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The Dependency of Supply Chain Management and Product Quality on Product Innovation

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Abstract

One of the challenges faced by fashion MSMEs (Micro, Small and Medium Enterprises) in Bandung is the poor quality of their products. Product quality is one of the important aspects to consider while aiming for strengthening competitiveness and customer satisfaction. Therefore, the fashion MSMEs need to continuously improve their product quality to be better and more reliable in order to gain consumer's trust and satisfaction. Supply chain management has been proven to affect product quality. On the other hand, product innovation is also needed to ensure continuous improvement in product quality. This study applied a quantitative method to analyze the direct and indirect influence of supply chain management on product quality. The indirect influence used product innovation as an intermediating variable. The data were collected by distributing questionnaires among fashion MSMEs in Bandung area and processed by using SmartPLS 3.2.8. The inner model, outer model and bootstrapping were produced in data processing to identify the root causes of the problem based on the phenomena raised in this study. The analysis results showed that supply chain management has significant effects on product quality. Product innovation as a mediating factor also significantly affects the relationship between supply chain management and product quality. This study contributes as references for fashion MSMEs to improve their product quality through supply chain management and product innovation to achieve competitive advantages and high customer satisfaction rates.

Keywords
product quality; supply chain management; product innovation; smart PLS method

I. Introduction

The Micro, Small and Medium Enterprises (MSMEs) sector is one of the important drivers of Indonesia's economy that absorbs human labor and reduces unemployment rates (Amalina, 2020). The MSMEs in the fashion industry are growing rapidly especially in Bandung area as the largest fashion industry in Indonesia. Bandung is known as the fashion city in Indonesia and its government actively promotes the growth of MSMEs in the creative industry including the fashion sector to provide job opportunities for the citizens of Bandung (Humas. Bandung, 2018). Based on Table 1.1, the creative industry in Bandung is dominated by the fashion industry with 43,71% that makes it the most important sector and the biggest contributor to the city's GDP.

Many of fashion MSME's products have become trends and are very popular among tourists, both local and international. It gives great opportunities for MSME fashion products to reach the international market. The government also encourages fashion MSMEs to expand their sales area to the international market and increase export capacities of the MSMEs products. Various efforts have been made by the government to

increase the income of rural communities. One of the thing that can be seen from the real actionof the meaning of developing villages is the support of the central government, through cross- ministerial efforts to provide space for the developmentof the village potential (Anggraeni & Pitoyo, 2020). On the other hand, the pressure of the global market makes fashion MSMEs struggling to compete with foreign products or even other local products. Some of the fashion MSMEs are hindered by the poor quality of their products which makes them unable to compete with neither local brands nor foreign brands. Those fashion MSMEs need to improve their product quality to be at least on the same level as the products from international brands, but with relatively competitive prices (Merahputih, 2016).

Table 1. The Contribution of creative industry sectors in Bandung 2017

No	Creative Industry	GDP Subsector	Percentage
1	Fashion	45.803.769.843	43,71%
2	Culinary	16.080.768.980	15,62%
3	Art market	685.870.805	0,65%
4	Craft	10.170.688.435	10,82%
5	Architecture	4.134.446.695	3,95%
6	Design	6.159.598.596	5,88%
7	Advertising	8.305.034.367	7,93%
8	Video, Film, Photography	250.431.983	0,24%
9	Interactive game	337.392.321	0,32%
10	Music	3.824.179.411	3.65%
11	Performing Arts	124.467.644	0,12%
12	Publisher and Printing	4.283.989.793	4.09%
11	Computer Services and Software	1.040.637.861	0.99%

Source: Statistics of Indonesia 2017

Affordable prices, good product quality, and attractive packaging can be competitive advantages for fashion MSMEs. Fashion MSMEs also need to manage their business operations correctly to increase efficiency and achieve competitive advantages. The failure to manage business operations can decrease product quality which could result in the cutback of product sales. One of the methods to gain efficiency in business processes is through supply chain management. Supply chain management presents solutions for companies to achieve efficiency through cost reduction in the production process while making room for improvements to maintain customer satisfaction (Anatan, 2018; Lotfi et al, 2013). The fashion MSMEs require high-quality materials at affordable prices. However, some of the raw materials are difficult to obtain from within the country so they need to buy imported materials which makes it even more difficult to manage given the time and effort it needs to import those materials from abroad. The well-implemented supply chain management can help MSMEs to maintain efficiency in their production process and deliver good quality products to their consumers (Heizer and Render, 2013: 138).

