

## Uncertain Supply Chain Management

homepage: [www.GrowingScience.com/uscm](http://www.GrowingScience.com/uscm)**The effect of supply chain innovation and e-procurement implementation on supply chain performance of manufacturing organization****Mahdani Ibrahim<sup>a</sup>, Banta Karollah<sup>b\*</sup> and Rimal Mahdani<sup>c</sup>**<sup>a</sup>Universitas Syiah Kuala, Indonesia<sup>b</sup>STIES-Banda Aceh, Indonesia<sup>c</sup>Universitas Teuku Umar, Indonesia**ABSTRACT***Article history:*

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The purpose of this study is to analyze the effects of the e-procurement on supply chain performance and supply chain innovation. The study also investigates the effect of supply chain innovation on supply chain performance. The research method is a quantitative survey, and the research data is obtained by distributing online questionnaires on a scale from 1 to 7 distributed via social media. Respondents in this study are 250 managers of manufacturing organizations in Indonesia determined by simple random sampling method. The model used in this study is the causality model and to test the hypotheses proposed in this study, the analytical technique used is Structural Equation Modeling (SEM) with SmartPLS software as a data analysis tool. The independent variable of this research is e-procurement implementation, supply chain innovation and the dependent variable is supply chain performance. The stages of data analysis are validity test, reliability test and hypothesis testing. The results of this study indicate that the application of e-procurement had a positive and significant effect on supply chain performance, the application of e-procurement had a positive and significant effect on supply chain innovation, supply chain innovation had a positive and significant effect on supply chain performance and supply chain innovation was able to mediate the effect of e-procurement on supply chain performance.

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**1. Introduction**

In the era of the industrial revolution, technological changes accompanied by intense competition between companies have become a challenge for companies in developing their business in the future front (Arlbjørn et al., 2011). E-procurement has evolved into the use of electronic technology to streamline and activate procurement activities (Bakhshi & McVittie, 2009). E-procurement is defined as a comprehensive process by which organisms use IT systems in establishing agreements for the acquisition of products or services (contractors) or purchase of products or services in return for payment (purchases) (Mwangi & Kagiri, 2016). E-procurement includes various elements including electronic ordering, internet bidding, auctions and is automatically integrated into the procurement system (Kusi-Sarpong et al., 2019). The e-procurement strategy appears as a means to achieve goals in reducing costs and increasing productivity, namely in terms of increasing product revenue and increasing customer satisfaction so as to increase profits (Arlbjørn et al., 2011). The benefits of e-procurement are reduced transaction costs, faster ordering, wider choice of vendors, more efficient procurement process standards, control over procurement expenditures, better employee compliance, easy internet access by buyers, reducing the number of documents based on administrative procedures iterative and re-engineering in procurement work. E-procurement offers promising opportunities as a way of efficiency, transparency, openness of public procurement, certainty of contracts awarded to bidders

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with the best value (Arlbjørn et al., 2011). The e-procurement process has been transformed with the integration of the internet and supply chains resulting in better information flow between companies and a more effective supply chain.

