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KAIZEN 5'S INDUSTRIAL WORK CULTURE-BASED SCHOOL FACILITIES AND INFRASTRUCTURE MANAGEMENT MODEL'S SUSTAINABLE DEVELOPMENT GOALS (SDGS) AT STATE VOCATIONAL SCHOOLS IN THE BIREUEN REGENCY

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Abstract

Introduction: An essential part of Indonesia's National Education Standards are the infrastructure and facilities for education. All formal and informal educational institutions are required to provide facilities that assist students' physical, intellectual, social, emotional, and psychological development, as stipulated in Article 45 of the National Education System Law No. 20 of 2003. **Objective**: In order to create a school facilities and infrastructure management model that is focused on the Sustainable Development Goals (SDGs), this project will integrate the 5S Kaizen industrial work culture into vocational schools (SMK Negeri) in the Bireuen Regency. It also assesses how useful and successful the model is at streamlining school facility management. **Method**: The study used Plomp's model as part of its Research & Development (R&D) process, which consisted of five stages: analysis, design, development, implementation, and assessment. Principals, vice principals, heads of expertise programs, workshop leaders, administrative leaders, and effective teachers were among the participants. Validated by expert evaluations, implementation observations, response surveys, and competency tests, the research tools included a model book, an implementation manual, and a module guide. Results: The average validation scores for the generated model were 4.57 (model), 4.62 (implementation handbook), and 4.63 (module guide), indicating strong validity. Positive participant response rates in trials I and II were 85.91% and 86.31%, respectively, indicating that classical completeness was attained. The N-Gain analysis classified its effectiveness as moderate, showing competency gains of 61.75% and 62.21%. **Conclusion**: The model promotes ongoing advancement in vocational education by encouraging an organized, industry-based approach to SDG-aligned school facility management. For policymakers and school administrators working in vocational education settings, this study offers a novel paradigm for incorporating industrial methodologies—specifically, 5S Kaizen—into the administration of educational infrastructure.

Keywords: ***Sustainable Development Goals (SDGs), School Facilities and Infrastructure Management, School Stakeholders, Industrial Work Culture, Kaizen 5S.***

INTRODUCTION

The demand for top-notch human resources is greatly impacted by the fierce rivalry that characterizes the shift to Society 5.0 in all spheres of life. In order to accelerate social and economic development, this period places a strong emphasis on human-centered integration with technology [1]. In order to achieve resilience, economic efficiency, and sustainable growth in a variety of areas, including education, Society 5.0 places a higher priority on human-machine collaboration than Industry 4.0, which concentrated on machine-to-machine automation. This worldwide change necessitates an open system in Indonesia, especially in education, which is the cornerstone of developing human resources. Providing and maintaining sufficient educational infrastructure and facilities is one of the key elements in attaining high-quality education. Institutions of higher learning have a strategic role in making

sure that students acquire both information and character-building skills that help them become capable and responsible citizens [2], [3]. But even with legislative frameworks that stress the value of infrastructure and amenities in schools, there is still a big disconnect between policy and practice.

Infrastructure and educational facilities are essential parts of Indonesia's National Education Standards. All formal and informal educational institutions are required by Article 45 of the National Education System Law No. 20 of 2003 to provide facilities that promote students' intellectual, social, emotional, psychological, and physical development [4]. Additionally, the Minister of Education and Culture's Regulation No. 22 of 2023 lays out the minimal requirements for educational facilities, including infrastructure like labs, canteens, and places of worship, as well as furniture, educational media, books, learning resources, and information and communication technology. Many Indonesian schools, particularly those located in isolated and impoverished locations, suffer from poor infrastructure in spite of these legal obligations. According to reports, many schools lack enough furniture, lab space, classrooms, and access to digital learning resources [5].

The problem is made worse by natural catastrophes like earthquakes and floods, which destroy school structures and create dangerous learning environments [6]. The difference between urban and rural schools demonstrates a phenomenon in which national education policies fall short of guaranteeing that all regions have fair access to high-quality educational facilities. In order to guarantee a favorable learning environment, school infrastructure management is essential. The planning, procurement, inventory, supervision, maintenance, and removal activities are all part of the management of educational infrastructure and facilities. Learning results, teacher productivity, and student motivation are all directly impacted by well-managed facilities [7], [8]. Nevertheless, a number of studies have identified shortcomings in the way these management concepts are being applied. The changing demands of educational institutions are not always met by the management methods for school infrastructure that are currently in use. For instance, although some schools have implemented the ISO 9001:2008 framework [9], its main objective is procedural compliance rather than encouraging a flexible and collaborative management style. Similar to this, studies have demonstrated that including all parties involved in the school—teachers, students, parents, and local communities—can improve the efficacy of infrastructure management; however, many schools do not have these kinds of participatory processes in place [10].

