Analysis Smart Supply Chain (Ssc) and Supply Chain Resilience in Supporting Smart Technology and its Impact on Operational Performance on A Geothermal Company

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A B S T R A C T

This research aims to analyze the influence of smart supply chain to operational performance, supply chain resilience and smart technologies as well as roles smart technologies in mediating smart supply chain to operational performance and moderate supply chain resilience to operational performance at a geothermal company. The sampling design used in this research is a non-probability sampling with purposive sampling technique. The processed data came from 242 respondents and then analyzed using Structural Equation Modelling (SEM) method. The research found that smart supply chain has positive influence on operational performance, supply chain resilience and smart technologies, and supply chain resilience has positive influence on smart technologies and operational performance and smart technologies has positive influence on operational performance. The research results found smart technologies able to mediate the influence of smart supply chain toward operational performance but not able to moderate the influence supply chain resilience to operational performance. This study shows that operational performance can be maximized and optimized using smart supply chain technologies to support the implementation of smart technology.

A R T I C L E   I N F O

INTRODUCTION

Indonesia is a country rich in renewable resource potential and has the potential to produce 3,600 gigawatts (GW) of renewable electrical energy originating from geothermal energy, sun, wind, ocean currents, waves, bioenergy and hydro. Based on regional typology, Indonesia currently has more than 4,400 potential rivers, of which 128 are large rivers. The Mamberamo River in Papua has a potential of 24,000 megawatts (MW), the Kayan River in North Kalimantan has a potential of 13,000 MW, then renewable energy sourced from Indonesian geothermal energy is in the area ring of fire (EBTKE, 2023).

Even though Indonesia has potential as a supplier of electricity from renewable energy, breakthroughs in supply chain infrastructure are still limited. The government seeks to optimize the energy transition through implementation smart system and digitalization in the energy sector. Smart system applied to increase efficiency, convey information, and improve people's welfare thanks to digital technology and New Renewable Energy (EBT) as drivers of the ongoing energy transition (EBTKE, 2022).

The digitalization process increases efficiency and creates competitive advantages. Advanced technology integration transforms traditional supply chains into data-driven powerhouses. In the ever-evolving energy industry, digital practitioners are implementing Smart Supply Chain using technology and automated data analysis to optimize the flow of goods and services (Atria Innovation, 2023), so that Smart Supply Chain can improve operational efficiency and achieve unprecedented levels of sustainability in the oil and gas industry.

Smart supply chain in the geothermal industry in Indonesia it can be done from upstream to downstream, currently the final consumer for Geothermal company electricity output is the State Electricity Company (PLN) which is the sole consumer, thus making the flow of the electricity supply chain very dependent on the

technology owned by the company and the cooperation that exists. Intertwined with PLN, the Geothermal company implements several technologies smart supply chain such as the use of RFID, real-time monitoring who can measure output electrically real-time as well as artificial intelligence which in real time is able to inform the supply chain conditions to supplier and consumers as well as a solution for optimizing Warehouse Management. Where just by directing the RFID scanner to the part of the stock you want to track, the company can track more than 100 items per second with an accuracy of up to 99% using RFID.

Supply Chain Resilience the company is shown when the company is in difficult situations beyond the company's control such as the COVID-19 pandemic, wars in Russia and Ukraine, and the war in the Gaza strip. Situations like this can affect the company's supply chain which can reduce company efficiency and performance. Application Smart Supply Chain can support Supply Chain Resilience (Alkhatib & Momani, 2023) because it can reduce dependence on humans and offers automation which can make the supply chain more organized because it can adapt to current conditions.

In the long term, this problem can be addressed with a slower but permanent impact on the supply chain. Supply chain leaders can address challenges in the form of short-term shocks and deeper structural reforms. Structural reform may be the only way for leaders to restore corporate resilience in supply chains (Behl et al, 2022).

Application smart supply chain (SSC) can speed up the implementation of smart technologies (Alkhatib & Momani, 2023). In industry 4.0, digitalization of services is necessary with implementation Internet of Things (IoT) and Enterprise Resource Planning (ERP) on supply chain to significantly improve operational performance metrics. Some companies have increased production 10 to 200 percent, reduced product costs 5 to 40 percent, and reduced time to market 30 to 90 percent. Put forward

by the site https://www.prieds.com/post/smart-supply-chain-dengan-iot-dan-erp, that the industry seeks to increase operational flexibility and the ability to change production volumes (Prieds.com, 2020), IoT facilitates data exchange real-time inside supply chain, creating a unified view of production, planning, inventory, quality and delivery forecasting. These tools can create transparency and trust, as well as reduce costs and risks supply chain. For example, it can receive signals when raw materials are out of stock, or track the flow of materials using geolocation to speed up distribution chain operational processes and have a direct impact on cost reduction.

