

Operational Risk Analysis for Barcoding Project in PT. XYZ with Enterprise Risk Management Method

1st Amanda Putri Kusumawardhani
*Major of Industrial Engineering
 Industrial & System Engineering
 Faculty*
 Bandung, Indonesia
 amandapkusumawardhani@gmail.com

2nd Endang Chumaidiyah
*Major of Industrial Engineering
 Industrial & System Engineering
 Faculty*
 Bandung, Indonesia
 endangchumaidiyah@yahoo.co.id

3rd Rita Zulbetti
*Major of Industrial Engineering
 Industrial & System Engineering
 Faculty*
 Bandung, Indonesia
 zulbetti@gmail.com

Abstract— PT. XYZ is running the Barcoding Project to facilitate the process of recording raw material data in the production process. This Barcoding Project certainly has operational risks that may occur, therefore by using the Enterprise Risk Management approach (ERM) that is a process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise which focused on the operational risk of the company. The result of risk identification, found there are 26 operational risk that occur in Barcoding Project. These risks stem from human resource risk, system risk, barcoding system risk, production risk, machine risk, and other risks. The result of the assessment of each risk is based on its severity and the probability of occurrence, besides that this study calculates the total operational risks that may occur in Barcoding Project. From the risk assessment conducted in the research, it can be seen from the category high risk, medium risk and low risk then, the risks that need to be prioritized to be controlled are risk with category high risk and medium risk.

Keywords— Enterprise Risk Management, Operational Risk, Barcoding Project

I. INTRODUCTION

PT. XYZ is a company operating in the food industry since 1958. PT. XYZ produces various kinds of beverage products. As one of the food industry that dominate the market in Indonesia the company performs a good production system in order to meet customer satisfaction. Currently, the company must identify operational risks and risk management for Barcoding Project at PT XYZ IT Department where the IT department itself integrates the system at PT XYZ as well as actively participates in the development of technology usage and innovation in PT XYZ. The risk associated with the possibility of undesirable or unexpected adverse events (losses) [2]. Figure 1 shows how the process flow in barcoding project is running :

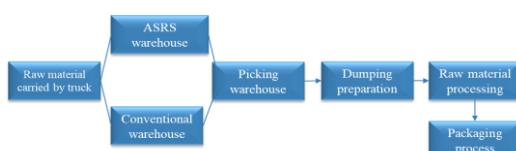


Figure 1. Process Flow

The Barcoding project is implemented at the stage from where raw material comes and stored in a conventional warehouse where there is a storage rack with an ASRS (Automated Storage and Retrieval Systems) system that is used to retrieve and store shelves until the raw materials are processed into finished products in place of UHT preparation. In Barcoding Project, barcode attachment will be made on each raw material that has just arrived and has been arranged on a shelf that has an ASRS system based on the expiry date. After raw material is arranged on the shelves by ASRS system, raw material is taken to be processed with the raw material sequence that first enter the expiration period to be processed first, the material is attached with the label accompanied by barcode. The barcode can identify the raw material name, raw material quantity, raw material expiration time, and machine used to process raw material. The next process is raw material is taken to picking warehouse for the sorted and then grouped on the pallet based on the recipe for each product, after raw material is grouped based on recipe for each raw material product that has been grouped will be attached barcode label that provide information about raw material in the pallet. On the next step the group of raw materials that have been grouped based on the recipe will be wrapped and protected by plastic and attached with a barcode label to be taken to the UHT preparation site or where the raw material is processed to become a product. The purpose of the barcode attachment itself is intended to facilitate the material data collection system from the warehouse where raw material for the manufacture of the product is received to the place where the product is made to minimize the occurrence of logging errors. In barcode use there are some risks where the process of sticking barcode on raw material itself is done by factory workers. It is realized by the company to avoid events related to the company's operations which are not expected and can harm the company. In addition, risk identification also needs to be done considering the company has some problems before the implementation of a barcode system such as raw material data errors which made raw materials coming into the dumping machine are different from those monitored in the oracle system. From the problems above this paper aims to identify and analyze the operational risk with Enterprise Risk Management (ERM) method. It is expected that the results of this

research conducted for Barcoding Project in IT Division of PT XYZ company can be give solution for operational risk management in Project Barcoding IT Division of PT. XYZ.

II. LITERATURE REVIEW

A. Risk Management

Risk is linked by probability of bad occurrence (loss) that not desirable, or unexpected. In other words, the probability shown uncertainty [2].