A significant theoretical gap is the absence of integration between industry-based quality management frameworks and school infrastructure management. Although kaizen 5S (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke) is frequently applied in industrial settings to increase sustainability and efficiency, its usage in educational facilities management is yet relatively unexplored [11]. Despite its potential advantages, research indicates that Indonesian vocational high schools (SMK), which are meant to replicate industrial work settings, have not fully embraced 5S-based infrastructure management [12], [13]. This theoretical shortcoming emphasizes the necessity of a fresh approach that incorporates industrial work culture into the administration of educational infrastructure. Several research studies have investigated the impact of school facilities on student learning outcomes. Jannah & Sontani (2018) found that well-managed facilities enhance student motivation, while [14] highlighted the role of infrastructure in improving learning effectiveness. Additionally, [15] emphasized that proper infrastructure management can mitigate disaster risks in schools. However, there is limited research on the implementation of structured facility management models tailored to the needs of vocational schools. A preliminary research on infrastructure management was carried out at a vocational school in Bireuen Regency, Indonesia, in March 2023. The COVID-19 epidemic impeded the proper adoption of the 5S management model, despite the school having been socialized on it in 2021. Several teachers and five heads of vocational programs interviewed revealed that just one educational unit had undergone 5S training, while others were not familiar with its tenets. A coordinated approach to infrastructure maintenance was also lacking among school administration and leadership, which led to disorganized and dilapidated facilities.

Comparative research at other vocational schools, such Cirebon Regency's SMK Nusantara Weru, has shown that 5S-based management may greatly enhance the organization of the school's infrastructure [15]. In a similar vein, Medan's vocational schools have achieved an efficiency rate of 82.4% in their technical workshops by implementing 5S principles [14]. These results imply that efficiency, sustainability, and accountability may be improved by incorporating industrial work culture into school infrastructure management. Regarding the Kaizen 5S model's application to the unique requirements of vocational schools, there is still a study gap. There isn't a defined framework that synchronizes 5S with Indonesia's educational infrastructure management policies, even though some schools have partially adopted these concepts. Research on how to adapt this approach to various school contexts, taking into account elements like financial constraints, stakeholder participation, and regulatory compliance, is also lacking.

The purpose of this study is to create and use a Kaizen 5S-based infrastructure and facility management model for vocational high schools in light of the shortcomings that have been identified. The study's goals are to: (1)

examine the state of infrastructure management in vocational schools today and pinpoint the main obstacles; (2) assess how well the Kaizen 5S model works to improve school facilities and infrastructure management; (3) offer a flexible and organized framework for incorporating 5S principles into infrastructure management in vocational schools; and (4) gauge stakeholder opinions regarding the model's implementation. The importance of this study is in its capacity to close the gap between best practices for industrial management and the administration of educational infrastructure. Through a methodical and collaborative approach, this research aims to improve school facilities' sustainability and efficiency, which would ultimately raise the standard of vocational education in Indonesia.

LITERATURE REVIEW

Management of Infrastructure Facilities in Schools

Achieving institutional goals requires efficient management of the educational infrastructure. Infrastructure and facilities include any material resources that either directly or indirectly aid in the process of teaching and learning. School buildings and other facilities that indirectly support education are referred to as educational infrastructure, whereas teaching aids and lab equipment are examples of resources that are directly used in instruction. Planning, purchasing, using, maintaining, and discarding are all parts of the extensive cycle that goes into managing these components [16]. School buildings and furnishings, instructional resources including textbooks, teaching aids, and lab equipment, and educational media, including audio-visual materials, are the three main types of educational facilities. To guarantee their best use and sustainability, these resources are managed using a systematic process. Policies pertaining to infrastructure management, such as systematic planning based on specified needs and the creation of a master plan that includes buildings and laboratories, are the responsibility of schools. Schools also need to make sure that infrastructure policies are effectively communicated to staff, students, and teachers. Management of the lab and library is essential to improving the educational process. Well-defined policies for book borrowing and resource use are necessary for library operations, and laboratory facilities need to be updated frequently to keep up with scientific and technical developments. Additionally, facilities that facilitate extracurricular activities should be built in compliance with national standards. A well-run infrastructure system makes a big difference in creating a productive and comfortable learning environment [17]. One essential duty in education is to continuously improve the quality of schools. All elements of the school environment must actively participate in this duty; the principal alone cannot fulfill this role as manager. Collaboration between educators, administrators, and stakeholders is essential for the successful implementation of Total Quality Management (TQM) in schools in order to establish a long-lasting system of quality improvement. The principal plays a key role in directing this endeavor, highlighting the critical role that leadership plays in creating an organizational culture that fosters quality enhancement [18], [19].