This research aims to analyze the effect of using smart supply chain in supporting implementation of the smart technology in energy companies which can improve the company's operational performance in the energy sector.

LITERATURE REVIEW
Supply Chain Management (SCM)
Supply Chain Management (SCM) is an integrated process that is integrated in the supply chain using information technology to manage relationships between companies and suppliers, customers and business partners. Supply Chain Management involves controlling the flow of goods and services and includes processes that convert raw materials into a product. The SCM process involves active rationalization of the company's supply side activities to achieve competitive advantage in the market (Lukman, 2021).

Smart Supply Chain
A smart supply chain combines all these perspectives and leverages supply chain operations through the adoption of digital technologies, particularly with regard to digital technology bases, i.e. generic digital technologies used in a variety of different applications and domains such as IoT, cloud computing, big data, and artificial intelligence (AI) (Lerman et al., 2022). SSC can be used in supply, production and distribution processes to connect upstream and downstream units of the supply chain real time. This reduces channel costs and improves operational efficiency (Li, 2020).

Supply Chain Resilience
Supply Chain Resilience is the adaptive capacity of supply chain to predict and respond to disruptions quickly and efficiently, and achieve better operational conditions after disruptions (Alkhatib & Momani, 2023).

Network supply chain designed with both proactive and reactive capabilities allows reducing the likelihood of disruption events, thereby bringing the organization to a stronger and more sustainable state (Juan et al., 2022).

Smart Technologies
Smart technologies such as Industrial IoT, Big Data Analysis, and cloud is the main supporter in smart technology company. Features of this technology are incorporated into devices that enable the system to work intelligently. Smart devices have sensors to collect, analyze and infer data, and communicate with other smart devices (Lee et al., 2023).

Conceptual Framework for Research
One of the efforts for a company's business success is supply chain management. By understanding the supply chain, companies can design strategies Smart Supply Chain as well as Supply Chain Resilience to win the competition and achieve good operational performance.

Research by Lee at al., (2023) found three perspectives smart supply chain management which forms operational performance that is instrumented supply chain, interconnected supply chain and intelligent supply chain, This research found these three factors that support implementation supply chain in improving the company's operational performance. This finding is possible supply chain oriented to the latest technology. Therefore, the success of SCM will depend on implementation smart supply chain technologies. Meanwhile, research from Alkhatib and Momani (2023) uses variables smart

technologies to moderate influence supply chain resilience to operational performance.

Based on the explanation above, the role of smart Supply Chain Technologies toward Operational Performance in a research framework is as follows:

Hypothesis Formulation

Previous research by Lee et al. (2023) found a positive influence between Smart Supply Chain and Operational Performance, other research from (Li, 2020) also found something similar, where implementation Smart Supply Chain can reduce distribution channel costs and be more environmentally friendly. In addition, research by Sarkis et al. (2021) found the influence of digitalization on Operational Performance, as well as roles Supply Chain Resilience in supporting implementation Smart Technologies.

Smart Supply Chain is a series of technologies consisting of IoT, cloud computing, big data, and artificial intelligence artificial intelligence (AI) (Lerman et al., 2022). Purpose of application Smart Supply Chain is to improve the company's operational performance through efficiency and faster processes with support Smart Supply Chain. Previous research by Lee et al., (2023) found a positive influence between Smart Supply Chain to Operational Performance, This result is supported by research from Lerman et al., (2022) and Bag et al. (2020) who found a positive influence from implementation Smart Supply

Chain to Operational Performance. Based on the explanation and research results above, in this study the researcher formulated a hypothesis, namely:

H1: Smart Supply Chain influences Operational Performance positively.

Supply Chain Resilience is the adaptive capacity of supply chain to predict and respond to disturbances to recover quickly and efficiently so as to achieve ideal and better operational conditions after disturbances (Alkhatib & Momani, 2023). Smart Supply Chain can support Supply Chain Resilience with automation features in the deployment of Smart Supply Chain. Research by Shen & Sun (2023) shows the role of smart supply chain in improving supply chain resilience on the JD.com site. Research by Tortorella et al. (2022) and Ivanov et al. (2021) also shows the positive influence of smart supply chain toward supply chain resilience. Based on the explanation and research results above, in this study the researcher formulated a hypothesis, namely:

H2: Smart Supply Chain positively influences Supply Chain Resilience.

