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# EVALUATING THE ROLE OF LABOR PRODUCTIVITY IN ENHANCING OVERHEAD COST EFFICIENCY AND PRICE RESPONSIVENESS: A QUANTITATIVE-DESCRIPTIVE CASE STUDY OF PT PROTEINMAGG MAGPRO INDUSTRI IN INDONESIA'S PET FOOD INDUSTRY

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*Abstract*
*This study investigates the role of labor productivity in improving overhead cost efficiency and enabling price responsiveness in a price-sensitive industry. Focusing on PT ProteinMagg Magpro Industri, a startup in Indonesia's insect-based pet food sector, the research adopts a quantitative-descriptive method using SEM-PLS to examine the relationships among labor productivity, overhead cost efficiency, and pricing flexibility. The analysis is based on 36 months of internal operational and financial data, including output volumes, labor hours, and overhead components. Results indicate that higher labor productivity positively impacts overhead cost efficiency, which in turn significantly improves the company's ability to respond to market-driven pricing. These findings highlight that internal efficiency is not only an operational concern but a strategic necessity, particularly for startups with limited resources. The study offers practical implications for productivity-driven cost management and contributes to the broader discourse on strategic cost control in emerging manufacturing firms.*
***Keywords: Labor Productivity, Overhead Cost Efficiency, Price Responsiveness, Startup, Strategic Cost Management***

Abstrak
Penelitian ini mengkaji peran produktivitas tenaga kerja dalam meningkatkan efisiensi biaya overhead dan mendukung responsivitas harga di industri yang sensitif terhadap harga. Studi dilakukan pada PT ProteinMagg Magpro Industri, sebuah startup di sektor pakan hewan berbasis serangga di Indonesia, dengan pendekatan kuantitatif-deskriptif menggunakan SEM-PLS untuk menguji hubungan antara produktivitas tenaga kerja, efisiensi biaya overhead, dan fleksibilitas harga. Analisis dilakukan berdasarkan data operasional dan keuangan internal selama 36 bulan, termasuk volume output, jam kerja tenaga kerja, dan komponen overhead. Hasil menunjukkan bahwa peningkatan produktivitas tenaga kerja berdampak positif terhadap efisiensi biaya overhead, yang selanjutnya secara signifikan meningkatkan kemampuan perusahaan dalam merespons harga pasar. Temuan ini menegaskan bahwa efisiensi internal bukan hanya persoalan operasional, tetapi juga kebutuhan strategis, terutama bagi startup dengan sumber daya terbatas. Studi ini memberikan implikasi praktis dalam manajemen biaya berbasis produktivitas serta kontribusi akademik pada diskursus pengendalian biaya strategis di sektor manufaktur yang berkembang.
**Kata Kunci**: ***Efisiensi Biaya Overhead, Manajemen Biaya Strategis, Produktivitas Tenaga Kerja, Responsivitas Harga, Startup***

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## 1. INTRODUCTION

The Indonesian pet food industry has experienced rapid and continuous growth in recent years, driven by increasing urbanization, rising disposable incomes, and the growing perception of pets as family members. With projections showing a compound annual growth rate of 14.45% from 2025 to 2030, the industry presents a lucrative yet highly competitive landscape. However, this growth comes with heightened price sensitivity among consumers, especially in online marketplaces where even minor price differences can significantly influence purchasing decisions. In such a context, maintaining operational cost efficiency is not just a financial objective, but a critical strategy for survival and growth, particularly for startups with limited capital and high overhead burdens.

PT ProteinMagg Magpro Industri is a startup operating in this dynamic industry, producing insect-based animal feed made primarily from black soldier fly larvae (BSFL). Positioned as a sustainable and innovative alternative to traditional protein sources, the company faces unique operational challenges. Among the most pressing is the disproportionately high share of overhead costs within its total production expenses, which constrains its ability to adopt competitive pricing strategies in a price-elastic market. These indirect costs, such as facility maintenance, utility expenses, and depreciation, are not easily scalable and often remain rigid even when production increases.