Industrial Work Culture

A key component of business success is work culture, which is influenced by values that are drawn from traditions, religion, conventions, and organizational rules and develop into ingrained behaviors [20]. The Decree of the Minister of State Apparatus Empowerment and Bureaucratic Reform (2002) states that work culture is a quality-driven daily approach that reflects significant values, increases motivation, and motivates service delivery to continuously improve. In order to improve productivity and meet upcoming problems, industrial work culture seeks to transform attitudes and behaviors. Cooperation, improved communication, improved interpersonal connections, increased openness, improved family spirit, increased reactivity to external changes, and increased productivity are only a few advantages of its adoption. Among the fundamental elements of industrial work culture are:

1. Attitude: An assessment of things, people, or occasions that reflects sentiments or mental models regarding concepts and actions.
2. Subjective Norms: Group-based norms that force employees to follow particular protocols by means of outside pressure.
3. Perception of Control: Control perceptions that impact regulatory compliance and determine employees' confidence in their capacity to carry out or abstain from particular activities.

The Occupational Safety and Health (OSH) System is a structured approach to controlling workplace risks and guaranteeing efficient safety protocols.

1. Work Pressure: Mental and physical health are impacted by psychological stress brought on by a heavy workload, interpersonal contacts, or organizational responsibilities.
2. Intention: The innate motivation behind a person's choice to embrace or reject work culture ideas, which has a direct effect on administrative procedures.
3. Core Task Behavior: Following technical operational guidelines, including safety regulations.

4. Control Behavior: This refers to how employees believe they can adhere to or depart from workplace norms depending on environmental and regulatory considerations.
5. A strong industrial work culture encourages productivity, adaptability, and long-term expansion of a company.

Industrial Work Culture Models

In order to maximize resource and infrastructure management in the manufacturing sector, effective industrial work culture models incorporate techniques like Kaizen, Lean Management, Six Sigma, Total Quality Management (TQM), Just-In-Time (JIT), Theory of Constraints (TOC), Total Productive Maintenance (TPM), Value Stream Mapping (VSM), Kanban, and the SCRUM Framework. Kaizen, which translates to "continuous improvement," stresses small steps toward improvement and is frequently combined with Lean, Six Sigma, and TQM to increase productivity [21]. Six Sigma emphasizes data-driven methods to reduce errors and enhance quality, while Lean Management concentrates on waste reduction and resource efficiency. The JIT approach improves responsiveness to market demands while lowering inventory expenses. To increase total productivity, the Theory of Constraints (TOC) emphasizes the significance of locating and controlling major bottlenecks [22]. While VSM visualizes material and information flow to increase efficiency and sustainability [23], TPM emphasizes preventive maintenance to increase equipment effectiveness (Shannon et al., 2023). Furthermore, SCRUM and Kanban improve teamwork and workflow flexibility in project management. The Kaizen 5S Industrial Culture Model, which incorporates sustainability and cleanliness principles to improve infrastructure management, might be advantageous for vocational schools. Additionally, giving facilities top priority in school-based administration helps lessen teacher stress and burnout brought on by onerous administrative requirements. In educational settings, putting these industrial work culture principles into practice promotes efficiency and sustainability.

