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The Effect Of Supply Chain Integration On Technological Innovation Performance Mediated By Supply Chain Knowledge Sharing

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ABSTRACT

This research focuses on the analysis of Technological innovation performance. Technological innovation performance is influenced by Supply chain integration and knowledge sharing. This study used 140 respondents of Batik handicraft SMEs in Kulonprogo Yogyakarta. Data analysis using path analysis with Partial Least Square program 3.2.8. The results showed that the Technological innovation performance model was accepted, and all the paths analyzed were significant. This study shows that the Supply chain model can be applied to SMEs with conditions of limited resources. During the crisis, Covid-19 SCI was very much needed. SCI reflects the requirements of mutual assistance between suppliers, SMEs, and consumers. Helping each other led to the success of SMEs in terms of technological innovation, which indeed had to change drastically during this pandemic.

KEYWORDS: Supply chain, integration, knowledge sharing, and innovation performance.

I. INTRODUCTION

The improvement of industry in Indonesia is presently occurring quickly in accordance with the advancement of science and innovation.The procedure of industrialization of Indonesian culture has quickened with the foundation of diverse organizations and workplaces. The development experienced is not only an increase but also a decrease. So that from year to year,the industry in Indonesia has increased and decreased. Companies engaged in manufacturing and trade compete with each other to survive and become the best. This encourages each company to carry out various innovations and business strategies to develop further. The business environment is increasingly competitive and full of change; uncertainty is inevitable. New-normal due to the covid-19 pandemic has changed all the operations of SMEs. The impact of co-19 also befell the consumption patterns of consumers. Risk arising from consumer demand, for example, comes from the strengthening position of consumers because of the many choices of companies offering the same product or service. Businesses and production managers must deal With these uncertainties well so that costs (especially inventory costs) are minimal while still meeting these consumers' demands.More and more research on technological innovation performance is affected by Supply Chain Integration (SCI) has been issued in recent years. In any case, there is still no uniform comprehension of specific definitions.The term performance can be interpreted as an assessment to find out the final goal to be achieved by individuals, groups, and organizations. Technology Innovation is to introduce new technology, new services, and new and more useful ways. The level of sales of new products, the sale of innovative products, the success rank of creative projects, the cost and speed of developing recent products, leading or participating in the development of industry standards, and the cost and speed of developing new products (Chen et al., 2006).According to Hagedoorn and Cloodt (2003), for evaluating technological innovations from new products, patent quotations, the number of patents, and investment R & D, the performance evaluation of technological innovation is based on (1) Level of sales of new products. (2) Lead or participate in developing industry standards. (3) Measuring the index, namely sales of innovative products, (4) Success rates of creative projects, and (5) Cost and speed of developing new products.

Technological innovation performance and SCI focus on production methods, organizations, and technological innovations. Inter-organizational and intra-organizational coordination of processes and services and capital and supply chain partners in products, management between companies, and information can achieve highly efficient results is the definition of SCI, according to Levary (2000). According to Flynn et al. (2010) that SCI is a process of collaboration between members of intra-organizational and inter-organizational supply chains by managing all operations together in a supply chain. SCI aims to effectively control the progression of services or products,

financial affairs, information, and decision to accomplish the most excellent incentive for clients requiring little to no effort and rapid. According to Mentzer (2000), SCI collaborates between companies and other companies explicitly gracefully chain the executives, integrating entire network processes, various risks and interests, and relationship integration, including integrating corporate behavior and information integration and collaboration. Narasimhan and Kim (2002) said that SCI must be separated into external and internal integration and break up external integration intoprovider integration and consumer integration. SCI is classified into supply integration and client integration, given the integration arc (Frohlich and Westbrook, 2001).SCI in this examination primarily alludes to SCI external (including provider integration and client integration). With SCI, it will influence supplychain Knowledge Sharing. Knowledge Sharing can help make recent thoughts and encourage the improvement of current business chances to maximize organizations' ability to produce solutions and efficiency with a competitive advantage. K.S. happens at the inter-organizational and organizational, spotlights on the supply chain of K.S. at the inter-organizational level. Argote et al. (2000) definesocial relations between two companies, including exchanges between representative information organizations, talent, and experience. K.S. between partners supply chain can encourage knowledge-making processes, lighten internal difficulties of limited sources of knowledge, increase innovation speed within the company, and reduce development costs. There are many handicraft businesses located in Yogyakarta, especially in the KulonProgo Regency areas. In Kulonprogo Regency, the superior product that is owned is Batik. Batik itself is a pictorial texture explicitly made by composing or applying Malam to the material. At that point, the handling is prepared with a specific goal in mind that has distinctive characteristics.Indonesian Batik, all in all, strategies, innovation, and the advancement of related themes and culture, by UNESCO has been assigned as a Humanitarian Heritage for Oral and Non-Cultural since October, 2nd 2009. Pekalongan, Solo, and Yogyakarta are the three batik icons in Java.

