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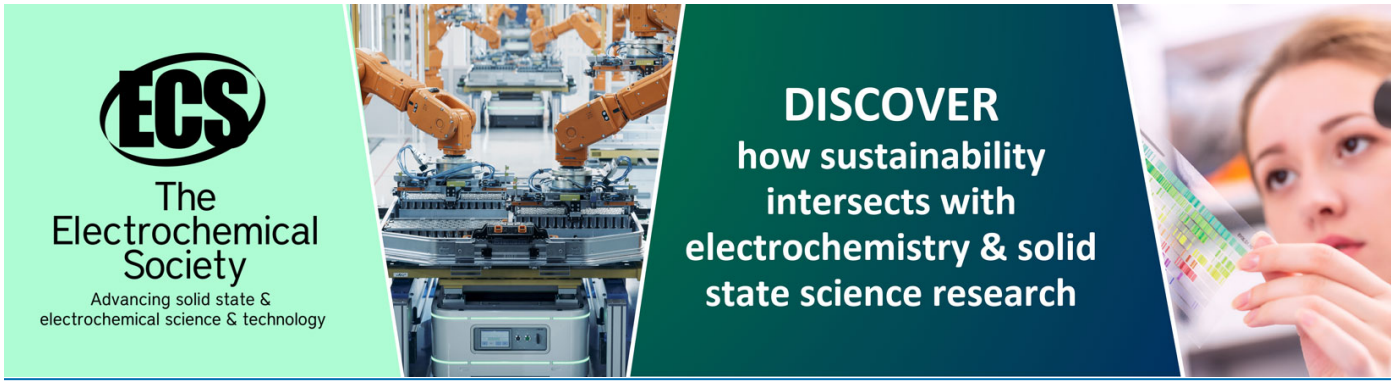

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Design of Procurement Process Monitoring Dashboard for Supporting Food Security Supply Chain Risk Management System in Indonesian Bureau of Logistics

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Abstract. Food Security is a conditon for the fulfillment of food for every people. Rice as one of the main commodities in Indonesia and it can affect a country's economic *stability.* The government in Indonesia established Bureau of Logistics (Bulog) to maintain food security. Perum Bulog Subdivre Bandung is one of the regional sub-divisions under the auspices of Perum Bulog which manages the distribution of rice to the five regions of Bandung. Bulog has the duty to maintain the pillars of Food Security including Availability, Accessability and Stability. Rice Procurement process is an important process. To maintain the pillars, Bulog need risk identification in the rice commoditiees procurement prosess using SCOR, FMEA and AHP. there are 12 risk events and 16 risk agents which are divided based on the three pillars of food severity and for mitigation strategies are divided into 3 main causes with 3 alternatives from each main cause. So that in order to facilitate monitoring, a monitoring system dashboard was designed for the Perum Bulog Subdivre Bandung

1. Introduction

National Stability is closely related to food security. There are three pillars of food security i.e. Availability, accessability and stability. To keep the pillars of food security in Indonesia, the Government formed an institution that is the public business entity of the company logistics (Perum BULOG). The Indonesia Logistics Bureau (Bulog) is a government-owned company in Indonesia which deals with food distribution and price control. The task of the public mandate of Perum BULOG is a presidential instruction No. 3 year 2012 Paddy Procurement policy/rice and the distribution of Rice by the Government, which is the embodiment of government intervention in the national rice commodities to strengthen food security. Bulog Subdivre Bandung has three warehouses to meet rice 105 sub to do distribution to a distribution point 279 [4]. Though not the only commodity rice only supplied by Bulog but just the process of procurement of commodities of rice just the only processes that can be managed independently of full responsibility by Bulog Subdivre Bandung. Based on data from Bulog Subdivre Bandung year 2018, every month the higher demand i.e. There is on commodities of rice 233,170 Kg. The figure was the highest number compared to other commodities so that it can be said the process of procurement of rice is very important. The importance of the process of procurement of rice in Bulog certainly needs to be done the identification of associated risks that may arise that can disrupt the process of procurement and also the pillars of food security which is the primary function of the Bulog. The purpose of the identification of risks namely can recommend improvements to the company's risk indicators have not reached or meet the targets, so as to ensure the product gets to the hands of the consumer is a quality product. In addition, to keep the pillars of food security is certainly becoming a reference to Bulog to keep the national food security. Perum Bulog so far haven't made any identification of the risks that may occur in each activity in the process of procurement of rice.