Kaizen Culture

"Continuous improvement," or kaizen as it is known in Japanese, is a key concept in industrial management. By determining the best practices that increase productivity while preserving high-quality results, it places an emphasis on simplifying work [24]. Kaizen culture is based on three fundamental ideas: (1) that there is always space for improvement and that no process is flawless; (2) that progress is constant; and (3) that behavior, mentality, workflows, and quality results are all areas of improvement. Employee performance, production procedures, product quality, operational cost reduction, and workplace safety are all continuously improved via kaizen culture. Kaizen, which originated in Japan, has an impact on social, personal, and international developments in addition to economic settings. The phrase, which signifies gradual growth, combines the words "Kai" (change) and "Zen" (good). In corporate contexts, it engages every worker in a methodical procedure meant to maximize efficiency and cultivate a process-oriented attitude.

Taichi Ohno, former President of Toyota Motors Corporation, introduced Kaizen as a managerial strategy that integrates all employees in the pursuit of gradual yet continuous enhancement. Though rooted in Japanese industry, Kaizen is universally applicable, as organizations worldwide seek sustainable improvements. It aligns with methodologies such as Total Quality Management (TQM), Zero Defects (ZD), and Just-In-Time (JIT), all of which prioritize quality control and system refinement. All organizational levels are involved in improving work systems, quality, and productivity to produce a productive and efficient work environment. Kaizen culture is an organized and disciplined approach to continuous improvement.

Characteristics and Dimensions of Kaizen Culture

Kaizen culture in an organization is characterized by natural evolution, ongoing improvement, and active engagement. Kaizen culture is defined by the following three main traits:

1. Continuity: Kaizen is an ongoing journey toward quality enhancement and efficiency. It is based on Japan's long-term cultural perspective and encourages a continuous process where advancements are always conceivable.
2. Natural Progression: Kaizen has no set time limits and proceeds in an organic and progressive manner, in contrast to structural or technological advancements.
3. Cooperation: To ensure collective intelligence and problem-solving, effective Kaizen necessitates active participation at all organizational levels, from top management to staff.

Five essential dimensions characterize the success of kaizen culture in organizational development:

1. Work Discipline: In order to maintain consistency in performance and adhere to set standards, organizations must instill self-discipline in their personnel.
2. Workplace: A positive and encouraging work environment encourages creativity, productivity, and dedication to company objectives.
3. Employment Relations: Positive interactions between managers and staff members foster mutual respect, trust, and teamwork.
4. Leadership: Instilling the values of Kaizen requires strong leadership that inspires, motivates, and guides staff members toward common goals.
5. Employee Training: Ongoing education and career advancement strengthen staff members' abilities, guaranteeing a culture of quality improvement and continuous progress.

Kaizen Culture Indicators

Kaizen cultural indicators are more commonly referred to as 5S culture, which is made up of five key concepts that must be followed for management to be effective and efficient [25]. These are as follows:

1. Seiri (brief): Conciseness refers to the process of separating elements that are essential from those that are not, as well as eliminating extraneous items from the workspace. Freeing up workspace and improving flexibility in space utilization are the goals of this activity.
2. Seiton (Neatness): Nice refers to organizing things according to their intended purpose and putting them in a suitable manner to reduce the amount of time needed to look for and locate them. Each object in this application typically includes a label that is relevant to its volume and function.
3. Seiso (Clean): Clean refers to keeping equipment or products in a state that is appropriate and hygienic for usage. To establish a hygienic and secure work environment, this entails cleaning the flooring, equipment, tools, and other parts of the workspace.
4. Seiketsu (Care): Treating entails extending the idea of cleanliness within the worker's own self and continuously keeping oneself tidy, clean, and concise. The company's annual plan schedule must include the application of this idea, which calls for standards.
5. Shisuke (Diligence): Diligence entails forming a habit of 5S activities and cultivating a self-disciplined mindset. This entails following the guidelines set forth in each task and consistently keeping things tidy, clean, and organized.

METHODS

Research Design

This study employs Plomp's (1997) model approach for research and development (R&D). Five stages of development are included in the Plomp model: (1) preliminary inquiry; (2) design; (3) realization/construction; (4) test, evaluation, and revision; and (5) implementation (Rohmat, 2012).

Data Collection Techniques

In order to assess the efficacy, feasibility, and validity of the Kaizen 5S industrial work culture-based school facilities and infrastructure management model, a research tool was created. The following tools were utilized in this study: 1) a technical sheet for data collection; 2) a validation sheet for the model; 3) a model observation sheet; and 4) a test of learning outcomes

Validation Sheet

All validation sheets in this study were used to measure the validity of the model, the validity of the management device, and the validity of the instruments required in this study. The validation sheets used in this study are: a) model book validation sheets, b) model implementation guidebook validation sheets, and c) module book validation sheets for the implementation of school facilities and infrastructure management models based on the Kaizen 5S industrial work culture.