II. LITERATURE

Theory of Supply Chain : Supply Chain is a framework that includes the procedure of creation, delivery, storage, distribution, and sale of products to satisfy the need for such products. Supply Chain incorporates all procedures and exercises engaged with the delivery of the product to the clients (customers). The entirety of this provides production forms in assembling, transportation frameworks that move products from completing to retail outlets, products stockpiling stockrooms, distribution focuses where shipping in enormous parties is isolated into littler parties to be sent back to stores lastly to retailers.Who sellthese products (Jones et al., 2019). In this case, it is best to do it together with retailers using a benchmark such as CPFR (Collaborative Planning Forecasting and Replenishment).This conjecture is utilized to estimate the amount and sort of crude material that must be purchased. At that point, the completed merchandise is put away in the stockroom until requested by the distributor. According to Turban et al. (2004), there are three main components of the Supply Chain, namely: (1) Internal Supply Chain Segments, (2) Downstream Supply Chain Segments, and (3) Upstream Supply Chain Segments.

Technological Innovation Performance : Technology Innovation is introducing new technology, new services, and new and more useful ways. An essential course for companies to get sustainably competitive is Technology Innovation. According to Hagedoorn and Cloodt (2003) that for the appraisal of technological innovation performance of the number of licenses, patent quotations, new products, and investment R&D. Also, Jones et al. (2019); Min & Lu (2017) propose that technology innovation performance appraisal is based on measuring the index namely: sales of cost, innovative products, and rush of development of new products, level of sales of new products, leading or participating in developing standards industry, and success rates of creative projects. Noticeable open innovation instances originate from enormous assembling organizations having a place with the high-tech part (Chesbrough, 2003). Additionally, small and medium-sized organizations practice technological innovation. They can benefit a lot from opening their innovation process because they often lack the resources to develop and commercialize new products themselves. Observational outcomes from van de Vrande et al. (2009) indicates that showcase related market-related targets propel technological innovation in SMEs. SMEs utilize a few technical innovations rehearses simultaneously to serve clients adequately or open new markets, with significant objectives to make sure about income and support development.This was affirmed by Parida et al. (2012), who explored the impacts of four approaching technological innovation exercises on the exhibition of high-tech SME innovations. Parida et al. (2012) contend that from one perspective, SMEs contrasted with huge companies that are constrained in regards to technological innovation rehearses because of an absence of own assets and unstructured development forms. Then again, SMEs can get numerous advantages from open development exercises due to this gives an approach to remunerate to the shortage of assets and interior ability.

SCI : SCI is the process of cooperation between members of the fitting chain o intra-organization and inter-organization. SCI manages all operations together in a supply chain.
SCI aims to effectively control the flow of services or products, decisions to reach maximum value for customers at financial affairs and low cost, high speed, and information (Flynn et al., 2010). According to Otchere, Annan,

