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SUPPLY CHAIN PERFORMANCE: MATERIAL FLOW AND FINANCIAL FLOW THROUGH SUPPLIER RELATIONSHIP MANAGEMENT

Pudjo Sugito¹, Tanto Gatot Sumarsono¹, Syaiful Arifin¹

¹Faculty of Economics & Business, University of Merdeka Malang, Indonesia

**Corresponding author:* pudjo.sugito@unmer.ac.id

Abstract.

This study aims to analyze the direct influence of material flow and financial flow on supply chain performance, and also analyze the indirect influence through supplier relationship management on supply chain performance. This research is explorative with a survey technique as a data collection tool. Exogenous variables in this study are material flow and financial flow, endogenous variables are supply chain management performance and supplier relationship management as mediating variables. Material flow is the description of the transportation of raw materials, pre-fabricated parts, components, integrated objects, and final products as a flow of entities. The term applies mainly to advanced modeling of supply chain management. The indicators are inventory quantity, lead time, and out-of-stock. The population in this study was 124 business actors, with a sample of 100 business actors. The sampling technique used was simple random sampling. Questionnaires were used as primary data collection tools, which were then analyzed with the help of Smart Partial Least Squares analysis techniques. The results of the analysis show that there is a direct and significant influence of material and financial flow on supply chain management performance. In fact, supplier relationship management significantly mediates the influence of material flow and financial flow on supply chain management performance. Also, supplier relationship management has a significant influence on supply chain management performance. This means that both material flow, financial flow, and supplier relationship management play an important role in improving supply chain management performance. This research focuses only on and is limited to industries in Indonesia. Empirical assessments of the response diversity of suppliers provide buyer companies with an effective means to enhance their supply base management for resilience. The research result is useful for teaching to understand how to increase supply chain performance.

Keywords: Supply Chain, Material Flow, Financial Flow, Supplier Relationship Management

1. Introduction

A supply chain is a network of individuals and companies that are involved in creating a product and delivering it to the consumer. Links on the chain begin with the producers of the raw materials and end when the van delivers the finished product to the end user. Supply chain management is a crucial process because an optimized supply chain results in lower costs and a more efficient production cycle. Companies seek to improve their supply chains so they can reduce their costs and remain competitive.

In the dynamics of global market competition lately, the introduction of products with increasingly shorter life cycles, and increasingly high customer expectations for products and services, will certainly force companies to invest and focus on the supply chain to achieve



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competitive advantage in order to support the continuity of their business (Kaewchur et al, 2021; Sule & Oshi, 2022). At the same time, transportation and communication technology continues to develop rapidly, for example, mobile communication, the internet, has driven the ongoing evolution of the supply chain and techniques related to its management.

In a real product chain, raw materials are obtained and processed in processing facilities, then sent to storage warehouses, and then sent to customers or retailers. Consequently, to reduce prices and improve service quality, effective supply chain strategies must consider interactions at various levels in the supply chain that occur (Idris et al, 2023). The supply chain is also known as a logistics network, consisting of suppliers, manufacturing or manufacturing centers, warehouses, distribution centers, and retail stores, as well as raw materials, semi-finished goods, and finished products. Supply chain management carefully considers each facility that has a significant impact and plays a role in making products, to be able to adjust to customer needs. Of course, in some supply chain analyses, including suppliers and customers, because they have an impact and are related to the achievement of the supply chain. Measurement of supply chain management performance needs to be done. This is because high performance optimizes costs from the entire system, which includes transportation and distribution costs to raw material centers, semi-finished goods in the processing process, and finished goods. The meaning of cost suppression is not merely an effort to reduce transportation costs or reduce existing inventory, but an effort to develop through a comprehensive system approach to provide materials to products supported by adequate information technology in the entire existing supply chain. Of course, it is the target of every business entity. However, to achieve it, hard work is needed at all levels of management, from the bottom to the top. This means that a high spirit of collaboration is needed by releasing partial interests in each section (Zhong et al, 2022). Not only that, to realize this good performance, business entities must also be managed in an integrative manner, with a greater orientation towards achieving long-term goals than short-term goals (Partyka, 2022).

