role in the social and economic development of a country (Lase et al., 2024; Muslih et al., 2025; Purnomo et al., 2025). In Indonesia, efforts to improve the quality of education continue to be made through various policies and reforms, especially in facing challenges in the digital era. As technology develops and the needs of the world of work become increasingly complex, the education sector is faced with the need to formulate a clear vision, optimize resources, and develop systems responsive to change. Therefore, strategic planning, program evaluation, and data-based decision-making are key elements in improving the quality of education services.

Strategic management in education functions to plan and direct educational policies and programs to achieve the desired goals (Habibi, 2020). Evaluation of educational programs, on the other hand, is a mechanism for measuring the effectiveness of the policies implemented and ensuring that these

programs have a real impact on the quality of education (Soebroto & Murniarti, 2024; Taali et al., 2024). Meanwhile, education development planning must be adapted to current developments, including integrating technology into the curriculum and learning (Aprianto & Wahyudi, 2023; Isti'ana, 2024; Rozeqqi, 2024).

However, even though there have been efforts to improve the quality of education, the implementation of education policy in Indonesia is still faced with various challenges. Limited human resources (HR), uneven infrastructure, and a mismatch between education policy and industry needs are obstacles to creating relevant and quality education. In this context, data-based decision-making has a very important role in ensuring that every policy and step taken is based on information that is accurate and relevant to education needs in Indonesia.

Some of the predecessor literature, namely the Implementation of School-Based Strategic Management (SBMS), aims to improve the quality of education by providing more autonomy to schools, involving all stakeholders in the decision-making process, and managing school resources based on local potential and needs (Nirmayanthi et al., 2024). Information systems strategic planning at SDIT Al Muthmainnah, using the Ward and Peppard model with the support of Critical Success Factors, SWOT, Value Chain, and McFarlan's Strategic Grid analysis, produces business strategies, information technology, and information systems management that are structured and controlled based on levels of importance (Wijaya et al., 2023).

The results of previous research by (Darling-Hammond et al., 2020) Darling-Hammond et al. (2019) emphasize the importance of evidence-based education policies to improve the effectiveness of national policies. However, this study focuses more on the integration of data in decision-making. The study (Schleicher, 2020) It is found that the lack of quality data in many developing countries is a major challenge in education reform, while this study highlights how available data can be optimized. The research (Zhao, 2021) Discusses the importance of digital innovation in education, but this research emphasizes more data management strategies for policymakers. In addition, research (O.E.C.D., 2004) Shows that data-driven decision-making can narrow education gaps, in line with the findings of this study regarding disparities between urban and rural areas. Studies (Flum & Kaplan, 2012) Discuss the effectiveness of strategic leadership in education but do not specifically highlight aspects of data-driven evaluation. Thus, this research makes a new contribution by integrating strategic management, program evaluation, and educational planning concepts in one data-driven decision-making model that is adaptive to the digital era.

In contrast to previous research, this study emphasizes integrating strategic management, program evaluation, and educational development planning with data-based decision-making in the digital era, focusing on Indonesia's educational challenges. Unlike previous studies emphasizing theoretical analysis or specific aspects, this study offers a comprehensive approach to creating a responsive and adaptive education system. It highlights the persistent gap in addressing educational resource disparities across regions and emphasizes the importance of leveraging digital technology for equitable education. The research provides a novel framework combining these three key elements, proposing a data-driven model to formulate effective and relevant education policies. By aligning strategic management and planning with evidence-based program evaluation, the study aims to guide policymakers and education stakeholders in tackling inequality and enhancing education quality, especially in remote areas. The findings are expected to offer practical solutions for creating Indonesia's resilient and technology-driven education system.

2. METHODS

This research employs a bibliographic method to collect and analyze relevant literature from leading academic databases, including Google Scholar, JSTOR, ScienceDirect, SpringerLink, and

ProQuest. These sources ensure credibility and up-to-date information. Keywords such as "strategic management in education," "educational program evaluation," "digital transformation in education," and "data-driven decision-making in education" guide the search process. Selected literature must meet strict criteria, focusing on strategic management, program evaluation, educational development planning, and data-based decision-making, prioritizing publications from the last five years to maintain relevance. The analysis involves categorizing sources by research focus and synthesizing findings to identify key concepts, theories, and their applicability in Indonesian education. This method integrates diverse perspectives and supports evidence-based recommendations for improving strategic planning and program evaluation within Indonesia's education sector.

