

Raw Material Cost Optimization A Systematic Review Of Budgeting Practices In The Manufacturing Sector

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Abstract—Raw material cost optimization is a critical factor that significantly affects operational efficiency and financial success in the manufacturing sector. In an increasingly competitive business environment, the ability to effectively manage raw material costs impacts not only the profitability but also the competitiveness and long-term sustainability of the company. This study aims to conduct a systematic review of various raw material budgeting practices implemented in the manufacturing industry, analyzing the methodologies and approaches used to optimize raw material costs. The research employs a systematic literature review method, gathering data from Google Scholar and reputable academic journals. Studies were selected based on strict inclusion and exclusion criteria, and the gathered data were qualitatively analyzed to identify the key findings from the relevant articles. The findings of this study indicate that the implementation of information technology, cost standardization, and adaptive procurement strategies play a significant role in improving raw material forecasting accuracy and cost efficiency. Furthermore, the research highlights the importance of structured budgeting in reducing cost variances and improving cost control across manufacturing companies, whether in SMEs or large corporations. This review provides practical insights for companies in developing more efficient budgeting strategies and offers recommendations for further research exploring the impact of industry-specific contextual factors on the effectiveness of raw material budgeting methods.

Keywords— *raw material cost, budgeting, cost efficiency, manufacturing sector, adaptive procurement strategies*

I. INTRODUCTION

In a competitive business environment, optimizing the cost of raw materials is a critical aspect that determines the financial success of manufacturing companies. Efficiency in managing raw material costs not only affects profit margins but also price competitiveness and operational sustainability. Over the last decade, raw material price volatility has posed significant challenges for manufacturing companies, making effective budgeting a strategic tool for managing risk and maximizing the efficiency of the risks faced by companies in ensuring smooth sales in subsequent periods is too large[1]. Research indicates that the integration of advanced technology in budgeting systems can improve accuracy in forecasting raw material needs, which in turn enhances purchasing decisions and cost efficiency. Additionally, adaptive budgeting practices are able to respond to market price fluctuations more quickly, reducing waiting times and unnecessary storage costs [2]. However, there is still a lack of literature regarding various budgeting techniques and methodologies that affect the optimization of raw material costs. In particular, the lack of comparative studies between industrial sectors and the influence of contextual factors on budgeting effectiveness remains a challenge that requires further attention [3]. This limitation indicates the need for a more measured approach in managing the raw material cost budget, which can be the basis for developing a more efficient production cost budget in the future.

Therefore, this study aims to conduct a systematic review of budgeting practices used in the manufacturing industry, focusing on strategies for optimizing raw material costs. Through this literature review, the article seeks to identify, analyze, and synthesize data from recent research that has published relevant findings in the last five years. This is done to gain a deeper understanding of best practices in raw material cost budgeting, while offering evidence-based recommendations for improving efficiency and effectiveness in budget management in the manufacturing sector, which ultimately is expected to support the sustainability and growth of companies. This research further reinforces the importance of production cost budgeting as a foundation for the development and continuity of the business [4].

Literature Review

The literature review delves into key theories on optimizing raw material costs and budgeting practices within the manufacturing sector. A comprehensive and systematic search was conducted across major academic databases, including PubMed, IEEE Xplore, and Google Scholar, to ensure an unbiased representation of the field. This approach aligns with the methodology outlined by [5], emphasizing the importance of an extensive and meticulous investigation of all relevant studies on a particular topic [5]. This review encompasses various budgeting approaches that have been researched by scholars, their effectiveness in the context of the manufacturing industry, and shortcomings identified in the existing literature. The primary focus of this review is to identify budgeting strategies that significantly contribute to improving efficiency and reducing raw material costs in the manufacturing sector. Several studies highlight the role of technology in enhancing budgeting accuracy and adapting to raw material price fluctuations, while others show that cost-based approaches and internal control strategies can help companies keep expenditures under control. There is also literature examining weaknesses in current budgeting practices, particularly regarding differences in implementation across various industrial sectors and a lack of comparative studies discussing contextual factors affecting the effectiveness of budgeting.