Observation Sheet

1. Observation Sheet on the Application of the Kaizen 5S Industrial Work Culture-Based School Facilities and Infrastructure Management Model
2. Observation Sheet on the Application of the Kaizen 5S Industrial Work Culture-Based School Facilities and Infrastructure Management Model

3. Using the management tools created, observers observed the implementation of the school facilities and infrastructure management model based on the kaizen 5S industrial work culture using the observation sheet on the implementation of the model.

Four criteria are used to evaluate the implementation of the school facilities and infrastructure management model, which is based on the kaizen 5S industrial work culture: 1) preliminary description; 2) representation and resolution of the proposed problem; 3) management scope and functional management methods; and 4) closing activities. Provided aspects (Internet ↔ Perceived).

This study uses unstructured interviews as its main technique of gathering data. This method enables a thorough investigation of the perceptions, experiences, and insights of participants. As supplemental methods, observation and document analysis are also used to guarantee triangulation and robustness. These extra techniques strengthen the validity of the results by validating and strengthening the information gleaned from interviews.

Participant Selection and Model Testing

In Bireuen Regency, Aceh Province, a number of State Vocational High Schools (SMK) have conducted research on the creation of an industrial work culture-based model for managing school assets and infrastructure. The time frame for this study was January 2024–October 2024. Managing school resources and cultivating the culture of school inhabitants are two aspects of the actions this study examines. At State Vocational High Schools (SMK) in Bireuen Regency, the principal, vice principal, head of department, head of workshop, as well as productive, normative, and adaptive teachers, are the subjects of a study on the creation of a school facilities and infrastructure management model based on the Kaizen 5S industrial work culture.

Table 1. Number of Sample

No.	Location	Number of Samples
1	SMK Negeri 1 Simpang Mamplam	10
2	SMK Negeri 1 Jeunieb	10
3	SMK Negeri I Jeumpa	8
4	SMK Negeri 1 Bireuen	12
5	SMK Negeri 1 Peusangan	13
6	SMK Negeri 2 Peusangan	13
7	SMK PP Negeri Bireuen	13
8	SMK Negeri 1 Gandapura	13

The quantity of samples used in this investigation is indicated in the table above. Purposive sampling, a method for selecting data sources with specific considerations, is the sampling strategy that was employed. Purposive sampling, according to Sugiyono (2016), is a sampling strategy that facilitates the exploration of the object under study and development by choosing individuals or components that are thought to know the most about what the researcher expects.

Data Analysis

In order to determine whether the school facilities and infrastructure management model, which is based on the Kaizen 5S industrial work culture and includes the tools and instruments created, has satisfied the requirements of validity, practicality, and effectiveness, the data gathered from the research activities was analyzed. Based on the strength of the theoretical foundation and internal consistency among the model's components, data collected from experts and practitioners was analyzed to see if the Kaizen 5S industrial work culture-based school facilities and infrastructure management model, as well as the tools and instruments created for it, met the validity criteria. Using the field trial data, the practicality and effectiveness of the produced research devices and instruments, as well as the school facilities and infrastructure management model based on the Kaizen 5S industrial work culture, were assessed.

RESULTS

Research Findings

In this study, a school facilities and infrastructure management model based on the Kaizen 5S industrial work culture in vocational schools will be developed and tested. The model's creation process will be examined, along with its applicability and efficacy. Some significant conclusions that may be drawn from the field trial's results are as follows:

The Development Process of the Kaizen 5S Industrial Work Culture-Based Facilities and Infrastructure Management Model

This study's model creation procedure adheres to the Plomp research phase, which comprises the preliminary stages of investigation, design, and execution. A literature study is conducted to examine pertinent theories during the first phase of investigation, along with an appraisal of the field's needs and issues. Experts and practitioners created and verified the Kaizen 5S industrial work culture-based school facilities and infrastructure management model throughout the design process. Both limited and large field experiments were conducted to test the concept in the setting of vocational schools (SMK) throughout the implementation phase. The Plomp technique offers a precise and guided framework for developing models, resulting in outcomes that are more quantifiable and pertinent to industry demands.

