The Effect Of Supply Chain Risk Management On Supply Chain Performance Through Supply Chain Integration And Information Quality In Paper Manufacturer

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Abstract: Globalization affects the changes in business in an area. China's regulation in forbidding the import of recycled paper affects many paper manufacturers almost in the whole of South-East Asia. Paper manufacturer overgrew in East Java in 2017. As the demand grew fast, the Indonesian government revised an old regulation that limits the usage of woods in the paper industry. Because of the disruption, the government take policy the risk that the paper manufacturer's owner must face just got bigger. This research aimed to identify how big supply chain risk management can affect supply chain performance through supply chain integration and information quality. The data was gathered from the paper manufacturing industry using a questionnaire. Thirty questionnaires were received from 40 questionnaires that were sent (response rate of 75 %.). Only a few samples were used because there were only 46 paper manufacturers categorized as the middle and large industry with a total worker of more than 100 people. Partial Least Square analyzed the hypothesis. The result indicates that supply chain risk management affects supply chain integration. Information quality doesn't directly affect supply chain performance; supply chain risk management affects information quality; supply chain integration affects supply chain performance. The next research should use another type of industry and study the supplier-customer relationship.

Keywords: Information Quality, Supply chain risk, supply chain integration, and performance

INTRODUCTION

Risk is something to be dealt with by every entrepreneur, including shortage, government disruption, nature disaster, etc. The supply chain is constantly exposed to risk and is increasing as the competition gets tighter. Supply chain risk management has an essential role in almost every aspect, especially for decision making (Garvey and Carnovale, 2020). Information sharing, risk sharing, and incentive sharing can help reduce the supply chain system's risk. For optimizing the reduction of risk, it is mandatory to have the willingness of risk-sharing and team-working spirit. Should the risk-sharing be successful or not, it is determined by the desire to share information in each supply chain member (Munir et al., 2020). Information distribution is determined by the company's supply chain integration system, where an integrated information system connects every supply chain member. A neat supply chain integration system can ease the information flow, especially the information about product, process, schedule, and company's ability (Flynn et al., 2010). A high collaboration level can provide accurate information about resources and its ability to provide its customer's need. Supply chain integration with enterprise resources planning has an essential role in increasing competitive advantage (Tarigan et al., 2020).

Successful integration has a lot of benefits, one of which is increasing risk management performance (Munir et al., 2020). Risk management also has an essential role in the survivability of the company (Dellana et al., 2019). The failure of managing risk can be fatal for the company's finance. Only one big accident can cause destructive aftermath of the company's finance. A lot of company doesn't care about supply chain risk management because managing risk needs to spend money, and sometimes it requires a lot of money (Cai et al., 2020). However, many companies were forced to shut down their company because they cannot manage the risk. The quality of the information in a supply chain system has an important role. Good quality of data can increase supply chain performance (Marinagi et al., 2015). Without a piece of accurate data, there will be misunderstandings that can disrupt productivity and performance. Supply chain performance can be assessed by the production cost and the customer's response to the company's performance. Aside from the frequency of information exchange, information accuracy, and information, timeliness also has an essential role in the supply chain system. A combination of internal and external integration can affect supply chain performance (Sagawa and Nagano,

2015). The internal integration can help the information flow be more accurate, fast, and efficient so that supply chain performance can be increased (Liu et al., 2012; Ralston et al., 2015). In 2017, Indonesia's paper industry experienced an increase in development because of China's regulation that forbade importing recycled paper to be processed, becoming high-grade paper. Many paper companies in China imported high-grade paper from Indonesia because importing recycled paper is prohibited. This research has three purposes: investigating the effect of supply chain integration for supply chain risk management, information quality, and supply chain performance; investigating the impact of information quality for supply chain risk management and supply chain performance; investigating the effect of supply chain risk management for supply chain performance.

LITERATURE REVIEW
2.1. Supply chain risk management
Supply chain risk is a supplier as a supply risk, production as a manufacturing process risk, and customer distribution as a delivery risk (Sreedevi and Saranga, 2017). Divided uncertainty into two categories which were internal and external (Dellana et al., 2019). Internal uncertainty was defined as the company's capacity uncertainty, export-import regulation, postponing of information, and internal organizational uncertainty. External uncertainty was defined as competitor action, political rule, price fluctuation, supplier quality, manufacturing result, and unexpected cost caused by external action. An unorganized company can cause uncertainty within its supply chain system (Cai et al., 2020). Supply chain risk management has three categories in its framework, which are: tools that are used to manage the risk; a company's behaviour towards the risk; and techniques that are used to minimalize the risk (Lavastre et al., 2012). Quantitative risks are shortage, excess goods, expired excess goods, shortage in inventory and production process (Garvey and Carnovale, 2020). Qualitative risks lack the accuracy, reliability, and precision of material in a supply chain system.