Below is Table 1, which summarizes previous relevant research, including the methodologies used, key findings, and the practical implications of those findings.

TABLE I. LITERATURE REVIEW

Title, Authors	Methodology	Main Findings
Budget Training and Profit-Loss Report at Warung Makqita UMKM [6]	Survey, Interview, Socialization, Education, Training, Evaluation / UMKM Warung Makqita, Surabaya	Training improved understanding and ability to prepare budgets and profit-loss reports

Analysis and Application of Standard Production Costs as Cost Control for Raw Materials, Direct Labor, Factory Overhead [7]	Field Studies, Literature Studies with Observation, Interviews, and Documentation / PT Madukara Malang	Applied cost standards help reduce cost discrepancies and avoid losses
Design of a Cost Budget Plan System (Case Study at Merapi Jaya Sablon Bandung) [8]	Case Study / Merapi Jaya Sablon, Bandung	Lack of budget planning leads to inefficient cash expenditures
The Role of Production Budget as a Management Control Tool in Controlling Production Costs (Empirical Study at PT. Nadera Jaya) (Andriani 2020) [9]	Descriptive-Associative with a quantitative approach	The production budget at CV. Putra Mataram deviates from standard procedures, failing to effectively control production costs.
Budget Analysis of Production Costs at UD. Seragam Monalisa Kediri (Mechicha Mei Sulistyono Rini 2023) [10]	Descriptive Quantitative / UD. Seragam Monalisa, Kediri	Budgets for raw materials and direct labor are not effective enough in controlling costs
Cost Variance Analysis of Sugar Production to Measure the Efficiency of a Sugar Factory (Case Study: PG Wonolangan PT Perkebunan Nusantara XI) (Immas Viva Suryana 2021) [11]	Case Study with Interviews, Observation, and Documentation	Cost variance in production shows unfavorable variations, especially in raw materials, direct labor, and factory overhead
Improving Financial Management Efficiency in Micro, Small, and Medium Enterprises (MSMEs) Through Budget Strategies: Case Study of UMKM SeGlass [12]	Case Study / UMKM SeGlass, Universitas Negeri Makassar	Structured budgeting helps UMKM SeGlass in planning and controlling expenditures, identifying sources of revenue and wastage
Operational Budget Preparation as a Management Function at Depot Karya Jaya Palembang (Tyas Permata et al. 2021) [13]	Quantitative with Interviews and Library Research / Depot Karya Jaya, Palembang	Operational budget preparation integrates old sales data and new sales targets, requiring ongoing adaptation
Profit-Loss Budget as a Profit Planning Tool at DNA Bakery Tamban [14]	Quantitative with Case Study / DNA Bakery Tamban, Tamban District	Preparing a profit-loss budget helps DNA Bakery in planning and controlling expenditures and projecting net profit
Cost of Goods Manufactured and Cost of Goods Sold Calculation Against Net Profit (Case Study of Istiqomah Tempe Factory Bandar Lampung) (Angelica and Hadi 2024) [15]	Descriptive Analysis / Istiqomah Tempe Factory, Bandar Lampung	Variable Costing results in lower expenditures compared to Full Costing in COGS calculation
Budget Preparation for the Production Cost of Baby Pillows at Babyfynn Sass Bandung (Andry Arifian Rachman et al. 2022) [16]	Technical Assistance / Babyfynn Sass Bandung	Budget preparation for raw materials, direct labor, and overhead for baby pillows aids in determining selling prices

Factors Affecting Planning and Control Budgets for Trading Companies: Management Accounting Literature Review (Renaningtyas et al. 2022) [17]	Literature Study / Trading Companies	A well-prepared production cost budget and effective cash budget are crucial for accurate planning and control of company finances, ensuring financial stability and smooth operations.
Budget Analysis of Production Costs as a Tool to Increase the Effectiveness of Production Cost Control at CV Megasari Inti Sinergi ([18] and Santoso 2023)	Qualitative Descriptive with Interviews / CV Megasari Inti Sinergi, Cassava Chip Producer	Using a production cost budget as a cost control tool is proven effective, resulting in actual production costs lower than budgeted
Literature Review on Value Relevance (A Literature Study) (Harahap et al. n.d.) [19]	Literature Review Top accounting journals	The relevance of accounting information value is shown through the statistical relationship between accounting figures and market equity value