## 2. Literature Review

### 2.1 E-Procurement

E-procurement is defined as a comprehensive process in which organizations use IT systems to build agreements in the acquisition of products or services (contractors) or purchase product services in exchange for payment (purchases) (Vaidyanathan et al., 2008; Wong et al., 2013). This includes electronic ordering, card purchases, auctions and integration of procurement systems automatically. E-procurement is also defined as the use of information technology to facilitate business-to-business (B2B) purchasing transactions for materials/goods and services (Pongsuwan et al., 2016). E-procurement is a procurement process that refers to the use of internet-based (integrated) information and communication technology (ICT) to carry out the stages of the procurement process including searching, sourcing, negotiating, ordering, receiving and reviewing post-purchase separately or simultaneously (Presutti et al., 2003). E-procurement is also an integral part of the B2B process and is an important part of an organization's ability to function effectively, whereas B2B e-procurement systems are open systems that enable organizations to reach and transact with suppliers and customers in virtual marketplaces. E-procurement is a web-based procurement that automates supply chain communications, transactions and collaboration with partners to enhance collaboration, streamline processes, control costs, improve information exchange within the organization (Ramkumar & Jenamani, 2014). E-Procurement was developed with an integrated goods and services procurement system. Systems that require the internet as a basis for communication from providers of goods/services, the community and the government. E-Procurement consists of two procurement system methods, namely E-Tendering and E-Purchasing. Whatever procurement method is used, in general there are 4 parties involved and working independently in the procurement process, namely: (1) Commitment Making Officer (PPK) (2) Procurement Service Unit (ULP) (3) Work Recipient Official or Committee; and (4) goods/services Providers. Factors that influence the successful implementation of E-Procurement include: (i) E-Leadership; (ii) Transformation of mindset and action patterns; (iii) Availability of Infrastructure. E-Procurement was developed due to various factors of failure and poor performance in manual procurement of government goods and services. Identification of various weaknesses that exist in the performance of the procurement of goods and services is expected to be resolved by creating an E-Procurement system. The system is said to be successful if it is supported by several factors as in Shan et al. (2020) namely E-Leadership, Transformation of mindsets and patterns of action, and Availability of Infrastructure. So, it can be concluded that the successful implementation of E-Procurement will be able to improve the performance of government procurement of goods and services.

### 2.2 Supply chain innovation

According to Rotich and Okello (2015) and Shan and Shi (2020), supply chain innovation integrates developments in information technology and technology related to logistics processes and new markets to increase efficiency operations and improve service effectiveness. The supply chain consists of all activities covering the management of business processes, procurement, conversion and logistics activities in the global industry through one network, from suppliers, manufacturers and distributors to end users with the aim of achieving effective and efficient customer satisfaction. Generally, supply chain innovations include efficient consumer response (ECR) (Thawiwinyu & Laptaned, 2009), online market services (Vaidyanathan et al., 2008), technology procurement (Wong et al., 2013), and data scanning and these aspects, marketing and distribution of products can be ordered online without complicated procedures. For example, through Amazon, people only order goods online and then deliveries are made using partners, namely shipping expeditions, which are generally processed online. This of course will reduce costs, time, and distance (Mazzola et al., 2015). Furthermore, measurement of supply chain performance can serve as an indicator of the extent to which supply chain activities are running well. Positioning is done to determine the next strategy. However, to determine supply chain innovation performance and positioning, these innovations need to be measured (Stroeken et al., 2000). Therefore, in this study, a review will be analyzed related to the extent of the role of performance measurement in supply chain innovation. Oke et al. (2013) and Piera et al. (2014) explained that supply chain innovation performance has positive influence on satisfaction with supply chain results. Manufacturing that has good supply chain innovation performance stems from innovative supply chain activities so that MSMEs have an advantage in competing in terms of new thoughts, new ideas, being able to improve services related to supply chain activities, and this can provide satisfaction with the supply chain results obtained by the manufacturer.

### 2.3 Supply chain performance

Following this definition, a supply chain consists of companies that transport raw materials from the earth/nature, companies that transform raw materials into semi-finished materials or components, suppliers of product support materials, assembly companies, distributors, and retailers who sell goods. to the final consumer (Mafini et al., 2020; Puschmann & Alt, 2005). In the supply chain there are several main players who are companies that own Meanwhile Supply Chain Management (SCM) is an integrated application that provides information system support to management in terms of procuring goods and services for companies as well as managing relationships between partners to maintain the level of availability of products and services that are needed by the company optimally. SCM integrates starting from the delivery of orders and processes, procurement of

materials raw materials, order tracking, information dissemination, collaborative planning, performance measurement, after-sales service, and new product development. So, if the supply chain is the physical network, namely the companies involved in supplying raw materials, producing goods or sending them to end users, while SCM is a method, tool or management approach (Bakhshi & McVittie, 2009).