2.2. Supply Chain Integration
Supply chain integration is defined as the relationship between a company with its supplier and customer. Supply chain integration is also defined as the relationship within its system's member. Flynn et al. (2010) divided integration into two categories, which are internal and external. Like enterprise resources planning implementation, internal integration is the relationship within its cross-functional integration (Tarigan et al., 2020; Ince et al., 2013). Internal integration is used to measure how far a company can manage its strategy, collaboration within its department's member, and production process to fulfil its customer demand. External integration is divided into two categories which are: integration with customer and integration with supplier. Supply chain integration is integration with the customer, and integration with the supplier is defined as the relationship with a supplier. Good integration between the company and its supplier and customer plays an essential role in the supply chain system (Koçoğlu et al., 2011). It's needed, so that information and material flow are not disturbed. Internal integration is mandatory before going to external integration (Tarigan et al., 2019b). Good internal integration should first precede external integration. Information sharing within supply chain members is defined as exchanging critical information (Ince et al., 2013). Information sharing is the distribution of essential information within a supply chain member (Marinagi et al., 2015). In many aspects, uncertainty triggered the Supply chain integration level in a company.

2.3. Information Quality
Information quality is defined as trusted, complete, objective, reliable, accurate, and verified information (Marinagi et al., 2015). Information quality can be measured by timeliness, accuracy, completeness, adequacy, and reliability (Tarigan et al., 2019a). The distribution of information in the company can play an essential role in the supply chain system. A common problem in distributing information is what kind of information should be broadcast, how it's distributed, and to whom it's distributed. It is common for a company to make a production mistake because of misinformation. The wrong information can financially harm a company. Aside from the content of the information, timeliness also plays an important role in information distribution. Every company has the same purpose: avoiding uncertainty in its business process (Sagawa and Nagano, 2015). Good information quality can minimize uncertainty. Uncertainty is the last thing to expect in a business process since it negatively affects a company's supply chain performance. In this research, the information quality is measured by its accuracy, timeliness, completeness, and credibility (Ince et al., 2013).

2.4. Supply Chain Performance
Supply chain performance is defined as the company's ability to fulfil its customer demand in terms of production cost, delivery, and customer satisfaction (Yu et al., 2016). Supply chain performance can be measured by supply chain flexibility, supply chain integration, good response to customers, and supplier performance (Al-Shboul et al., 2017). Indicators established supply chain performance is measured by the supply chain's role in system integration, accuracy in fulfilling order demand, supply chain flexibility, the responsive supply chain for demand, and reduction of the company operating costs (Tarigan et al., 2020). Supply chain performance can be measured by the timeliness of product delivery to customers, improvement in the quality of the company's products, the adequacy of materials according to needs and increased flexibility

over time (Tarigan et al., 2019b). This study uses indicators to measure supply chain performance are optimal storage stock cost, optimal operational cost, fulfil delivery order on schedule, fulfilment demand from customers, and avoid shortage.

2.5. Research Hypothesis

Integration with the leading supplier can help the company manage risk (Lavastre et al., 2012; Munir et al., 2020). The integration within the supply chain member can improve flexibility, response, firm performance and competitive advantage (Sreedevi and Saranga, 2017; Tarigan et al., 2020). Technologies also integrated each other to mitigate the risk. Information can help improving supply chain risk management efficiently.

H1:   Supply chain risk management has a positive relationship with supply chain integration.

The relationship between supply chain integration and information quality is rarely investigated (Sagawa and Nagano, 2015). A company with a high level of information quality also has a high integration level (Tarigan et al., 2019a). For reaching a maximum result of integration, a company needs to improve and invest in its information quality (Wiengarten et al., 2010). Supply chain integration is mandatory to align supply chain member. In this case, information quality plays a significant role, especially invalidity and timeliness. Thus, there is a clear relationship between information quality and supply chain integration.

H2:   Supply chain integration has a positive relationship with information quality.

