MAGISTER MANAJEMEN-UNISSULA
SAMaJ
SULTAN AGUNG MANAGEMENT JOURNAL

The Role of Capability Building Programs and Continuous Improvement as Moderation to Increase Mining Industry Productivity

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Abstract. *This study aims to analyze the effect of the Capability Building Program on productivity in the mining industry, with Continuous Improvement as a moderating variable. The research is based on PT XYZ need to enhance operational efficiency amid declining coal prices and increasing production targets. The study involved 60 respondents from various divisions. A quantitative approach using Partial Least Square (PLS) analysis was employed. The results indicate that Continuous Improvement has a positive and significant effect on productivity, while the Capability Building Program shows a positive but not significant effect. However, Continuous Improvement significantly strengthens the relationship between the Capability Building Program and productivity. This means that training effectiveness is enhanced when supported by a culture of continuous improvement. The findings emphasize the importance of integrating employee capability development with continuous improvement efforts to increase productivity efficiency in the mining sector.*

Keywords*: Building; Capability; Continuous; Improvement; Program.*

1. Introduction

Industry Mining is a sector that contributes significantly to economic growth in various countries, including Indonesia. According to data released by the Indonesian Ministry of Energy and Mineral Resources (ESDM), the mining sector will contribute approximately 10% to the national Gross Domestic Product (GDP) by 2023.(Ministry of Energy and Mineral Resources of the Republic of Indonesia, 2024)However, the challenge of increasing productivity efficiency remains a pressing issue. In this context, the role of capacity building programs and continuous improvement is a key strategy for companies to increase productivity in the mining industry.

OnIn 2024, coal prices are expected to fall by 28 percent and another 12 percent in 2025. Upside risks to the coal price outlook include higher-than-expected growth in Chinese

consumption and factors that could reduce renewable electricity production, such as low rainfall or light wind conditions.(Paolo Agnolucci & Kaltrina Tema, 2024).

In this context, it's important to understand that efficiency and productivity are not just measurable numbers, but rather the result of a complex system involving various factors, including human resources, technology, and business processes. When we talk about capability building programs, we're referring to developing employee skills and capabilities to adapt to industry changes and demands.

Meanwhile, continuous improvement is an approach focused on the ongoing improvement of processes, products, and services. These two programs should work hand in hand to create an innovative and responsive work environment.

The underlying gap in this phenomenon stems from company policies that mandate efficiency across all business processes to enhance operational competitiveness, lower costs, and reduce production time for greater effectiveness and efficiency. This requires the development of internal employees within the company and its partners through capability-building programs to encourage continuous improvement within existing business processes. The reality on the ground is that many mining companies possess the resources and technology but fail to capitalize on opportunities to enhance their employees' capabilities. This indicates a lack of communication between employees and management regarding the benefits of these programs, as well as a lack of implementation support.

This situation creates a vicious cycle whereby lack of participation in training programs leads to low employee skills and capabilities, which in turn impacts the company's productivity and operational efficiency. In many cases, mining companies tend to neglect human resource development, focusing more on short-term results than long-term investments in employee capability development. This can potentially lead to stagnation in innovation and efficiency improvements, which are crucial for survival in a highly competitive industry.

To address this gap, a more holistic approach is needed in implementing capability-building programs and continuous improvement. One solution is to develop an organizational culture that supports learning and innovation, through employee development, one of which is a capability-building program.

Research from (Appelbaum et al., 2012),Organizational culture change is key to the success of improvement programs. A strong organizational culture can encourage employees to be more open to change, take risks, and actively participate in training programs and improvement initiatives.

Besides Additionally, companies need to implement a reward system that motivates employees to actively participate in training programs and improvement initiatives. For example, companies can provide incentives for employees who successfully implement new

techniques that improve operational efficiency. This could take the form of financial bonuses, public recognition, or the opportunity to take on a larger role in strategic projects. By providing appropriate rewards, companies can encourage employees to be more involved and contribute to improvement efforts.