**3. Method**

This research method is a quantitative survey, the research data was obtained by distributing online questionnaires on a scale of 1 to 7 which were distributed via social media. Respondents in this study were 250 managers of manufacturing organizations in Indonesia who were determined by simple random sampling method. The model used in this study is the causality model and to test the hypotheses proposed in this study, the analytical technique used is SEM (Structural Equation Modeling) with SmartPLS software as a data analysis tool. The independent variable of this research is e-procurement implementation, supply chain innovation and the dependent variable is supply chain performance. The stages of data analysis are validity test, reliability test and hypothesis testing.

The research hypothesis is:

**H1:** *The implementation of e-procurement has a positive and significant effect on supply chain performance.*

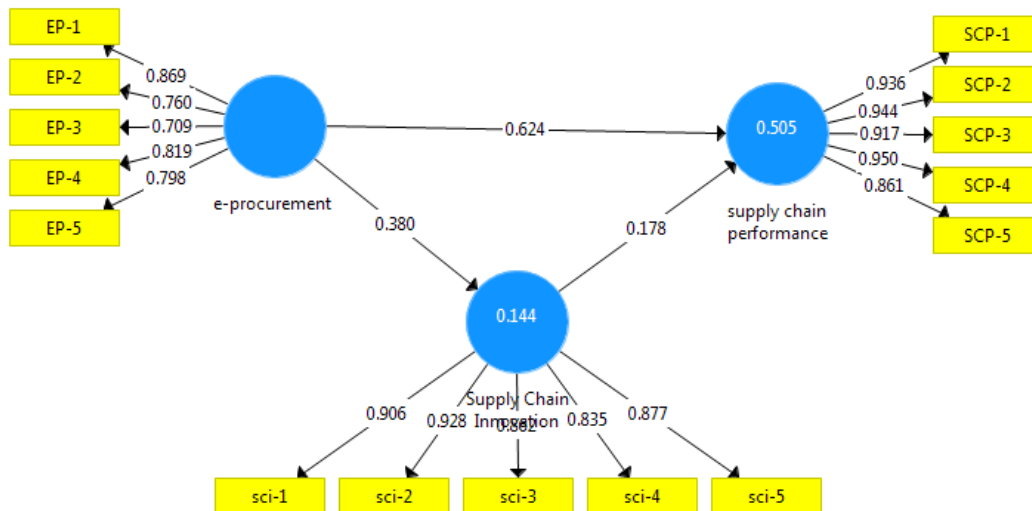
**H2:** *The implementation of e-procurement has a positive and significant impact on Supply Chain Innovation.*

**H3:** *Supply chain innovation has a positive and significant effect on supply chain performance.*

**4. Result and Discussion**

*4.1 Convergent Validity*

Based on data analysis from the online questionnaire shown in Fig. 1, it is known that all research variable indicators have an outer loading value greater than > 0.7. According to Hair Jr et al. (2020), an outer loading value between 0.5 – 0.6 is considered sufficient to meet the requirements for convergent validity so that all indicators meet the requirements for convergent validity.



**Fig. 1.** Loading Factors

*4.2 Discriminant Validity*

Based on the data presented in Table 1 it is known that the AVE value of all variables is greater than > 0.5. Thus, it can be stated that all variables have good discriminant validity, the composite reliability value of all research variables is greater than > 0.7.

**Table 1**  
Reliability Testing

	Cronbach's Alpha	rho A	Composite Reliability	Average Variance Extracted (AVE)
e-procurement	0.805	0.876	0.732	0.665
supply chain performance	0.816	0.807	0.809	0.601
Supply Chain Innovation	0.808	0.845	0.856	0.676

Because it is based on the Convergent Validity test and reliability test feasible items and variables have been obtained, and analysis Discriminant validity uses the Cross loading value already showed good results, and the AVE value was also above 0.5 all, then PLS SEM analysis is still feasible to continue.

#### 4.3 Heretroit – Monotrait Ratio (HTMT)

The best recent measurement criterion is to look at the Heretroit-Monotrait Ratio (HTMT) value. If the HTMT value is <0.90 then a construct has good discriminant validity.

