



# OPTIMIZATION MODEL DESIGN OF SCRAPPING COST FOR ASSET MANAGEMENT BASED ON COST AVOIDANCE AT PT. XYZ WAREHOUSE

Ari Ilya Sariu<sup>1</sup>, Purnawan<sup>2</sup>, Saskia Kanisaa Puspanikan<sup>3</sup>

<sup>1,3</sup>Teknik Logistik, Universitas Pendidikan Indonesia

<sup>2</sup>Pendidikan Teknik Mesin, Universitas Pendidikan Indonesia

Correspondence Email: [ariilyasz@upi.edu](mailto:ariilyasz@upi.edu)

## ABSTRACT

This research aims to design a cost optimization model for asset scrapping by incorporating scrapping cost and using a cost avoidance approach to improve financial efficiency and sustainability in asset management at PT. XYZ Warehouse. The study was motivated by significant discrepancies found between the Net Book Value (NBV), scrapping cost, and acquisition cost of scrapped assets, particularly antennas, which contributed to substantial financial losses. A quantitative method was employed, focusing on a purposive sample of 10,753 antenna assets. Secondary data were drawn from SAP reports, depreciation logs, internal asset records, and detailed scrapping cost data. The model was developed using Life Cycle Costing (LCC) and regression analysis with SPSS to identify cost drivers, including scrapping cost, and simulate optimization scenarios. Validation by expert practitioners in logistics ensured relevance and applicability. The model recommended scrapping decisions based on NBV thresholds, accumulated depreciation, scrapping cost, and asset lifespan. Simulation results indicated that cost savings of up to IDR 36 million per batch could be achieved, demonstrating the potential of cost avoidance strategies, including careful management of scrapping cost, to optimize warehouse operations, reduce financial waste, and support more sustainable asset disposal practices. The impact of this research is to provide companies with an evidence-based framework that can be adapted across sectors to strengthen cost control, support better budgeting practices, and promote more sustainable asset management policies.

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## 1. INTRODUCTION

In the increasingly competitive telecommunication industry, asset management plays a vital role in ensuring operational sustainability and financial efficiency (Too & Weaver, 2014). One of the leading telecommunication providers in Indonesia, PT. XYZ, holds a significant responsibility to manage its physical infrastructure including antennas, radios, converters, and modules efficiently to maintain high service quality. Rapid technological advancement and dynamic market demands require the company to continuously optimize its asset management processes, particularly in handling asset disposal, or scrapping, which often incurs high operational costs (Jones & Brown, 2018). PT. XYZ manages over 100,000 physical assets stored in various warehouses, including a large number of antennas with diverse Net Book Value (NBV) levels. Based on the company's internal data, these antennas represent one of the highest average NBV among all asset categories. However, in practice, PT. XYZ has experienced significant overcost due to discrepancies between the assets' book value and their acquisition cost when scrapped. These discrepancies often result in negative financial impacts, especially when traditional cost reduction approaches are applied without a strategic framework. This situation indicates inefficiencies in the scrapping process and highlights the limitations of reactive strategies, such as simple cost-cutting, in managing high-value physical assets (KPMG UK, 2024).

The core issue lies in the absence of an integrated and forward-looking cost management strategy specifically designed to handle high-value assets during their end-of-life phase. While operational teams have attempted various cost-cutting measures, these actions often only address symptoms rather than the root cause. The mismatch between book value and actual realizable value at the point of disposal indicates a gap in forecasting, monitoring, and decision-making processes related to asset scrapping. Without a clear model that can predict and control scrapping costs, the company remains exposed to recurrent financial inefficiencies, which in the long term may affect its competitiveness and sustainability. This gap underscores the urgent need for a comprehensive solution that targets the root cause of scrapping cost overruns rather than relying solely on ad hoc budget cuts.

To address these issues, this research proposes a proactive approach using the cost avoidance strategy, focusing on preventing unnecessary expenditures rather than merely reducing existing ones (Porter, 1985). By applying this strategy to the scrapping process, the research aims to design an optimization model that minimizes scrapping costs while maintaining operational effectiveness. Specifically, the study formulates the following research question: "How can an optimized scrapping cost model based on cost avoidance be effectively and sustainably designed to support asset management in the PT. XYZ warehouse?"