To face these challenges, the mining industry must adapt by effectively implementing capability-building programs and continuous improvement. By addressing existing research gaps and gaps, companies can improve productivity and operational efficiency. Implementing appropriate solutions, including developing organizational culture and reward systems, will play a critical role in the success of these programs. This research is expected to significantly contribute to the development of productivity improvement strategies in the Indonesian mining industry.

Thus, it can be concluded that although many mining companies have recognized the importance of productivity efficiency, numerous challenges remain to effectively implement capability building and continuous improvement programs. Through a holistic approach, management support, and the development of a supportive organizational culture, companies can address the existing gap and achieve their desired productivity improvement goals. This research is expected to provide useful insights and recommendations for mining companies in their efforts to improve efficiency and productivity in the future.

The level of efficiency of a company is closely related to the productivity generated by the company. According to(Zaqi Al Faritsy, 2015)Productivity is the ratio of results (either goods or services) divided by inputs/resources (such as labor, capital, or management). So, the better we do our work (with fewer resources and waste), the more productive we will be and the more value added to the goods or services provided. research with six sigma methodology and improvement stages with 5S. The results showed that the initial work productivity of the frame series was 1.56 sigma, after improvements it became 1.99 sigma.

Meanwhile, according to(Yunitasari & Nurhayati, 2017)conducted research using the Just in Time (JIT) method which can reduce several wastes such as defective products, raw material inventory, poor (wasted) processes and process time. The Process Cycle Time (PCE) value is 60.56% where this value indicates that the opportunity to increase system efficiency is still very large, so activities that are included in Non Value Added must be reduced. To address these challenges, it is crucial for companies to develop a clear strategy for implementing capability-building programs for employees. One initial step is to conduct training and outreach on the importance of sustainability and how capability-building programs and continuous improvement can contribute to this goal. By increasing awareness and understanding throughout the organization, employees will be more motivated to participate in continuous improvement initiatives. Furthermore, companies can create an environment that supports innovation by providing incentives for employees who propose improvement ideas. This can foster a collaborative and innovative work culture, which in turn supports continuous improvement.

In conclusion, Capability Building Programs and Continuous Improvement are essential steps to support a company's productivity efficiency. While there are challenges in implementing them, with the right strategy, companies can overcome these obstacles and harness the potential of both approaches. By improving operational efficiency and developing employee skills, companies can not only increase their competitiveness in the global market but also contribute to environmental sustainability.

2. Research Methods

This research is explanatory, examining the relationship between independent and dependent variables, and testing the hypotheses proposed in the study. This research aims to explain the hypothesis testing with the aim of confirming or strengthening the hypothesis, which in turn can strengthen the underlying theory. In this case, it examines the moderating influence of capability building programs and continuous improvement on mining industry productivity.

3. Results and Discussion

Productivity is a crucial concept in business and management, describing the ability of a system, process, or organization to produce maximum output using minimal input. In this context, output can be goods or services, while input includes various resources such as labor, capital, and management. In other words, productivity efficiency is about how an entity can maximize its output without wasting existing resources.

It's important to understand that productivity isn't just about producing more with less, but also about creating added value in every process. A company that is efficient in productivity will not only save costs but also improve the quality of the products and services it offers. Therefore, the better a company is at performing its tasks while minimizing resources and waste, the more productive it will be.

However, to achieve high productivity, companies need to conduct in-depth analysis of various aspects of their operations.One approach is to implement an effective management accounting system. This system can help companies identify areas that require improvement and cost reduction. For example, if a company experiences rising production costs, management accounting analysis can help identify the causes, whether it's raw material waste, inefficient labor hours, or other issues. With this information, companies can take steps to improve processes and increase efficiency.