II. METHOD

The Systematic Literature Review method employed in this study is a structured approach to synthesize and critically evaluate existing research on raw material cost budgeting in the manufacturing sector. Performing an SLR is an essential step in understanding the state-of-the-art and identifying gaps and challenges in a specific field, as highlighted by.[20] . The flowchart in Figure 1: Research Methodology Flowchart provides a visual representation of this systematic process, ensuring transparency and clarity at each stage. Below is a detailed explanation of the steps illustrated in the flowchart:

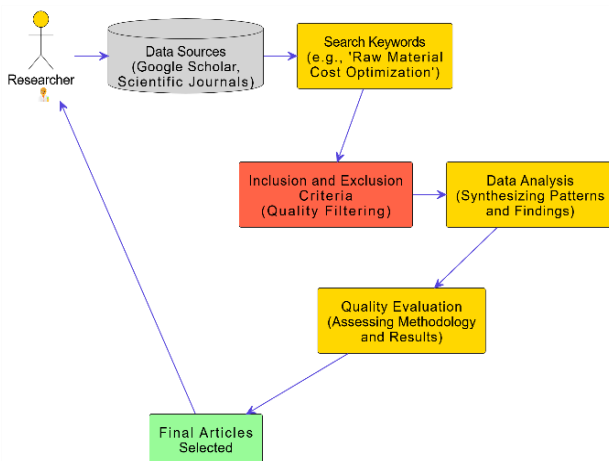


Figure 1. research methodology flowchart

Research Methodology Explanation, The Systematic Literature Review method employed in this study systematically synthesizes and critically evaluates research on raw material cost budgeting in the manufacturing sector. The methodology follows a structured process, as described below:

a) Data Sources Data was gathered from credible platforms such as Google Scholar and leading scientific journals, focusing on topics directly related to:

- Management accounting,
- Cost budgeting, and Cost optimization.

To ensure the findings were relevant, only articles published within the last five years were included. This time constraint ensures that the data reflects the most current trends and methodologies.

b) Search Keywords, The search process used specific, carefully chosen keywords to identify articles relevant to the study's objectives. Examples of these keywords include:

- "Raw material cost optimization",
- "Production cost budgeting",
- "Adaptive budgeting strategies", and "Cost variance analysis".

The use of precise keywords allowed the study to retrieve articles aligned with the scope of raw material cost budgeting in the manufacturing context.

c) Inclusion and Exclusion Criteria, A rigorous filtering process was applied to ensure the quality and relevance of the articles reviewed:

- Inclusion Criteria, Articles were included if they: Focused on raw material or production cost budgeting in the manufacturing sector, and Employed clear, valid, and reliable research methodologies.
- Exclusion Criteria, Articles were excluded if they: Focused on non-manufacturing sectors, Lacked empirical evidence or robust findings, or Used unreliable or unclear methodologies.

This step refined the dataset to include only studies that contribute meaningfully to the research objectives.

d) Data Analysis The selected articles underwent a descriptive qualitative analysis to synthesize their findings. This analysis involved:

- Identifying patterns and themes within the data, Highlighting key findings, and Comparing differences and similarities across the studies.

