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SUPPLY CHAIN RISK MANAGEMENT IN THE FUTURE INDUSTRY IN INDONESIA IN FACING THE COVID-19 PANDEMIC

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ABSTRACT

The COVID-19 pandemic that has hit the world, especially Indonesia since March 2, 2020, has given rise to several impacts on the economy and worsened the export-import performance. Non-construction investment is at risk of slowing down due to the decline in prospects for exports of goods and services and disruption of production chains. This research was conducted on a furniture company in Pasuruan, East Java. The company obtains its raw materials from China at about 30% of its production needs with the main consumers come from United States. The initial stage of the research was to identify the business processes based on 4 core SCOR processes. The research method used was House of Risk (HOR) to identify the risk events and risk agents in HOR Phase I, and determine the preventive strategy on HOR Phase II. There were 45 risk events and 30 risk agents, where the risk agent with the highest ARP value was prioritized to obtain the risk management strategies. It was obtained social restrictions due to the COVID-19 pandemic contribute the highest score of

Keywords: Supply Chain, Risk Management, SCOR, HOR

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1. Introduction

The COVID-19 pandemic in Indonesia was declared to have started on March 2, 2020, which was the first announcement that there was an Indonesian citizen who had a positive status to be infected by the virus [1]. Up until March 28, 2020, there were 1,155 confirmed positive cases of COVID-19 in Indonesia, with areas spreading in 29 provinces from Aceh to West Papua. The COVID-19 crisis at this moment has reached a critical phase that has impacts on all levels of society across the globe, spreading to 159 countries, not only in the Asian region, but also to Europe and the United States. The main problem is the way to suppress the spread and mitigate the disease itself. There are things that should not be ignored, however, considering that there is no definite prediction when this pandemic will end. One of the major impacts besides health problems is on the economic sector, both micro and macroeconomics. The economic impact is also significant for both small and large companies. According to the *OECD Economic Outlook Interim Report* in March 2020, the projection for annual global GDP growth for 2020 decreased by half a percent to 2.4% due to the coronavirus outbreak [2]. However, a more durable and more intensive coronavirus outbreak could slow global growth by up to 1.5%. The report underscores the importance for the government to act swiftly and decisively to surmount the coronavirus and its economic impact.

Several studies have been conducted to predict the impacts of the Covid-19 pandemic on supply chain. There are studies that predict the short-term and long-term impacts of the Covid-19 pandemic on supply chains and sustainability development [3], [4], [5], [6], [7], [8]. Another research studied the impact of the pandemic in Pakistan and stated that small and medium enterprises were affected the most [9]. It was stated that the supply chain disruption in that study was 47.82%, which was the biggest disturbance after finance. A study states that Indonesia is among the 15 economically affected countries due to the Covid-19 pandemic [10]. In addition, non-construction investment is at risk of slowing down due to the declining prospects for exports of goods and services and the disruption of production chains. Companies the business processes of which carry out export-import activities clearly feel the impacts of this problem. One of them is a furniture company located in Pasuruan, East Java. The furniture industry provides a major contribution to Indonesia's economic growth.

In accordance with data from the same report, it can be identified that the three main business fields that dominate the structure of the Indonesian economy are manufacturing, agriculture, forestry and fisheries sectors, as well as the wholesale and retail trade sector. Manufacturing sector plays a very large role and is the highest source of economic growth in Indonesia. There was a decline in the growth of non-oil and gas manufacturing, which originally reached 4.85%, to 4.77% in 2018. This growth is far below the national economic growth as displayed in Figure 1. The main factor contributing to the decline in non-oil and gas manufacturing growth is the slowdown in the growth of the food and beverage manufacturing, and furniture industries, as displayed in Figure 2.