**Table 2**

The results of Heretroit – Monotrait Ratio (HTMT)

Variables	Heretroit – Monotrait Ratio (HTMT)		
	e-procurement variable	supply chain innovation	supply chain performance
e-procurement variable			
supply chain innovation	0.462		
supply chain performance	0.633	0.377	

The conclusion of the Heteroit-Monotrait Ratio (HTMT) test is as follows,

1. The e-procurement variable for supply chain innovation has a Heteroit-Monotrait Ratio value of 0.462 <0.90 meaning that the discriminant validity is good, or really different from other constructs (unique constructs).
2. The e-procurement variable on supply chain performance has a Heteroit-Monotrait Ratio (HTMT) value of 0.633 <0.90, meaning that discriminant validity is good, or completely different from other constructs (unique constructs).
3. The supply chain innovation on supply chain performance has a Heteroit-Monotrait (HTMT) value of 0.377 <0.9 meaning that the discriminant validity is good, or really different from other constructs (unique constructs).

#### 4.4 Variant Analysis ( $R^2$ ) or Determination Test

Analysis of Variant ( $R^2$ ) or Determination Test, namely to find out the influence of the independent variables on the dependent variable, the value of the coefficient of determination can be shown in Table 3.

**Table 3**

R-square value

Variable	R-Square
Supply Chain Performance	0.505

Based on the r-square value in Table 2, we understand that e-procurement and supply chain innovation explains the supply chain performance variable of 0.505 or 50.5%, and the remaining 49.5% is explained by other constructs outside those examined in this study.

#### 4.5 F-Square

The F-square measurement is a measure used to assess the relative impact of an influencing variable (exogenous) on an affected variable (endogenous). The F-square criteria according to are as follows: (1) If the value of F-square = 0.02 means the small effect of exogenous variables on endogenous; (2) If the F-square value = 0.15 means that the effect is being/moderate from the exogenous variable to the endogenous one; and (3) If the F-square value = 0.35, it means that the effect is large from the exogenous variables on the endogenous ones.

**Table 4**

F-Square

Variables	F-square		
	e-procurement variable	supply chain innovation	supply chain performance
e-procurement		0.020	0.567
supply chain innovation			
supply chain performance		0.099	

The conclusion from the F-Square results from the table above is as follows:

- a) The e-procurement variable for supply chain innovation f-square=0.020 means the small effect of exogenous variables on endogenous ones.
- b) The e-procurement variable on supply chain performance f-square=0.567 means that the effect is large from the endogenous exogenous variables.
- c) The supply chain innovation on supply chain performance F-square=0.099 means the small effect of exogenous variables on endogenous.

### 4.6 Q-square

The Q-square value is also used to determine the goodness of the model, where the higher the Q-Square value indicates that the structural model is getting fit with the data. The Q-square test in this study can be seen in the following table:

**Table 5**  
Q-square Test Results

Variable	SSO	SSE	Q <sup>2</sup> (=1-SSE/SSO)
e-procurement	600,000	600,000	
supply chain innovation	600,000	383,716	0.360
supply chain performance	600,000	383,543	0.438

Based on the table above, it is known that the sum of the QSquare values for the two endogenous variables is 0.798. These results mean that the magnitude of the diversity of data described by this research model is 79.8%. While the remaining percentage of 20.2% is explained by other factors that are outside the model of this study. Thus, this research model is declared to meet the requirements of goodness (model fit).

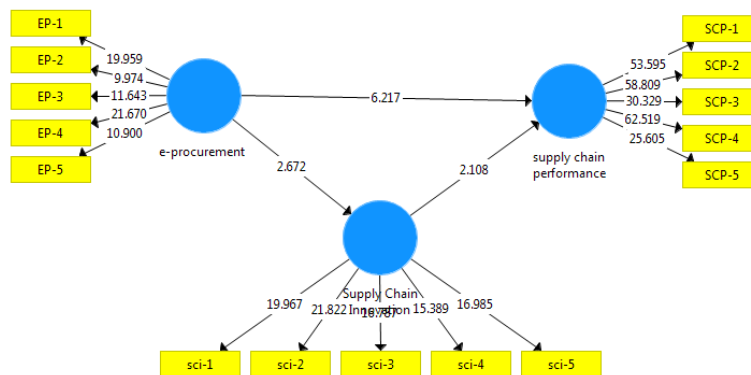
### 4.7 Goodness of Fit (GoF)