The synthesized data was presented in tables and narrative summaries, offering a clear overview of strategies for raw material cost budgeting and their practical implications.

e) Quality Evaluation of Studies The selected articles were subjected to a thorough evaluation to ensure the validity and reliability of the findings. The assessment focused on:

- The methodological rigor of each study, The accuracy and reliability of the results, and The relevance of the findings to raw material cost management in the manufacturing sector.

f) Articles that lacked strong methodologies or presented invalid data were excluded from the final analysis, ensuring that only high-quality research informed the study. According highlighted by.[20]

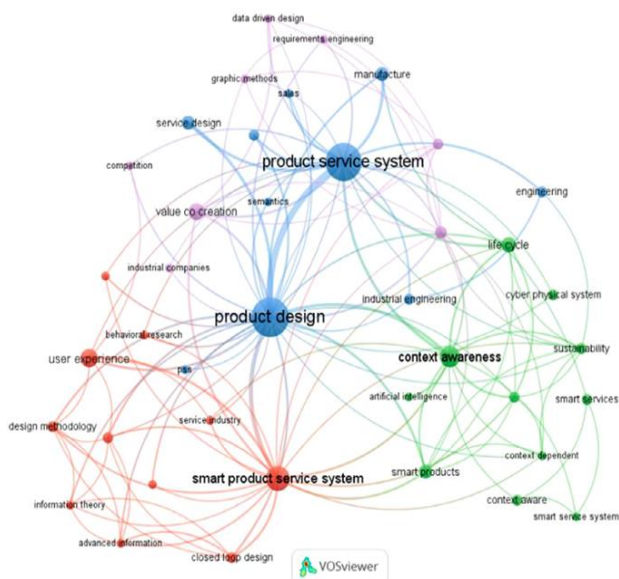


Figure II. Keyword co-relationship analysis using cauterization in Vos viewer

Fig. 2 shows a keyword co-relationship analysis using Vos Viewer, which simplifies identifying related clusters. Node size reflects the number of articles linked to a keyword, and lines indicate term connections. This analysis addresses research questions through both quantitative and qualitative approaches. Quantitative analysis processes categorized and coded data, often using frequency analysis to highlight event recurrence or population percentages (e.g., technology types or framework usage). Qualitative analysis, meanwhile, narrates results, discusses future research directions, and draws conclusions from the findings.

III. RESULTS AND DISCUSSION

From the literature review conducted, it is evident that cost budgeting practices vary significantly across sectors and depend on the methods and goals aimed to be achieved. Here are some key findings from previous research that depict various approaches in budgeting raw materials, direct labor, and production overhead:

a) **Increasing Efficiency through Structured Budget Strategies:** [6] demonstrate that training in budget preparation and profit-loss reporting can enhance SME managers' understanding of managing finances more efficiently. In this context, structured budgets help improve business sustainability. This is crucial

for small businesses and SMEs with limited resources but aiming to optimize financial management.

b) **Applying Standard Costs as Cost Control:** [7] found that implementing standard costs can help reduce discrepancies in raw material and direct labor costs, as well as prevent losses. Standard costing allows companies to have better control over expenditures, especially when facing price fluctuations. The application of methods like the least square is highly recommended for companies looking to optimize cost control.

c) **Expenditure Efficiency through Budget Information Systems:** [8] highlight that a lack of budget planning leads to inefficient cash expenditures. This study indicates that the development of a budget information system can enhance expenditure efficiency and achieve company objectives. This is relevant for companies wanting real-time control over their budgets, allowing for quicker adjustments to financial condition changes.

d) **Effectiveness of Budget as a Management Control Tool:** [9] asserts that at PT. Nadera Jaya Furniture, the production budget does not serve as an effective management control tool for regulating production costs. The study recommends reassessing the production budget's effectiveness to enhance its role in cost management. This implies that refining the production budget is crucial for improving cost control efficiency within the company.

e) **Using Proper Budgeting to Control Production Costs:** Sulisty [10] found that budgets for raw materials and direct labor at UD. Seragam Monalisa Kediri are not effective enough in controlling production costs. Therefore, more accurate budget preparation and the use of the Bill of Production (BOP) method are needed to enhance cost control. This approach is recommended for companies facing challenges in controlling raw material and labor costs.

f) **Cost Variance Analysis as a Tool for Production Cost Efficiency:** [11] show that cost variances in production at PG Wonolangan are unfavorable, particularly in raw materials and direct labor. Uncontrolled raw material cost variances exceeding the budget require a reevaluation of the budget. This study underscores the importance of variance analysis as a tool to enhance cost efficiency and identify discrepancies in the budget.