In previous research [2] conduct research to identify, determine and formulate the strategy of supply chain risk mitigation using FMEA and AHP. [9] conducts research on risk analysis in the production of beverages using FMEA and AHP. Whereas, in this research, identify the risks, define and formulate mitigation strategies the process of procurement of rice at perum bulog with regard to pillar of food security by using SCOR, FMEA and AHP. This research will be conducted on the identification of the risks that may occur in the company as well as proposed strategies on handling that can be applied to mitigate risks that may occur in the process of procurement of rice by using method *Supply chain Operations Reference* (SCOR) and FMEA as well as *Analytical Hierarchy Process* (AHP). Based on things that have been on the above mentioned above, then the need to conduct risk management for BULOG so that the pillars of food security with maintained to minimize the impact of a given risk. In addition, with this research obtained the highest risk incident and appropriate mitigation and monitoring against those risks which can interfere with pillar of food security.

2. Method and materials

2.1 Food Security

In Indonesia, food security is set in the legislation of the Republic of Indonesia number 18 year 2012 on food that is defined as a condition to satisfy food for households that are reflected from the availability of sufficient food, a good number of as well as quality, safe, equitable and affordable. Three pillars in food security which is contained in this definition is the availability (*Availability*), affordability (*Accessibility*) both physically and economically, and stability (*stability*) that must be available and affordable at any time and any place.

2.2 Supply Chain Operation Reference (SCOR)

According to putra (2016) the SCOR method is used to classify the activities that occur from the supplier to the customer according to the process contained in the SCOR method stage of each activity that builds traceability[7]

2.3 failure mode and effect analysis (FMEA)

The failure mode and effect analysis(FMEA) method has the ability to represent the level of risk in a process with RPN value indicators [11]

3. Results and discussion

3.1 Supply Chain Flow

Members of the supply chain is the whole of the parties involved in the supply chain activities ranging from upstream to downstream in Perum Subdivre Bulog Bandung. Not only directly involved but also involved indirectly.

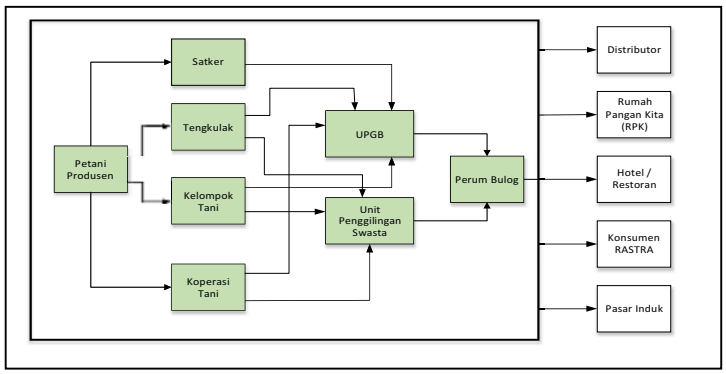

Fig 1. Supply chain flow In Bulog

3.2 Identify Risk

Risk is something that leads to uncertainty over the occurrence of an event during a specified time interval, the event which led to the loss of a loss on a small scale or large scale that can affect the viability of a company[1]. This mapping aims to identify activities on the SCOR model has a relationship with every process in the procurement of rice in Bulog. So, by doing this mapping can be known to any process or activity which are represented by each process of SCOR. In this research, only use three process from five process of SCOR there is Plan, Source and Return. Process return is return goods to the supplier. After mapping the activity of each process that is *Plan*, *Source* and *Return* appropriate SCOR model then proceed with doing the mapping of each activity into an attribute that is a pillar of the resistance food. There are three levels from SCOR model. Table 1 shows the activities of the rice procurement process with the Source process.