Smart Technologies allows a company to generate more sales or higher margins than competitors. (Twin, 2023). Implementation smart supply chain can improve performance smart technologies at the company. Research by Lee et al., (2023) show
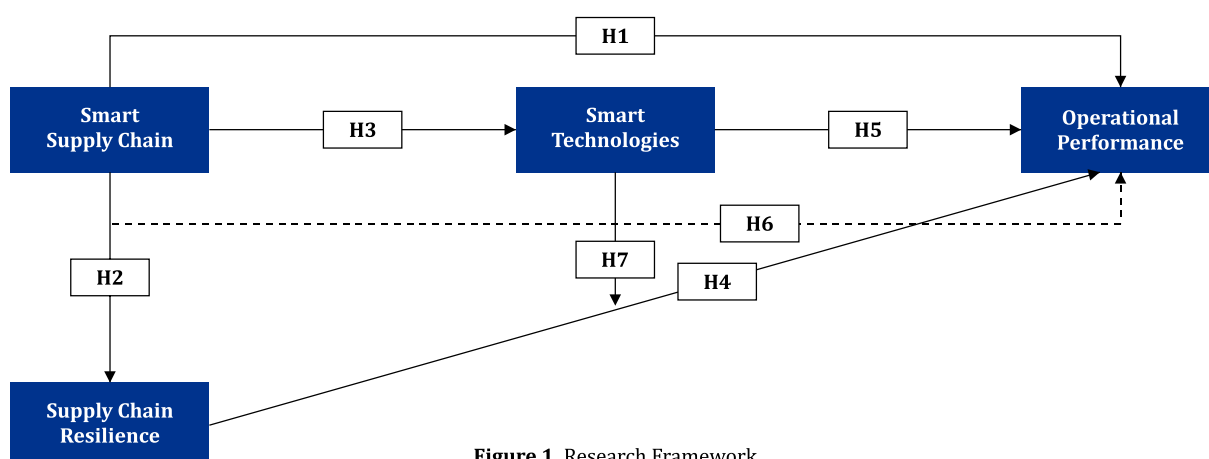

Figure 1. Research Framework

that smart supply chain support implementation smart technologies. Research by AlMulhim (2021) and Hota et al. (2022) also found a positive influence on implementation smart supply chain to smart technologies. Based on the presentation and research results above, in this study the researcher formulated a hypothesis, namely:

H3: Smart Supply Chain positively influences Smart Technologies.

The role of the supply chain is increasingly important in a company's operational performance. The company's operational performance will be better with a supply chain that can adapt to the environment and business demands. Supply chain resilience have a positive influence on operational performance. Research by Alkhatib & Momani (2023) shows that there is a positive influence between supply chain resilience to operational performance. Research by Juan et al. (2022) and Ramakrishna et al. (2023) also showed similar results. Based on the explanation and research results above, in this study the researcher formulated a hypothesis, namely:

H4: Supply Chain Resilience positively influence the Operational Performance.

Implementation smart technologies increase operational performance on companies. Research by Lee et al., (2023) shows that smart technologies support operational performance. Research by Alkhatib & Momani (2023) also found similar results. However, research by AlMulhim (2021) found different results, showing that smart technologies has no effect on operational performance. Based on the explanation and research results above, in this study the researcher formulated a hypothesis, namely:

H5: Smart Technologies positively influence the Operational Performance.

The success of the smart supply chain improving operational performance depends on the technology owned by the company. Smart technologies includes the implementation of internet of things, big data and artificial intelligence on smart supply chain. Smart technologies can mediate the relationship between smart supply chain to operational performance. Research by Lee et al. (2023) dan Al-Ayed & Al-Tit (2023) shows that smart technologies were able to mediate the relationship between smart supply chain and operational performance. Based on the explanation and research results above, in this study the researcher formulated a hypothesis, namely:

H6: Smart Technologies mediates the relationship between Smart Supply Chain toward Operational Performance.

Smart technologies support supply chain resilience (Ivanov et al., 2021). Smart technologies making companies more adaptive to changes and dynamics in the supply chain. Smart technologies moderating influence supply chain resilience toward operational performance. Research by (Lee et al., 2024) and Alkhatib & Momani (2023) shows that smart technologies are able to moderate the relationship between supply chain resilience and operational performance. Based on the explanation and research results above, in this study the researcher formulated a hypothesis, namely:

H7: Smart Technologies moderate the relationship between Supply Chain Resilience toward Operational Performance.