and Anin (2013), SCI, three-dimensional namely: (1) Customer Integration, 2) Internal Integration, and (3) Supplier Integration. Stefansson (2002) assumes that SCI as a link between producers, customers, suppliers, and all chains through I.T. development and communication is possible. Simon and Petnji-Yaya (2012) express that I.T. coordination in SMEs will improve execution with a more significant SCM integration level, the better SME execution. Knowledge-based customization framework for S.C. integration that intends to improve supply chain perceptions by obtaining measurable action data and formulating methodologies for supply chain configurations that drive long-term achievement composed by (Cheung et al. 2012). Lii and Kuo (2013) show that collaborative innovation's orientation positively affects SCI, manageable intensity, and general performance. Sezen and Çankaya (2013) portray the beneficial outcomes of technological innovation on effortless improvement for companies.The close collaboration that connects technology innovation is increasingly helpful for improving lasting supply chain performance. Kim et al. (2018) recommend that integration between virtual companies dependent on information technology can be utilized as an effective administration system for providers, improving cross-fringe supply chain connections, accordingly improving speaking execution.Gemnden et al. (1996) show that the first collaboration of providers in product innovation projects can reduce high-cost design changes in later stages, abbreviate the improvement pattern of innovation projects, and increment improvement productivity.Lindgreen et al. (2018) also indicate that data innovation in overseeing supply chain processes and improving execution keeps on being a primary concern for companies.

The discoveries of a review directed by Singh and Power (2014) show the possibility to assemble imaginative capabilities through mix through the collaboration to access, share, and increasing knowledge. Xiuhong (2013) proposes a dynamic model of information move frameworks like the capacity for knowledge integration and expressive force.

H1: SCI effect on technological innovation performance
H2: SCI effect on the Supply Chain Knowledge Sharing

Supply Chain Knowledge Sharing **(SCKS) :** Hult et al. (2006) speculate that knowledge has long been considered a strategic resource in the supply chain. The leading proponent of supply chain management is the Knowledge management description (Samuel et al. (2011).This procedure is accomplished through different techniques, including making, sharing, and applying information and exercises that can be assessed and best practices in organizational memory to support all organization components to keep learning (Egelie, 2019).As a result, knowledge management must go past organizational limits in light of the organization's have to use its knowledge resources, in this manner, remembering its accomplices for S.C. (Malhotra et al. 2005). Social cooperation between two companies, comprising trade between organizational experience, employee knowledge, and capabilities, defines the K.S. supply chain (Argote et al., 2000).Grawe et al. (2009) also show that this organizational culture is strengthened by the continuous sharing of information and intelligence. Concerning the flexible chain, information sharing is extended to the company's supply chain partners. This prompts an expansion in the accuracy of information request(demand), which reduces product structure and production arranging a factory and allows it to have a better response to client needs (Flynn et al. 2010).

Different investigations talk about the job of communication technology and information technology in projects identified in withknowledge management (Angeles, 2012; Al-Karaghouli et al., 2013; Chen et al., 2013). Meanwhile, there are technology enablers for the success of the process knowledge management, namely, (i) tools and applications; and (ii) communication technology and information (Heisig, 2009). The above success can be acquired if the business organization that is run can utilize knowledge to make forms that can be more effective and efficient.Besides, business organizations can use knowledge to organize and add worth or advantage to customers by fostering one of a kind item advancement developments (Dyer, 1998; Stoltz-andersen, 2014).Then again, Knowledge Management is characterized as deliberate coordination in an organization that directs everything in the organization, including processes, technology, human resources, and organizational structures to build an incentive through reuse, the development of thoughts and inventive thoughts and innovation (KimizDalkir, 2011). De Vries and Brijder (2000) proposed a structure for hybrid supply channels through exploratory contextual analysis at IBM. Their structure illustrates that a serious environment causes conduit systems to take a form hybrid. Hence, the channel strategy hybrid makes it important to oversee and impart knowledge with partners, while Mellat-Parast's (2013) research found that quality management and SCM tools must have integrated applications for more excellent organizational performance.
Through a case study on the adoption of authoritative frameworks in SMEs, Chong and Bai (2014) show that the utilization of information, the acquisition of knowledge, and the dissemination of knowledge influence the choice to adopt technology and increment its S.C. integration.