g) **Budgeting Strategies for SMEs in Financial Management:** [12] in a case study on UMKM SeGlass find that structured budgeting can help SMEs identify revenue sources, control expenditures, and prevent wastage. With the right budgeting strategy, SMEs can improve operational efficiency and productivity. This finding emphasizes the importance of structured budgeting for SMEs to achieve better financial goals.

h) **Controlling Profit with Profit-Loss Budgeting:** [14] in a study at DNA Bakery Tamban show that profit-loss

budgeting helps the company in planning and controlling expenditures and projecting net profit. This highlights the importance of profit-loss budgeting as a tool for enhancing financial control and operational efficiency.

- i) Implementing Variable Costing for Expenditure Efficiency: [15] demonstrate that using the Variable Costing method results in lower expenditures compared to the Full Costing method in the calculation of the cost of goods sold (COGS). This method more accurately reflects actual production costs, thereby increasing net profit. This finding is relevant for companies wanting to optimize production costs with a more efficient method.
- j) Assistance in Budget Preparation for SMEs: [16] show that technical assistance in budget preparation can help SMEs like Babyfynn Sass Bandung determine accurate selling prices and control costs. This assistance is relevant for SMEs needing support in managing budgets efficiently.
- k) Factors Affecting Planning and Control Budgets: [17] in their study identify that production cost budget, cost control, and cash budget significantly affect the planning and control budget in trading companies. This result affirms that good budget management can enhance the effectiveness of planning and control in companies.
- l) Effectiveness of Production Cost Budgeting for Cost Control: [18] find that an effective production cost budget can better control actual production costs at CV Megasari Inti Sinergi. This result highlights the importance of accurate production cost budgeting to enhance profitability through more effective cost control.
- m) Effectiveness of Production Cost Budgeting for Cost Control: [21], adopting a structured and methodical approach is essential for developing Lean frameworks. Their systematic literature review highlights critical components, such as design methods, theoretical considerations, and evaluation techniques, which play a vital role in ensuring the practicality and success of Lean framework implementation. The study underscores that well-constructed framework, like the introduced House of Guidance, offer a clear roadmap for enhancing processes and achieving better outcomes in Lean practices [21].
- n) Method for Conducting Systematic Literature Review (SLR) for Cyber Risk Assessment: Zahari Mohd Amin et al. (2022) introduced a systematic approach for conducting an SLR specifically tailored to cyber risk assessment. Their method involves three key stages: planning, conducting, and reporting the review. The process utilizes inclusion and exclusion criteria for screening results, with tools such as EndNote and the PRISMA flow diagram enhancing the organization and accuracy of the literature selection. This approach ensures a comprehensive and

precise identification of relevant studies, offering an alternative to traditional literature review methods. It is especially valuable for researchers aiming to analyze cyber risks systematically and in depth [22].

IV. CONCLUSIONS

This research demonstrates that optimizing raw material costs in the manufacturing sector requires a budgeting approach tailored to the specific needs of the company. Through systematic review, it has been proven that practices such as the implementation of information technology, the use of cost standards, and adaptive procurement strategies can significantly reduce raw material costs and improve operational efficiency. Technological approaches help enhance forecasting accuracy and reduce raw material waste, while cost standards allow companies to better control expenditures. Additionally, structured and well-planned budgets provide a solid foundation for companies to effectively manage costs, both in large corporations and SMEs.

The findings also highlight that there is still a need for further studies exploring the influence of industry context on the effectiveness of various budgeting methods, such as differences between sectors or scales of operation. Overall, the results of this study can guide manufacturing companies in implementing more efficient budgeting practices and provide a basis for future research in developing adaptive budgeting strategies that align with market dynamics. Additionally, identifying market opportunities and product sales growth, as well as planning operational marketing budgets, are essential for aligning with these market dynamics" [18].

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