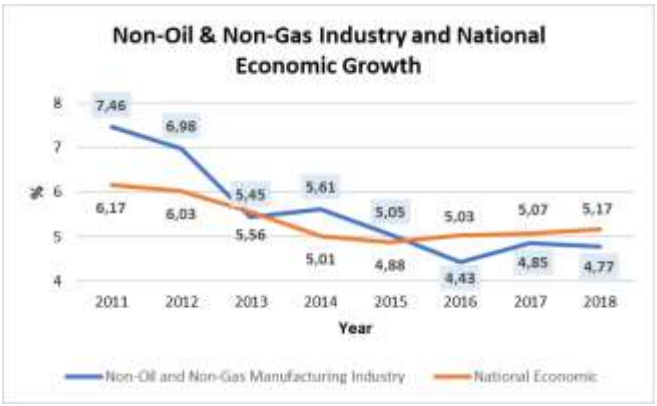

Fig. 1. Graph of National Economic Growth and Non-Oil & Gas Manufacturing Industry

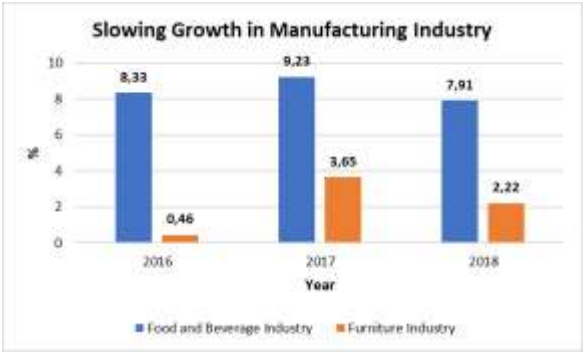

Fig. 2. Slowing Growth in the Manufacturing Industry

The existence of the COVID-19 pandemic will clearly exacerbate the slowdown of growth in the furniture industry if risk mitigation is not implemented in this industry. Therefore, in this study, a risk analysis will be carried out in the supply chain of furniture industry in order that it can minimize the impacts that occur and can provide recommendations in the form of improvements to the perceived impacts and prevention of risks that may occur in the future.

The furniture company that becomes the object of this research is a large exporter company the main customers of which are from the United States. As the main consumer, it is clear that this will have a lot of influence on the furniture company business that becomes the object of this research. In addition, in terms of raw materials, the company possesses about 30% of raw materials from foreign suppliers, especially China. The raw materials supplied from China are in the form of panel wood, i.e. particle board (PB), MDF, LVL and LVB, and veneer. Moreover, imported non-wood raw materials are in the form of supporting materials or hardware such as knobs, bolt handles, and others. Meanwhile, the remaining 70% is local raw materials in the form of sawn timber, panels, hardware, paint, cardboard and the others.

In supply chain management, the entire related parties play a role in the distribution of goods so that it can be carried out properly in terms of quantity, quality and punctuality, both from local and importing suppliers. There is a risk that inaccuracies in quantity, quality and punctuality may result in losses in each link. As a consequence, risk management and appropriate preventive measures are required so as to minimize losses. With the COVID-19 pandemic, there is a necessity to make efforts to safeguard the supply chain which aims to ensure that the movement of goods in quantity is according to the need, quality and punctuality while still prioritizing the safety of actors on the field in the supply chain system. Supply chain safeguards must be put in place for maintaining the continuity of the supply-demand process, and reducing the vulnerability of threatening disruptions to the personnel in charge.

This study aims to mitigate security threats both in supply chain security and security related to human safety related to the COVID-19 pandemic, which are:

1. To build efficiency and secure the movement of goods in the supply chain of the furniture industry.
2. To encourage the supply chain system in order to be able to face and survive the growing threats and dangers of COVID-19.
3. To build systems that can recover quickly in the event of disruption such as the COVID-19 pandemic.
4. To identify the hazards that occur in connection with the security (safety) of field officers who are responsible for the movement of goods.

With these aims, a strategy and commitment are required to ensure the supply chain security and human safety. This study uses House of Risk for supply chain security while still considering the human safety of supply chain actors.