GoF is a measure of the accuracy of the model as a whole, because it is considered a single measurement of the measurement of the outer model and the inner model. The measurement value based on Goodness of Fit has a range of values from 0 to 1. The GoF value is getting closer to 0 indicating the model is getting less good, conversely the further away from 0 and the closer to 1, the better the model. The criteria for the strength and weakness of the model are based on GoF measurements, namely 0.36 (GoF large); 0.25 (GoF medium), and 0.10 (GoF small). To find out the GoF value in PLSSEM it was done manually and the resulting GoF value = 0.309 Small GoF value = 0.1, medium GoF = 0.25, and large GoF = 0.38. From testing R2, Q2 and GoF, it can be seen that the model formed is robust. So that hypothesis testing can be conducted.

## 5. Hypothesis Testing

### 5.1 Direct Effect

Hypothesis testing in this study was carried out by looking at the T-Statistics value and the P-Values value. The research hypothesis can be declared accepted if the P-Values < 0.05.



**Fig. 3.** Hypothesis testing

The research hypothesis was carried out with the help of SmartPLS (Partial LeastSquare) 3.0 software. These values can be seen from the bootstrapping results. The rules of thumb used in this study are the t-statistic >1.96 with a significance-value level of 0.05 (5%) and the beta coefficient is positive. The value of testing the research hypothesis can be shown in Table 3 and for the results of this research model can be described as shown in Fig. 3.

**Table 6**  
Hypothesis testing

Correlation	T Statistics	P Values	Result
e-procurement →Supply Chain Innovation	6.217	0.000	Supported
Supply chain innovation → supply chain performance	2.108	0.000	Supported
Supply chain innovation → supply chain performance	2.672	0.000	Supported

### 5.2 Indirect Effects

The purpose of the Indirect Effect analysis is useful for testing the hypothesis of the indirect effect of an influencing variable on endogenous influenced variables which are mediated/mediated by an intervening variable. The criteria for determining the indirect effect are if the P-Values are 0.05, then it is not significant, meaning that the mediator variable (Supply chain innovation) does not mediate the effect of an exogenous variable (e-procurement) on an endogenous variable (supply chain performance). In other words, the effect is direct.

**Table 7**  
Indirect Effects

Correlation	P Values	Result
e-procurement → Supply Chain Innovation → supply chain performance	0.0039	Supported

Thus, it can be concluded that the Indirect Effect values shown in the table above. Indirect effect of X e-procurement → Supply Chain Innovation → supply chain performance, P-Values  $0.039 < (0.05)$  (significant), then Supply chain innovation is able to mediate the effect of e-procurement on supply chain performance.

#### **E-procurement relationship → Supply Chain Innovation → supply chain performance**

Based on data analysis, the p-value is  $0.039 < (0.05)$  (significant), then supply chain innovation is able to mediate the effect of e-procurement on supply chain performance.

#### *E-procurement implementation and supply chain performance*

The results of the hypothesis test show that the t value  $6.217 > 1.96$  so it is concluded that the implementation of e-procurement has a positive and significant effect on supply chain performance.