Figure 1. Model Book and Guidance Implementation Book

Figure 2. Module Implementation Book

Practicality of the Kaizen 5S Industrial Work Culture-Based Facilities and Infrastructure Management Model

The field trial's findings demonstrate that the Kaizen 5S industrial work culture-based school facilities and infrastructure management model satisfies the practicality requirements. This model received a high average score (4.60 for experts and 4.03 for observers at the limited trial stage; 4.60 for experts and 4.22 for observers at the broad-field trial stage) based on the evaluation by experts (IP/IO) and observers (IO). This indicates that the model is realistic and workable for use in vocational schools.

Effectiveness of the Kaizen 5S Industrial Work Culture-Based Facilities and Infrastructure Management Model

Three primary indicators—the management process, management ability, and stakeholder response—are used to gauge how well the Kaizen 5S industrial work culture-based school facilities and infrastructure management model is working. The following conclusions about the efficacy of this approach are based on the outcomes of the wide field trial and the confined field trial:

Management Process

According to the results of a small but comprehensive field test, the implementation of the Kaizen 5S industrial work culture-based school facilities and infrastructure management model produced a noteworthy N-Gain score. The N-Gain average in the wide field trial was 62.21%, but it was 61.75% in the confined field experiment. This indicates that the trial participants' level of competence has significantly increased, placing them in the effective category. Statistical tests, such as homogeneity and normality tests, were performed to verify the data's validity. The Kolmogorov-Smirnov test results for the normality test revealed a p-value of 0.200, indicating that the data is normally distributed. This attests to the accuracy of the measurements taken during the field tests. Furthermore, a p-value of 0.413 from the homogeneity test indicated that the data group in both the broad and confined trials was homogeneous. As a result, it is possible to compare the two groups in a meaningful way without the influence of unintended variables.

Manageability

Following the implementation of this strategy, participants' capacity to oversee school infrastructure and amenities has been significantly improved. The limited trial's average manageability score was 4.5, indicating a high degree of model implementation proficiency. The average score rose to 4.22 in the wide field exercise, demonstrating the model's exceptional capacity for facility and infrastructure management.

Stakeholder Response

Results from stakeholder responses to this paradigm are encouraging. The benefits and utility of the school facilities and infrastructure management model, which is based on the Kaizen 5S industrial work culture, were well received by 85.91% of stakeholders in the short field trial. The response rate rose to 86.31% during a large field test, suggesting that the model is well-liked and will likely be applied in the future. This enhances the validity of the study's findings by enabling a genuine comparison between the two groups free from the influence of unintended variables. It also demonstrates that the applicable management model can be successfully implemented in both trial groups without being impacted by important outside variables.

Kaizen 5S Industrial Work Culture-Based Facilities and Infrastructure Management Research Products

Three primary products—the School Facilities and Infrastructure Management Model Based on Kaizen 5S Industrial Work Culture—are the outcome of the research on creating a model for managing school facilities and infrastructure based on the Kaizen 5S industrial work culture. This framework was created to assist in the management of school infrastructure and facilities using the Kaizen 5S (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke) concepts. The purpose of this model is to increase the efficacy and efficiency of facility and infrastructure management in vocational schools through practical application. Guide to Model Implementation.

The purpose of this handbook is to help schools gradually adopt the Kaizen 5S-based facilities and infrastructure management model. The theory, implementation steps, and methods for ongoing assessment and development are all included in this manual. modules for training. The purpose of this module is to teach vocational school teachers and infrastructure managers how to comprehend and implement the Kaizen 5S-based facilities and infrastructure management model. Case studies, training materials, and assessments of model application are all included in this module. The study's outputs, which include training modules, implementation guides, and a Kaizen 5S-based facilities and infrastructure management model, are intended to enhance the management of facilities and

infrastructure in vocational schools, particularly with the goal of developing a more effective, efficient, and sustainable managerial process. These products significantly aid in the accomplishment of instructional objectives and equip vocational schools to handle future facility and infrastructure management difficulties.

DISCUSSION

In the process of creating this model, a school facilities and infrastructure management model based on the Kaizen 5S industrial work culture was discovered and implemented in the Bireuen Regency's State Vocational High Schools (SMK). The study's findings demonstrate that the State Vocational School of Bireuen Regency may successfully and very effectively implement Kaizen 5S in the management of its infrastructure and facilities. These results lend credence to the ideas that, when tailored to local contexts, Kaizen can increase management effectiveness and quality [26], [27]. According to this study, the model's performance is bolstered by adaptations to local requirements and the proactive involvement of stakeholders in facilitating the model's adoption.