Product innovation is also a requirement for a company that faces global competition. Through product innovation, the company will be able to keep up with the rapid changes of the market and customer's wants (Kanagal, 2015). Researchers have proven that innovation has significant effects on product quality. Hartini et al. (2012) argued that innovation such as modification and additional features can improve product quality which in turn will also increase customer satisfaction. Al-Rasyid et al. (2018) concluded product innovation has a positive and significant effect on consumer's purchase

decisions. Didonet et al. (2012) studied the relationship between supply chain management and innovation. The study revealed that innovation both in the product and supply chain processes can improve product quality and customer satisfaction. Khalil et al. (2018) examined the mediating effects of product innovation on supply chain management and proved that product innovation positively affects the relationship between supply chain management and product quality.

This study aims to empirically examine both the direct and indirect effects of supply chain management on product quality in fashion MSMEs. The indirect effect uses product innovation as a mediating variable. The study uses questionnaires for data collection with fashion MSMEs in Bandung as respondents. The remainder of the paper is organized as follows: Section 2 reviews related literature while Section 3 presents the proposed framework and hypothesis. Section 4 provides data processing and discussion. Finally, Section 5 concludes the study and suggests future works of this study.

II. Review of Literature

Over the decades, researchers have studied the effects of supply chain management (SCM) on product quality and customer satisfaction. Arawati and Agus (2011) proved the significant effect of SCM on production performances and product quality in the Malaysian manufacturing industry, the study results showed that there was a linkage between production performance and SCM. Lotfi et al. (2013) also examined the relationship between supply chain integration and product quality. The integrated supply chain has effects on conformance quality, each dimension of supply chain integration affects each dimension of product quality. Supply chain management ensures efficiency in each production process while maintaining product quality. Superior quality products can help companies to increase their revenues and profits. The relevance of manufacturing in developing human cociety is no longger contestable. The march of word economic history as epitomizedby the industrial revolution, and the subsequent emergence of several countries, especially the Asean Tigers into the club of industrialized nations have all confirmed the hitoricityof manufacturingin stimulating economic growth and development (Misbahu Sa'idu, Aminu Bakari Buba, 2021).

While SCM can help companies to maintain their efficiency and product quality, the ever-changing market challenges them to keep up the pace. One of the ways to meet the changes in the market is by doing innovation. Innovation can be defined as the modification or additional features that give value added to the products. Al-Rasyid et al. (2018) analyzed the impact of innovation and price on consumer's purchasing decisions. The study resulted that both innovation and prices significantly affect consumer's purchasing decisions. Product innovation is a key for the company to overcome global competition (Kanagal, 2015). Hartini (2012) revealed a positive effect between innovation and product quality where continuous innovation can improve product quality. Didonet et al. (2012) emphasized the importance of innovation in SCM, both in the products and processes. Innovation can support SCM whether in the process, technology or products. Khalil et al. (2018) studied the mediating effect of innovation on supply chain management. Innovation needs to be seen from the upstream to the downstream processes such as material processing, consumer perception, supporting technology, etc. Innovation positively affects the relationship between supply chain management and product quality, in accordance with Mpado et al. (2015) that concluded product innovation mediates business network and relationship performances.

Even though much research has been done in the area of supply chain management, but from the author's knowledge, research entirely studying both direct and indirect effects of supply chain management on product quality is scarcely done especially in the fashion industry. This study combines both direct and direct effects of supply chain management on product quality. Based on the literature review, product innovation is taken into account as the mediating factor. By studying both direct and indirect effects of supply chain management at once, it can be fairly compared how significant each effect on product quality is and how significant product innovation affects the relationship between supply chain management and product quality.