3. FINDINGS AND DISCUSSIONS

The Role of Strategic Management, Program Evaluation, and Educational Planning in Formulating Vision, Mission, and Optimizing Educational Organization Resources

In Indonesia, many educational institutions still face challenges in formulating a clear and structured vision and mission. One of the main problems is the lack of strategic planning based on data and real needs (Paramansyah et al., 2023). There are still many educational institutions that have not succeeded in achieving their stated goals because school management has not been carried out effectively (Fathurrochman et al., 2022). Many educational institutions, especially in remote areas, still rely on conventional administrative approaches without considering technological developments and labor market dynamics (Sari et al., 2024). This causes a mismatch between educational output and industry needs so that graduates are less ready to compete in the world of work.

Apart from that, the evaluation of education programs in Indonesia is still often carried out formally without any concrete follow-up (T. Amalia, 2019). Many educational programs are implemented without in-depth impact analysis, making their effectiveness difficult to measure. A lack of data-driven monitoring systems also means ineffective programs remain in place, while innovation and updates are often delayed. As a result, the quality of education has not improved significantly, especially in schools with limited resources.

Optimizing resources in education is also a crucial issue. Many educational institutions face obstacles to funding (Armawati & Rosadi, 2021; Nurharirah & Effane, 2022), unequal distribution of teaching staff (Husna, 2025; A. P. Rahmawati, 2022; Susianita & Riani, 2024), as well as limited use of technology. Schools in urban areas tend to have better access to facilities and quality teaching staff, while remote areas still experience a shortage of teachers and adequate infrastructure (Damayanti & Nuzuli, 2023; Mukaromah, 2020; Salsabila et al., 2020). Without a good resource management strategy, this gap will continue to widen, hampering equitable access and quality of education in Indonesia.

The theory of Competitive Advantage introduced by Michael Porter is very relevant to the challenges faced by educational institutions in Indonesia, especially in strategic planning (Darmawan & Grenier, 2021; Goyal, 2020; Öz, 2019). Porter emphasized the importance of analyzing the external and internal environment to determine the competitive advantage of an institution. Some schools have initiated strategic steps in urban areas, such as analyzing labor market needs and mapping resources. However, in remote areas, the application of this kind of strategy is still very limited. This imbalance results in significant differences in educational output between urban and remote schools, ultimately creating a mismatch with industry needs. To answer this challenge, educational institutions must adopt a competitive advantage-based approach. By analyzing the labor market and technological developments, they can formulate a vision and mission more relevant to society's needs and the world of work.

Approach Five Ps of Strategy from Henry Mintzberg provides a more comprehensive view of strategy. Mintzberg not only views strategy as a plan (Plan) but also includes other aspects such as Ploy,

Pattern, Position, and Perspective (S. I. Amalia & Mohammad, 2023; Khalifa, 2023). In Indonesia, many educational institutions still use conventional administrative approaches that do not consider labor market dynamics and technological developments. This shows that applying the Five Ps is still limited, especially in formulating long-term strategies. To face rapid changes in education and the labor market, educational institutions must be more proactive in integrating positions and perspectives related to market needs. With this approach, they can create more effective and adaptive long-term strategies.

The CIPP model (Context, Input, Process, Product) by Daniel Stufflebeam offers an evaluation framework that is very relevant to the conditions of educational program evaluation in Indonesia (Dizon, 2023; Nurmasari et al., n.d.). Based on field data, many program evaluations are carried out only formally, without an in-depth analysis of the program's context, input, process, and results. This kind of evaluation cannot provide a comprehensive picture of the success or failure of the program. By adopting the CIPP Model, educational institutions can conduct more comprehensive and data-based evaluations. This model allows every aspect of the program, from planning to final results, to be evaluated in depth to increase accountability and effectiveness of educational programs.

Draft Responsive Evaluation developed by Robert Stake is very relevant for improving the quality of educational evaluation in Indonesia (Gürel & İşcan, 2020; Harjanti et al., 2019). Evaluations carried out in many educational institutions tend not to involve various stakeholders, such as students, parents, and the community. As a result, the resulting policies often do not reflect real needs in the field. Responsive Evaluation emphasizes the importance of involving various parties in the evaluation process to obtain relevant input. With this approach, educational institutions can develop more adaptive and contextual policies and be able to answer the real needs of students and society.