Supply chain risk management plays an essential role in its performance (Sreedevi and Saranga, 2017; Munir et al., 2020). One of which is ensuring supply and manufacturing flexibility. Supply chain risk management can prevent an unexpected expenditure, thus improving supply chain performance in the financial aspect (Cai et al., 2020). Effective supply chain risk management improves the economic element and improves product quality, customer satisfaction, and punctual delivery time. Supply chain risk management affects supply chain performance (Dellana et al., 2019). At first, supply chain risk management seems to be adding a burden for company expense, but supply chain risk management can give more advantage so that the supply chain system can run smoothly (Elleuch et al., 2016).

H3:   Supply chain risk management has a positive relationship with supply chain performance.

Information quality level needs to be improved along with the escalation of supply chain practice to enhance supply chain performance (Zhou et al., 2014). When information quality is improved, a better supply chain performance is obtained (Marinagi et al., 2015). The supply chain performance can be enhanced when information quality is improved from sharing information (Koçoğlu et al., 2011). Information quality has an important role in almost every aspect, such as measuring forecast, logistic status, capacity and planning (Wiengarten et al., 2010).

H4:   Information quality has a positive relationship with supply chain performance.

Information quality is an essential part of the supply chain system (Al-Shboul et al., 2017). Good information quality can reduce the probability of a risk occurring to run that supply chain management more efficiently (Zhou et al., 2014). Information is often treated as a resource, and many people don't share it because they are afraid of other people competing with them. Don't share information can be a problem in the supply chain system (Elleuch et al., 2016). Thus, in supply chain risk management, a piece of accurate and complete information is mandatory.

H5:   Supply chain risk management has a positive relationship with information quality.

Internal and external integration positively affect supply chain performance (Sagawa and Nagano, 2015; Ralston et al., 2015). Internal integration can improve information processing to improve supply chain performance (Liu et al., 2012). Internal integration can reveal each need in the supply chain system (Al-Shboul et al., 2017; Zhou et al., 2014). Therefore, internal integration can make all supply chain member align their works so that supply chain performance can be improved (Koçoğlu et al., 2011). External integration, especially integration with customer, can provide market changes information to be anticipated by the company (Yu et al., 2016). The company's anticipation can give a lot of advantages such as reducing production cost, making a more accurate forecast and raw material stock (Flynn et al., 2010).

H6:   Supply chain integration has a positive relationship with supply chain performance.

RESEARCH METHODS

Quantitative research is defined as a research method that is used to collect valid data to study a particular case (Sekaran and Bougie, 2016). Quantitative research has the purpose of measuring the effect of an independent variable towards a dependent variable. In this research, the independent variable is supply chain risk management, whose relationship with supply chain integration, information quality, and supply chain performance is measured. This research population is 351 manufacturing companies in East Java, with 81 companies categorized as the middle and large industry paper. The researcher sent 40 surveys randomly, 30 samples were sent back (response rate 75%). The respondents are PPIC manager or people with equal position, and a survey was categorized as a close-ended question.