The role of material flow is very important in realizing supply chain management performance. This is because the smoothness of material has benefits on the efficiency of transportation costs and inventory costs, which are often relatively large in almost every manufacturing entity. Research on the importance of material flow management has been revealed in several studies, which state that inventory management systems can improve supply chain management performance (Oteki & Sakwa, 2020; Al Kurdi et al, 2022). Financial flow, as another factor in determining supply chain management performance, also has a significant effect on improving performance (Komal et al, 2022). In addition, the role of suppliers is very important, considering that without suppliers, the company will not be able to carry out its production activities. Therefore, supplier relationship management is very important in order to ensure the smooth supply of materials, especially raw materials, as the main input for the manufacturing entity. So it is not surprising that many studies have found a close relationship between supplier relationship management and supply chain management performance (Azis et al, 2023). Based on several previous studies, the hypothesis formulation is as follows:

H1: Material Flow significantly affects supply chain performance,

H2: Financial Flow significantly affects supply chain performance,

H3: Supplier management relationship significantly affects supply chain performance

H4: Material flow and financial flow through supplier relationship management significantly affect supply chain performance,



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Based on the research objectives, several previous studies, and the formulation of hypotheses that have been described, the conceptual framework for the research is as follows

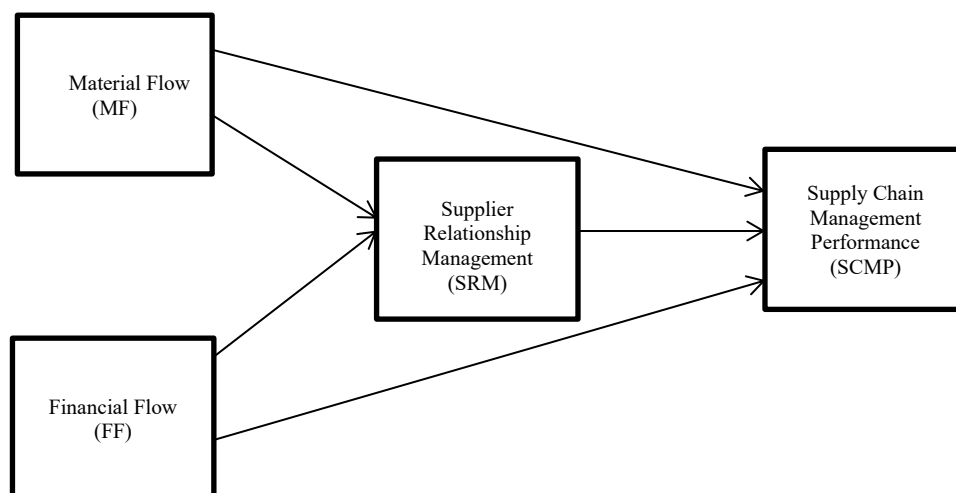


Figure 1. Research Framework

2. Research Method

Research on supply chain management performance is explorative in nature, with survey techniques as a primary data collection tool. Consisting of 3 (three) research variables, namely, exogenous variables in this study are material flow and financial flow, endogenous variables are supply chain management performance and supplier relationship management as mediating variables. Material flow is the description of the transportation of raw materials, pre-fabricated parts, components, integrated objects, and final products as a flow of entities. The term applies mainly to advanced modeling of supply chain management. Indikatornya adalah kuantitas persediaan, lead time dan out of stock. Financial flow consists of transactions and other flows and represents the difference between the opening financial balance sheet at the start of the year and the closing balance sheet at the end of the year. Indicators are cash inflows and cash outflows. Then, Supply chain performance refers to the extended supply chain's activities in meeting end-customer requirements, including product availability, on-time delivery, and all the necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner. Supplier relationship management is a systematic approach to planning, evaluating, and managing goods or services from suppliers/vendors/or providers. The indicators use inventory investment, inventory efficiency, and forecasting accuracy. While supplier relationship management is the systematic approach to evaluating vendors that supply goods, materials, and services to an organization, it involves determining each supplier's contribution to success and developing strategies to improve their performance. The population in this study was the SME entities in the Gerbang Kertasusila area, East Java, Indonesia, totaling 124 units, with a sample of 96 SME entities. The sampling technique used was proportional random sampling.



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The analysis technique for processing primary data consists of outer model and inner model analysis. In addition, a goodness-of-fit model test is needed, which aims to test the predictive power of the model and the feasibility of the model. The criteria that must be met include (a). Q2 predictive relevance to see the predictive power of the model => smartpls blindfolding output and (b). Model Fit to see whether the model and data are feasible to test the influence of variables. The requirement is that SRMR must be less than 0.10. Finally, the inner model test. This stage is carried out to test the significance of the direct influence of exogenous variables on endogenous variables, as well as the significance of mediating variables on the influence of exogenous variables on endogenous variables. In this significance test, it can be stated to have a significant effect if the p value <0.05 or T value > 1.96 (Hair et al, 2021).