Approach Management by Objectives (MBO) from Peter Drucker provides a strategic solution to overcome the problem of lack of targeted planning in many educational institutions in Indonesia. (David, n.d.; Jayadatta & Sheeri, 2023). Based on field data, many educational institutions have not designed clear and measurable strategic goals. This is a big challenge, especially in areas that lack infrastructure and resources. MBO offers a goal-based planning approach that can be measured and evaluated. By formulating more focused goals, educational institutions can focus more on achieving desired results and increasing accountability at every stage of educational program implementation.

Total Quality Management (TQM), introduced by Edward Deming, provides a relevant approach to improving the quality of education in Indonesia, especially in remote areas. TQM focuses on continuous quality improvement through the involvement of all elements in the education system (Kigozi et al., 2019). However, field data shows that TQM principles have not been fully implemented in many educational institutions, especially those facing limited resources and infrastructure. Educational institutions can improve quality by applying TQM principles, ranging from resource management and learning processes to stakeholder satisfaction. This approach allows educational institutions to continuously improve their services so that the quality of education can improve comprehensively and sustainably.

This research identifies several main challenges faced by educational institutions in Indonesia in formulating a clear vision and mission and optimizing resources to achieve educational goals. The research results show that strategic planning based on data and real needs is still poorly implemented in urban and remote areas. Many educational institutions still rely on conventional administrative approaches without considering dynamic changes in the labor market and technological developments. Evaluations of educational programs that are carried out tend to be limited to administrative aspects and do not involve stakeholders as a whole. Besides that, resource management remains a big challenge, with an imbalance in the distribution of teaching staff and technological limitations that hinder an effective learning process.

Evaluation of Educational Programs Facilitates Evidence-Based Decision-Making to Measure the Effectiveness of Achieving Learning Goals

Evaluation of education programs in Indonesia still faces various complex challenges. One of the main problems is the lack of an evaluation system that is based on evidence and accurate data (Meilinda & Sabaruddin, 2021). Many educational policies are implemented without going through a thorough analysis of their effectiveness in achieving learning goals. For example, the implementation of the Merdeka Curriculum in several schools has not been fully evaluated with clear standards, making it difficult to assess its impact on improving the quality of learning (Barlian & Solekah, 2022; Suryaman, 2020). This lack of comprehensive, evidence-based evaluation means decisions are often based on assumptions or policy pressures rather than valid data.

In addition, many educational institutions face obstacles in collecting and processing evaluation data, especially in remote areas. Limited technological infrastructure and lack of capacity of teaching staff to use digital evaluation tools are the main obstacles to implementing evidence-based decision-making (Annisa et al., 2024; Munir & Su'ada, 2024; Yusuf & Sodik, 2023). For example, the education report card system introduced by the government is still not fully understood and utilized optimally by schools in rural areas. As a result, the data produced is not always accurate and less representative of educational conditions in various regions, making it difficult for the government to formulate right-on-target policies.

Another problem is the lack of stakeholder involvement in the education program evaluation process (Rahwati, 2019; Simamora et al., 2024). Evaluations often only focus on administrative and academic aspects without considering the perspectives of students, parents, and the community. The success of an educational program is not only measured by academic results alone but also by its impact on students' readiness to face the challenges of the world of work and social life. This lack of evaluation involving various parties has made education policies less relevant to real needs in the field. Hence, they cannot improve the quality of education as a whole.

Finally, sustainability and consistency in evaluating educational programs remain a big problem in Indonesia. Many policies and programs are evaluated sporadically or only over a certain period without any long-term monitoring mechanism. For example, the School Operational Assistance (BOS) program and various teacher training programs are often evaluated only in terms of budget absorption (Nurrochman et al., 2023; Saifrizal & Yusuf, 2023), not from the real impact on improving the quality of education. This inconsistency in evaluation makes it difficult to measure the program's effectiveness as a whole, so evidence-based decision-making is not optimal for improving the quality of education in Indonesia.

