Human Resource Competence, Spare Part Procurement Lead Time, and Operational Smoothness at PT Wahana Bara Sentosa

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Abstract.

Background The availability of spare parts is a critical factor in maintaining the operational reliability of heavy equipment in mining companies. Delays in spare part procurement may extend lead time, increase downtime, reduce mechanical availability, and disrupt production targets. In this context, human resource competence plays an important role in ensuring that procurement activities are carried out accurately, quickly, and effectively.

Objectives This study aimed to analyze the role of human resource competence in influencing spare part procurement lead time and its impact on operational smoothness at PT Wahana Bara Sentosa.

Methods This study used a descriptive qualitative approach. Data were collected through observation, semi-structured interviews, and documentation. The informants consisted of personnel directly involved in spare part procurement and operational activities, including procurement supervisors, maintenance planners, mechanics, warehouse controllers, operational supervisors, and production superintendents. Data were analyzed through data reduction, data display, and conclusion drawing.

Results The findings showed that human resource competence affected the effectiveness of spare part procurement. Technical competence helped reduce errors in spare part identification, digital competence supported the use of ERP and e-procurement systems, analytical competence improved demand planning, negotiation competence influenced vendor response time, and managerial competence strengthened coordination across departments. The main factors causing long procurement lead time included layered PR–PO administration, slow vendor response, long-distance delivery, and weak planning of critical spare parts. Long lead time contributed to increased equipment downtime, reduced mechanical availability and physical availability, delayed hauling activities, and higher operational costs.

Conclusion Human resource competence has an important role in reducing spare part procurement lead time and improving operational smoothness at PT Wahana Bara Sentosa. Strengthening technical, digital, analytical, negotiation, and managerial competencies is necessary to improve procurement responsiveness, reduce downtime, and support more efficient mining operations.

Keywords: Human Resource Competence; Procurement Lead Time; Spare Parts; Downtime; Operational Efficiency.

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INTRODUCTION

Modern industrial development requires companies to continuously improve operational effectiveness and efficiency in order to remain competitive in an increasingly complex business environment. In the mining industry, operational performance is highly dependent on the reliability of heavy equipment, such as excavators, dump trucks, bulldozers, loaders, and other production-supporting units. When heavy equipment experiences damage and the required spare parts are not available on time, operational activities may be delayed and production targets may not be achieved. Downtime is a critical operational issue because it refers to the period when equipment cannot be used, thereby reducing productivity and increasing operational costs (Stevenson, 2022).

Spare part availability is an essential component in maintaining equipment reliability. In mining operations, spare parts are not only used to replace damaged components but also support preventive and

corrective maintenance activities. Delays in spare part procurement may increase equipment downtime, disrupt hauling and loading processes, and create additional operational costs. Heizer and Render (2020) emphasized that procurement lead time is an important indicator of operational effectiveness because it determines how quickly operational needs can be fulfilled. Similarly, Chopra and Meindl (2021) stated that delayed spare part procurement can disrupt maintenance activities and reduce supply chain responsiveness.

Lead time in spare part procurement refers to the time required from the submission of a material request or purchase request until the spare part is received by the user or warehouse. In practice, procurement lead time is influenced by both internal and external factors. Internal factors include human resource competence, administrative procedures, coordination between maintenance, warehouse, and procurement departments, and the use of digital procurement systems. External factors include vendor responsiveness, spare part availability, transportation distance, and logistics constraints (Kimwaki, 2024; Wijaya et al., 2022).

At PT Wahana Bara Sentosa, spare part procurement is closely related to the smooth operation of heavy equipment. The company depends on the readiness of equipment to support coal handling, hauling, and port-related operational activities. However, delays in spare part procurement remain a major challenge. Several causes include layered purchase request and purchase order procedures, slow vendor response, limited alternative suppliers, long delivery times, and suboptimal planning of critical spare parts. These conditions may extend lead time and increase equipment downtime, which can reduce mechanical availability, physical availability, and production achievement.