The data was measured with a 5-point Likert scale like the primary research. The data was processed by statistic program PLS (Partial Least Square). The respondents are managers who know the supply chain system in their company, such as PPIC manager, accounting manager, finance manager, dan someone with an equal clearance who are believed to know the condition of the supply chain system in their company. The survey was given directly to the respondent by the researcher and some of the researcher's friends. PPIC (Planning Production Inventory Control) department mainly represented supply chain risk management because PPIC holds an essential responsibility of running the production section, including stock and schedule work. The PPIC department filled 40% of the surveys and 33% from the marketing department. The marketing department had a considerable risk of customers who couldn't pay their debt to the company. The purchasing department filled 13% of the surveys. Purchasing department was exposed to risk, primarily because of the raw material's quality and timeliness in delivery of raw materials.
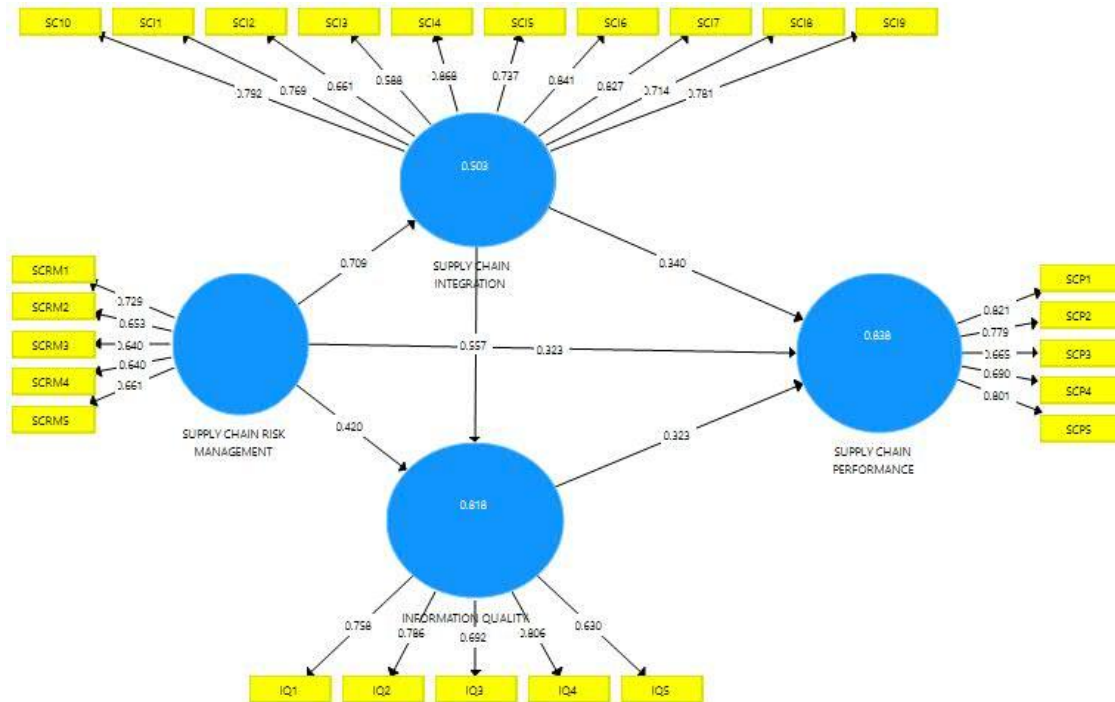

Fig.1:Loading factor of research model

Convergent validity was measured by the loading factor (Hair et al., 2019). Supply chain risk management's indicators were continuous brainstorming (SCRM1) with a loading factor of 0.729. They were evaluating the risk (SCRM2) with a loading factor of 0.653, having risk management strategy (SCRM3) with a loading factor of 0.640. Implementing the risk management strategy (SCRM4) with a loading factor of 0.640; and ready facing the risk (SCRM5) with a loading factor of 0.661. supply chain integration was measured by ten indicators which were: all department are well connected (SCI1) with a loading factor of 0.769; having a good relationship with customers (SCI2) with a loading factor of 0.661; having a good relationship with suppliers (SCI3) with loading factor of 0.588; having a connected system with customers (SCI4) with loading factor of 0.868; customers support in product quality development (SCI5) with loading factor of 0.737; customers support in product cost development (SCI6) with loading factor of 0.841; treat suppliers as the company's extension (SCI7) with loading factor of 0.827; having a connected system with suppliers (SCI8) with loading factor of 0.714; supporting supplier in improving product quality (SCI9) with loading factor of 0.781; supporting suppliers in developing the product cost (SCI10) with loading factor of 0.792.

Information quality is the third variable which was measured by five indicators which are: distributed information is accurate (IQ1) with loading factor of 0.758; timeliness distribution of information (IQ2) with loading factor of 0.786; information distributed is clear (IQ3) with loading factor of 0.692; information distributed is complete (IQ4) with loading factor of 0.806; and information distributed is credible (IQ5) with loading factor of 0.630. Supply chain performance was measured by five indicators which are: have an optimal storage stock cost (SCP1) with loading factor of 0.821; have an optimal operational cost (SCP2) with loading factor of 0.779; can fulfil delivery orders on schedule (SCP3) with loading factor of 0.665; can fulfil demand from customers (SCP4) with loading factor of 0.690; can avoid shortage (SCP5) with loading factor of 0.801. All loading factors are above 0.5, which means all variables were in terms of convergent validity.

Composite reliability is a block indicator that measure the internal consistency of the construct's indicator. Information quality variable had a value of composite reliability of 0.855; supply chain integration variable with the value of 0.932; supply chain performance with the value of 0.867; and supply chain risk management variable with the value of 0.798. All composite reliability's condition was met by all the variables with the value of more than 0.7. Therefore, all the variables were reliable (Hair et al., 2019).

ANALYSIS AND RESULTS.