The importance of cost control as a method for achieving cost efficiency. They explained that effective cost control requires collaboration between departments and the use of information technology that supports management accounting. For example, by utilizing project management software, companies can monitor work progress in real time, identify bottlenecks, and take corrective action before problems escalate. With this approach, companies can not only reduce costs but also increase overall productivity.

Quoted from(Kustini, 2020))demonstrates that work productivity is the ability to produce goods or services by optimally utilizing existing resources. They also emphasize the importance of training and work discipline in increasing employee productivity. For example, companies that regularly provide their employees with training on efficient work techniques will see long-term productivity increases. Strong work discipline also contributes to efficiency, as disciplined employees tend to be more focused and productive in completing tasks.

Continuous Improvement Continuous Improvement is a systematic approach aimed at continuously improving operational performance. Focusing on improving processes, products, and services, Continuous Improvement involves all elements of the organization, from top management to frontline employees. This approach focuses not only on the end result but also on the processes that lead to that result. This concept, which has been adopted by many organizations worldwide, aims to create a culture of continuous improvement.

According to(Bessant & Francis, 1999)Continuous improvement can be defined as a continuous effort to increase operational efficiency and effectiveness by reducing waste and increasing customer value. In this context, it's important to understand the various methodologies used in continuous improvement, such as Lean, Six Sigma, and Kaizen, each of which has distinct characteristics and applications.

Lean methodology, for example, focuses on reducing waste in every aspect of business processes. Indicators include time, resources, and even ineffective labor, among others.

The study involved 60 respondents, all Capability Building Program training participants from various divisions within a mining company, from superintendent level and above. Data shows that the CSR division dominated the number of participants with 12, followed by Operations, GA & Security, and Finance & Accounting.

The even distribution of respondents from various divisions, such as Human Capital, PMO, Procurement, and Training, reflects that this capability development program spans multiple organizational functions, both operational and strategic. This supports the relevance of this research, which aims to analyze the role of capability building programs in increasing productivity and how continuous improvement can strengthen this influence.

Inferential testing is a statistical technique used to draw conclusions or make predictions about a population based on data collected from a research sample. The goal is to determine whether the results obtained from the sample can be generalized to the entire population or larger group. The analysis was conducted using SmartPLS software version 4.0.

Discriminant validity Used to ensure that constructs or variables in a measurement model truly measure different things or do not overlap with each other. In other words, discriminant validity measures the extent to which constructs or variables in a measurement model can be distinguished from each other. Discriminant validity, namely cross loading, Fornell-Larcker and latent variable correlation.

An indicator/statement is declared valid if the relationship between the indicator/statement and its construct/variable (cross loading value) is higher than its relationship with other constructs. The following are the results of data processing using SmartPLS version 4 with cross loading results as in the table below.

that this model can be used to analyze the relationship between latent variables and the confidence that the model accurately reflects the data and has relevant predictive ability:

1) SRMR (Standardized Root Mean Square Residual): The SRMR value is 0.079, which is smaller than the maximum limit of 0.10. This indicates that the model has a good fit between the observed data and the hypothesized model. This means that the difference between the observed covariance matrix and the model covariance matrix is small, so the model is considered fit.

2) d-ULS (Unweighted Least Square Discrepancy): The d-ULS value of 0.567, which is greater than 0.05, indicates that the model structure has no significant deviations and is acceptable. This indicates that the model approaches the ideal relationship expected from the data.

3) dG (Geodesic Discrepancy): The dG value of 1.921 is also greater than the limit of 0.05, indicating that the model has good global fit, and the relationships in the model do not show significant differences compared to the actual data.

4) Chi-Square: The Chi-Square statistical value of 536.331 is greater than the Chi-Square table value (21.026), which means the model is declared fit. This indicates that the model significantly fits the sample data, and the model structure can explain the relationship between variables. well.

5) NFI (Normed Fit Index): An NFI value of 0.644, which is close to the ideal value of 1, indicates that the model has a fairly good level of fit, although not optimal. This indicates that the model is still acceptable for describing the data.