Human resource competence is therefore an important factor in improving procurement effectiveness. Employees involved in procurement must have technical knowledge of spare parts, digital skills in using ERP or e-procurement systems, analytical ability to forecast material needs, negotiation skills to communicate with vendors, and managerial competence to coordinate across departments. Purba et al. (2024) explained that human resource competence in supply chain management includes technical, digital, analytical, negotiation, and managerial competencies. These competencies are required to reduce administrative errors, improve decision-making, and accelerate procurement processes.

In the era of digital procurement and Supply Chain 4.0, technology can support faster and more transparent procurement processes. However, digital systems will not operate effectively without competent human resources. Noviyanti et al. (2022) noted that digital procurement can reduce administrative delays, but its success depends on employees' ability to use digital systems properly. Therefore, digital competence becomes a key requirement in accelerating procurement lead time and supporting operational continuity.

Based on these issues, this study analyzes the role of human resource competence in influencing spare part procurement lead time and its impact on operational smoothness at PT Wahana Bara Sentosa. This study is expected to provide practical recommendations for improving human resource competence, reducing procurement delays, minimizing downtime, and supporting more efficient mining operations. The content of this article was developed based on the independent project report conducted at PT Wahana Bara Sentosa.

METHOD

Research Design

This study used a descriptive qualitative approach. This approach was selected because the study aimed to describe and analyze the role of human resource competence in spare part procurement lead time and its impact on operational smoothness. The research focused on actual conditions in the company, especially the interaction between procurement, maintenance, warehouse, vendors, and operational units.

Research Site

The research was conducted at PT Wahana Bara Sentosa, a company operating in the coal mining and coal port sector. The company is located in Palembang, South Sumatra. The research focused on the procurement and operational processes related to heavy equipment spare parts.

Informants

The informants were selected using purposive sampling because they were directly involved in the procurement, maintenance, inventory, and operational processes. The informants included a procurement or purchasing supervisor, maintenance planner, heavy equipment mechanic, warehouse or inventory controller, maintenance or operational supervisor, and production superintendent.

Data Collection

Data were collected through observation, interviews, and documentation. Observation was conducted to examine the actual workflow of spare part procurement, maintenance planning, warehouse activities, and operational constraints. Semi-structured interviews were conducted with informants to obtain detailed information about human resource competence, procurement lead time, vendor responsiveness, and downtime. Documentation was used to support the findings through procurement records, maintenance reports, downtime data, warehouse records, and operational performance reports.

Data Analysis

The data were analyzed using qualitative descriptive analysis. The analysis process consisted of data reduction, data display, and conclusion drawing. Data reduction was conducted by selecting relevant information from interviews, observation notes, and documents. Data display was carried out by organizing the findings into themes based on the research variables. Conclusion drawing was conducted by interpreting the relationship between human resource competence, procurement lead time, and operational smoothness.

RESULTS AND DISCUSSION

Results

The results are presented based on three main themes: human resource competence, spare part procurement lead time, and operational smoothness.

Human Resource Competence in Spare Part Procurement

The findings showed that human resource competence played an important role in determining the effectiveness of spare part procurement. Competence was reflected in technical ability, analytical ability, communication and coordination, ERP mastery, negotiation skills, and managerial ability.

Table 1. Findings on human resource competence

Indicator	Main Finding	Operational Meaning
Technical competence	Employees' ability to understand spare part specifications affected the accuracy of procurement requests.	Better technical competence reduced errors in spare part identification.
Analytical competence	Maintenance planners were able to analyze spare part needs, but historical damage data were not always used optimally.	Weak analysis may result in inaccurate planning and longer lead time.
Communication and coordination	Miscommunication between maintenance, warehouse, and procurement sometimes delayed spare part requests.	Stronger coordination is needed to accelerate PR–PO processing.
Digital competence	Some employees had not fully optimized ERP and e-procurement features.	Limited digital competence slowed administrative processing.
Negotiation competence	Procurement staff focused more on price negotiation than delivery time negotiation.	Lead time negotiation with vendors needs improvement.
Managerial competence	Multi-level approval and unclear escalation procedures caused delays.	Better managerial coordination can reduce internal bottlenecks.