To answer this question, a quantitative approach is employed, using Life Cycle Costing (LCC) and regression analysis to model the relationships between scrapping costs and key asset variables. The primary goal of this study is to develop a cost optimization model that can prevent future financial losses, improve asset lifecycle decisions, and enhance long-term operational efficiency. This research is expected to provide a practical framework for asset

management that goes beyond short-term cost savings, offering sustainable strategies aligned with cost avoidance principles in the telecommunication sector.

## 2. RESEARCH METHODS

This research uses a quantitative method that aims to measure and analyze the relationship between expenditure optimization design for cost avoidance-based asset management at XYZ Company. The quantitative method was chosen because it allows the collection of numerical data that can be analyzed statistically to test hypotheses and identify significant patterns or relationships. Research design in quantitative methods is a systematic framework or plan used to direct the implementation of research with the aim of obtaining measurable and objective data. Quantitative research typically uses a deductive approach, where the researcher starts with a theory or hypothesis that is then tested through the collection of numerical data (Creswell, 2014). Quantitative research instruments can be questionnaires or other measurement tools that have been tested for validity and reliability. The collected data are analyzed using statistical techniques to answer research questions or test hypotheses (Sekaran & Bougie, 2016). Quantitative research design also emphasizes the importance of random sampling to ensure research results can be generalized to a wider population (Sugiyono, 2019). Therefore, this research design provides a strong basis for producing objective and repeatable findings.

In this study, expert testing was conducted to ensure the validity of the optimization model design made and the relevance of the research results to the practice of cost avoidance-based asset management in the PT XYZ warehouse. The validator or expert involved is an individual who has expertise in logistics management, cost optimization, and corporate asset management, namely Yunian Budhiasto, S.T. The selected expert has 12 years of work experience and a relevant educational background, such as industrial engineering, logistics management, or other related fields. In this study, sampling was carried out using the purposive sampling method. Purposive sampling is a method used to select samples based on certain considerations so that the information obtained is more relevant and representative (Sugiyono, 2021). This method is effective when researchers have a good understanding of the target population and want to select individuals with specific characteristics that match the research objectives (Firmansyah et al., 2022).

The questionnaire instrument used a Likert scale of 1-5, where a score of 1 indicates "Strongly Disagree" and a score of 5 indicates "Strongly Agree." The questionnaire was designed to provide a quantitative assessment of the indicators. Meanwhile, the interview guide was prepared to explore expert opinions in more depth regarding the validity, practicality, and effectiveness of the model. The assessment results from the questionnaire will be analyzed quantitatively by calculating the average score of each indicator to determine the feasibility level of the model. Data from interviews will be analyzed qualitatively using thematic analysis to identify expert inputs and recommendations. This data analysis technique aims to process and evaluate the data collected in order to provide a clear picture of scrapping cost expenditures and potential optimization that can be done through the principle of cost avoidance. The data that has been collected will be processed and analyzed using a quantitative approach with optimization methods. The analysis steps are designed to produce a model that can minimize scrapping costs in asset management at the PT XYZ warehouse based on the principle of cost avoidance. This research uses two main types of data, namely primary data obtained directly from interviews, and discussions with related parties via online and secondary data sourced from company documents, financial reports, asset management policies, and relevant literature.

Descriptive Analysis is used to provide an overview of the data collected related to scrapping cost expenditures at PT XYZ. This approach aims to describe in detail the costs incurred during the asset scrapping process, starting from acquisition until the asset is written off. The data analyzed includes asset acquisition costs, Net Book Value (NBV), acquisition depreciation, and accumulated depreciation.

Furthermore, Life Cycle Costing (LCC) analysis is applied to identify the total costs incurred for each asset throughout its life cycle. In this study, LCC serves to evaluate whether the scrapping process that has been carried out is already optimal or whether there is still potential for cost savings.

In addition, regression analysis is conducted to identify the relationship between scrapping costs and other variables that may influence them. This analysis helps determine the factors that have the greatest impact on scrapping costs, such as asset age, maintenance frequency, and the degree of asset damage or obsolescence. For this purpose, the researcher used the Statistical Package for the Social Sciences (SPSS) version 25 software.

### 3. RESULTS AND DISCUSSION

PT XYZ manages various categories of assets stored in its warehouse to support operations and network maintenance. Among these, antenna assets represent a significant portion, totaling 10,753 units with a combined net book value (NBV) of IDR 6,193,214 out of the warehouse's total asset value of IDR 19,178,556. In practice, these antenna assets vary widely in acquisition cost and NBV — from fully depreciated units with zero book value to assets with relatively high residual value.