Labor productivity plays a crucial role in addressing this challenge, as it directly affects how efficiently overhead costs are absorbed per unit of output. Low productivity leads to inefficiencies such as idle time and suboptimal resource utilization, increasing the cost burden per product unit. For a resource-constrained company like PT ProteinMagg, improving labor productivity offers a controllable and impactful pathway to reduce unit costs, enhance overhead efficiency, and ultimately support more flexible and competitive pricing strategies. Despite some internal initiatives to optimize schedules and upskill staff, persistent inefficiencies indicate the need for a more structured and data-driven approach.

Previous studies have emphasized the relationship between labor productivity, overhead cost efficiency, and market responsiveness, particularly in manufacturing and startup contexts. However, there remains a gap in the literature when it comes to examining these dynamics within the pet food sector, especially in emerging markets such as Indonesia. Most existing research either focuses on large-scale manufacturers or overlooks the specific challenges faced by niche, sustainability-driven startups operating under severe cost constraints and high price elasticity. This research aims to fill that gap by focusing on a single case study: PT ProteinMagg Magpro Industri.

The primary objective of this study is to evaluate how labor productivity influences overhead cost efficiency and how that efficiency supports price responsiveness in a highly competitive and price-sensitive market. Using a quantitative-descriptive approach, this research applies Structural Equation Modeling–Partial Least Squares (SEM-PLS) to test the proposed relationships, supported by a detailed analysis of 36 months of the company's operational and financial data. The study seeks not only to provide theoretical insight into cost dynamics and productivity in startup manufacturing, but also to offer practical recommendations tailored to PT ProteinMagg’s strategic and operational context.

## 2. LITERATURE REVIEW

This study is grounded in the Strategic Cost Management (SCM) framework and Contingency Theory, which collectively emphasize the alignment of internal operational strategies with external environmental pressures. Labor productivity is conceptualized as a key

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cost driver that influences overhead cost efficiency the ability of a company to optimize indirect expenditures per unit of output. The literature suggests that in high fixed-cost environments, improving labor productivity can significantly lower unit costs by maximizing resource utilization and minimizing idle time. Previous research by Ramesh & Sumitra (2024) and Oteri et al. (2023) supports the view that lean operations and effective labor deployment are critical in improving cost flexibility and market responsiveness. The study adopts a model where labor productivity affects overhead cost efficiency, which in turn affects the firm's ability to respond to price elasticity. This relationship is explored empirically using a structural equation modeling (SEM-PLS) approach, and further contextualized through descriptive analysis of internal company documents. The review of literature serves not only to frame the research variables but also to explain the logic behind the hypothesis development.

## 3. RESEARCH METHODOLOGY

This study employs a mixed-methods approach that integrates quantitative modeling and descriptive document analysis. The quantitative component uses Structural Equation Modeling–Partial Least Squares (SEM-PLS) to test the relationships between labor productivity, overhead cost efficiency, and price responsiveness. This method is suitable for small sample sizes and non-normal data, which aligns with the study's use of 36 months of internal operational data from PT ProteinMagg Magpro Industri. The variables are measured using ratio-based indicators: output per labor hour (labor productivity), overhead cost per unit output (cost efficiency), and elasticity-based pricing agility (price responsiveness). The descriptive component involves the systematic analysis of internal records, including monthly production logs, overhead breakdowns, labor allocations, and internal pricing evaluations. This method allows the study to identify structural inefficiencies and cost allocation patterns within the company. By combining statistical evidence with contextual insights, the research provides a robust evaluation of operational performance and its strategic implications.

Although this study uses an empirical model similar to prior research, it is distinguished by its context focusing on an insect-based pet food manufacturing startup and its dual-method approach. It does not rely on interviews or survey responses but instead utilizes real operational and financial data, ensuring a grounded and practical interpretation of cost and productivity dynamics. The methodology allows the researcher to explore not just theoretical relationships but also develop actionable insights specific to the case company's internal challenges and strategic needs

## 4. RESULTS AND DISCUSSION

This section presents the core findings and analytical interpretations of the study by integrating quantitative results from Structural Equation Modeling Partial Least Squares (SEM-PLS) and descriptive insights derived from operational data of PT ProteinMagg Magpro Industri. The goal is to assess the magnitude and significance of the relationships between labor productivity, overhead cost efficiency, and price responsiveness three critical constructs that underpin the firm's competitiveness in a price-sensitive market. The SEM-PLS approach was selected due to its robustness in handling small-sample models and non-normally distributed data, allowing for the analysis of 36 months of performance records from the company's early production stages. The model enables both direct and indirect effect testing, which is essential in validating the role of labor productivity not only as an isolated efficiency metric but as a foundational driver of strategic pricing capacity.