The results indicate that technical competence is essential in preventing incorrect spare part requests. Employees who understand the difference between genuine, OEM, and replacement parts are more likely to submit accurate requests. Digital competence is also important because ERP and e-procurement systems can accelerate document processing when used properly**.**

Factors Causing Long Spare Part Procurement Lead Time

The study identified several factors that caused long procurement lead time. These factors came from internal administrative processes, vendor response, logistics, and spare part planni**ng.**

Table 2. Factors causing long procurement lead time

Factor	Finding	Impact
Internal administration	PR–PO processing required multi-level approval.	Approval delays extended internal lead time.
Vendor responsiveness	Some vendors took 1–3 days or more to respond to quotation requests.	Slow quotation response increased total procurement duration.
Spare part availability	Critical spare parts were not always available in stock.	Stock shortages increased dependence on external suppliers.
Delivery and logistics	Spare parts from outside the region required long delivery time.	Delivery delays increased total lead time.
Planning of critical spare parts	Safety stock and critical spare part planning were not fully optimized.	Poor planning increased the risk of equipment downtime.

The findings showed that the average lead time could exceed the company's ideal target, especially for critical spare parts. Spare parts from outside the region or imported OEM components required longer delivery times. Vendor response was also found to be one of the most influential factors in procurement delay.

Impact of Lead Time on Operational Smoothness

Long lead time affected equipment downtime and operational effectiveness. When spare parts were not available, damaged heavy equipment could not be repaired immediately, causing delays in operational activities.

Table 3. Impact of procurement lead time on operational smoothness

Indicator	Finding	Operational Impact
Equipment downtime	Downtime increased when spare parts were unavailable.	Heavy equipment could not operate according to schedule.
Mechanical availability	Delayed spare parts reduced mechanical availability.	Equipment readiness decreased.
Physical availability	Units were physically available but could not be used due to waiting for spare parts.	Operational capacity declined.
Production achievement	Hauling and loading activities were disrupted.	Daily production targets were difficult to achieve.
Operational cost	Downtime caused overtime, idle fuel consumption, and additional maintenance costs.	Operational efficiency decreased.

The results showed that long spare part procurement lead time had a direct effect on equipment downtime. This condition disrupted hauling cycles, reduced production achievement, and increased operational costs.

Summary of Research Findings

Table 4. Summary of the relationship among variables

Variable	Main Finding	Relationship
Human resource competence	Technical, digital, analytical, negotiation, and managerial competencies influenced procurement effectiveness.	Higher competence supported faster and more accurate procurement.
Procurement lead time	Long lead time was caused by administration, vendor response, logistics, and weak critical spare part planning.	Longer lead time increased downtime.
Operational smoothness	Downtime affected mechanical availability, physical availability, production achievement, and operational cost.	Operational smoothness improved when lead time was controlled.

Discussion

The findings of this study indicate that human resource competence is a key factor in improving the effectiveness of spare part procurement at PT Wahana Bara Sentosa. Technical competence is particularly important because procurement staff must understand spare part specifications, equipment types, part categories, and operational urgency. When employees do not fully understand spare part specifications, errors in material requests or purchase orders may occur, resulting in document revisions and delays in the procurement cycle. This finding is consistent with Purba et al. (2024), who emphasized that technical competence is a fundamental element in supply chain effectiveness because it reduces administrative errors and accelerates decision-making. The field findings also show that technical understanding of spare part types and procurement procedures determines ordering accuracy and reduces the risk of incorrect spare part identification.

Digital competence also plays an important role in procurement efficiency. Although PT Wahana Bara Sentosa has implemented ERP and e-procurement systems, the findings show that several system features have not been fully utilized. Employees tended to use basic functions such as inputting purchase requests and checking stock, while more advanced features such as real-time tracking, vendor performance dashboards, and automated approval monitoring were not optimally applied. This supports Ariyanto and Setiana (2023) and Noviyanti et al. (2022), who stated that digital procurement can improve efficiency only when employees have adequate digital competence. In other words, technology alone does not guarantee faster procurement if human resources are not able to operate and optimize the system effectively.