RESEARCH METHODS

This research uses quantitative techniques using a survey design that describes attitudes, opinions, behavior or characteristics of the population. Creswell (2016) stated that surveys help identify important individual beliefs and attitudes. Data collection was carried out by distributing questionnaires using Google Forms. The results of data collection are then evaluated and conclusions are drawn. Data grouping uses the Likert scale method. In this research, the population used is employees in the Geothermal energy sector. In this research, there are 5

variables with 40 item question. The minimum number of respondents required in this research is 40 questions multiplied by 5 variables, namely 200 respondents.

The variables used in this research are as follows, the independent variable, namely the variable that influences the dependent variable, in this research is smart supply chain. Mediating variables, namely variables that influence the independent variable on the dependent variable;

the mediating variable in this research is smart technologies. The dependent variable is a variable that is influenced or resulting from the independent variable; The dependent variable in this research is operational performance performance (Y) with indicators and questions that can be seen in Table 1. Data were analyzed using a model Structural Equation Modelling (SEM) using the help of the SmartPLS 3 application.

Table 1. Research Dimensions and Indicators

Variable	Dimensions	Indicator	Source
Smart Supply Chain	Integrated Supply Chain	1. Our company integrates technology in the electricity supply chain	(Lee et al., 2023)
		2. We keep up with rapid technological changes which are addressed by updating software and systems regularly	
		3. We use RFID for factory automation to increase the efficiency of electricity supply from upstream to downstream	
	Interconnected Supply Chain	1. We have real-time power supply monitoring capabilities.	
		2. We use standard communication protocols, such as: WiFi, Internet Protocol, and Hypertext Transfer Protocol (HTTP).	
		3. We emphasize coordination, integration and process management throughout the electricity supply chain.	
		4. We have storage/storage electricity that is visible to the entire supply chain	
		5. Electricity demand by customers can be seen by the entire supply chain	
	Intelligent Supply Chain	1. We have adapted smart process for planning, procurement and distribution of electricity.	
		2. We use devices to actively monitor electricity distribution.	
		3. We use systems to provide more accurate information for effective decision making.	
Supply Chain Resilience	Supply Chain Agility	1. Our supply chain responds quickly to changing delivery time requirements.	(Alkhatib & Momani, 2023)
		2. Our supply chain responds quickly to changing product design requirements.	
		3. Our supply chain maintains high responsiveness as demand increases.	
		4. Our supply chain responds quickly if improvements are made to chain structure or performance.	
	Supply Chain Flexibility	1. Our company has the ability to distribute electricity more quickly to customers in order to build better relationships with them.	
		2. Our company has the ability to change electricity allocation according to demand and develops a number of new innovations every year and at affordable costs.	

		3. Our company has the necessary flexibility to meet various customer and supplier demands at the same time.	
		4. Our company has the ability to change and modify the allocation and specifications of the electricity distributed.	
		5. Our company has the ability to carry out different electricity monitoring schemes.	
	Supply Chain Collaboration	1. Our company and partners in the supply chain exchange all relevant information accurately and in a timely manner.	
		2. Our company and supply chain partners have various agreements on improvements that benefit the entire electricity supply chain.	
		3. The company and our partners in the supply chain manage electricity stock and demand forecasts cooperatively.	
		4. Our company and partners in the supply chain collaborate to acquire, absorb and apply relevant knowledge for the benefit of all.	
		5. Our company and supply chain partners share the benefits and costs (such as savings on inventory costs and losses on change orders) resulting from participatory supply chain management.	
Smart Technologies		1. Smart technology/Smart technologies able to produce accurate and reliable data.	(Lee et al., 2023)
		2. Applying smart technology/smart technologies in the form of cloud computing/cloud computing can improve the company's process capabilities	
		3. Smart storage technology can improve electricity storage in the supply chain	
		4. The application of smart technology increases the company's ability to understand electricity supply in the supply chain	
		5. The application of smart technology such as the internet of things (IoT) can connect all smart technology related to supply chain workflows via the internet	
		6. The application of smart technology, such as robotics, has increased the capacity of the geothermal industry.	
		7. The application of smart technology, especially big data, tends to improve the quality of company data	
Operational Performance		1. We use smart technology and smart supply chains to reduce waiting times in supplying electricity to consumers	(Lee et al., 2023)
		2. We use intelligent technology and intelligent supply chain to estimate accuracy output generated electricity	
		3. We use intelligent technology and intelligent supply chain have resource planning geothermal better.	
		4. We use smart technology and smart supply chain has better operational efficiency	
		5. We use smart technology and smart supply chain to reduce electricity buildup rate	
		6. We use smart technology and smart supply chain to save costs	
		7. We use smart technology and smart supply chain to get more accurate costing	