The goal of supply chain management is to create a fast, efficient and network of business relationships or supply chains, to get company products from concept to market. Consumer needs are increasing day by day which results in consumers wanting products that have good distribution channels. the product needed by the consumer reaches the consumer at the right place and time where it is stated that a product, however good the quality, will only be sold in the market if it is within reach of the consumer at the right time needed. Supply chain management is a reciprocal relationship between providers and customers to deliver optimal values to customers at relatively low costs but provide overall supply chain benefits (Wijaya et al., 2022). Competition in the distribution industry is getting tougher. One of the things that makes a distribution company survive is providing the right product to consumers at the right time, and at an economical cost. Product availability and economical selling prices can only occur if there is good coordination between the company and the parties in its supply chain (Albinkhalil & Razzaque, 2021). The role of suppliers (suppliers), companies and distribution networks for goods to consumers is urgently needed. It is this awareness of the existence of cheap, fast and high-quality products that gave birth to a new concept, supply chain management (Ngeno & Kinoti, 2017). Supply chain management is a system that involves the processes of production, delivery, storage, distribution, and sale of products in order to meet the demand for these products, the supply chain includes all processes and activities involved in delivering these products to the hands of consumers (Albinkhalil, 2021). These include the manufacturing process, the transportation systems that move the product from the manufacturer to the retail outlets, the warehouses where the products are stored, the distribution centers where large dozen shipments are divided into small dozens to be sent back to the stores and finally to the retailers. who sells the product. An efficient operation of the supply chain depends on the complete and accurate flow of data related to the requested product from the retailer to the customer.

#### *Application of e-procurement and Supply Chain Innovation*

The results of the hypothesis test show that the t value  $2.108 > 1.96$  so it is concluded that the implementation of e-procurement has a positive and significant effect on Supply Chain Innovation. Chang and Wong (2010) in their research determined the factors that motivated them to adopt e-procurement and how to measure their performance in assessing benefits by using the trust variable as moderating in the relationship between e-marketplace and e-procurement (Bakhshi & McVittie, 2009). Chang and Wong (2010) used two stages of analysis, namely qualitative and quantitative approaches. The results of his research show that companies that adopt e-procurement are more likely to participate in e-marketplaces so that company performance increases (Craighead et al., 2009). Trust, which is a moderate variable, is proven to have an impact on a company's willingness to adopt e-procurement when considering its participation in the e-marketplace. Researchers want to prove that participation in e-marketplaces can improve company performance, where trust is a moderating factor between the adoption of e-procurement and e-marketplaces (Arlbjørn et al., 2011). And the results of the study show that companies that have adopted e-procurement are more likely to participate in e-marketplaces and trust is the basic element that influences a company's willingness to participate because trust affects anxiety about information disclosure.

### *Supply chain innovation and on supply chain performance*

The results of the hypothesis test show that the  $t$  value  $2.672 > 1.96$  so it is concluded that supply chain innovation has a positive and significant effect on supply chain performance. This supports research conducted by (Mafini et al., 2020) which shows that supply chain innovation has a positive effect on satisfaction with supply chain results. Manufacturing that has good supply chain innovation performance stems from innovative supply chain activities so that Manufacturing has an advantage in competing in terms of new ideas, new ideas, able to improve services related to supply chain activities, and this can provide satisfaction with supply chain results obtained by Manufacturing (Gupta et al., 2020). Furthermore, Goffnett and Goswami (2016) revealed that supply chain innovation implementation of an e-procurement system has provided a lot of visibility and transparency of company expenditure transactions both individually and at a unit scale within the company, which supports increased efficiency of processes and costs. With this capability, companies can carry out audit trails in the system, understand spending patterns that occur and provide information that supports management in making more effective decisions, improving supplier performance, optimizing budgets and planning. However, the results of a comparative study of the implementation of e-procurement systems in several companies show that the implementation of e-procurement speaks strongly of non-technical issues related to organizational aspects involving changes to the procurement process and the organization. According to Tiwari et al. (2019) Decentralization of functions in the procurement department in large companies is one of the obstacles in forming volume synergies at the corporate level, so it is necessary a centralized procurement function was developed to support operational and administrative cost efficiency. With adequate organizational, process and architectural support for implementation e-procurement allows companies to move from handling operational transactions for procurement transactions to a strategic position in managing suppliers for maximize added value for the company, and also be able to carry out integration that does not only focus on the internal scope but can also touch the global level (Mafini et al.,2020).