Proposed Model

Based on the literature review, supply chain management has proven to have both direct and indirect effects on product quality. Combining both direct and indirect effects in a study can give a more comprehensive view on those effects, the significance of each direct and indirect effect in influencing product quality and the significance of supply chain management as a whole in affecting product quality. Product innovation has also proven to affect the relationship between supply chain management and product quality, so this study uses product innovation as mediating variable in examining the indirect effect of supply chain management on product quality. The proposed model used in this study is shown in Figure 1 below.

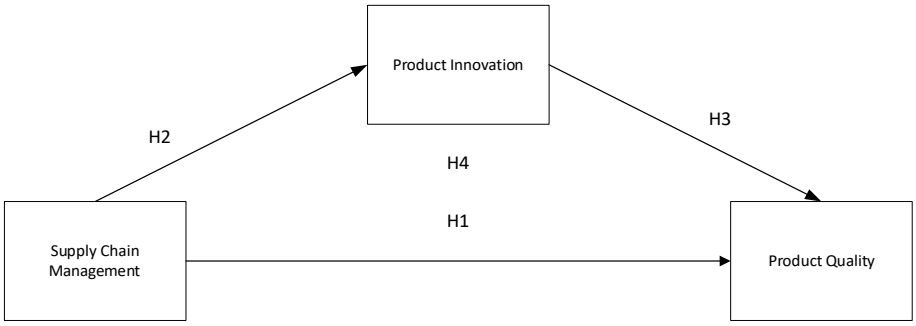

Figure 1. *The Proposed Model*

Most of the raw material used in fashion MSMEs is imported material, so it is necessary for fashion MSMEs to implement supply chain management in their business since it takes more time and effort to managed imported materials. Supply chain management gives a positive and significant effect on product quality and company performance which both resulted in high customer satisfaction (Arawati and Agus, 2011). Lotfi et al. (2013) showed that an integrated supply chain supports product quality, each dimension of the supply chain positively affects each dimension of product quality. Supply chain management can help MSMEs to gain efficiency through cost and time reduction without neglecting product quality (Heizer and Render, 2013). Based on previous research, the first hypothesis for the proposed model is:
H1: Supply chain management positively influences product quality

Didonet et al. (2012) highlighted the important implementation of supply chain management for innovation in products and processes. While maintaining production efficiency, supply chain management also helps companies to incorporate innovation (Anatan, 2018). Fashion MSMEs need to continuously innovate both their products and processes to be able to compete in today's global market. While allowing fashion MSMEs

to reach a wider market area, the global market also makes the industrial competition tighter. Fashion MSMEs not only have to compete with other local products but also with other products from around the world. Continuous innovation can improve product quality (Hartini, 2012) and can be one of the factors that influencing consumer's purchasing decisions (Al-Rasyid et al., 2018). Hence, the second and third hypotheses for the proposed model are:
H2: Supply chain management positively influences product innovation
H3: Product innovation positively influences product quality

Khalil et al. (2018) studied the effects of product innovation on supply chain management. The results of the study showed a positive impact of product innovation on the relationship between supply chain management and product quality. Innovation is needed from the beginning to the end of the production processes. Mpado et al. (2015) also concluded that innovation intercedes the performances of the businesses and its related network. Those literature establish the fourth hypothesis of the proposed model as follow:
H4: Product innovation has a mediating effect on the relationship between supply chain management and product quality

III. Research Methods

3.1 Sampling Method

The data were collected by using online questionnaires to 351 from the total of 2524 fashion MSMEs in Bandung. The sample size was determined based on Yamane and Isaac's method shown below:

$$n = \frac{N}{1 + N(e)^2}$$

Where:
n: Total sample required
N: Total Population
e: The Level sample of wrong (Sampling Error), usually 5%

$$n = \frac{2524}{1 + 2524(0.05)^2}$$

n = 345

The minimum number of respondents for this study is 345 fashion MSMEs, hence the collected data from 351 fashion MSMEs is sufficient. The sampling method used was purposive sampling which relies on the researcher's judgment to choose respondents from the population (Sugiyono, 2018).

This research uses both data sources from primary data sources and secondary data sources. Primary data sources are gathered from surveying 351 samples of respondents in gathering information about MSME of fashion in Bandung. Secondary data sources are obtaining data through other sources, which come from the internet, literature reviews, journals, previous research, books, and other reliable sources to be used as a reference in this study to gather information about the product quality, product innovation and supply chain management.