2. Methods

This research was conducted at one of the furniture companies in Pasuruan, East Java in June - October 2020. This research started from problem identification and literature study. The issue of COVID-19 which affects the whole aspects of life including the furniture industry is the background of this research. Furthermore, the mapping of supply chain activities was carried out to determine the supply chain flow from upstream to downstream in furniture companies in Pasuruan. After that, the identification of risks that have the potential to arise in the supply chain of the company was performed in terms of the occurring risks, the sources of the risk, the location of the risks and the way they arise. This risk identification stage employed the SCOR development method which divides business activities into four, i.e. plan, source, make and deliver.

The next stage was an assessment of the level of impacts or severity of the risks along with an assessment of the chance of appearance. The level of correlation between the risk and the risk agent was calculated and then poured into House of Risk (HOR). In HOR, there is also a determination of risk ranking and prioritization of risk agents in order to identify which risk agent has the biggest impact on the supply chain of the company. Business process engineering must be carried out to ensure the sustainability of a

business process in the midst of the COVID-19 pandemic. There is also a flow chart from this research which can be observed in Figure 3.

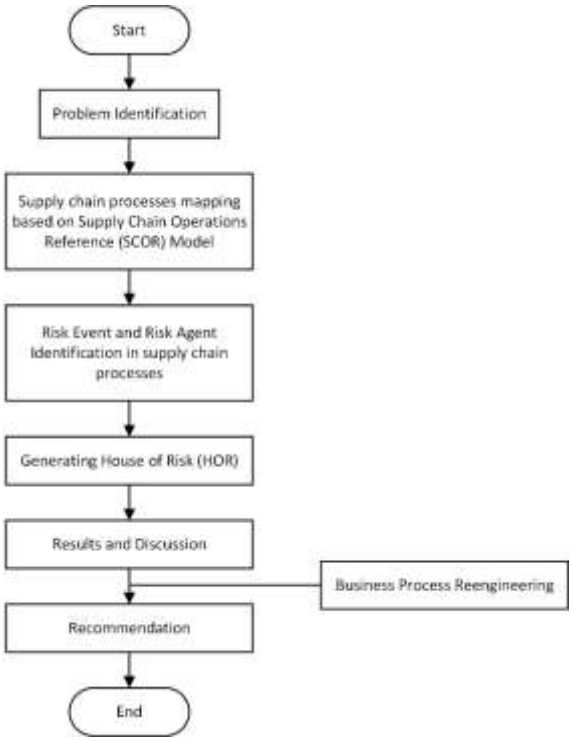

Fig. 3. Research Flowchart

3. Results and Discussion

3.1 Process Identification

This research is a case study research in a furniture company in Pasuruan, East Java. The company is a furniture producer in the form of beds, mirrors, dressers, chests, nightstands, and baby cribs. The finished products are then exported to the United States based on orders from distributors or to consumers directly. Raw materials in the form of sawn timber and non-sawn timber as well as supporting materials come from local and international suppliers. About 30% of raw materials come from China. The company business process map can be observed in Figure 4. The flow of the production process and an overview of the production of several parts can be viewed in Figure 5 and Figure 6.