H_3: supply chain K.S. influences technological innovation performance
H_4: SCKS mediates the effect of SCI on technological innovation

III. METHODS

The Sampling procedure in this research is utilizing Census. Census is an inspecting method when all individuals from the populace are being used as tests. This is frequently done if the populace is moderately small, so this can minimize errors. The method used in this study is a survey method to collect data from research objects, namely by interviews (structured or unstructured), by giving questionnaires and observing people and phenomena. Analysis of the data is quantitative. (Uma Sakaran, 2006). The population is a speculation zone comprised of articles/subjects withspecific characteristics and attributes controlled by analysts to be concentrated and reached determinations (Hair et al., 1989). The population in this study were all Batik KulonProgo SMEs, Yogyakarta. The population is 140 SME Batik respondents. This study used the Partial Least Square (PLS) analysis method with the Smart PLS 3.2.8 program. This technique consists of an external model or estimation model and an inward model or basic model. Outer models or indicator tests are performed to evaluate the validity of the model and the reliability. The outcomes external model in this study are shown in Table 2 as follows.

IV. RESEARCH RESULTS

Description of the characteristics of Respondents : This research contains data that has been collected many 140 SMEs in this study. The respondent can be identified regarding: (1) the position. (2) length of business, and (3) the number of employees of the respondents as follows:

Table 1. Characteristics of respondents

Category	%
Manager	46.7
Owner and Manager	53.3
Length of business	
<Ten years	40.6
≥ Ten years	59.4
Number of Employees	
2-5 People	48.5
6-10 People	32.7
≥ 10 People	18.8

V. TEST RESULTS OUTER MODEL

Table 2. Construct Reliability

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
SCI	0.800	0.802	0.870	0.626
Supply Chain KnowledegSharing	0.877	0.891	0.621	0.851
Technological Innovation Performance	0.887	0.889	0.922	0.747

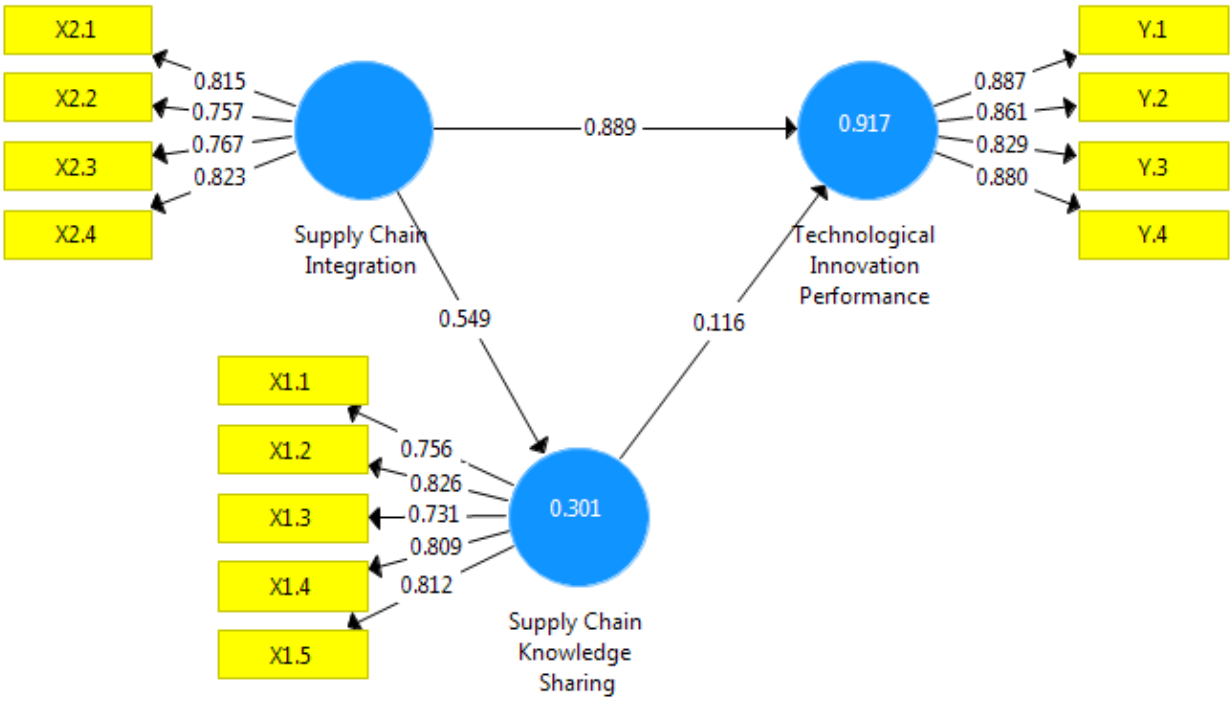

Figure 1. PLS-Algorithm

Convergent Validity : The value of external loading on latent variables with indicators is an understanding of convergent validity. According to Chin, quoted by Imam Ghozali (2014), said that a value outer loading between > 0.7 is considered to be very good to meet the requirements convergent validity. Table 2 shows each indicator variable has a value > 0.7 so that all indicators are declared or valid.