3.2 Measurement

a. Independent Variable

Supply Chain Management as independent variable was measured by using 17 indicators divided into four categories, namely Strategic Supplier Partnership (Hamister, 2012) with four indicators, Information Sharing (Hamister, 2012) with four indicators, Quality Information (Hamister, 2012) with four indicators and Customer Relationship (Sukati, 2011) with five indicators.

b. Mediating Variable

Product Innovation as mediating variable was measured by using 10 indicators divided into five categories namely Relative Advantage (Rasyid and Indah, 2018), Compatibility (Rasyid and Indah, 2018), Trialability (Rasyid and Indah, 2018), Observability (Rasyid and Indah, 2018) and Complexity (Rasyid and Indah, 2018) each consisted of two indicators.

c. Dependent Variable

Product Quality as dependent variable was measured by using 21 indicators divided into 7 categories namely Performance (Mansori, 2018), Features (Mansori, 2018), Reliability (Mansori, 2018), Conformance (Mansori, 2018), Durability (Mansori, 2018), Aesthetic (Mansori, 2018) and Perceived Quality (Mansori, 2018) each consisted of three indicators.

IV. Results and Discussion

The relationships between variables were analyzed by using Partial Least Square (PLS) as one of the alternative methods in Structural Equation Modelling (SEM). PLS was chosen because it is relatively easy to use to explain the relationship between latent variables without many requirements or assumptions on the data. PLS measurement model is divided into two models namely the outer model and the inner model (Abdillah and Jogiyanto, 2015). The outer model measures the validity and reliability of the model while the inner model predicts the relationship between latent variables.

4.1 Outer Model Measurement

Figure 2 presents the results of outer model measurement using SmartPLS. Measurements used in the outer model consisted of three testing namely convergent validity, discriminant validity and reliability testing.

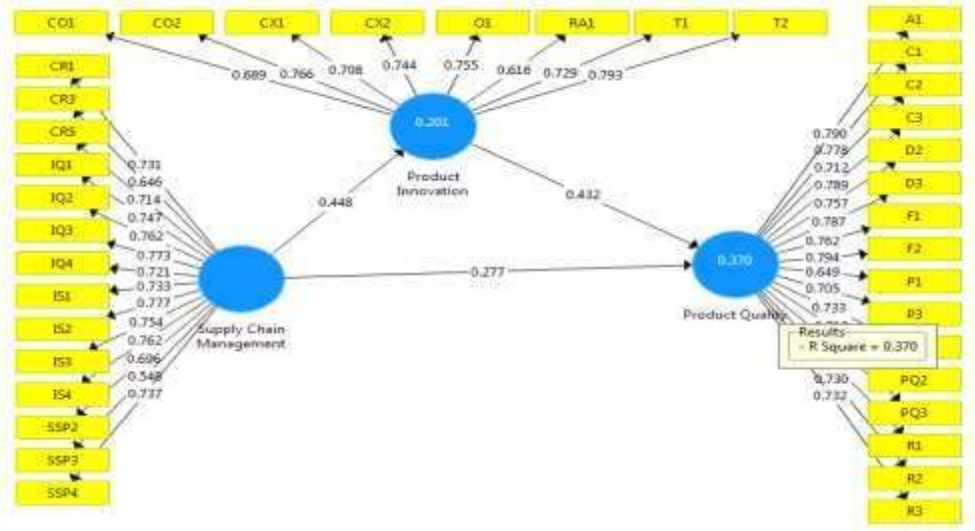

Figure 2. *Outer Model Measurements*

a. Convergent Validity

Each indicator must have a loading factor greater than 0,5 to be stated practically and validly significant (Jogiyanto and Abdillah, 2015). The higher the loading factor value, the more important the indicator is in explaining its latent construct. Loading factors for each indicator in this study are bigger than 0,5, hence all indicators are valid. Furthermore, the Average Variable Extracted (AVE) value of each variable also needs to be greater than 0,5 to be considered with adequate convergence validity. Table 2 shows the AVE of each latent variable, AVE for all variables is bigger than 0,5 which means all variables in this study have adequate convergence validity.