Effective asset management is crucial for maintaining asset value and preventing damage that may lower resale or salvage potential. Structured asset management also facilitates inventory budgeting, prevents over-purchasing, and reduces the risk of asset loss, all of which can have a significant impact on the company's operations (Nasution, 2015). Well-implemented asset management encourages more efficient resource utilization, reduces waste, and maximizes the long-term value of assets. This includes systematic mapping and cost-benefit analysis to ensure optimal asset use and greater organizational benefit (Ansory & Indrasari, 2018).

A company that effectively manages scrapping costs through optimization can significantly reduce expenditures by leveraging technology to extend asset lifespans and better allocate resources (Boccardo et al., 2018). Company expenditures cover all costs incurred to support operational activities, including raw material procurement, labor, asset maintenance, marketing, and distribution. Efficient spending directly influences profit margins and business sustainability (Horngren et al., 2021).

Scrapping cost optimization aims to minimize expenses arising from disposing of obsolete or unused assets (Onibala et al., 2018). This can be achieved by identifying opportunities to lower scrapping costs through better planning and preventive maintenance. Excessive scrapping expenses can negatively affect a company's finances, making it essential to adopt appropriate strategies to control these costs (Selvi & Srinivasan, 2015). In asset management, a cost avoidance strategy helps companies maintain operational continuity without major disruptions that would otherwise require costly repairs (Gomes et al., 2015). By taking preventive measures, companies can avoid larger expenses in the future.

The results of this study show that applying a cost avoidance-based optimization model to asset scrapping significantly improves cost efficiency in warehouse asset management at PT XYZ. The findings indicate that conventional scrapping practices — which mainly rely on historical cost and linear depreciation — frequently cause financial inefficiencies due to mismatches between NBV and acquisition cost. By integrating Life Cycle Costing (LCC) and regression-based decision variables, the proposed model enables more precise identification of scrapping inefficiencies.

Simulation results demonstrate that scrapping costs could be reduced by up to IDR 1.9 billion, with antenna assets alone contributing savings of approximately IDR 750 million. Key cost drivers identified include asset age, depreciation rate, NBV, and maintenance costs. The optimized model suggests scrapping assets only when maintenance and operational costs exceed disposal thresholds and when NBV falls below a predefined limit. This approach ensures that assets with remaining economic value are not scrapped prematurely.

In practical terms, the model acts as a strategic tool for asset managers to make informed, data-driven decisions that prevent unnecessary spending and extend asset lifecycles. By shifting from reactive to proactive cost management, the model contributes to greater operational sustainability and stronger financial performance, particularly in asset-intensive industries such as telecommunications.

### Life Cycle Cost (LCC) Calculation

In this study, the scrapping cost optimization approach is carried out using the Life Cycle Cost (LCC) concept. The LCC concept was chosen because it is able to provide a comprehensive overview of the total costs incurred throughout the life cycle of an asset, starting from the acquisition, operation, maintenance, and disposal stages. The basic LCC formula used in this study is:

$$LCC = C_{acquisition} + C_{operation} + C_{maintenance} + C_{disposal}$$

Each component reflects a different cost phase. However, the focus of the analysis is on controlling and reducing  $C_{disposal}$ , which is the cost incurred when the item or asset unit is no longer used and must be disposed of or scrapped. The  $C_{disposal}$  component is formulated with the formula:

$$C_{disposal} = \sum_{i=1}^n (B_{handling,i} - R_{salvage,i})$$

Description:

$B_{handling,i}$  = handling cost of scrapping the  $i$ -<sup>th</sup> unit

$R_{salvage,i}$  = residual/income value of scrap sales of the  $i$ -<sup>th</sup> unit

$i$  = the  $i$ -<sup>th</sup> unit out of a total of  $n$  units to be scrapped.

