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The Influence of Lean Supply Chain, Information Technology and Socially Oriented Sustainability on Operational Performance in Panel Manufacturing Companies

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Abstract

This study of panel manufacturing firms examines lean supply chains, information technology, and socially-oriented sustainability. Just-in-time statistical process control and lead time reduction have three dimensions in this study of thin supply chains. Big data, cloud computing, and the internet of things focus on this study's information technology dimensions. Safety and health, employee well-being, and product responsibility are all socially-oriented sustainability variables that can be measured. The primary data used in this study comes from the distribution of questionnaires to 4-panel manufacturing company employees. The purposive sampling method was used to select the research sample, resulting in 185 models from four-panel manufacturing companies. It is used for hypothesis testing in the form of SEM using IBM AMOS 24 software and IBM SPPS 22. Research shows that lean supply chains positively impact social sustainability and operational effectiveness. Data shows that IT can directly affect social sustainability and operational performance. A positive correlation was found between operational efficiency and socially conscious sustainability. The results of this study provide information that applying a lean supply chain and information technology can improve socially oriented sustainability and the company's operating performance, which will later create sustainability performance that can benefit all parties, both within the company and the community around the company.

Keywords
lean supply chain; information technology; social sustainability orientation; operational performance

I. Introduction

Indonesia's manufacturing sector is an important engine of growth for the country (Prihadyanti, 2015). The dynamic nature of the manufacturing industry encourages companies to become more efficient in producing high-quality products at lower costs in the shortest time possible (Novais et al., 2020).

Separate research groups have examined lean, agility, and sustainability. Environmental sustainability may be compatible with a short supply chain. However, research into social sustainability is still underappreciated, as is the difficulty of integrating social sustainability objectives with lean supply chains. (Ciccullo et al., 2018).

Supply chains benefit significantly from adopting lean and agile methods because they maximize operational efficiency while allowing quick and flexible responses to rapidly changing market demands (Raji et al., 2021).

The use of information technology has boosted the supply chain's effectiveness and efficiency (Sanders & Premus, 2002). Research into supply chain technology is still ongoing. It significantly impacts company productivity through integrating the supply chain, such as RFID, cloud computing, blockchain, and big data (THUN, 2010).

Several critical aspects of global supply chains, including worker health and safety, working conditions, human rights, and social impacts, necessitate companies to implement various socially sustainable supply chain practices (Winter & Knemeyer, 2013).

Based on articles (Nath & Agrawal, 2020), (Ganbold et al., 2021), and (Croom et al., 2018), researchers are interested in conducting a study with the title: "The influence of lean supply chains, information technology and socially oriented sustainability on operational performance in panel manufacturing companies."

1.1 Formulation of the Problem

In light of the information provided in the preceding paragraphs, the problem that will be the subject of this investigation can be stated as follows:

1. Is there any influence of a *lean supply chain* on *social sustainability orientation*?
2. Is there any influence of *information technology* on *social sustainability orientation?*
3. Is there any influence of a *lean supply chain* on operational performance?
4. Is there any influence of *information technology* on operational performance?
5. Is there any influence of *social sustainability orientation* on operational performance?

1.2 Problem Goal

1. To test and analyze the influence of the lean supply chain on social sustainability orientation.
2. To test and analyze the impact of information technology on social sustainability orientation.
3. To test and investigate the effect of a lean supply chain on operational performance.
4. To test and analyze the impact of information technology on operational performance.
5. To test and analyze the influence of social sustainability orientation.

II. Review of Literature

2.1 Lean Supply Chain

Currently, most industries are trying to produce customized products. It is challenging for large-scale enterprises to effectively create product design and production control to meet the demands and needs of products according to consumer tastes through *lean supply chain techniques* (Abualfaraa et al., 2020).

2.2 Information Technology

The use of information technology by local government agencies, educational institutions, businesses, health care providers, and their employees to produce significant improvements and positive changes in urban society (transformation) is an essential element for controlling the community in the corporate environment that supports innovation and knowledge dissemination (Romanelli, 2020).

2.3 Social Oriented Sustainability

It is defined as the extent to which a company's activities impact the social environment and its community, as well as the company's global commitment to all social sustainability practices through its supply chain, in terms of social sustainability orientation (Nath & Agrawal, 2020; Croom et al., 2018).

2.4 Operational Performance

Operational performance is defined by Pintado and Ahmadi (2021) as the ability achieved by the company in the form of product development efficiency, process improvement, quality uniformity, and quicker product completion times (short lead times). Development is a change towards improvement (Shah et al, 2020). Short lead times, suitable production conditions, and effective production decisions contribute to increasing the company's level of social sustainability orientation. This, in turn, leads to a boost in the company's operational efficiency. Consequently, a focus on social responsibility positively affects operational efficiency (Narkhede, 2017; Hasan, Asaad, and Rosman I., 2018).