6) GoF (Goodness of Fit): A GoF value of 0.799, which is above the 0.36 threshold, indicates that the model has a very good level of global fit. This value places the model in the strong goodness of fit category, meaning the model is very suitable for explaining the relationships between latent variables in the study.

7) 7) Q^2 Predictive Relevance: The Q^2 value of 0.758 for the productivity variable, shows a very strong predictive ability, this indicates that the model can relevantly predict latent variables based on their structural relationships. Furthermore, the interaction between Continuous Improvement and the Capability Building Program on Productivity (as a moderating effect) was also proven significant. The interaction path coefficient was recorded at 0.153, with a t-statistic of 3.064 and a p-value of 0.001. This indicates that Continuous Improvement strengthens the influence of the Capability Building Program on productivity, although the Capability Building Program is not directly significant. This means that training

programs and the development of new capabilities provide an optimal impact on productivity when integrated with consistent continuous improvement practices in the work environment.

By identifying and eliminating waste, organizations can create more efficient processes that are more responsive to customer needs. Six Sigma, on the other hand, emphasizes reducing variability in processes to improve product and service quality. This method uses statistical tools to analyze data and identify the root causes of problems. Meanwhile, Kaizen, originating in Japan, emphasizes small, continuous improvements. This approach encourages all members of the organization to contribute to improvements, creating a sense of ownership and collective responsibility for the company's performance.

These improvements are not only visible in numbers, but also in product quality and customer satisfaction. For example, a case study showed that the implementation of Lean methodology in the production process successfully reduced production cycle time by 40% and customer satisfaction by 25%. This success demonstrates that continuous improvement is not just theory, but can be applied in practice to improve operational performance.

However, implementing continuous improvement doesn't always go smoothly. Challenges such as resistance to change, lack of employee training, and lack of management support can hinder the improvement process. Therefore, it's crucial for organizations to build a culture and develop employee capabilities through programs designed to support continuous improvement. This culture encompasses a commitment from all levels of the organization to participate in the improvement process. In this regard, employee training and development are crucial. Employees equipped with the right knowledge and skills are better able to contribute to the implementation of continuous improvement.

This evaluation includes performance measurement, data analysis, and feedback from employees and the company. By conducting regular evaluations, organizations can identify areas for improvement and adapt their continuous improvement strategies to meet changing needs.

A thorough analysis of the implementation of continuous improvement shows that the success of this strategy depends heavily on the involvement of all elements of the organization. Employees who understand the importance of continuous improvement through the development of individual capabilities implemented by the company and have the opportunity to contribute to the improvement process are more motivated to perform well. Furthermore, support from top management is crucial. Management that demonstrates a commitment to continuous improvement creates a positive environment and encourages employee innovation.

In practice, continuous improvement can be applied in various industrial sectors, particularly the mining industry. In the mining sector, for example, continuous improvement measures include EWH (effective work hours), hauler payload, digger productivity, and hauler speed. It's important to remember that continuous improvement is not a final destination, but rather

a continuous journey. Organizations must continuously adapt and innovate to remain relevant in a competitive market. In this context, continuous improvement becomes an invaluable tool for achieving competitive advantage. Through a systematic and structured approach, organizations can identify improvement opportunities and implement them effectively.

In conclusion, Continuous Improvement is a crucial approach for organizations seeking to enhance their operational performance. By involving all elements within the organization and implementing the right methodology, companies can achieve greater efficiency and increase customer value. Regular evaluation and a supportive culture are also key factors in ensuring successful implementation. Therefore, continuous improvement is not just a strategy, but a philosophy that every organization must adopt to survive and compete in the global marketplace.