The hypotheses in this research need to be tested using the null hypothesis method. The tests were run by testing the inner model. Table 1, the gamma coefficient of supply chain risk management towards supply chain integration was 0.709 with a T-statistic of 10.902>t-table 1.96 (α = 5 %), which means that there was a significant effect of supply chain risk management towards supply chain integration. The company had SOP in brainstorming to face the risks, especially the risk with the customers. The company treated the relationship with customers carefully; they involved risk management in it so that the relationship can last long. The gamma coefficient of supply chain integration towards information quality was 0.557 with a T-statistic of 5.081>t-table 1.96 (α = 5 %), which means a significant effect of supply chain integration towards information quality. It means that the relationship with customers' needs to be done frequently. The relationship also needs information exchange to measure the forecast and raw material level planning's. The information was then distributed to the risk management department, helped by software to distribute the information completely, and processed. Supported by software in distributing the information, then can say that the company had invested in their integration system. The result also supported the research of Wiengarten et al. (2010), who said that to obtain a maximum integration result, the company needs to improve and investigate in their information quality.

Table 3. Hypotheses Testing Result from Inner Weight

Hypotheses Test	The original estimate	Mean of subsamples	Standard deviation	T-Statistic
SCRM→SCI	0,709	0,739	0,065	10,902
SCI→IQ	0,557	0,559	0,110	5,081
SCRM→SCP	0,323	0,338	0,131	2,462
IQ→ SCP	0,323	0,311	0,186	1,736
SCRM→IQ	0,420	0,420	0,116	3,626
SCI→ SCP	0,340	0,334	0,148	2,307

Gamma coefficient of supply chain risk management towards supply chain performance was 0.323 with a T-statistic of 2.462>t-table 1.96 (α = 5 %), which means there was a significant effect of supply chain risk management towards supply chain performance. This means that the more brainstorming the company did, the more prepared they are facing the risk, especially raw material stock risk. Therefore, the company can have an optimal raw material storage cost because they can prevent the risk so that unexpected cost wouldn't occur. The gamma coefficient of information quality towards supply chain performance was 0.323 with a T-statistic of 1.736< t-table 1.96 (α = 5 %), which means there was no effect on information quality to increase supply chain performance. The lack of sample could cause this analysis in this research. PLS program can run the bootstrapping process with only 30 samples; however, the statistic result was unstable, so the T-statistic generated couldn't meet the requirement. Therefore, couldn't see the effect of information quality on supply chain performance in this research. The result didn't get along with Marinagi et al. (2015) result; information quality gets improved to better performance can be expected.

The coefficient of supply chain risk management towards information quality was 0.420 with a T-statistic of 3.626> t-table 1.96 (α = 5 %), which means a significant effect of supply chain risk management towards information quality. The company that brainstorming continuously can affect the completeness of information distribution. Upon brainstorming, the company can get more information about the risk they will be facing. Will then distributed the information in the supply chain system; an efficient risk management system will always be supported by good information quality. Bad Information quality will inhibit the supply chain system (Elleuch et al., 2016). The coefficient of supply chain integration towards supply chain performance was 0.340 with a T-statistic of 2.307> t-table 1.96 (α = 5 %); which means an effective supply chain effect integration towards supply chain performance. Relationship with customers can give lots of benefits, one of which is to estimate the sales forecast and stock. Relationship with customers can allow the company to prevent overbuy and overstock to reduce the raw material storage cost to a minimum level. This result supported Sagawa and Nagano (2015) research that said that internal and external integration would positively affect performance. The work also supported Flynn et al. (2010) research that noted that external integration could reduce production and raw material cost.

CONCLUSION

The results can be concluded below: first, supply chain risk management positively affected supply chain integration because the company did brainstorm continuously about the risk. Second, supply chain integration

positively affected information quality because the company already had a connected system with the customer to estimate their sales forecast and stock. Third, supply chain risk management positively affected supply chain performance because the company did brainstorm continuously about the risk. Fourth, information quality didn't affect supply chain performance because a complete information distribution didn't have any effect on supply chain performance. Fifth, supply chain risk management positively impacted information quality because the company did brainstorm continuously about the risk. Last, supply chain integration positively affected supply chain performance because it already had a connected system with the customer to estimate their sales forecast and stock. Paper manufacturers in East Java need to improve their supply chain risk and management quality. Even though it seems to add more cost to the company, supply chain risk management can prevent unexpected expenses, which can be huge. Risk management can be treated as insurance. Companies need insurance to run their activity smoothly and safely. The next research needs to distinguish more type of industry to get more homogeny data.

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