Composite Reliability : The part used to test the reliability value of indicators on a variable is composite reliability. A variable can be expressed, satisfying composite reliability in the event that it has a worth composite reliability > 0.6 (Ghozali, 2014). In light of the information introduced in Table 2 above, all the variables shown show that the research composite reliability value is> 0.6.From these values it can be concluded that all variables have a high level of reliability because it shows the adequacy of the composite reliability of each variable.

Average Variance Extracted (AVE) : Standardize the appropriate model needed Average variance extracted value (AVE)> 0.5 for each number of indicators.Given the information introduced in Table 2 above, it is realized that the AVE estimation of every variable has a value> 0.5. Hence it tends to be expressed that every variable has good validity.

Cronbach's Alpha : The Cronbach alpha value can be used to strengthen the reliability test with the composite reliability above. If a variable has a Cronbach alpha value> 0.7, the variable can be categorized as reliable or meets Cronbach alpha (Ghozali, 2014). In light of the information introduced above in Table 2, each study variable has a Cronbach alpha value tends to be seen> 0.7. Based on these results, it tends to be concluded that all variables have a significant level of reliability, supported by the results that show that each research variable meets the requirements for the Cronbach alpha value.

Discriminant Validity : If the cross-stacking factor indicator value in the variable is greater than the different variables, an indicator can be declared to meet the discriminant validity (Ghozali, 2014). Given the information,the introduction appeared in Table 3. The value of each indicator cross-loading factor shows that the variable value is greater than the cross-loading value of the other variable indicator. In light of the outcomes acquired in Table 3, it very well may be expressed that until now, the indicators used in the study have a decent discriminant validity in determining their respective variables.

Table 3. Cross Loading (Discriminant Validity Test)

	SCI	Supply Chain KS	Technological Innovation Performance
X1.1	0.397	0.756	0.466
X1.2	0.308	0.826	0.345
X1.3	0.311	0.731	0.325
X1.4	0.571	0.809	0.623
x1.5	0.462	0.812	0.496
X2.1	0.815	0.432	0.759
X2.2	0.757	0.419	0.733
X2.3	0.767	0.443	0.719
X2.4	0.823	0.441	0.800
Y.1	0.867	0.515	0.887
Y.2	0.805	0.541	0.861
Y.3	0.773	0.584	0.829
Y.4	0.845	0.454	0.880

Inner Model Testing Results

Table 4. Results of Inner Model

Testing	Result	Criteria
The Coefficient of Determination (R-square) Supply Chain Knowledge Sharing Technological Innovation Performance	 0.301 0.917	 Weak Good
Predictive Relevance (Q-square) $Q^2 = 0.941$	94%	Good, meaning that the observed values have been reconstructed well with relevance predictive
The Goodness of Fit (GoF)	64%	Large