RESULTS AND DISCUSSION

Descriptive Statistical Test

Descriptive statistics for smart supply chain shows that the mean for all respondents the value is 4.052 and it can be concluded that the respondents agree with the statement for the dimensions smart supply chain, the SSC6 and SSC8 indicators are the indicators with the highest value of 4.107 so consumers most agree with the statement "We use standard communication protocols, such as: WiFi, Internet Protocol, and Hypertext Transfer Protocol (HTTP)." And "We take care of the floor inventory which can be seen through the supply chain".

For variables supply chain resilience, statistics shows that the mean for all answers the is 3.979 and it can be concluded that the respondents agree with the statement for the variable supply chain resilience, The SCR12 indicator is the indicator with the highest value of 4.070 so consumers most agree with the statement "Our company and partners in the supply chain collaborate to acquire, absorb and apply relevant knowledge for the benefit of all".

Variable smart technologies, Mean variable is 4.041 and it can be concluded that the respondents agree with the statement for the variable smart technologies, The ST7 indicator is the indicator with the highest value of 4.112 so that consumers most agree with the statement "We use smart technology and a smart supply chain to reduce waiting time in supplying electricity to PLN.

For Operational Performance variable it can be seen that the value mean for all answers the value is 4.017 and it can be concluded that the respondents agree with the statement for the variable Operational Performance, while the OP4 indicator is the indicator with the highest value of 4.066 so consumers agree most with the statement "We use smart technology and a smart supply chain to reduce stockpiling levels of the inventory part.

Hypothesis Test (t Test)

This t statistical test is used to test the influence the independent variable towards the dependent variable. To test statistical hypotheses, Based on the analysis results using SmartPLS 3, hypothesis testing can also be carried out based on value significance level 0.05 (α = 5%), for hypothesis testing can be seen in table 1.

Discussion

Hypothesis testing is carried out by looking at the p-value between variables smart supply chain to operational performance. As a requirement for a hypothesis to be accepted, it must fulfill predetermined criteria starting from path coefficients positive, t-value above 1.64 to p-value below 0.05. Based on the test results, a value is obtained path coefficient of 0.767 with a positive coefficient, the t-value is 25.83 which is greater

Table 2. Hypothesis Testing Results

Hypothesis	Path	O	T	P	Conclusion
H1	Smart supply chain positive influence on operational performance	0,767	25,843	0,000	Supported
H2	Smart supply chain positive influence on Supply chain resilience	0,823	30,121	0,000	Supported
H3	Smart supply chain positive influence to Smart technologies	0,803	28,002	0,000	Supported
H4	Supply chain resilience positive influence on operational performance	0,578	8,698	0,000	Supported
H5	Smart technologies positive effect on operational performance.	0,478	7,112	0,000	Supported
H6	Smart technologies mediating influence Smart supply chain technologies to operational performance.	0,175	4,381	0,000	Supported
H7	Smart technologies moderating influence Supply chain resilience to operational performance.	-0,024	1,067	0,143	Not Supported