The education evaluation model developed by Donald Kirkpatrick is very relevant to be applied in analyzing educational policies and programs in Indonesia, including the Independent Curriculum (W. Rahmawati et al., 2021; Ridho et al., 2020). Kirkpatrick offers four levels of evaluation that can be used to assess program effectiveness comprehensively. The first level, reaction, focuses on student and teacher responses to the program, assessing whether they found the training or curriculum relevant and useful. The second level, learning, evaluates how students and teachers understand and apply the material taught. The third level, behavioral, analyzes whether there is a change in teaching methods or behavior after program implementation. The fourth level, outcomes, measures the achievement of end goals such as improved skills or academic outcomes.

However, research results show that the evaluation of educational programs in Indonesia tends to focus on the level of reaction and learning only. This has resulted in a lack of attention to behavior change and long-term impact, which is critical to ensuring educational programs substantially change the quality of learning. By applying evaluation to the fourth level, educational institutions can better understand the overall impact of policies and increase the effectiveness of educational programs.

Responsive evaluation developed by Robert Stake is also very relevant to the condition of education in Indonesia, especially regarding the lack of stakeholder involvement in the evaluation process. Many educational program evaluations in Indonesia only involve teaching staff, while students, parents, and the community are often not involved (Faizin & Kusumaningrum, 2023; Mutia & Riyana, 2019; Najat et al., 2023). This causes policy decisions to be less contextual and do not fully reflect real needs in the field. Stake's responsive approach emphasizes the importance of open dialogue and the involvement of various parties in the evaluation process. By involving various perspectives, evaluation results can become richer and more relevant so that the policies are more targeted and contextual according to community needs.

Meanwhile, Michael Fullan highlighted the importance of evaluation for understanding the impact of changes in the education system. (Dillah et al., 2023; Hendrizal & Syaifuddin, 2023). In Indonesia, policy changes such as implementing the Independent Curriculum and teacher training are often not supported by consistent and structured evaluation. As a result, the impact of these changes on educational quality is difficult to measure accurately. Fullan emphasized that evaluations carried out holistically and continuously can provide deeper insight into how policies bring about change and how these policies can be adjusted to achieve better results.

The evaluation approaches of Kirkpatrick, Stake, and Fullan offer a complementary framework for improving the education evaluation system in Indonesia. By integrating these models, educational institutions can develop a more comprehensive evaluation approach, involving all stakeholders and ensuring that education policies are relevant and have a sustainable positive impact.

This research highlights the challenges of evaluating educational programs in Indonesia, focusing on evidence-based decision-making to enhance learning outcomes. A major issue lies in data collection and processing limitations, particularly in rural areas, where inadequate technological infrastructure and a lack of teacher training result in reliance on manual methods. For example, many schools struggle to utilize the government's education report card system due to unfamiliarity with its digital tools, leading to unreliable data for informed decisions. Additionally, program evaluations often emphasize administrative aspects, such as budget usage, rather than assessing the impact on learning objectives. Policies like the Merdeka Curriculum are rarely evaluated against clear standards, resulting in decisions driven by assumptions rather than valid evidence. Furthermore, stakeholder involvement in evaluations is minimal, excluding students, parents, and communities, which limits understanding of broader impacts, such as workplace readiness. Inconsistent monitoring of programs like BOS and teacher training further weakens evidence-based decision-making, hindering long-term educational improvements.

Long Term Strategy Through the Integration of Curriculum, Infrastructure, and Human Resources to Improve the Quality of Education that is Relevant in the Digital Era

In Indonesia, although there have been efforts to improve the quality of education, the challenges faced in integrating curriculum, infrastructure, and human resources (HR) in the education sector are still very large. One of the main problems is the unequal distribution of education quality between regions (Fatchuroji et al., 2023; Sitorus et al., 2024). In remote areas, access to education relevant to the needs of digital and global industries is very limited. The curriculum implemented in some schools often does not keep up with technological developments and changing job market demands. In addition, limited adequate infrastructure, such as internet access and digital-based learning facilities, is a barrier for students and teachers to develop the skills needed in the digital era.

Apart from these problems, developing teacher competency is also a significant obstacle. Many teaching staff are not yet trained in utilizing digital technology optimally in the learning process (Anwar et al., 2021). This impacts teachers' inability to integrate technology effectively into the existing curriculum. In addition, high administrative burdens often divert their attention from developing the quality of learning. Without strong support in terms of training and adequate infrastructure, quality

education relevant to current developments and industry needs is difficult to realize.