Table 1. Mapping activities to process Source

Source					
Level 1	Level 2		Level 3		activities
sS-Source	*sS2*	*Source Make-to-Stock*	*sS2.1*	Schedule Product Deliveries	Request for offer that goes into Bulog
					evaluation of product offerings
					make a purchase order
					determine the product lead time
					Product delivery by supplier
			sS2.2	Receive Product	product receive from the supplier
			sS2.3	Verify Product	check the products received
					Check the product quality based on the stated criteria
					Recording of Quality Inspection Results (HPK)
			sS2.4	Transfer Product	Making LHPK and GD1M
					storage of products in warehouses based on quality
			sS2.5	Authorize Supplier Payment	Checking the completeness of documents
					make a payment warrant
					disbursement of payment

To find the indicators for Bulog, there is the basic source. Global Food Security Index (GFSI) The Global Food Safety Initiative (GFSI) brings together key actors of the food industry to collaboratively drive continuous improvement in food safety management systems around the world. Table 2 shows the Global Food Security Index.

Table 2. Global Food Security Index

Global Food Security Index	
Availability	2.1) Sufficiency of supply
	2.2) Public expenditure on agricultural R&D
	2.3) Agricultural infrastructure
	2.4) Volatility of agricultural production
	2.5) Political stability risk
	2.6) Corruption
Accessability	1.1) Food consumption as a share of household expenditure
	1.2) Proportion of population under global poverty line
	1.3) Gross domestic product per capita (US$ PPP)
	1.4) Agricultural import tariffs
	1.5) Presence of food safety net programmes
	1.6) Access to financing for farmers
Stability	3.1) Diet diversification
	3.2) Nutritional standards
	3.3) Micronutrient availability
	3.4) Protein quality
	3.5) Food safety

From doing interview with the expert, researchernot only know for the activities, researcher also known what the problems and risk that happened on procurement process. Next step is verification the list of risk event and risk agent to the expert from Bulog. If the expert accepted the verification of risk eent and risk agent, the expert could scoring directly on the questionnare.

Table 3. Risk Event and Risk Agent

Attribute	*Risk Event*	*Risk Agent*
Availability	Conduct procurement planning	Fluctuating Requests
		Delay in information from consumers
	Error planning the number of product needs	The range of data needs is not representative
	Low supplier yield	Capacity calculation error
	Product is damaged	Low quality sacks
		Erratic road conditions
	Product quality is not according to request	Taking only 10% of the sample load
	Changes in product quality	Supply disruption due to erratic weather
	Product is damaged	Product storage exceeds maximum storage limit
		There are warehouse pests

Table 3. Risk Event and Risk Agent (continued)

Attribute	*Risk Event*	*Risk Agent*
Accessibility	Rejection of product return policy	the damage caused is not due to supplier error
	The absence of a suitable route	Limited transportation
	Delayed product delivery process	Determine the return schedule according to the route
Stability	Low product availability	The selling price of farmers is greater than the HPP
		Low grain absorption from farmers
	Delay in product arrival	Production operational constraints

Of all the risk event and risk agent that has been obtained through interviews with the expert, the assessment was done. Each incident risks and causes of risks in value by the expert. The assessment was conducted using FMEA. From FMEA could find the highest rank from every pillars or atribut. After get scoring from the questionnare of every risk event and risk agent, next step is get the RPN score. To get the RPN score it have to multiplay every ccriteria score that filled from the expert