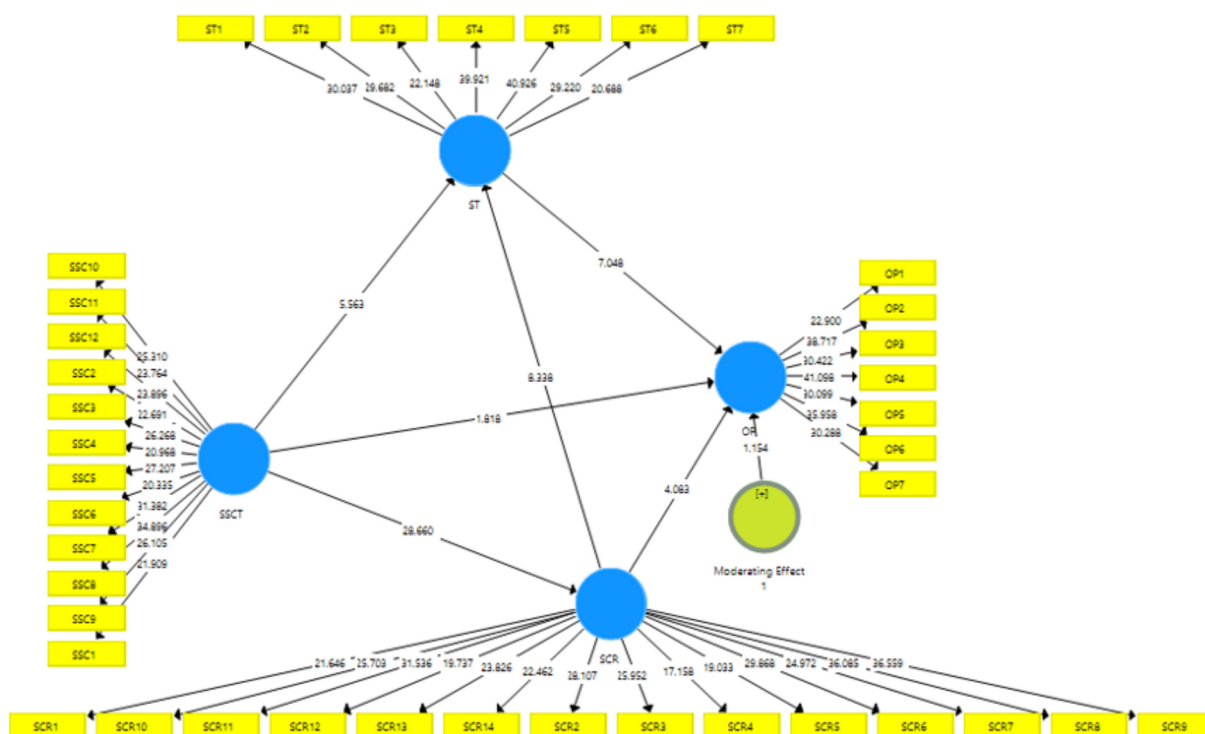Source: Data Analysis Result (2024)

Figure 2. Hyphotesis Testing Result

than the minimum value of 1.64 and the p-value is 0.000 below 0.05. Based on this, it can be concluded that H1 is accepted smart supply chain positive influence on operational performance.

These results are in accordance with previous research by Lee et al., (2023) who found a positive influence between Smart Supply Chain to Operational Performance as well as research by research from Lerman et al., (2022) and Bag et al. (2020) who found a positive influence from implementation Smart Supply Chain to Operational Performance, Smart Supply Chain is a series of technologies consisting of IoT, cloud computing, big data, and artificial intelligence artificial intelligence (AI) (Lerman et al., 2022). The application of these technologies aims to improve the company's operational performance through efficiency and faster processes with support Smart Supply Chain, this result is thought to be caused by respondents in this study who felt the benefits of implementation of smart supply chain at their place of work, as many as 26% of respondents in this study were employees who worked directly in the

department of supply chain management, based on the results of the questionnaire, among the many benefits of smart supply chain; What is felt is the use of standard communication protocols, such as: WiFi, Internet Protocol, and Hypertext Transfer Protocol (HTTP) so as to be able to maintain the level of inventory which can be seen through smart technology, so that this technology can facilitate the flow of geothermal electricity distribution from upstream to reaching the final distribution chain, namely PLN.

Hypothesis testing is carried out by looking at the p-value between variables smart supply chain to supply chain resilience. As a requirement for a hypothesis to be accepted, it must fulfill predetermined criteria starting from path coefficients positive, t-value above 1.64 to p-value below 0.05. Based on the test results, a value is obtained path coefficient of 0.823 with a positive coefficient, the t-value of 30.121 is greater than the minimum value of 1.64 and the p-value of 0.000 is below 0.05. Based on this, it can be concluded that H2 is accepted and smart supply chain positively influence the supply chain resilience.

The results of this study support previous research by Shen & Sun (2023) showing the existence of a role smart supply chain in improving supply chain resilience on the JD.com site. Apart from that, research by Tortorella et al. (2022) and Ivanov et al. (2021) also shows the positive influence of smart supply chain to supply chain resilience. There are modern features in smart supply chain which is thought to be the main contributing factor of smart supply chain in affecting supply chain resilience. Supply chain resilience is the adaptive capacity of supply chain to predict and respond to disturbances to recover quickly and efficiently so as to achieve ideal and better operational conditions after disturbances (Alkhatib & Momani, 2023). The smart supply chain can support supply chain resilience with the automation featured in the deployment of smart supply chain. This research found that the highest indicators of supply chain resilience is the existence of a supply chain between geothermal companies and partners that can collaborate to obtain, absorb and apply relevant knowledge for the benefit of suppliers and distributors. This shows that collaboration between supply chains is a key factor behind supply chain resilience, the existence of smart supply chain is able to simplify the collaboration process, with the features of smart supply chain like connection WiFi, Internet Protocol, and Hypertext Transfer Protocol (HTTP) as well as the implementation of AI to predict the partner's needs. Hence to make smart supply chain as a factor that can strengthen the supply chain resilience.