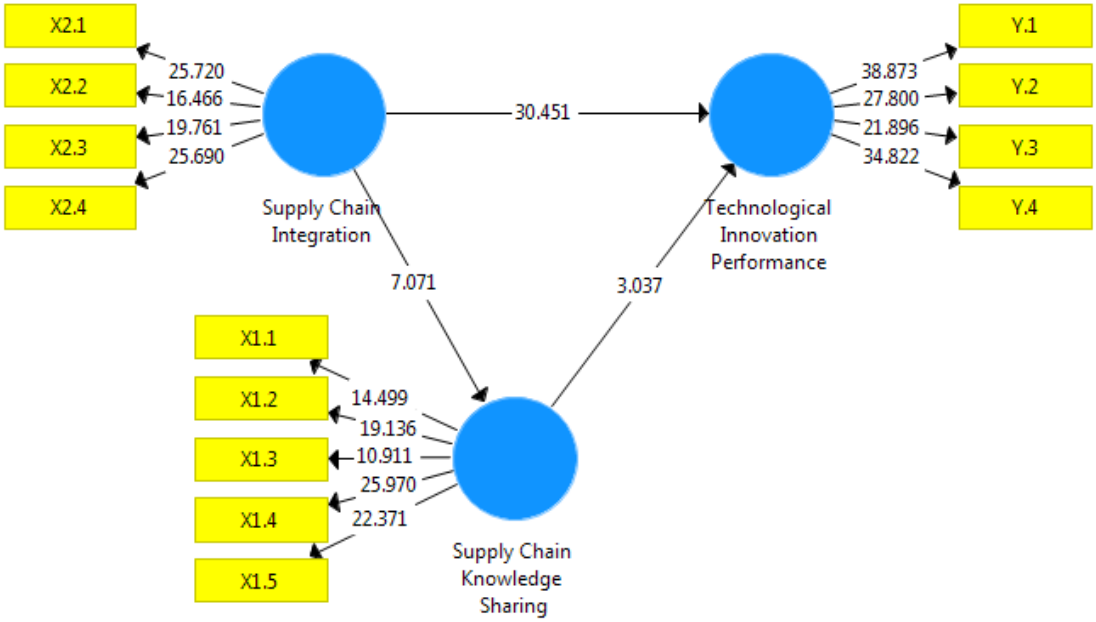

Figure 2. PLS-Bootstrapping

Hypothesis testing is finished by looking at thet-statistics and probability value. For t-table value for α 5% is 1.960. The probability value, the p-value with α of 5%, is < 0.05. So the hypothesis acknowledgment models are the point at which the value of t-statistics > t-table. Hypothesis testing methods Smart PLS 3.2.8 is performed by a procedure, bootstrapping to acquire the relationship impact exogenous variables on endogenous variables as follows:

Table 5. Path Coefficient

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (| O / STDEV |)	P-Values
SCI → Supply Chain KS	0.549	0.554	0.078	7.071	0.000
SCI → Technological Innovation Performance	0.889	0.889	0.029	30.451	0.000
Supply Chain KS →Technological Innovation Performance	3.037	0.115	0.038	0.116	0.003

Table 6. Specific Indirect Effects

	Original Sample (O)	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (| O / STDEV |)**	p-values
SCI→ Supply Chain KS → Technological Innovation Performance	0.064	0.064	0.025	2.568	0.011

VI. DISCUSSION

Calculation value Bootstrapping from Hypothesis 1 has an original value example positive of 0.549. A p-value of 0.000 (in Table 5) shows that SCI has a positive and noteworthy impact on technological innovation performance. This research is equivalent to the analysis of Yen-Teoh & Pan (2009); Ou et al. (2010), which express that I.T. integration in SMEs will improve implementation with more significant integrated supply chain levels management, the better performance of SMEs. The adoption of innovative supply chain technology innovations viably amplifies the performance of sustainable supply chains and improves dynamic adaptability to change the external environment. Therefore, companies must utilize new technological equipment such as renewable technology, information technology, and the use of the internet to improve company digitalization and smooth out procedures with a definitive objective of improving economic, environmental performance, and social. Likewise, it is necessary to develop further and create technical cooperation with upstream supply chain sections and downstream supply chain sections, which can successfully improve supportable supply chain performance.

Also, the government can assist SMEs in terms of strengthening their internal integration. This can be done by providing support for human resource development (for example education, training, consulting, training) that will improve SME management skills, such as the creation of effective operational and production plans and functional coordination.Calculation value Bootstrapping from hypothesis 2 has a value original sample positive of 0.889 p-values of 0.000 (in Table 5) shows that SCI has a positive and essential effect on supply chain K.S. This research is consistent with Li and Hu (2012), which aims to describe the importance of sharing knowledge supply chain using the Prisoner's Dilemma Model of the theory game. The researchers researched and talked about the connection between K.S. between companies and company revenue in the supply chain, concluding that drawn-out income and operational productivity could be improved all through S.C. by rehashing K.S. between individuals supply chain. Marra et al. (2012) state that organizations must cooperate to share knowledge, so knowledge management actions must be created is the definition of product development.Calculation value Bootstrapping from hypothesis 3 has a value original sample positive of 0.116 p-values of 0.003 (in Table 5). It indicates that theK.S. supply chain becomes the main element to improve and make a positive and important impact on technological innovation performance. The outcomes of this research are following the study of Lim et al. (2017), which proves that organizational learning, information, information technology, shared knowledge creation, and knowledge storage in helpful development in the supply chain are the most elevated main impetus for improving the dynamic abilities of the supply chain. In hypothesis 3, the value shown in the original sample is the smallest among the other hypotheses.