Complementing the quantitative results, a detailed document-based descriptive analysis was conducted to unpack the operational behaviors and structural bottlenecks underlying the statistical relationships. This includes monthly breakdowns of overhead expenditures, labor

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utilization patterns, and cost-per-unit fluctuations. Special attention was given to indirect cost components such as utilities, indirect labor, depreciation, and maintenance elements that collectively make up the largest share of total production costs yet remain poorly scalable in the face of output variability. These findings provide important managerial insights into the sources of inefficiency and how they can be mitigated through productivity-enhancing strategies such as skill development, workflow redesign, and labor-to-output alignment.

The overall integration of quantitative and qualitative findings is structured to answer the central research question: how can labor productivity improve overhead cost efficiency and thus support pricing responsiveness in a highly elastic market environment? The discussion is framed within the theoretical foundations of Strategic Cost Management and Contingency Theory, which jointly argue that internal efficiency must be aligned with external market dynamics for a firm to remain competitive. The results presented here are not merely statistical validations but are interpreted through the lens of practical implications for startup-stage manufacturers navigating resource constraints and operational rigidity. This section ultimately serves to bridge operational diagnostics with strategic recommendations that are both evidence-based and context-specific.

**SEM-PLS Analysis Results**

a. Measurement Model Evaluation

The measurement model was tested for reliability and validity using standard metrics. All constructs showed acceptable levels of reliability (Cronbach's Alpha and Composite Reliability > 0.7) and convergent validity (AVE > 0.5). The outer loadings of all indicators exceeded 0.60, confirming that the latent variables were well represented by the chosen indicators. Discriminant validity was ensured through Fornell-Larcker criteria and HTMT ratios, which confirmed that each construct was distinct.

b. Structural Model and Hypothesis Testing

The structural model reveals the following significant relationships:

Table 1
Path Coefficients, T-Values, and P-Values

| Relationship | Coefficient | T-Statistic | P-Value |
|---|---|---|---|
| **Labor Productivity → Overhead Efficiency** | 1.275 | 3.935 | 0.005 |
| **Overhead Efficiency → Price Responsiveness** | 2.099 | 2.556 | 0.008 |

*Source: Processed by the author (2025)*

The above results support H1 and H2. Labor productivity significantly enhances overhead cost efficiency, and in turn, efficient overhead structures significantly improve price responsiveness. The magnitude and significance of both paths ($p < 0.01$) suggest that internal productivity strategies can be effectively leveraged to support external pricing agility a vital capability in price-elastic industries.

**Descriptive Analysis and Operational Interpretation**

The analysis of PT ProteinMagg Magpro Industri's cost structure reveals a disproportionate allocation of operational expenditures toward factory overhead (FOH), which consistently exceeds both direct material and direct labor costs. Over a 12-month observation in 2024, FOH averaged above IDR 1.3 billion per month, while direct labor and material costs remained relatively flat at approximately IDR 165 million and IDR 154 million, respectively. This means

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that over 70% of the company's monthly production costs are not directly attributable to output-generating activities. Such a cost distribution is particularly unsustainable for a startup operating in a highly price-sensitive sector, where fixed cost rigidity directly threatens profitability. This reflects a phenomenon commonly referred to as cost stickiness, where overhead costs fail to adjust downward in periods of reduced activity (Rosyafah et al., 2023).

The breakdown of FOH reveals that indirect labor and utility expenses are among the most significant contributors. Indirect labor which includes quality control staff, maintenance technicians, and shift supervisors accounts for more than IDR 240 million per month. Utility costs (electricity, water, and gas) follow closely at IDR 257 million per month, with further portions allocated to maintenance, office supplies in the production unit, and packaging. Notably, the overhead composition does not exhibit elasticity with respect to output fluctuations. These findings support previous research that identified the inflexible nature of overhead in SMEs as a key barrier to operational scalability (Oteri et al., 2023; Wolfram & Csaba, 2021).