Table 4. *RPN score and Ranking*

Attribute	*Risk Event*	*Risk Agent*	Severity (1-10)	Occurance (1-10)	Detection (1-10)	RPN	RANK PER PROSES
Availability	Conduct procurement planning	Fluctuating Requests	7	6	7	294	4
		Delay in information from consumers	7	5	5	175	8
	Error planning the number of product needs	The range of data needs is not representative	6	8	6	288	5
	Low supplier yield	Capacity calculation error	8	2	2	32	10
	Product is damaged	Low quality sacks	9	5	5	225	7
		Erratic road conditions	9	7	6	378	2
	Product quality is not according to request	Taking only 10% of the sample load	9	3	4	108	9
	Changes in product quality	Supply disruption due to erratic weather	9	7	5	315	3
	Product is damaged	Product storage exceeds maximum storage limit	9	5	6	270	6
		There are warehouse pests	9	8	8	576	1
Accessibility	Rejection of product return policy	thedamage caused is not due to supplier error	8	3	4	96	3
	The absence of a suitable route	Limited transportation	6	7	4	168	2
	Delayed product delivery process	Determine the return schedule according to the route	9	6	6	324	1
Stability	Low product availability	Theselling price of farmers is greater than the HPP	7	4	6	168	2
		Low grain absorption from farmers	8	5	5	200	1
	Delay in product arrival	Production operational constraints	6	3	4	72	3

3.3 Mitigation Strategy

From FMEA obtained one of the highest ranking risk with the cause of each attribute. In determining mitigation strategies in the process of procurement of rice, mitigasi alternatives required in each risk causes. Alternative derived from brainstorming with the company and from the references. In this case the final assessment is obtained from each individual without changing the assessment of each individual [8]. In the structure hierarcy AHP, there are three levels. Level one is the goal. Level two is the criteria and level three is the alternatives. Previously, to get the value that will be counted questionnaires obtained from comparison of pairs. Questionnaires filled out by the expert.

Table 5. Result for Mitigation Strategy

Level 1	Level 2			Level 3	
Goal	Criteria	Eigen vecto	Risk agent	Alternative	Eigen vector
Mitigation Strategy of procurement process risk	Availability	0.37037	There are warehouse pests	Fumigate every three months	0.07825
				Spraying every month	0.17134
				Monitoring the cleanliness and maintenance of the warehouse	0.75041
	Accessibility	0.07025	Determine the return schedule according to the route	Look for the route that suits the fastest schedule	0.69096
				Adjust the transport capacity used on the same route	0.09140
				Determine the amount of transport in accordance with the cargo to be sent back	0.21764
	Stability	0.55092	Low grain absorption	Expanding the Bulog channel	0.70712
				Implement commercial mechanisms	0.07015
				Make maximum absorption during the harvest	0.22273

3.4 Monitoring System Design

Dashboard is a User Interface that is quite unique. The main purpose of a dashboard is to assist users in making the right and fast decisions based on available data [10]. Monitoring system disigned for maintaining food security. There is two actors that can access this system. They are the manager and the procurement admin. Both of actors can view the dashboard. They have to login first to access the dashboard. Procurement Departement also could input data, edit data and delete data of procurement. Figure 2 shows the main page dashboard. There have three condition of pillars food security. Above the condition of every pillars, shows Key Performance Indicator(KPI). Creation of KPI is the best policy to do supply chain management[6]

Figure 2. Main Page

Figure 3 Shows availability, accesibility and stability page. On the page show one of indicator of availability pillar if it on the availibility page. The dashboard shows data history in 1 year before too. On the bottom side, there is activities, risk event and risk agent which effect the indicators. Its have same in every page of availability, accessibility and stability. But have different indicator, activities, risk event and risk agent.

Figure 3. Availability, Accesibility and Stability Page

4. Conclusion

Based on the results of risk identification and risk analysis there are risks in the process of procurement of rice that can interfere with the three pillars of food security. on the attribute of *Availability* there are seven and ten risk causes the risk, while on the *Accessibility* attributes, there are three occurrences of the risk and the three causes of risk as well as on the *Stability* attributes, there are two events risk and the three causes of risk. Overall, the process of procurement of rice there are 12 and 16 risk occurrence causes of risk. The risks identified are then conducted an assessment with FMEA to get priority for risk mitigation strategies designed.