Hypothesis testing is carried out by looking at the p-value between variables of smart supply chain to smart technologies. As a requirement for a hypothesis to be accepted, it must fulfill predetermined criteria starting from path coefficients positive, t-value above 1.64 to p-value below 0.05. Based on the test results, a value is obtained path coefficient of 0.803 with a positive coefficient, the t-value of 28.00 is greater than the minimum value of 1.64 and the p-value of 0.000 is below 0.05. Based on this, it can be concluded that H3 is accepted and smart supply

chain is positively influencing smart technologies.

These results support previous research by Lee et al., (2023) which shows that smart supply chain support implementation smart technologies as well as research by Al Mulhim (2021) and Hota et al. (2022) also found a positive influence on implementation smart supply chain to smart technologies. This result is thought to be due to characteristics smart technologies allows a company to generate more sales or higher margins than competitors. (Twin, 2023). Implementation smart supply chain can improve performance smart technologies in Geothermal companies, because as time goes by, companies are required to digitize in all sectors, with implementation smart supply chain can help this integration because supply chain performance is one of the factors that can improve overall company performance, the results of the questionnaire show that the main benefit of implementing smart supply chain in the application of smart technology in geothermal companies is due to capability smart supply chain in reducing electricity distribution time to PLN, the geothermal energy business model with Geothermal companies as suppliers and PLN as distributors makes the distribution channel more centralized because there are not many parties involved in managing the supply chain, this makes it possible to smart supply chain This is a competitive advantage because it can differentiate the Geothermal company's ability to supply electricity to PLN.

Hypothesis testing is carried out by looking at the p-value between variables supply chain resilience to smart technologies. As a requirement for a hypothesis to be accepted, it must fulfill predetermined criteria starting from path coefficients positive, t-value above 1.64 to p-value below 0.05. Based on the test results, a value is obtained path coefficient of 0.578 with a positive coefficient, the t-value of 8.69 is greater than the minimum value of 1.64 and the p-value of 0.000 is below 0.05. Based on this, it can be concluded that H4 is accepted and supply chain resilience positive influence on operational performance.

These results support the results of previous research by Alkhatib & Momani (2023) showing a positive influence between supply chain resilience to operational performance as well as research by Juan et al. (2022) and Ramakrishna et al. (2023) also showed similar results. This result is thought to be due to the increasingly important role of the supply chain in the company's operational performance. The company's operational performance will be better with a supply chain that can adapt to the environment and business demands, supply chain resilience determine how the supply chain can adapt to all changes in the supply chain, such as a surge in demand from PLN or other obstacles outside normal business in the Geothermal company's electricity distribution. This research uses research objects, namely employees who work at geothermal companies, where the company where they work has the competencies in distributing electricity to PLN. This condition makes the supply chain resilience of these companies earn the best score as proven based on the results of the questionnaire where respondents consider that supply chain resilience as follows: "If a company is in the good category, good supply chain resilience can improve the company's operational performance by speeding up the supply chain and capabilities recovery when there is a problem in the supply chain."

Hypothesis testing is carried out by looking at the p-value between variables smart technologies to Operational Performance. As a requirement for the hypothesis to be accepted, it must meet the criteria that have been determined starting from path coefficients positive, t-value above 1.64 to p-value below 0.05. Based on the test results, a value is obtained path coefficient of 0.478 with a positive coefficient, the t-value is 7.11 which is greater than the minimum value of 1.64 and the p-value is 0.000 below 0.05. Based on this, it can be concluded that H5 is accepted and smart technologies positive influence on operational performance.

This research supports the results of previous research by Lee et al., (2023) shows that smart technologies support operational performance. And research by Alkhatib & Momani (2023) also found similar results. However, research by Al Mulhim (2021) found different results, showing that smart technologies has no effect on operational performance, This result is thought to be caused by the good smart technology in the company where the respondent works, where based on the survey results it was found that smart technology in the company was considered good in the eyes of respondents so that its implementation smart technologies can increase operational performance in companies, this is proven based on the results of questionnaires where indicator with the highest value for the variable operational performance is that the existence of smart technology and smart supply chains can reduce the level of stockpiling inventory parts, so that in practice the use of smart technology can provide significant efficiency with barrier-free distribution.In fact smart technologies which is used not only in distribution channels but in the company's entire digital ecosystem, making geothermal companies have their own master system that can be connected and improve the company's overall operational performance.