III. Research Method

3.1 Data Collection

A questionnaire was distributed to employees of PT. Deltakita Tatajaya, PT. Kifa Citra Mandiri, PT. Suryamas Elsindo, and PT Sumber Budi Sakti Indonesia, were directly relevant to the problem variables being studied. Research in this area makes use of independent and dependent variables, as well as mediating variables (Mediating Variable). It is hypothesized in this study that five variables, namely the lean supply chain and information technology (information technology), are linked via the medium of social sustainability orientation to operational performance (operational performance).

Data used in this study was gathered by distributing online questionnaires and then collecting responses from participants. Respondents were asked to rate themselves on a scale of 1 to 5. A total of four manufacturing companies in West Jakarta were surveyed to gather data. Two electrical manufacturing companies in Indonesia are studied and analyzed in this study using the SEM method. This study's sampling strategy makes use of probability sampling. Based on the description (Hair JR et all, 2010), the sample and population used in this study is 120 times the number of indicators, 24 X 5 = 120. A sample size of 185 was chosen in this study to meet the Maximum Likelihood Estimate (ML).

Table 1. Sample Composition of Each Company

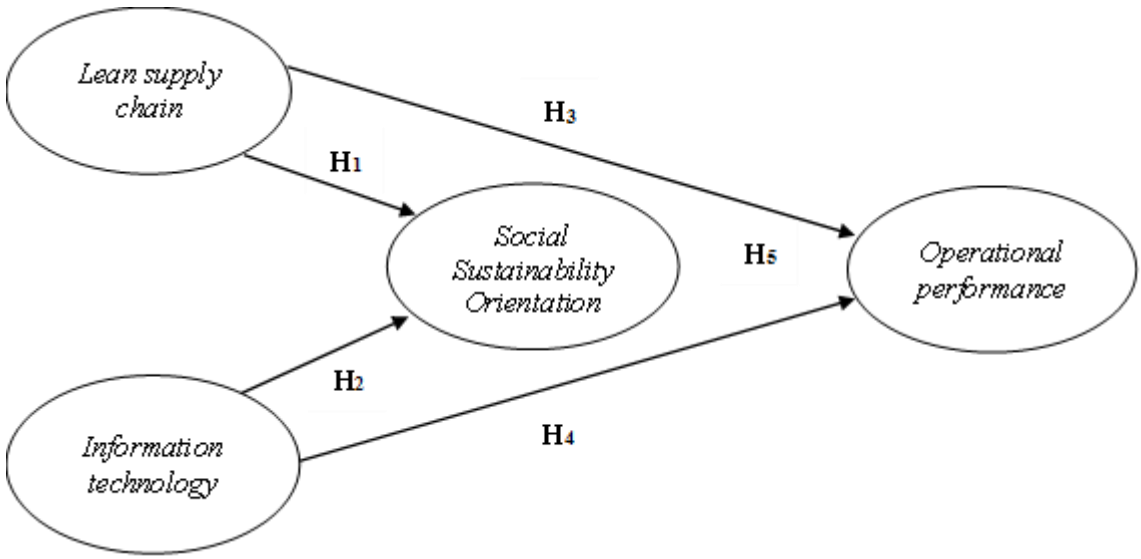
No	Company	Number of Samples
1.	PT. Delta Kita Tatajaya	48
2.	PT. Suryamas Elsindo	45
3.	PT. Kifa Citra Pratama	50
4.	PT. Source Budi Sakti	37
	Total =	185

No	Company name	Long-Standing	Company Products
1.	PT. Delta Kita Tatajaya	23 years	Industrial Pumps, LVMDP (*low voltage main distribution panel)*
2.	PT. Suryamas Elsindo	26 years	Relay, Transformer, MCB (*miniature circuit braker)*, MCCB *(Moulded Case Circuit Braker)*, ACB *(Automatic Circuit Braker)*
3.	PT. Kifa Citra Pratama	22 years	LVMDP Panel, MCC Panel, Capacitor Bank, Electricity for *Medium Voltage*
4.	PT. Source Budi Sakti	16 years	Box Panel, Bank Capacitor, and Control Panel

Before using SEM to model the data, surveys were distributed and their validity and reliability evaluated (Structural Equation Model). IBM AMOS 24 was used to perform tests for fact and dependability. After that, IBM AMOS 24 was used to perform a confirmatory factor analysis (CFA). According to Bandur and Bidastuty (2019), Confirmatory Factor Analysis (CFA) is an improved method for determining whether research concepts have been proven to be reflected or applied to relevant indicators. Structural Equation Modeling (SEM) examines CFA (SEM). This is why a crucial part of SEM is creating detailed model specifications (Budiastuty & Bandur, 2020).

3.2 Theoretical Framework

According to the research of Nath and Agrawal (2020), the operational performance antecedents include a lean supply chain, agility, and a socially sustainable outlook. Every one of these factors has the potential to have an impact on operational efficiency in one way or another. Using the antecedents of the lean supply chain, information technology, and social sustainability orientation as variables, this study examines operational performance. The thin supply chain and information technology can directly influence the social sustainability orientation and operational performance. Information technology and the lean supply chain can directly impact operational performance. Still, an organization's commitment to social sustainability can have an equally significant indirect impact (indirect effect). The agility variable from Nath and Agrawal's research has been replaced by an information technology-based variable in this study, making it unique (2020). In this context, a lean supply chain and modern information technology link social sustainability and operational performance. An information technology-based thin supply chain mediates the link between a company's social sustainability orientation and its operational performance, as explained in more detail in the conceptual framework below.