The variable  $B_{\text{handling}[1],i}$  is the cost required to handle the scrapping process, including labor, transportation, and waste treatment costs that may arise. Meanwhile,  $R_{\text{salvage}[2],i}$  is the residual value or income obtained from the sale of scrap products, such as scrap metal or components that still have selling value. With these components in mind, the optimization strategy focuses on minimizing scrapping handling costs and maximizing the sale value of scrap, so that the total  $C_{\text{disposal}} [3]$  can be reduced as low as possible. The target set in this study is that the total disposal cost of all units analyzed does not exceed Rp10,000,000. In the initial condition before optimization, the scrapping policy was carried out directly without considering the potential revenue from the residual value of the material or the asset sale option. Assuming that all units were scrapped, there was no residual value income that could reduce costs, so the total scrapping costs were fully borne by the company in the form of handling costs of Rp 1,000,000 per unit. With a total of 11 units, the total handling costs that arise reach Rp 11,000,000, which is fully borne by the company. Conversely, in the post-optimization condition, the cost avoidance approach is applied by utilizing the potential residual value that can still be obtained from each unit. In this strategy, units with high book value such as TURNKEY QUAD BAND HUAWEI and KATHREIN PENTA BAND are not immediately scrapped, but are attempted to be resold or donated to generate additional income. Meanwhile, other units are still prepared for scrapping, but with the calculation of the utilization of the remaining metal material, so that it can provide a residual value even though it is relatively small, which is Rp 400,000 per unit. From the calculation simulation, a total residual value of Rp 17,600,000 was obtained, consisting of 9 units with a salvage value of Rp 400,000 (total of Rp 3,600,000) and 2 units with a high residual value of Rp 7,000,000 each (total of Rp 14,000,000).

The calculation results show that the reduction in disposal costs ( $C_{\text{disposal}[4]}$ ) is calculated by the formula Handling Cost minus Residual Value, so that the total scrapping cost of Rp 11,000,000 is reduced to -Rp 6,600,000. This negative number in  $C_{\text{disposal}}$  means that the company not only managed to avoid the burden of scrapping costs, but even gained a surplus of Rp 6,600,000 from optimizing the scrapping process. In detail, units with low salvage value generate a  $C_{\text{disposal}}$  of Rp 600,000 per unit (handling cost of Rp 1 million minus salvage of Rp 400,000), while the TURNKEY and KATHREIN units actually contribute to eliminating disposal costs of Rp 6 million per unit because their selling value exceeds the handling cost. This finding confirms that a selective scrapping policy utilizing the salvage value of assets can turn cost into potential revenue. Even if the scheme of selling high-value units fails, the company can still reduce the total disposal cost to only IDR 5,400,000 (9 units  $\times$  IDR 600,000), which is still lower than the scrapping scheme without optimization. This proves that the scrapping cost optimization strategy is effective in reducing expenses to far below the target cost of conventional scrapping, which is generally above IDR 10 million.

From this simulation, it can be concluded that the implementation of cost avoidance strategies and the resale of scrap assets greatly support the efficiency of disposal costs. In addition, the company is also advised to continue to innovate in reducing handling costs, for example through the incorporation of scrap shipments or cooperation with more competitive third-party vendors. These policies not only have an impact on direct cost

savings, but also reflect more responsible and sustainable asset management. Thus, this optimization model can be used as a practical guideline for asset and cost management, while at the same time opening up opportunities for financial surplus from activities that were initially seen as mere expenses. This research specifically emphasizes the importance of applying the Life Cycle Cost (LCC) concept as a basis for designing an asset scrapping cost optimization strategy, in this case an antenna unit that is no longer in use. By using the LCC approach, companies can comprehensively look at all costs incurred from asset acquisition, operational period, maintenance, to the final stage, namely the removal or disposal process. The main focus is on the  $C_{\text{disposal}}$  component, because this stage is often a significant cost burden if not managed carefully. The  $C_{\text{disposal}}$  formula used in this study combines elements of handling costs ( $B_{\text{handling}}$ ) and potential income from residual or salvage value ( $R_{\text{salvage}}$ ), so that the calculation becomes more realistic and in accordance with practical conditions in the field.

To support a more accurate calculation, several key assumptions were applied. First, handling costs were set at an average of IDR 1,000,000 per antenna unit, covering all transportation, loading and unloading, administration, and waste treatment costs that may be required. Second, the residual value is determined based on the net book value (NBV). Units with zero or very low book value still have a potential scrap metal value of at least IDR 400,000, while units with an NBV above IDR 5,000,000 are assumed to still be worth selling or donating with a residual value of IDR 7,000,000. This assumption is relevant because it reflects the real potential of the remaining material and the condition of the asset's usability. Third, the cost avoidance strategy is an important point, because by selling or donating high-value units, companies can avoid handling costs while earning additional revenue that can be used to cover the cost of disposing of other units or even generate a surplus. The most important factor is Residual Value ( $X_3$ ), which has the most dominant negative effect (coefficient -0.95;  $p = 0.000$ ). This confirms that the greater the residual value of scrap, the smaller the scrapping cost. In other words, the residual value management strategy proved to be very effective in reducing the disposal cost burden. Meanwhile, Handling Cost ( $X_4$ ) shows a significant positive effect (coefficient 1.05;  $p = 0.000$ ), which means that the greater the unit handling cost, the higher the total  $C_{\text{disposal}}$ . From the calculation results, the final equation is obtained:

$$Y = 320.000 + 0.30X^1 + 0.02X^2 - 0.95X^3 + 1.05X^4$$

The constant in this equation is 320,000, although not significant ( $p = 0.578$ ), so the main interpretation lies in the contribution of the independent variables. Residual value is the most crucial factor that can reduce scrapping costs, while NBV, acquisition costs, and handling costs act as supporting variables in designing cost avoidance policies. Thus, these regression results further strengthen the evidence in the before and after optimization comparison table which shows a change in status from cost burden to disposal cost surplus. The optimization strategy that maximizes the residual value successfully eliminates handling costs and even generates residual income from scrap sales. These results support the

conclusion that the design of a cost avoidance-based scrapping cost optimization model effectively helps companies achieve asset management efficiency, while improving the overall performance of PT XYZ's warehouse management. This research specifically emphasizes the importance of applying the Life Cycle Cost (LCC) concept as a basis for designing an asset scrapping cost optimization strategy, in this case an antenna unit that is no longer in use. By using the LCC approach, companies can comprehensively look at all costs incurred from asset acquisition, operational period, maintenance, to the final stage, namely the removal or disposal process. The main focus is on the  $C_{\text{disposal}}$  component, because this stage is often a significant cost burden if not managed carefully. The  $C_{\text{disposal}}$  formula used in this study combines elements of handling costs ( $B_{\text{handling}}$ ) and potential income from residual or salvage value ( $R_{\text{salvage}}$ ), so that the calculation becomes more realistic and in accordance with practical conditions in the field.

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The positive impact of this optimization strategy is even more evident in the before-after comparison. If the sale of high-value units fails, the company can still reduce the disposal cost to only IDR 5,400,000, much smaller than the scenario without optimization. This result proves that asset management in the final phase of the life cycle can be directed to be more efficient with proper planning. Such a strategy is in line with the principle of operational efficiency, as companies can reduce routine costs and divert surpluses to other more pressing operational needs. In addition to simulation calculations, the regression analysis conducted in this study also strengthens the validity of the scrapping cost optimization strategy. The regression results show that the model is able to explain 90.2% of the variation in  $C_{\text{disposal}}$  through four independent variables, namely NBV, acquisition cost,

residual value, and handling cost. Interestingly, residual value ( $R_{\text{salvage}}$ ) emerged as the most dominant variable in reducing scrapping costs, indicated by a significant negative regression coefficient. This means that the greater the potential residual value of scrap or asset sales, the smaller the disposal burden that the company has to bear. In contrast, NBV, acquisition cost, and handling cost contribute as relevant supporting factors as they are closely related to the physical characteristics of the asset, the disposal procedure, and the inherent logistics costs.

The regression results also confirm that the optimization strategy by maximizing the residual value is a crucial step that must be integrated into the asset management policy. If this cost avoidance pattern is implemented consistently, companies not only save costs, but also have the opportunity to generate additional revenue from assets that should have been considered to have no economic value. Thus, this study shows that the application of the LCC-based scrapping cost optimization model and cost avoidance is proven to support the target of expenditure efficiency, strengthening asset management, and improving asset management.

#### 4. CONCLUSION

This study concludes that the application of a cost avoidance-based optimization model in asset scrapping significantly improves cost efficiency in warehouse asset management at PT. XYZ. The findings demonstrate that conventional scrapping methods, which rely solely on historical cost and linear depreciation, often lead to substantial financial losses due to mismatches between Net Book Value (NBV) and acquisition costs. By incorporating Life Cycle Costing (LCC) and regression-based decision variables, the model enables more accurate identification of scrapping inefficiencies. Simulation results revealed that scrapping costs could be reduced by up to IDR 1.9 billion, with IDR 750 million saved from antenna assets alone. Key cost drivers identified include asset age, depreciation rate, NBV, and maintenance expenses. The optimized model recommends scrapping only when maintenance and operational costs exceed disposal thresholds and when NBV falls below a defined limit, ensuring that valuable assets are not discarded prematurely. In practical terms, the model serves as a strategic tool for asset managers to make data-driven decisions that prevent unnecessary expenses and prolong asset lifecycle. It supports a shift from reactive to proactive cost management, ultimately enhancing operational sustainability and financial performance in asset-intensive environments like the telecommunications industry.

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