This means that the supply chain knowledge sharingin various KulonProgoBatik SMEs is still lacking in considering the process of creating knowledge and storing knowledge. Hope for SMEs' future must focus on the

application of knowledge and its suggestions related to the capacity to utilize new knowledge that will affect technological innovation performance. SMEs can build platforms knowledge sharinglike a virtual community on social media. The existence of a virtual community can helpthe knowledge of the manufacturing procedure, mitigate the inside challenges of restricted information assets, diminish improvement costs, and speed up advancement inside the company.Calculation value Bootstrapping from hypothesis 4 has a value original sample positive of 0.064 p-values of 0.011 (in Table 6) shows that supply chain knowledge sharing is positively and significantly able to mediate the effect of SCI on technological innovation performance. This study is in line with Eisenhardt and Martin's (2000) research, which shows that integration and technological knowledge among partners in the supply chain help realize major technological breakthroughs and innovations and enhance product and service innovation.All types of integration are essential, both internal and external integration, because the consequences of external integration (integration of customers and suppliers) on business implementation and competitiveness will only affect if internal integration is implemented. All fields that need to be integrated, such as financial flows, information flows, physical flows, processes, technology, innovation, strategies, knowledge, procedures, and key players, must be strengthened among SMEs. This will enable them to meet customer requirements by obtaining quality requirements and global quality standards, achieving cost reductions through waste minimization and rejection, and increasing productivity, which leads to better business performance and competitiveness.

In addition to investing in enterprise application integration (EAI), the government must also promote mechanisms for adopting information technology, such as educational programs, and help SMEs pursue rapid technological progress. Indonesia, especially the Special Region of Yogyakarta in the KulonProgo Regency, can learn from the Taiwan government. Taiwan Government has built a national information and communication technology infrastructure, which helps its companies in SCI by acting as a platform for sharing information throughout the supply chain (Wang 1999; Lee and Kim 2007; Chen et al. 2011).In terms of technology and business-to-business capabilities, helping SMEs in the digital economy Assistance can also improve SME's international competence (Chen et al. 2011). The Ministry of Trade and Industry in the 2017-2022 SMEs Development Plan to promote the digital economy and the internet under a cross-sectoral strategy. The plan welcomes other developments to further pursue its goals by utilizing technological improvements and extending them to all SMEs (DTI, 2018b).The government must also establish effective mechanisms that will unite all regulatory bodies and increase efficiency in every process involved in supply chain management and excess costs, which affect supply chain performance.

VII. CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This research directed an empirical study of SCI's effect on technological innovation execution mediated by supply chain knowledge sharing on KulonProgoBatik SMEs, Yogyakarta. The results of this study indicate: (1) SCI has a substantial and positive effect on technological innovation execution, (2) SCI has a significantand positive impact on supply chain K.S., (3) supply chain K.S. has significant and positive effects on technological innovation execution, (4) supply chain K.S. positively and significantly able to mediate the impact of SCI on technological innovation performance. The outcome of the hypothesis in this study forms a cognitive model of the supply chain that is conformable with the theory and developmentof the previousstudies. This finding shows that supply chain K.S. assumes a significant job in supporting the management's execution of practices supply chain. In this research, supply chainknowledge sharinghas been linked to SCI and technological innovation performance. Research on technological innovation performance that has been influenced by SCI has been widely studied. However, based on theoretical aspects, further researchers still provide opportunities to add other variables such as customer service management, inventory management, risk management, outsourcing, demand planning/forecasting, and logistics management. Also, there are still other opportunities, such as human logistics, green supply chains, global supply chains, sustainable supply chains, and reverse logistics.

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