Source: Nath and Agrawal (2020)

Figure 1. *Conceptual Framework*

IV. Results and Discussion

4.1 Descriptive Statistics

According to this study, the respondent's answer scale is from 1 to 5. The researcher calculated an index value to understand how respondents felt about the instrument. A 100-point scale will be used to convert the answer range for interpretation. As a result, the content of responses will be from 20 to 100. The (100-20)/3 = 26.67 intervals are used to interpret the index value using the three box criteria (three box method).

Table 2. Category Descriptive Analysis Index Value

Category Scoring Range	Interpretation
20.00 – 46.66	Low Interpretation
46.67 – 73.33	Medium Interpretation
73.34 – 100	High Interpretation

At this stage, a descriptive analysis is carried out by looking for the highest index value, the lowest index, and the average index value for each question indicator contained in this study. The following are the results of the descriptive analysis carried out :

1. Lean Supply Chain Variable Answer Score Index Value
   It is categorized as medium with an average index value of 60.35%. According to the respondents, this proves that the lean supply chain has a moderate interpretation.
2. Information Technology Answer Score Index Score
   It is categorized as medium with an average index value of 58.37%. According to the respondents, this proves that the lean supply chain has a moderate interpretation.
3. Social-Oriented Sustainability Answer Index Score
   It is categorized as medium with an average index value of 58.21 %. Based on this, it proves that socially oriented sustainability has a moderate interpretation according to the respondents.
4. Operational Performance Answer Score Index Score
   It is categorized as medium with an average index value of 60.35%. Based on this, it proves that operational performance has a moderate interpretation according to the respondents.

4.2 Validity Test

An indicator or question is valid if the r-correlation value is higher than the r-table or the significance value is < 0.05.

1. Lean Supply Chain Validity Test
   Because the r-count is greater than the r-table and the significance is less than 0.05, all questions are valid measures of the Lean Supply Chain variable.
2. Information Technology Validity Test
   Because all question items, the value of r-count > r-table is 0.361, and the significance of the correlation value is <0.05, it proves that all question items are valid as a measure of the information technology variable.
3. Social Sustainability Orientation Validity Test
   R-table 0.361 and significance 0.05 show that all items in the Social Sustainability Orientation variable are valid r-count > r-table.

4. Operational Performance Validity Test

Because the correlation value obtained r-count> r-table 0.361 and a significance value <0.05 proves that all question items are valid as a measure of the Operational Performance variable.

4.3 Reliability Test

A statement item with a Cronbach Alpha value greater than 0.7 is considered reliable. The following is a calculation of the reliability of the five variables in this study.

Table 3. Reliability Test

Variable	Alpha Cronbach's	Description
Lean Supply Chain	0.831	Reliable
Information Technology	0.805	Reliable
Social Sustainability Orientation	0.908	Reliable
Operational Performance	0.876	Reliable

According to the reliability test results, the Cronbach's alpha value for Lean Supply Chain was 0.831, Information Technology was 0.805, Social Sustainability was 0.908, and Operational Performance was 0.876. Because Cronbach's alpha values obtained are each > 0.8. This means that each variable has high reliability or good consistency as a measuring tool.

4.4 Research Results

Structural Equation Modeling model output is presented in the table below:

Table 4. Regression weight Structural Model Hypothesis Testing

Hypothesis			Estimate	SE	CR	P	Information
lean Supply Chain	--->	Social Sustainability Orientation	0.610 _	0.088 _	6,913	0.000 _	Positive influence
Information Technology	--->	Social Sustainability Orientation	0.291 _	0.099 _	2,933	0.003 _	Positive influence
Information Technology	--->	Operational Performance	0.352 _	0.075 _	4,694	0.000 _	Positive influence
Social Sustainability Orientation	--->	Operational Performance	0.258 _	0.065 _	3,944	0.000 _	Positive influence
lean Supply Chain	--->	Operational Performance	0.277 _	0.072 _	3,842	0.000 _	Positive influence

Empirical model testing is done by testing the hypotheses developed from the model. H0 should be rejected if the critical ratio (CR) is more significant than 1.96 and the p-value is less than 0.05. And from the overall results, the hypothesis is accepted, which means it shows that H1 to H5 have a positive effect.

V. Conclusion

According to a study involving four manufacturing companies and 185 respondents, lean supply chains positively impact social sustainability; therefore, H1 is accepted. This study's testing of hypothesis 2 revealed that information technology positively affects operational performance, so H2 is accepted. This study's testing of hypothesis 3 revealed that information technology positively impacts social sustainability; therefore, H3 is accepted. In addition, this study's testing of hypothesis 4 revealed that lean supply chains positively impact operational performance, so H4 is accepted. As a result, H5 has been accepted as the hypothesis that social sustainability improves operational performance.

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