The use of Kaizen 5S in the education sector, particularly in the management of infrastructure and facilities in vocational schools, is another innovative contribution made by this research. Despite the fact that Kaizen 5S is typically used in the industrial sector, this study demonstrates that the concepts may be successfully modified and implemented in vocational education. This innovation demonstrates that Kaizen 5S is applicable not just to increasing industry efficiency but also as a management model in the educational setting, particularly in vocational schools that need an efficient and sustainable managerial approach [28], [29].

However, this study also offers a fresh viewpoint, stating that obstacles including teacher resistance, bureaucracy, and a lack of funding could hinder the implementation of Kaizen in the education sector [30]. Even though these difficulties can arise, the study's findings demonstrate that they can be resolved with the right implementation techniques, like creating models based on local needs and enhancing teacher participation through training. The model's adaptation to local requirements is an innovative approach that closes a gap in the literature by highlighting the significance of local adaptation in the application of Kaizen-based management principles [31].

Furthermore, this study emphasizes how critical it is to modify the educational system in response to environmental demands and changes, as mentioned [32]. The Kaizen 5S approach offers adaptable and sustainable management solutions in this situation, which are pertinent to enhancing the effectiveness of the infrastructure and facility management of vocational schools. Thus, even if the education sector still faces difficulties in adopting Kaizen 5S, the study's findings demonstrate that the strategy can be a useful instrument for raising the standard of infrastructure management and facilities with careful planning and modification [33], [34].

The practicality of the Kaizen 5S industrial work culture-based school facilities and infrastructure management model aligns with straightforward and understandable management concepts that meet the demands of the vocational school learning environment. In keeping with the educational management theory proposed by [35], which highlights the value of sustainability and simplicity in managerial models, Kaizen 5S is intended to offer doable and methodical solutions that several stakeholders in vocational schools may readily apply. This model places an emphasis on easy, ongoing improvement measures that may be implemented right away without necessitating significant adjustments to the way schools are run.

This study also supports the conclusions of [36], who highlighted that a management model's capacity to adjust to actual field situations is a critical component of its viability. The observers' IP/IO assessment makes this clear, demonstrating that Kaizen 5S can effectively adjust to operational difficulties in vocational schools, including scarce resources and the requirement for effective facility and infrastructure management.

At the Bireuen Regency State Vocational School, the efficacy of the Kaizen 5S work culture-based school facilities and infrastructure management model was assessed using three primary metrics: stakeholder response, management results, and management ability [37], [38]. The significant improvement in each of the variables assessed indicates that this approach has been successful in enhancing the management of infrastructure and facilities in schools, according to the test results. The N-gain test, the normality test, and the pretest and posttest values were increased in order to gauge the effectiveness of this model management. With an n-gain test score of 62.21%, it fell into the effective category. Significant progress has been made, and these results corroborate those of other research, including the one conducted by Carnerud et al. (2018), which highlighted how the use of Kaizen can enhance managerial performance in general. The more critical findings in the study by [39], which discovered that in certain situations, the implementation of Kaizen took longer to produce substantial effects in more complex organizations [40], are nevertheless contradicted by the n-gain test results, which demonstrated great effectiveness. The context of the application at the Bireuen Regency State Vocational School, which has simpler features than the major enterprises examined by [41], [42], may be the cause of this discrepancy.

While there is a variation in the amount of time required to obtain meaningful results, this variation does not pose a challenge to the study. The findings of this study are actually a promising accomplishment, considering the school's lower size and complexity. Kaizen 5S may be implemented more flexibly at a smaller, more targeted institutional level, as demonstrated by the Bireuen Regency State Vocational Schools' successful speedier adoption of this approach. In fact, this suggests that Kaizen 5S can be a flexible and successful model for larger organizations as well as smaller educational institutions like the State Vocational School of Bireuen Regency. During the field-testing phase, there was a noticeable improvement in the capacity to oversee infrastructure and facilities. Teachers and administrative staff are among the management stakeholders who can effectively use the Kaizen 5S principles, as evidenced by their average management ability score of 4.22, which falls into the high category. These findings support those of Jaca et al. (2018), who found that Kaizen 5S can enhance managerial abilities across a range of industries, including education. However, study by [43] points out that in certain implementations, managerial abilities only increase somewhat in the short term since it takes time for changes in work culture to become internalized. The Kaizen 5S application, however, had a quicker beneficial impact at the Bireuen Regency State Vocational School, according to this study [44]. This could be because the school administration is dedicated to promoting this transformation.