The discussion that will be carried out is as follows:

1) The Effect of the Capability Building Program on Productivity

The analysis results show that the Capability Building Program's direct effect on productivity is insignificant (p-value = 0.053). The path coefficient value of 0.258 and t-statistic = 1.616 indicate that although the direction of the relationship is positive, the effect is not statistically strong enough. This indicates that training or capability development programs have not had a significant impact on increasing productivity if they are not followed up with consistent implementation in the work environment. This finding is in line with the view that training must be integrated with a supportive work system, so that the results can be implemented optimally.

This insignificance can also be understood by examining the indicators that make up the Capability Building Program variable. Indicators such as skill enhancement, mindset shaping, and behavioral change have significant potential for developing human resources. However, if training outcomes are not immediately implemented or supported by a concrete work structure, their impact on productivity will be insignificant. Similarly, leadership development and organizational alignment only have a tangible impact if leaders have the authority and work systems allow for change. Indicators such as measurement and impact tracking, continuous learning culture, and personalized learning paths require continuity in implementation so that training becomes more than a formality but a learning process embedded in daily work activities. Therefore, while these variables have significant potential, their impact will not be optimal without the support of a system that enables real implementation.

2) The Impact of Continuous Improvement on Productivity

In contrast to the Capability Building Program, the Continuous Improvement variable was shown to significantly influence productivity. The path coefficient value of 0.735, t-statistic = 5.201, and p-value = 0.000 indicate that a culture of continuous improvement directly

contributes significantly to increased productivity. This indicates that practices such as process efficiency, quality improvement, and waste reduction play a dominant role in increasing work output. This finding supports lean management and Kaizen theories, which emphasize the importance of continuous improvement in enhancing organizational performance.

The indicators that make up Continuous Improvement contribute significantly to achieving these results. Process efficiency indicators encourage optimal use of time and resources, while process quality ensures that each task produces error-free output. Process productivity increases because work processes run more smoothly and measurably. Furthermore, process cost and process safety indicators have a dual impact: reducing expenses and creating a safe work environment, ultimately strengthening employee morale and performance. This combination of indicators demonstrates that continuous improvement not only increases efficiency but also fosters a proactive and resilient work culture.

3) The Moderating Role of Continuous Improvement in the Relationship between Capability Building Program and Productivity

Interestingly, although the Capability Building Program did not have a significant direct effect, when interacting with Continuous Improvement, its effect on productivity became significant (p-value = 0.001; t-statistic = 3.064). The interaction coefficient of 0.153 indicates that Continuous Improvement strengthens the Capability Building Program's influence on productivity. In other words, training will be more impactful if supported by a work culture that encourages continuous improvement. This suggests that the synergy between training and adaptive work systems is a crucial combination in driving organizational performance.

This relationship can also be traced through indicators. When the skill enhancement and mindset shaping of the Capability Building program are combined with the process efficiency and quality of Continuous Improvement, the training results are more easily applied in real-world work. Behavioral change will be more stable if driven by continuously refined work processes, and leadership development will be optimal if leaders are accustomed to driving improvements in the field. In other words, each indicator in the Capability Building program will have greater "driving power" when supported by a Continuous Improvement work structure. This synergy explains why the moderating effect is significant, even though the direct effect of the Capability Building program is not.

4. Conclusion

This study aims to analyze the influence of the Capability Building Program and Continuous Improvement on productivity in the mining industry context, and to examine the role of Continuous Improvement as a moderating variable. Based on the results of data analysis using the SEM-PLS approach, several conclusions were obtained as follows: The Capability Building Program does not have a significant effect on productivity. Although it has a positive direction of influence, the test results show that the effect is not statistically strong enough. This

indicates that training and capability development have not been able to directly increase productivity if not accompanied by systematic implementation in the work environment. Continuous Improvement has a significant effect on productivity. This finding confirms that a work culture oriented towards continuous process improvement can significantly increase efficiency, quality, and performance output. Continuous Improvement moderates the relationship between the Capability Building Program and productivity. These results indicate that training effectiveness will increase significantly if supported by a work culture that allows for the implementation of training results in a sustainable and structured manner.

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