The misalignment between overhead growth and production performance reflects an underlying issue with operational leverage. Ideally, as production increases, overhead costs per unit should decrease due to the spread of fixed costs across a larger volume. However, ProteinMagg has not achieved such economies of scale, and its overhead-to-output ratio has remained unfavorably high. This inefficiency has a compounding effect: it constrains the company's ability to offer price discounts, limits participation in platform-wide promotional campaigns (e.g., Shopee flash sales), and undermines profit margins during demand fluctuations. This supports Andreevna et al. (2023), who argue that the absence of a standardized, scalable overhead allocation method can hinder startup competitiveness in volatile markets.

An evaluation of labor productivity over the observed period shows suboptimal performance, with a monthly average of 0.365 units per hour—significantly lower than the industry benchmark of 0.8 to 1.0 units per hour for similar small-to-medium production lines. This low productivity figure reflects several inefficiencies: frequent idle time, low specialization of tasks, and underutilization of shift hours. Although the company has initiated training programs and schedule optimization, improvements remain modest. Compounding the issue, a large proportion of the total payroll (nearly 60%) is allocated to indirect labor, further inflating overhead costs. These patterns align with findings from Radło and Tomeczek (2022), who emphasized the strategic importance of aligning labor structures and productivity tracking systems to achieve overhead efficiency in SMEs.

The descriptive analysis of labor structure reveals a lack of productivity-linked performance metrics in the company's HR system. Workload distribution tends to be flat across employees, regardless of the unit output achieved per shift. Furthermore, indirect labor positions such as warehouse coordinators and utility supervisors are not evaluated based on contribution to production throughput. This misalignment creates a culture of process rigidity, where roles persist independent of their efficiency impact. Prior research has shown that incentive misalignment is a common cause of persistent low productivity in early-stage manufacturers (Ramesh & Sumitra, 2024).

In addition to workforce design, the production scheduling system also contributes to inefficiencies. Monthly production logs indicate that several weeks had underutilized capacity, with operating hours capped at 40–60% of optimal levels. These underutilizations are often the result of delayed raw material procurement, misalignment between demand forecasting and production planning, and inadequate machinery maintenance. Similar operational bottlenecks have been identified in lean manufacturing studies, where cost rigidity and scheduling inefficiencies severely limit responsiveness to market signals (Sartal et al., 2020).

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The final aspect of the descriptive analysis concerns the company's ability to respond to price elasticity in digital marketplaces. Despite offering a competitively differentiated product (insect-based protein feed), ProteinMagg's market performance on platforms like Shopee remains relatively weak compared to its peers. These competitors demonstrate more flexible pricing behavior, frequently adjusting prices in line with demand trends, platform campaigns, and consumer engagement. In contrast, ProteinMagg's pricing strategy remains rigid. This behavior reflects the constraints identified by Shank and Govindarajan (2008), who noted that cost structure inefficiencies often manifest in limited pricing agility, especially when companies lack cost visibility or real-time cost tracking.

The company's pricing inflexibility is further illustrated by its inability to provide volume discounts or implement dynamic pricing across SKUs. Internal pricing memos show that proposed price changes are often rejected due to the risk of margin erosion. While this is financially cautious, it weakens competitive positioning in an elastic market. The strategic cost management perspective emphasizes that price responsiveness must be rooted in internal cost efficiency, allowing businesses to react to market signals without compromising profitability (Rounaghi et al., 2021). Without addressing cost structure reform, ProteinMagg risks falling behind in a sector where speed and flexibility are critical to consumer acquisition and retention.

**Strategic Interpretation**

The empirical findings and descriptive analysis suggest that labor productivity plays a critical role not only in reducing direct labor inefficiencies but also in determining the firm's ability to absorb overhead costs more efficiently. From a strategic standpoint, labor productivity should not be viewed merely as a measure of output per hour, but as a lever for structural cost optimization. This perspective aligns with the principles of Strategic Cost Management (SCM), which emphasize that internal operational levers such as productivity and process design must directly support broader competitive strategies like pricing flexibility and market responsiveness (Shank & Govindarajan, 2008). In the context of ProteinMagg, improvements in labor productivity can create a multiplier effect by reducing the fixed cost burden per unit and enabling participation in price-based promotional campaigns without risking negative margins.