Teachers' and school administration's positive reactions are also crucial markers of this model's effectiveness. In a stakeholder survey, 86.31% of participants expressed satisfaction with the application of the Kaizen 5S-based facilities and infrastructure management plan. Strong support from pertinent parties is indicated by this figure, which bolsters the model's long-term viability. This conclusion is consistent with a study by [45] that highlights the significance of stakeholder support for the success of management methods based on Kaizen. A contrary point of view, however, points out that although stakeholder approval is important, in certain situations, a very good response may conceal the remaining difficulties, such as the discrepancy between expectations and the actual implementation of the model [46], [47]. However, the study's findings demonstrate that the Bireuen Regency State Vocational School stakeholders' favorable reaction is sufficient to demonstrate the model's acceptability and effectiveness.

The Bireuen Regency State Vocational School's Kaizen 5S work culture-based approach to school facilities and infrastructure management has been successful in enhancing school facility and infrastructure management, according to these three metrics. The adoption of this approach can positively influence the creation of a more productive and efficient school environment, as demonstrated by the notable improvements in management outcomes, management capabilities, and favorable responses from stakeholders. Overall, the results of this study provide strong evidence that Kaizen 5S can be applied successfully in Bireuen Regency State Vocational Schools, despite some findings that indicate the application of this model in different contexts may show slower results or certain challenges. These differences in results actually demonstrate the success of adapting this model at a more focused scale and context.

CONCLUSION

The State Vocational Schools in the Bireuen Regency successfully implemented a school facilities and infrastructure management model based on the Kaizen 5S industrial work ethic. In order to improve productivity and efficiency in educational settings, a model that incorporates the principles of Seiri, Seiton, Seiso, Seiketsu, and Shitsuke was developed using the Plomp technique. In order to create a more structured and organized management system, the model was modified to fit the particular requirements and features of vocational schools. Evaluations by experts and practitioners confirmed that the model's high implementation feasibility was demonstrated by practicality testing. With an average of 4.60 for the Practicability Index (IP) and 4.22 for the Observation Index (IO), both of which are categorized as "high," the model is useful and appropriate for vocational schools. Testing for efficacy also showed notable advancements in infrastructure and facility management. The model improved stakeholder participation, maximized resource use, and increased efficiency. Stakeholder comments, management evaluations, and n-gain scores were analyzed. The results showed that 86.31% of improvements fell into the positive category, management competence received a score of 4.22 (high category), and 62.21% of improvements fell into the effective category.

Vocational schools can improve facilities and infrastructure management by following the strategic recommendations of the Kaizen 5S-based approach. Other vocational schools dealing with comparable issues can use this strategy, which encourages effectiveness, resource optimization, and a better learning environment. The approach reduces waste, makes the best use of available resources, and encourages increased staff and student productivity. To ensure that the concepts of industrial work culture are included into school administration, an implementation guide provides schools with step-by-step instructions on how to systematically adopt this model. In addition to providing theoretical concepts, this guide makes practical implementation easier, minimizing the

possibility of misuse and optimizing advantages in various educational contexts. In order to teach educators, employees, and students the value of industrial work culture in facilities and infrastructure management, the guide module is used. It makes the transition easier for schools by enabling internal training and simulation exercises prior to full deployment. The program also encourages self-directed learning and active participation in the upkeep of school resources. The curriculum contributes to the development of a productive and organized workforce ready for industrial occupations by promoting the Kaizen 5S principles. The approach should be tested in several State Vocational Schools throughout Aceh in future studies, taking into account differences in location, student population, and facilities. Its success under various circumstances will be better understood by assessing its efficacy in various scenarios. After then, ongoing assistance should be given in the early phases of implementation to help schools get past any potential roadblocks and guarantee a seamless adoption. The next step is to create a more thorough and organized training program for educators and learners that will make it simpler to understand and apply the Kaizen 5S-based management approach. Better teaching resources will improve students' recall of information and ability to use it practically in vocational school environments.

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