3. Result

3.1 Result of Outer Model

The results of the outer model analysis describe the relationship between latent variables and their indicators. This measurement model is used to test the validity and reliability of a construct. This outer model analysis can be carried out through several tests, namely convergent validity, discriminant validity, and composite reliability tests. First, Convergent Validity is a measurement model with a reflective indicator model that is assessed based on the correlation between item scores and construct values. The basis used in this test is that an indicator will be considered valid if the outer loading factor value is > 0.5 or the AVE (Average Variance Extracted) value is > 0.5 (Hair, 2021). The results show that the outer loading factor value is > 0.5 for each variable. This means that the material flow, financial flow, supplier relationship management, and supply chain management performance variables have high individual reflective measures, and each item is valid.

Table 1. Outer Loading Values of Latent Variables for Convergent Validity Test

Indicators of Research Variables	Material Flow (X1)	Financial Flow (X2)	Supplier Relationship Management (Y1)	SCM Performance (Y2)	Notes
X1.1	0.761				Valid
X1.2	0.863				Valid
X1.3	0.803				Valid
X1.4	0.764				Valid
X1.5	0.769				Valid
X2.1		0.813			Valid
X2.2		0.811			Valid
X2.3		0.800			Valid
X2.4		0.763			Valid
X2.5		0.790			Valid
Y1.1				0.738	Valid
Y1.2				0.828	Valid
Y1.3				0.808	Valid
Y1.4				0.747	Valid
Y1.5				0.804	Valid
Y2.1			0.829		Valid
Y2.2			0.842		Valid
Y2.3			0.768		Valid



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Indicators of Research Variables	Material Flow (X1)	Financial Flow (X2)	Supplier Relationship Management (Y1)	SCM Performance (Y2)	Notes
Y2.4			0.799		Valid
Y2.5			0.890		Valid

Source: processed data, 2024

Table 2: Average Variance Extracted (AVE)

Research Variable	Average Variance Extracted (AVE)	Rule of Thumb	Notes
Material Flow (X1)	0.628	> 0.05	Valid
Financial Flow (X2)	0.627		Valid
Supplier Relationship Management (Y1)	0.670		Valid
SCM Performance (Y2)	0.620		Valid

Source: processed data, 2024

Furthermore, it can be seen in Table 2 that the average variance extracted (AVE) value is > 0.5 for each variable. This means that the material flow, financial flow, supplier relationship management, and supply chain management performance variables have good convergent validity values and are valid.

3.2 Discriminant Validity

Discriminant validity is a measurement model with a reflective model of indicators that are assessed based on cross-loading of measurements with constructs. The basis used in this test is that an indicator will be considered valid if the cross-loading value is > 0.70 . The analysis shows that the cross-loading value is > 0.7 for each variable. The cross-loading value for each variable is higher than the correlation of the indicators and other variables. This means that each variable is able to predict the indicators in its block better than the indicators of other blocks. Therefore, it can be concluded that the construct of each item is discriminantly valid.

3.3 Composite Reliability.

Composite reliability is a test conducted to prove accuracy and consistency in measuring constructs. A variable can be declared reliable if it has a composite reliability value > 0.7 (Ghozali & Latan, 2015). In addition, this test can be strengthened by the Cronbach's alpha value, where the criteria that must be met by a variable in order to be declared reliable are the same as composite reliability, namely the Cronbach's alpha value > 0.7 (Ghozali & Latan, 2015).

Based on the analysis, it is revealed that the composite reliability and Cronbach's alpha values are > 0.70 for each variable. This means that the material flow, financial flow, supplier relationship management, and supply chain management performance variables have high reliability and meet the reliable criteria. Thus, the quality of the measurement model used in this study is valid and reliable, and can be continued to the outer model analysis stage.

3.4 Result of Inner Model Analysis

In this section, the results of the inner model analysis will be described, which are revealed by the large values of R-squared and Q-squared.



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3.4.1 R Square (R^2)

R^2 is a test used to measure the extent to which exogenous variables contribute to endogenous variables. The basis used in this test is that if the R^2 value is 0.75, 0.50, and 0.25, it means that the structural model is in the strong, moderate, and weak categories, respectively (Ghozali & Latan, 2015). Meanwhile, the results of data processing in this study are shown in the following table.

Table 3. R Square (R^2)

Research Variable	R Square	R Square Adjusted
Supplier Relationship Management (Y1)	0.450	0.437
SCM Performance (Y2)	0.671	0.659

Source: processed data, 2024

Based on Table 3, it is revealed that the R^2 value for the supplier relationship management variable is 0.450, which means that the material flow and financial flow variables have a moderate contribution of 45% to the supplier relationship management variable. While the R^2 value for the supply chain management performance variable is 0.671. This means that the material flow, financial flow, and supplier relationship management variables have a strong contribution of 67% to the supply chain management performance variable.