Table 2. AVE values for each latent variable

Variables	Average Variance Extracted (AVE)
Supply Chain Management (SCM)	0.524
Product Innovation (PI)	0.528
Product Quality (PQ)	0.554

b. Discriminant Validity

Discriminant validity uses cross-loading values on indicator level and Fronell-Lacker Criterion test on the variable level. On the cross-loading, indicators must have a higher correlation to their own latent variable than to other variables (Meilita et al., 2016). All indicators in this study have met this requirement, so it can be stated that on the indicator level, the model has good discriminant validity. While for the Fronell-Lacker Criterion, the variables can be stated to have discriminant validity if the AVE root value is higher than its highest correlation with other variables (Meilita et al., 2016). Table 3 shows the results of Fornell-lacker Criterion testing for each variable. The results show that the AVE root value of each variable is higher than its highest correlation with other variables which also confirms the good discriminant validity of the model.

Table 3. The Fornell-Lacker Criterion Results

	Product Innovation	**Product Quality**	**Supply Chain Management**
Product Innovation	**0,727**		
Product Quality	0,556	**0,745**	
Supply Chain Management	0,448	0,470	**0,724**

c. Reliability

The reliability testing in PLS uses two criteria to determine whether the data can be relied upon, Cronbach's Alpha and Composite Reliability. The Cronbach's Alpha and Composite Reliability should have a minimum value of 0.7 to be considered reliable (Meilita et al., 2016). Table 4 below shows the results of the reliability test of the outer model where each variable is reliable.

Table 4. The Results of Reliability Test

Variable	**Cronbach's Alpha (> 0,7)**	**Composite Reliability (> 0,7)**	**Conclusion**
Supply Chain Management	0,929	0,939	Reliability
Product Innovation	0,871	0,899	Reliability
Product Quality	0,946	0,952	Reliability

4.2 Inner Model Measurement

The inner model or structural model predicts the causal relationship between latent variables (Hair et al., 2014). Figure 3 below shows the inner model measurement of this study.

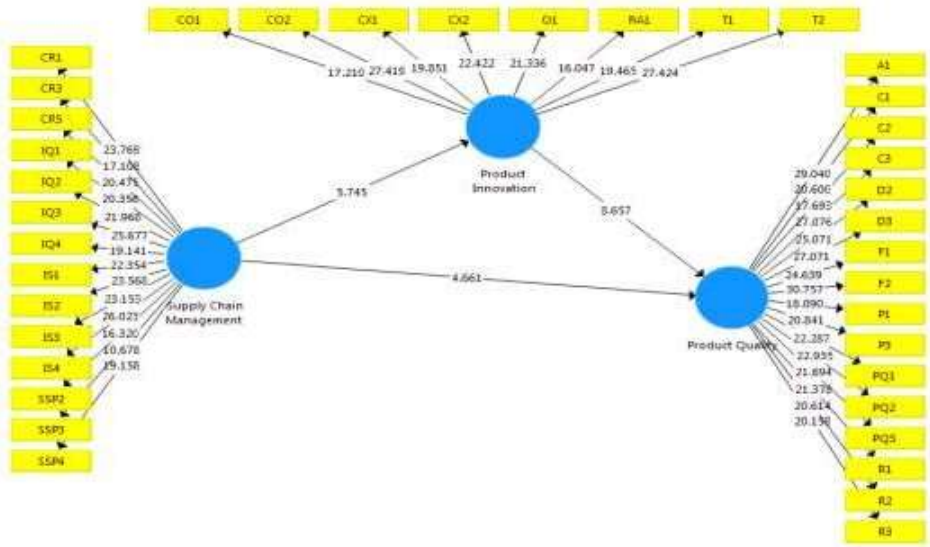

Figure 3. *Inner Model Measurement*

a. Bootstrapping

The prediction is based on the path values to determine the effects that can be expressed from the t value (Meilita et al., 2016). The t value is provided by bootstrapping. The t value is used to assess the significance of the prediction model in testing the structural model. Table 5 below summarizes the results of bootstrapping.