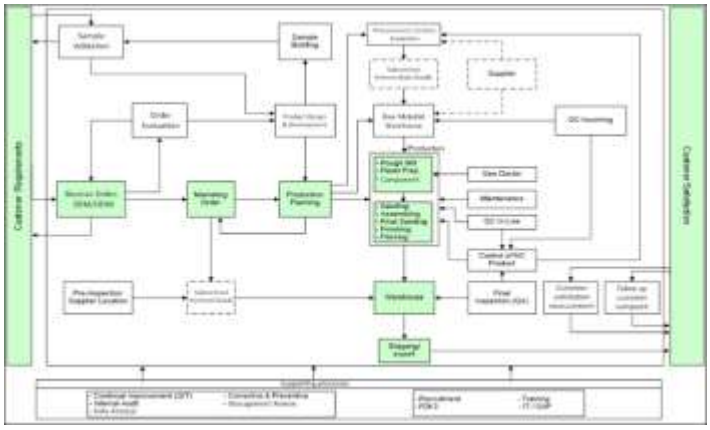

Fig. 4. Company Business Process Map

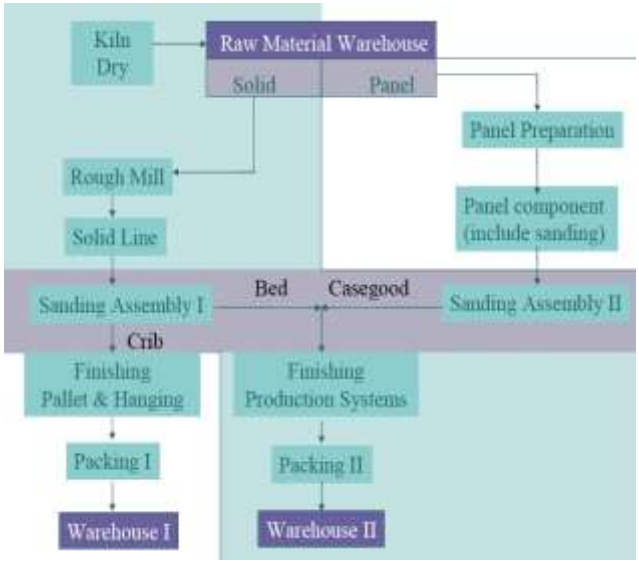

Fig. 5. Company Production Process Flow

Fig. 6. Furniture production process

3.2 HOR Phase I (Risk Identification)

The next process after process identification was to identify the business process / supply chain activity of the company based on the SCOR model (plan, source, make, and deliver), as shown in Table 1. Further identification of risk events and risk agents carried out by considering the risks and impacts as a result of the COVID-19 pandemic can be observed in the appendix.

Table 1. Identification of Business Processes based on SCOR Model

Proses	Sub-Proses
Plan	Production planning
Source	Receiving Raw Materials
	Raw material inventory recording
	Raw material inspection
Make	Production process
	Packaging process
Deliver	Delivery of finished products to customers

The results of ARP calculation can be viewed from the Pareto diagram in Figure 7. It was identified that the risk agent with the highest ARP value was "Social restrictions due to the COVID-19 pandemic" with an ARP value of 3900. The risk agent with the second largest value was the risk agent of "Less thorough operators" with an ARP value of 3550. The risk agent with the smallest ARP value was "Discrepancy of product handling with work instructions" with an ARP value of 180. The pareto diagram of the risk agents along with the Aggregate Risk Potential (ARP) value is displayed in Figure 7.

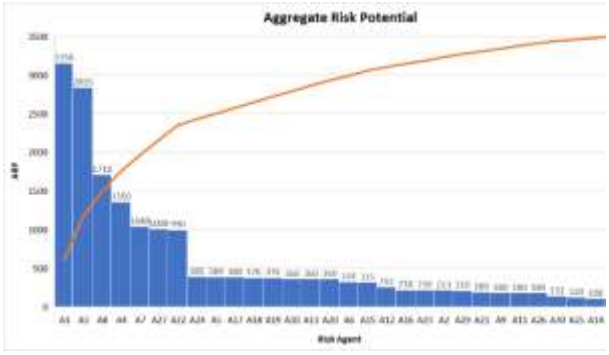

Fig. 7. Pareto Diagram of Aggregate Risk Potential (ARP) Values

Of the 30 risk agents obtained, five risk agents with the largest ARP values will be continued to be studied to identify the risk management strategies that will be carried out in HOR Phase 2. The five risk agents are presented in Table 2.