From the results of the expert assessment by using FMEA, obtained the highest ranking one or risk priorities of each attribute. On the attribute of *Availability* there are three alternative strategies for the mitigation of the causes of risks there is a pest of the warehouse. On the attribute of *Availability* there are three alternative strategies for the mitigation of the causes of risks there is a pest of the warehouse. And to attribute the *Stability*, there are three alternative strategies for risk mitigation of the causes of the low absorption of grain farmers. For these mitigation strategies using AHP method. Monitoring system designed in this study is the result of the design of monitoring system for maintaining food security. monitoring system designed to be made in the form of web-based applications. So it can make it easier to monitor the performance of the Bulog towards food security as well as the risk that the cause or the effect on food security. A research has been conducted to obtain the flexural strength of epoxy rattan fiber composite material as an alternative material for making car

spoiler products. As a comparison data is the flexural strength of car spoiler products with ABS plastic materials that are widely obtained in the free market. The flexural strength difference is less than 10%. The flexural strength of the epoxy rattan fiber composite has the opportunity to be used as a material for automobile spoiler products by improving the manufacturing process.

References

[1] A. Lokobal, "Manajemen Risiko Pada. Jurnal Ilmiah Media Engineering 4," 2014, pp. 109-118.

[2] E. A. Winanto and S. Imam, "Integrasi Meode Fuzzy FMEA dan AHP Dalam Analisi dan Mitigasi Risiko Rantai Pasok Bawang Merah," *Jurnal Teknologi Industri & Hasil Pertanian,* vol. 22, no. 1, 2017.

[3] Kuswandi, R.Y., E., Ridwan, A.Y., El Hadi, R.M. (2018). Development Of Monitoring Reverse Logistic System for Leather Tanning Industry Using SCOR Model. Proceedings of the 12th International Conference on Telecommunication Systems, Services, and Applications (TSSA)

[4] M. Novar, A. Y. Ridwan and B. Santosa, "SCOR and ahp based monitoring dashboard to measure rice sourcing performance at Indonesian bureau of logistics," in *Proceeding of the 12th International Conference on Telecommunication Systems, Services, and Applications, TSSA 2018*.

[5] Mahtamtama, E., Ridwan, A.Y., Santosa, B. (2018). Development Of Cycle Counting Monitoring Dashboard With Buffer Time Management For Cocoa Company. Proceedings of The 12th International Conference on Telecommunication Systems, Services, and Applications (TSSA)

[6] Mely Permatasari, P., Ridwan, A.Y., Santosa, B. Inventory Policy Determination for Raw Materials in ILY Pharmaceutical using Periodic Review (R, s, S) and Periodic Review (R, S) Method to Minimize Total Inventory Cost. 8th International Conference on Mechanical and Manufacturing Engineering 2017 (ICME'17). MATEC Web Conf. Volume 135

[7] Putra, A., Priandra, Y. & Yuniaristanto, 2016. *ANALISIS KETELUSURAN RANTAI PASOK HORTIKULTURA BERORIENTASI.* Surakarta, Seminar Nasional IENACO.

[8] T. Saaty, "Decision making with the analytic hierarchy process," *International Journal of Services Sciences ,* p. 83, 2008.

[9] R. Septifani, I. Santoso and Z. Pahlevi, "Analisis Risiko Produksi Freshtea Menggunakan Fuzzy Failure Mode and Effect Analysis (Fuzzy FMEA) dan Fuzzy Analytical Hierarchy Process (AHP) di PT. Coca-Cola Bottling Indonesia Bandung Plant)," *Prosiding Seminar Nasional Penelitian dan Pengabdian Masyarakat,* pp. 14-21, 2018.

[10] Waaly, A.N., Ridwan, A.Y., Akbar, M.D. Development of sustainable procurement monitoring system performance based on Supply Chain Reference Operation (SCOR) and Analytical Hierarchy Process (AHP) on leather tanning industry. International Mechanical and Industrial Engineering Conference (IMIEC) 2018, MATEC Web of Conferences

[11] Widianti, Firdausa. Failure mode and effect analysis (FMEA). *Pengujian Suhu Lemari Es dengan Metode Terintegrasi Fuzzy Failure mode and effect analysis (FMEA),* 18(1), pp. 8-23.