The inequality of education quality between regions, as well as limited access to education that is relevant to global market needs, shows the urgent need for thorough strategic planning (Puyt et al., 2024; Puyt & Antoniou, n.d.). This aligns with Ansoff's theory, which emphasizes the importance of strategies based on analysis of the internal and external environment. Integrating the curriculum with technological developments and job market demands demands flexible and adaptive long-term planning. These findings emphasize that education strategies in Indonesia must be designed to anticipate global changes while ensuring educational equality in urban and rural areas.

Infrastructure limitations, especially internet access and digital-based learning facilities, emphasize the relevance of Castells' theory. Castells emphasized the importance of connectivity and technology integration as the basis for educational transformation in the digital era (Costa et al., 2019; Jing, 2020; Zhen et al., 2020). This challenge is a major obstacle in ensuring that students throughout Indonesia have equal opportunities to access information and technology-based learning. For this reason, updating infrastructure and developing a digital-based curriculum is an urgent need so that education in Indonesia can respond to the demands of the 21st century.

Developing teacher competency is still a major obstacle in the education sector. Many teaching staff have not received continuous training to improve their competence. This is relevant to Werther & Davis's theory, which emphasizes the importance of investment in human resources to achieve organizational goals, including education (Ismi et al., 2022; Maria et al., 2024; Murugesan, 2022). Continuous education and training for teachers, good career management, and an effective performance evaluation system are needed to improve the quality of teaching staff. With this approach, teachers can be the main movers in creating an adaptive and progressive education system.

John Dewey emphasized that education must be relevant to society and current developments (Arifin, 2020; Fathoni, 2025). Challenges in Indonesia related to a curriculum that is not yet fully integrated with technology and industry needs strongly support this theory. The existing curriculum needs to be redesigned to be more relevant to local and global needs so that students can adapt to social, economic, and technological changes. Education connected to the real world will create students who can think critically and solve problems in line with the demands of the times.

Limitations in using technology for learning support Papert's theory, which underlines the importance of technology in enriching students' learning experiences. Technology can be a powerful tool for encouraging student innovation and creativity if used correctly (Hof, 2021; Wellner & Levin, 2024). Unfortunately, in many regions in Indonesia, technology adoption is still hampered by a lack of infrastructure and training for teachers. With the wider adoption of technology, education can become more inclusive and relevant to the needs of modern society.

Success in integrating technology and aligning curriculum with industry needs requires effective leadership. The research results highlight the importance of collaboration between school principals, education managers, and the government to create inclusive and sustainable policies. This is in line with Fullan's theory, which emphasizes that good educational leadership can drive reform effectively (Fullan, 2023; Fullan & Kirtman, 2019). This collaboration increases policy effectiveness and encourages a shared commitment to creating a better education system.

This research identifies several key findings in integrating curriculum, infrastructure, and human resources in the Indonesian education sector. First, there is a gap in the quality of education between urban and rural areas, where access to technology and digital learning is very limited. Second, although the curriculum has been adapted to current developments, many schools have not utilized technology to its full potential. Third, developing teacher competency in digital technology is still a big challenge, with many teaching staff not yet trained in integrating technology into learning. Fourth, management of educational infrastructure, including internet access and digital learning facilities, is still very limited,

especially in remote areas.

4. CONCLUSION

Strategic management, program evaluation, and educational planning are crucial in shaping a relevant vision of education in the digital age. The three complement each other in supporting effective data-based decision-making and are oriented toward improving the quality of education services. Adaptive strategic management allows educational institutions to respond proactively to technological developments and job market needs. Evaluating programs involving stakeholders across the board encourages more contextual and responsive policy formulation. Meanwhile, data-driven educational planning can identify real needs and direct resources optimally.

By integrating these three aspects, education services can be improved systematically, sustainably, and evenly, especially through digital technology in planning, implementing, and evaluating education. Therefore, the transformation of data-based education management is the key to answering the challenges of inequality, relevance, and quality of education in Indonesia in this digital era. Further research can be conducted field studies to test the effectiveness of implementing data-based management in certain educational units.

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