3.4.2 Q Square (Q^2)

Q^2 is a test used to assess model suitability. The basis used in this test is that if the Q^2 value > 0 , then the model has predictive relevance. Meanwhile, if the Q^2 value < 0 , then the model lacks predictive relevance (Ghozali & Latan, 2015).

Table 4. Q Square (Q^2)

Research Variable	Q Square
Supplier Relationship Management (Y1)	0.289
SCM Performance (Y)	0.399

Source: Processed Data, 2024

Based on table 4, it is revealed that the Q^2 value > 0 for both the supplier relationship management variable and the supply chain management performance. This means that the model is considered to have predictive relevance. Table 6 also explains that material flow and financial flow have a contribution of 0.289 to the supplier relationship management variable. While material flow, financial flow, and supplier relationship management have a contribution of 0.399 to the supply chain management performance variable.

3.4.3 Result of Hypothesis Test

Bootstrapping is a resampling procedure used to solve data problems that have a relatively small number of samples. The basis used in testing this hypothesis uses the criteria of t-statistic value > 1.96 and p value < 0.05 (significance level = 5%) (Ghozali & Latan, 2015).

Table 5. Hypotheses Test

	Original Sample (O)	Standard Deviation	T Statistics	P Values
Material Flow → SCM Performance	0.530	0.160	3.307	0.001
Financial Flow → SCM Performance	0.408	0.167	2.452	0.015
Supplier Relationship Management → SCM Performance	0.404	0.120	3.373	0.001
Material & Financial Flow → Supplier Relationship Management → SCM Performance	0.466	0.174	2.895	0.041

Source: Processed Data, 2024

Based on the results of the hypothesis test in table 5, both directly and indirectly it can be seen that the coefficient value is at a certain level of significance, where the basis used to test the hypothesis is the t-statistic value > 1.96 and p value < 0.05 (significance level 5%) (Hair, J. F. (2021). Based on Table 7, it is revealed that the first hypothesis (H1) 1 which states that material flow has a direct and significant effect on supply chain management performance, is accepted. This is because it has a T-statistic value of $3.307 > 1.96$ and a P value of $0.001 < 0.05$. The fourth hypothesis (H2), which states that financial flow has a significant effect on supply chain management performance, is proven correct. This is because the T Statistics are $2.452 > 1.96$ and have P values of $0.015 < 0.05$. The third hypothesis (H3), which states that supplier relationships have a significant effect on supply chain management performance, is also proven correct; This is because it has a T-Statistic value of $3.373 > 1.96$ and a P value of $0.001 < 0.05$. Furthermore, the sixth hypothesis (H4), which states that supplier relationships mediate the influence of material flow and financial flow on supply chain management performance, is also empirically proven to be true. This is because it has a T-statistic of $2.895 > 1.96$ and a p-value of $0.041 < 0.05$.

4. Discussion

Based on the hypothesis research results, material flow has a significant effect on supply chain performance. These research findings support two previous studies of the linkage between material flow and supply chain performance (Odek & Sakwa, 2020, and Al Kurdi et al, 2022). It means that improving supply chain performance requires material management by formulating material planning, monitoring, and lead time management, and implementing them as well as possible. In formulating material planning, it should consider the future needs of material by forecasting based on past material usage. Besides, supplier relationship management has a significant effect on supply chain management performance. This finding supports three previous studies of the relationship between material management and performance of supply chain management (Anh & Ha, 2020; Yehuala, 2023 & Azis et al., 2023) their research found that supplier relationships encourage the increase of supply chain



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performance. Also, supplier relationship management mediates both the effect of material flow and financial flow toward supply chain performance. However, the coefficient effect of supplier relationship management in mediating financial flow toward supply chain management performance is larger than mediating the effect of material flow toward supply chain management performance. This finding became a novelty of this research that, of course, contributes to the management science enrichment, specifically in the supply chain management area. Even, there is no previous research that places supplier relationship management as a mediating variable in the relationship between materials and financial flow with supply chain performance. It means this research topic is also a new research topic in the area of supply management science. Therefore, the findings of this research extremely contribute to science management.

5. Conclusion

Based on the research result analysis, it can be concluded that in order to improve supply chain performance, managers should be concerned with material management and financial management as well. It means that the manager should manage material flow and financial flow as fast as possible. Even to multiply supply chain performance, it should create a good relationship with the supplier. In other words, it requires a long time of supplier relationship management. In that way, supply chain performance can be improved, which finally contributes to the company's goal achievement overall.

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