Supply chain innovation integrates developments in information technology and related technologies with logistics processes and new markets to increase efficiency operations and improve service effectiveness. According to Mutangili (2019) The supply chain consists of all activities which include managing business processes, procurement, conversion and operations logistics in the global industry through a single network, from suppliers, manufacturers and distributors to end users with the aim of achieving customer satisfaction in an effective and efficient manner. In general, supply chain innovation includes efficient consumer response (ECR), online market services, technology procurement, and data scanning. Regarding aspects: With that, product marketing and distribution can be ordered online without complicated procedures. For example, through amazon, people only order goods online then the delivery is carried out by utilizing partners, namely shipping expeditions, which are processed throughout online. This of course will reduce costs. time, and distance. Furthermore, measurement of supply chain performance can serve as an indicator of the extent to which supply chain activities are going well. Positioning to determine the next strategy. However, to determine supply chain innovation performance and positioning, these innovations need to be measured. According to Matano et al. (2020) several uses of information technology in the supply chain and logistics sector including optimizing the supply chain (consolidating shipments and reducing the number of warehouses. reducing stock and saving storage space, so companies can just-in-time processing; streamlining supply chain networks to meet customer demands that are increasingly sensitive to speed of delivery, including in e-commerce trade.

Both product innovation and process innovation have a positive causal effect on competitive advantage. Companies must focus on increasing technical innovation to improve their performance and to gain competitive advantage. Previous studies show that one of the benefits of using innovation in the supply chain is to increase competence in the company's supply chain. Also, research conducted previously showed that Innovation has a positive influence on organizational performance. From previous research, it can be concluded that increasing the level of socialization mechanisms and technological innovation capabilities is an important driver for companies to improve the quality of relationships with partners, which in turn contributes to improving supply chain integration. One of the main conclusions of this study is that developing socialization mechanisms and cultivating technological innovation capabilities significantly contributes to improving supply chain partnerships, and ultimately, achieving successful supply chain integration. According to Siddiqui et al. (2022) Manufacturers are more likely to be effective in supply chain integration when making relentless efforts to grasp new ideas by seeking out new opportunities. Previous studies have shown that innovation in the supply chain supports a better understanding required to initiate and embed innovation supply chain integration practices within an organization that can facilitate more sophisticated management and operations in informational and physical flows along the supply chain. The studies conducted previously showed a positive relationship between supply chain technology and supply chain performance. Development of supply chain integration and supply chain performance requires innovation as organizations change. Innovation can mature and scale as organizations initiate and build relationships between suppliers and customers or become more integrated internally to create effective and efficient supply chains using state-of-the-art systems. This study shows that supply chain integration improves performance when supply complexity is high, whereas very limited or no effect of supply chain integration can be detected when supply complexity is low. The results also show that in an environment with high supply complexity, the use of structured communication means to achieve supply chain integration has a negative effect on cost performance. Integration in the supply chain can positively affect supply chain performance (Shafiee & Rejali, 2022; Matano et al., 2020). Research conducted supports supply chain integration and provides empirically corroborating evidence of the presumed relationship between supply chain integration and logistics performance, implying that internal, supplier and customer integration play an important

role in determining the level of logistics performance. The development of supply chain integration can improve organizational performance because supply chain integration can increase the ability to effectively carry out integrated activities that can help to fulfill consumer demands. This suggests that relationships with suppliers, customers, and among organizational functional units enhance knowledge creation, innovation orientation, and consequently improve supply chain performance.

## 6. Conclusion

The results of this study are that the application of e-procurement has a positive and significant effect on supply chain performance, the application of e-procurement has a positive and significant effect on supply chain innovation. Supply chain innovation has a positive and significant effect on supply chain performance and supply chain innovation is able to mediate the effect of e-procurement on supply chain performance. The adoption of e-procurement has significantly contributed to improvements in efficiency, achieved supply chain management, increased customer satisfaction, reduced operational tasks, time effectiveness, and reduced transaction costs. Manufacturing that has good supply chain innovation performance stems from innovative supply chain activities so that Manufacture has an advantage in competing in terms of new ideas, new ideas, being able to improve services related to supply chain activities, and this can provide satisfaction with supply chain results acquired by Manufacturing. Companies that have adopted e-procurement are more likely to participate in e-marketplaces and trust is a basic element that influences a company's willingness to participate because trust affects anxiety about information disclosure.

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