Table 2. Identification of Business Processes based on SCOR Model

Risk Agent	**Code**	**ARP**
Social restrictions due to the COVID-19 pandemic	A1	3150
Rapid test requirement for QC Incoming	A3	2835
Less thorough operators	A8	1720
Less thorough inspection process	A4	1350
Various quality of raw materials	A7	1040

3.3 Risk Management

In House of Risk (HOR) Phase 1, it was recognized that the risk agent with the highest ARP value was social restrictions due to the pandemic. In this study, the priority risk management was at the highest risk, which was the existence of social restrictions due to Covid-19. The biggest impact due to this social restriction was on the wood grading process and the hardware raw material inspection process. The riskiest thing is related to the process of supplying raw materials, both sawn timber and supporting hardware. Previously, both of them required an inspection process directly to the supplier before the raw materials were sent to the company. With the pandemic, it is necessary to redesign the impacted processes, i.e. the wood grading process and the inspection process by incoming QC, so as not to hamper the supply of raw and supporting materials. The proposed process design changes can be viewed in Figure 7. In addition, there is a strategy proposed to prevent problems in the supply chain of the company, which is Strategic Stock. Strategic stock is a stock procurement strategy for important raw materials or critical components required by the company so that the production process can continue to run smoothly. Companies may consider storing an inventory of raw and supporting materials in certain "strategic" locations (warehouses, logistics centers, or distribution centers) to be shared by multiple supply chain partners [11].

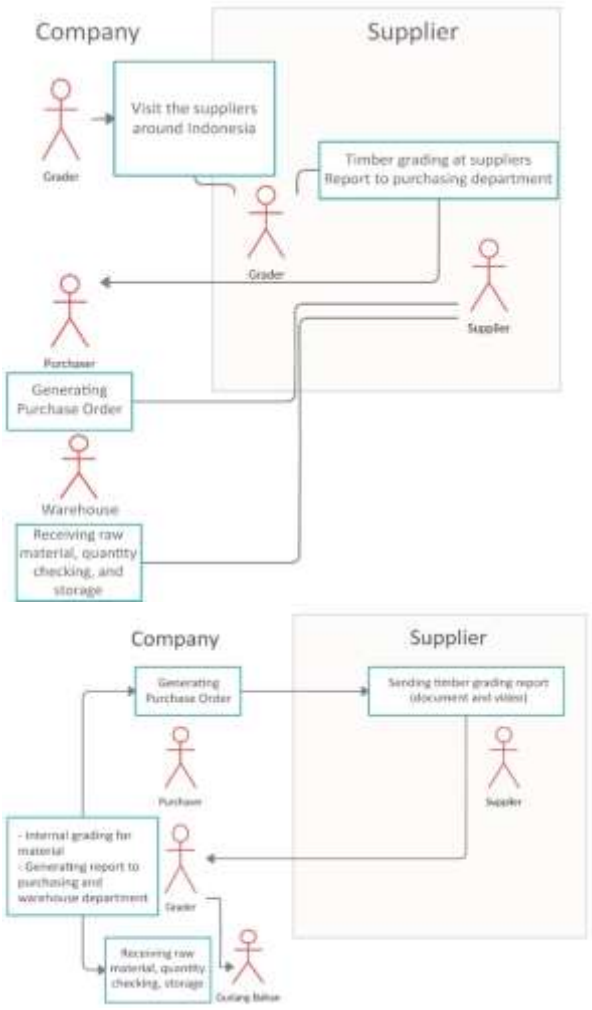

Fig. 8. Proposed Process Design Change

4. Conclusion

The COVID-19 pandemic clearly affects the supply chain for furniture companies that carry out export and import business processes. The riskiest thing in the supply chain in the furniture company business process in this case study is related to the existence of social restrictions. The highest risk identification is in the grading process carried out by the grader and the inspection for supporting raw materials carried out by incoming QC. The existence of new regulations related to social restrictions requires companies to think about a reserve strategy so that it does not affect supply chain performance. It is recommended that companies make an internal grading process to speed up the process and minimize the risk of shrinkage both in quality and quantity from the initial grading results carried out by the suppliers themselves. For supporting raw materials, it is recommended to implement a strategic stock by cooperating with several other furniture companies located in one location, which is in Pasuruan, along with large suppliers who can serve as joint suppliers.