Table 5. Bootstrapping Results

No	relationship	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	conclusion
Direct						
1	Supply Chain Management -> Product Innovation	0.448	0.078	5.745	0,000	H1 accepted
2	Supply Chain Management -> Product Quality	0.277	0.059	4.661	0,000	H2 accepted
3	Product Innovation -> Product Quality	0.432	0.050	8.657	0,000	H3 accepted
Indirect						
4	Supply Chain Management -> Product Innovation -> Product Quality	0.194	0.040	4.814	0,000	H4 accepted

For the 5% significance level used in this study, the hypotheses are accepted when the t-value is greater than 1.65 (Hair et al., 2014). It means there is a significant impact between the independent variable and dependent variable. As can be seen in Table 5, H1, H2, H3 and H4 are accepted so it can be inferred that:

a. Supply chain management has a positive and significant effect on product innovation.
b. Supply chain management has a positive and significant influence on product innovation.
c. Product innovation has a positive and significant effect on product quality.
d. Product innovation has a positive mediating effect on the relationship between supply chain management and product quality

b. R^2 Analysis

R^2 analysis is used to calculate the degree of variance of the independent variable against the dependent variable. Table 6 below presents the R^2 of the model.

Table 6. R-square Analysis Results

Latent Variables	(R^2).
Product Innovation	0,201
Product Quality	0,370

Based on Table 6, the R-Square value of Product Innovation variable is 0.201. It means the supply chain management explains 20,1% of product innovation while the other 79,9% is influenced by other variables not included in this study. Same with Product Quality, 37% of Product Quality is explained by Supply Chain Management while the other 63% is affected by other variables not included in this study.

Goodness of Fit

The Goodness of Fit (GoF) describes how well the model fits its set of observation (Hair et al., 2014). The GoF test for the PLS is conducted through the calculation below:

$$\text{Gof} = \sqrt{\text{Communality x } R^2}$$

Where:
Communality: The average communality index
R^2 : The regression analysis of the structural model

$$GoF = \sqrt{\overline{0{,}536} x \overline{0{,}285}}$$
$$GoF = \sqrt{0{,}153} = 0{,}391$$

Obtaining a Gof value of 0.391 > 0.25 so that it can be concluded that the model has a Gof with Medium category.

4.3 Result Analysis

The study discusses the need for product quality improvement in the MSME fashion industry, especially in Bandung area. The improvement aims to provide superior quality products with affordable prices for the consumers as competitive advantages for the MSMEs in the local and global market. Therefore, the fashion products of MSMEs must be supported with good materials, effective and efficient production processes, and continuous innovation.

Based on data processing results, the first hypothesis of this study is accepted with a path coefficient of 0,277, it means supply chain management has positive effect and influence 27,7% of product quality. Good implementation of supply chain management can increase product quality and vice versa. Previous studies also confirmed the effect of supply chain management on product quality. Lotfi et al. (2013) concluded product quality is important for the consumers. High-quality material and machinery, attractive designs, product durability, and cooperation between supply chain and manufacturing processes can help MSMEs meeting their consumer's expectations.

The second and third hypotheses of the study are also accepted with path coefficients of 0,448 and 0,432 respectively. Hence, supply chain management significantly affects product innovation and product innovation also influences product quality. Hartini (2012) stated the significant effect of product innovation on product quality. Innovation enhances MSME's competitive advantages to achieve customer satisfaction and widen its market share. Innovation can be implemented on the production processes, product design, features, products benefit, etc. that give additional value to the products and businesses.

The fourth hypothesis is also accepted with 0,194 of path coefficient, proving that product innovation has a positive mediating effect on the relationship between supply chain management and product quality. The higher product innovation supported by better supply chain management will improve product quality. According to Mpado et al. (2015), product innovation mediates the company's business performance.

V. Conclusion

Product quality is not only affected by its physical features but also affected by other factors along with the production processes. This study presents the positive and significant effects of supply chain management and product innovation on the fashion product quality of MSMEs in Bandung. Product innovation also has a positive mediating effect on the relationship between supply chain management and product quality. Good implementation of supply chain management and continuous product innovation give MSMEs the competitive advantages needed to maintain customer satisfaction and to compete in the global market. Future works can extend this study by adding other variables that may affect product quality and carry out the empirical study on other industrial or geographic areas.

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