Hypothesis testing is carried out by looking at the p-value between variables smart supply chain to Operational Performance with variables smart technologies as a mediating variable. As a requirement for the hypothesis to be accepted, predetermined criteria must be met starting from path coefficients positive, t-value above 1.64 to p-value below 0.05. Based on the test results, a value is obtained path coefficient of 0.175 with a positive coefficient, the t-value of 4.38 is greater than the minimum value of 1.64 and the p-value of 0.000 is below 0.05. Based on this, it can be concluded that H6 is accepted and smart technologies able to mediate influence smart supply chain to operational performance.

These results are in accordance with research by Lee et al. (2023) dan Al-Ayed & Al-Tit (2023) which shows that smart technologies are able to mediate the relationship between smart supply

chain and operational performance. This result is thought to be due to the success of smart supply chain in improving operational performance which depends on the technology owned by the company. Smart technologies includes implementation of internet of things, big data and artificial intelligence on smart supply chain, so the better the implementation of these four elements, the better it is as a smart supply chain. Thus, it can encourage better operational performance. Based on the questionnaire it was found that the main factor in the operational performance of geothermal companies is reducing buildup inventory parts which can be handled by smart supply chain and smart technologies. The existence of these two factors makes competitive advantage special for geothermal companies because with a single consumer system (PLN), consumers can choose to collaborate with companies that have more advanced technology than other companies.

Hypothesis testing is carried out by looking at the p-value between variables smart supply chain to Operational Performance with smart technologies as a moderating variable. As a requirement for the hypothesis to be accepted, predetermined criteria must be met starting from path coefficients positive, t-value above 1.64 to p-value below 0.05. Based on the test results, a value is obtained path coefficient of 0.024 with a negative coefficient, the t-value is 1.06, which is smaller than the minimum value, namely 1.64, and the p-value is 0.143, below 0.05. Based on this, it can be concluded that H7 is rejected and smart technologies unable to moderate influence supply chain resilience to operational performance.

These results are different from previous research by Lee et al. (2024) and Alkhatib & Momani (2023) show that smart technologies were able to moderate the relationship between supply chain resilience and operational performance. This is thought to be due to the inverse relationship between smart technologies to supply chain resilience (Ivanov et al., 2021). Smart technologies making companies more adaptive to changes and

dynamics in the supply chain and making supply chain resilience the company becomes stronger, but this does not necessarily improve the company's operational performance because there are still other factors involved in improving operational performance, the results of the questionnaire found that the existence of smart technology and a smart supply chain are the main factors in shaping the company's good operational performance, so smart technologies does not strengthen the influence of supply chain resilience toward operational performance because supply chain resilience is not tied to the application of smart company technology but is broader with the character of the supply chain being agile, flexible and collaborative.

CONCLUSION

The research results found positive influence of smart supply chain toward operational performance, supply chain resilience and smart technologies. The research results found supply chain resilience and smart technologies positive influence on operational performance, the research results found smart technologies are able to mediate influence smart supply chain to operational performance. However smart technologies are not able to moderate influence supply chain resilience toward operational performance.

Based on the research's results smart supply chain technologies have a positive influence on supply chain resilience while the indicator with the lowest value in this study is the variable of supply chain resilience with sound statement "The company and our partners in the supply chain manage electricity stock and demand forecasting cooperatively.", therefore it is recommended for Geothermal companies to increase cooperation between supply chains, especially with PLN as the sole consumer so that performance smart supply chain to be more optimal in support supply chain resilience.

Based on the research, it was found that the ST7 indicator which reads "We use smart technology and a smart supply chain to reduce waiting time

in supplying electricity to PLN" is the variable of smart technologies with the highest value in this research, so it is recommended that geothermal companies continue to maintain the performance of their smart technology in order to reduce electricity distribution time to PLN.

This research only analyzes the variables of smart supply chain technologies, supply chain resilience and smart technologies in forming Operational Performance. The research object is limited to Geothermal companies which in Indonesia only have one permanent customer, so it can provide different results if the research is carried out on different research objects with a wider business scope.

Future research can consider other variables that are relevant to understanding Operational Performance variables like supply chain integration which could be an influencing factor toward Operational Performance. Further research is needed to strengthen the phenomena found by conducting similar research with different industrial research objects.

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