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Appendix 1. Risk Events

Risk Event	Code
Production plan changes	E1
Differences between actual raw material inventory data and planning	E2
Delays in receiving raw materials from suppliers	E3
Internally performed grading of wood material only	E4
Additional metal inspection fees by Incoming QC	E5
Discrepancy of wood specifications from the suppliers with the requirements	E6
Incomplete raw material documents from supplier	E7
Pest contaminated wood	E8
Discrepancy of moisture content of the wood with the requirements	E9
Raw material arrangement error in the warehouse	E10
Discrepancy of supporting material quality (variety, type, color, size) with the requirements	E11
Sharp-object-contaminated wood and supporting materials	E12
Sudden order cancellation by the buyer	E13
Forced temporary closure of the company	E14
Discrepancy of wood moisture content from raw material warehouse with the requirements	E15
Size error when cutting wood	E16
Cutter mark on the wood surface	E17
Discrepancy of wood thickness during the leveling process of the wood surface with the standard	E18
Lack of strength and tightness on the wood joints	E19
Wrong-angled material cutting results	E20
Discrepancy of surface appearance with the standard	E21
Uneven or loosened veneer stitching	E22
Not-matched stitched veneer	E23
Unsuitable veneer laminating pressing results	E24
Less strong assembly between panels + veneer to the frame	E25
Peeled-off veneer edge banding	E26
Unsuitable surface thickness	E27
Cracked of broken materials	E28
Incorrect drill dimensions and spacing	E29
Non-standard sizes	E30
Sharp-object-contaminated products	E31
Pest contaminated products	E32
Hazardous chemical contaminated products	E33
Physical damage of the products due to dropping	E34
Unsuitable drying time	E35
Unsuitable hardware setting of the finished products	E36
Unsuitable construction of the finished products	E37
Unsuitable Box, marking, PO number, product codes, and product stickers	E38
Incomplete or unsuitable components of the finished products	E39
Discrepancy of Hardware with the Assembly Instruction	E40
Late delivery of products to customers	E41
Damaged product packaging in transit	E42
Dangerous sharp object contaminated containers	E43
Harmful pest or microorganism contaminated containers	E44
Limited delivery transportation capacity	E45

Appendix 2. Risk Agent

Risk Agent	**Code**
Social restrictions due to the COVID-19 pandemic	A1
Natural disasters	A2
A rapid test requirement for incoming QC	A3
Less thorough inspection process	A4
Too humid or dry storage environment	A5
Internally performed grading of wood material only	A6
Various quality of raw materials	A7
Less thorough operators	A8
Not-well calibrated planer machines	A9
Less strong hydraulic pressure of clamp carrier machines	A10
Too thin layer of glue spreader machines	A11
Unsuitable hot press machine pressure	A12
Unsuitable cold press machine pressure	A13
Unsuitable duration of glue tank heating	A14
Less strong edge banding machine pressure	A15
Discrepancy of stacking and storage of goods with work instructions	A16
Mistakes in the error cutting process	A17
Discrepancy of cutting with the work instructions of the gliben saw and sliding machines	A18
Not-well calibrated boring and mortising machines	A19
Not-well calibrated sander machines	A20
Not-well calibrated kuper machines	A21
Inappropriate stock taking process	A22
Unstandardized manual sanding process	A23
Unsuitable drying duration with the drying time standards	A24
Discrepancy of product handling with the work instructions	A25
Various paint viscosity	A26
Discrepancy of packing process with the work instructions	A27
Existence of product rework	A28
Poor material handling	A29
Unimplemented jewelry wearing policy by the workers	A30