Analytical competence is another important factor influencing procurement lead time. The results show that maintenance planners were able to analyze spare part needs, but historical damage data were not always used optimally by warehouse and procurement teams. This condition may cause critical spare parts to be processed through standard procedures, although they should receive urgent handling. This finding is in line with Tsani and Yanti (2022), who explained that analytical competence supports accurate demand

forecasting, faster decision-making, and better procurement prioritization. Therefore, the use of historical failure data and spare part consumption patterns is essential to prevent stock-outs and reduce procurement delays.

Negotiation competence also affects the speed of procurement. The findings indicate that procurement negotiation still focused more on price than delivery time, vendor response time, and service reliability. In mining operations, time is a critical factor because delayed spare parts can stop equipment operation and reduce production achievement. This finding supports Sari and Hutagaol (2023), who argued that negotiation competence should include non-financial aspects such as delivery schedules, warranty, vendor commitment, and response speed. Therefore, procurement staff need to strengthen lead time negotiation to ensure that vendors respond faster and deliver spare parts according to operational urgency.

Managerial competence is required to strengthen coordination across departments. Spare part procurement involves several units, including maintenance, warehouse, procurement, finance, and vendors. The results show that multi-level approval, unclear escalation procedures, and communication gaps between departments may increase administrative delay. This condition is consistent with Durek and Harisson's (2020) modern competency theory, which emphasizes that managerial competence in the Industry 4.0 and 5.0 era must include collaboration skills, adaptive capability, and decision-making ability. Stronger managerial coordination can reduce internal bottlenecks and improve procurement responsiveness.

The study also confirms that procurement lead time directly affects operational smoothness. Long lead time increases equipment downtime because damaged units cannot be repaired until the required spare parts are available. This condition reduces mechanical availability and physical availability, disrupts hauling and production activities, and increases operational costs. These findings are consistent with the Operational Reliability Framework proposed by Chowdhury and Paul (2022), which states that operational reliability depends on spare part availability, fulfillment speed, and material control accuracy. The report also shows that long lead time has a real impact on downtime, production disruption, and additional operational costs at PT Wahana Bara Sentosa.

Overall, the findings suggest that human resource competence has both direct and indirect effects on operational smoothness. Competent employees can accelerate procurement, reduce administrative errors, improve vendor communication, optimize digital systems, and ensure that spare parts are available when needed. Conversely, low competence may extend lead time and increase the risk of downtime. This is consistent with Supply Chain Responsiveness Theory, which explains that procurement responsiveness reflects an organization's ability to meet operational needs quickly and accurately (Gunasekaran et al., 2021). Therefore, improving human resource competence is a strategic requirement for reducing procurement lead time and supporting operational continuity at PT Wahana Bara Sentosa.

CONCLUSION

This study concludes that human resource competence plays an important role in reducing spare part procurement lead time and improving operational smoothness at PT Wahana Bara Sentosa. Technical competence supports the accuracy of spare part identification and reduces errors in procurement documents. Digital competence enables employees to use ERP and e-procurement systems more effectively, while analytical competence helps improve spare part planning based on historical damage data and operational needs. In addition, negotiation competence supports faster vendor response, and managerial competence strengthens coordination among procurement, warehouse, maintenance, and operational departments.

The findings also show that long procurement lead time is mainly caused by layered internal administration, slow vendor response, long delivery duration, weak critical spare part planning, and limited optimization of digital procurement systems. These conditions increase equipment downtime, reduce mechanical and physical availability, disrupt hauling and production activities, and raise operational costs. Therefore, improving human resource competence is a strategic priority for accelerating procurement processes, minimizing downtime, and supporting more efficient and reliable mining operations. PT Wahana Bara Sentosa is advised to strengthen technical and digital training, improve vendor management, implement service level agreements, establish fast-track procurement for critical spare parts, and maintain safety stock for components with high failure rates.

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AUTHOR CONTRIBUTION STATEMENT

Arda Prameswari contributed to the conceptualization of the study, data collection, field observation, data analysis, and preparation of the initial manuscript draft. Trisninawati provided supervision, methodological guidance, academic validation, and manuscript review. I Bagus Endrawan contributed to manuscript review, critical revision, and final approval of the article. All authors have read and approved the final version of the manuscript.

CONFLICT OF INTEREST AND FUNDING

The authors declare that there is no conflict of interest regarding the publication of this article.

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