Despite confirming the relationship between overhead efficiency and price responsiveness statistically, the descriptive data reveal a lag between operational improvement and strategic pricing execution. This gap reinforces the relevance of Contingency Theory, which posits that organizational systems must be designed to fit the specific demands of the external environment (Donaldson, 2001). ProteinMagg operates in a digitalized, price-elastic market where responsiveness is not optional but required. However, the firm's cost structure remains rigid, and its internal decision-making lacks the flexibility to adjust pricing in real-time based on competitive behavior. As observed in firms with high price elasticity exposure, failure to align internal efficiency with external agility often results in missed sales opportunities and declining customer retention (Varian, 2014; Rounaghi et al., 2021).

Furthermore, the analysis indicates that pricing rigidity is not merely an outcome of strategic caution but a reflection of deeper inefficiencies within the firm's operational design. The absence of productivity-linked incentives, over-reliance on fixed indirect labor, and underutilized capacity all contribute to overhead stickiness. These structural issues weaken the firm's ability to dynamically respond to market signals be it through bundling, flash sales, or volume discounting. Strategic literature supports the idea that firms with lean and responsive cost systems are better positioned to adapt to fluctuating demand without sacrificing

profitability (Oteri et al., 2023; Radło & Tomeczek, 2022). Therefore, before pricing flexibility can be achieved, ProteinMagg must first implement reforms in workforce design, production scheduling, and overhead allocation.

Importantly, the findings illustrate that productivity is not only a cost issue but also a strategic capability. As suggested by Sartal et al. (2020), firms that integrate automation and real-time monitoring into their operations can significantly enhance both scalability and responsiveness. While full automation may not be feasible for a startup like ProteinMagg, incremental investments in digital monitoring tools and modular labor design can yield substantial gains in throughput and cost absorption. These improvements would not only reduce per-unit overhead costs but also create headroom for adaptive pricing strategies an essential capability in price-driven online marketplaces.

In sum, the strategic interpretation of this research confirms that cost structure inefficiencies and low labor productivity are not isolated operational problems but interlinked constraints that limit competitive maneuverability. For ProteinMagg to remain viable and profitable, especially in a high-elasticity market, it must shift from a survival-oriented cost approach to a strategic cost management paradigm. This shift entails aligning internal cost behavior with market dynamics through workforce reform, scheduling optimization, overhead reallocation, and pricing agility. As the firm matures, these capabilities will not only protect margins but also enable growth in increasingly competitive digital environments

## 5. CONCLUSION AND RECOMMENDATION

This study has explored the strategic role of labor productivity in improving overhead cost efficiency and enabling price responsiveness within a resource-constrained manufacturing startup, PT ProteinMagg Magpro Industri. Using a quantitative-descriptive approach with SEM-PLS and document-based analysis, the research confirms that labor productivity significantly influences overhead efficiency, which in turn enhances the firm's ability to adapt pricing strategies in a highly elastic market. The empirical results underscore that internal productivity is not merely an operational metric, but a foundational driver of strategic cost management and competitive maneuverability. Descriptive analysis further reveals deep-rooted inefficiencies in cost structure, particularly in the rigidity of overhead components such as indirect labor and utility expenses. These inefficiencies contribute to low scalability and limited pricing flexibility, even when gross margins appear favorable. The firm's low labor productivity, misaligned performance incentives, and underutilized capacity prevent effective overhead absorption and constrain responsiveness in dynamic digital marketplaces. Such conditions reinforce the need for operational reforms before pricing agility can be sustainably achieved.

In conclusion, labor productivity must be treated as a strategic capability within startup manufacturing environments. Enhancing productivity through scheduling optimization, workforce redesign, and gradual process automation can reduce per-unit costs, improve overhead absorption, and create the financial space for adaptive pricing. Aligning these internal capabilities with market demands is essential to overcoming the constraints of fixed cost structures and gaining a foothold in competitive, price-sensitive sectors. For PT ProteinMagg, embracing strategic cost management is not only a path to profitability, but a necessary evolution for long-term survival and growth.

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