B. Risk Identification

Risk identification is conducted to identify what are the risks that will be faced by the organization. The risks that will be faced by an organization are from misappropriation by the employees and many more [5].

C. Risk Assessment

At this stage the company management had placed the size or scale used, including the design and research methodology to be utilized. The data will also have received both quantitative data and qualitative data and sorting data is done based on the methodology used. [4]

D. Risk Response

After gaining the risk assessment from risk matrix, then it is known that the response in facing the risks. Risk response planning is a process that is conducted to minimize the risk level until the accepted limit [6]

E. Risk Mitigation

After identification, measurement, and create risk matrix, the next step is to handle the risks. If one organization fails in handling risks, then the consequence can be serious, such as a large number of loss. Risks should be managed in various ways, such as avoidance, retention, diversification, or transferring to other party. It is very related between risk management, risk control, and risk financing [5].

F. Operational Risk

Operational risk is a kind of risk that generally occurs because of the internal problems of the company.. Operational risk are risks of direct and indirect losses as a result of inadequate internal processes or internal failures, as well as the effects of external people, systems or events [4].

G. Enterprise Risk Management

Enterprise Risk Management (ERM) is a process, that is affected by the management, board of directors, and other personnel from an organization applied in strategy setting and it includes the whole organization. It is designed to identify potential events that influence the organization. ERM consists of 8 components that are related to each other and it comes from the management process in operating a company and integrated with management process and these components are internal environment, goal setting, event identification, risk assessment, risk response, controlling event, information and communication, and surveillance [1].

H. Previous Research

According to previous research [8]. The result of risk mitigation should be categorized by risk level, and another research state [3] "risk matrix is a standard tool for establishing the connection between consequences and probabilities in risk assessment of a given exposure to risk".

III. METHODOLOGY

The conceptual model is used to show concepts that are related to each other in this research

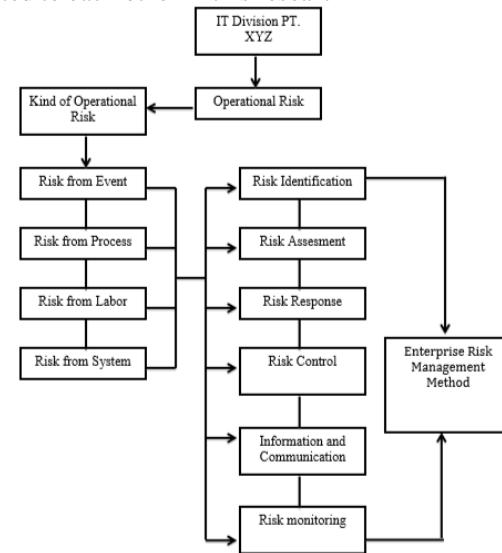


Figure 2. Conceptual Model

This research starts from identifying the risks that occur in Barcoding Project in IT Division PT. XYZ. The risks in Barcoding Project are from risk from an event, risk from process, risk from labor, and risk from system. After identifying the risk, this research calculates the risk assessment based on severity and occurrence, designs the risk response, decides the risk control, designs the information and communication, and monitors the risk control. This research uses COSO 2004 method for integrated system called Enterprise Risk Management. Besides that, this study also calculates the total operational risk that may occur in Barcoding Project PT. XYZ. This study used Analytical Hierarchy Process (AHP) to give weighting to every kind of risk that occurs in barcoding project. Generally, the decision-making process with the AHP method is based on these steps [7]:

1. Identifying problems and deciding the wanted solutions, then organizing hierarchy from the problems.
 2. Deciding element priorities.
 3. Considering the synthesis relation comparison to gain overall priority.
 4. Measuring consistency
 5. Calculating CI (consistency index) :
- $$CI = (\lambda \max-n)/n \quad (1)$$
- Where n = numbers of elements.

6. Doing calculation of Consistency Ratio (CR) with the formula:

$$CR = \frac{CI}{IR} \quad (2)$$

CR = Consistency Ratio, CI = Consistency Index, IR = Index Random Consistency. After that checking hierarchy consistency. If the value is above 10%, then judgement data assessment should be improved. But if Consistency Ratio is less or equals to 0,1 then the calculation result can be stated as true.

IV. RESULT AND ANALYSIS

A. Risk Identification

Based on risk identification that is gained from deep interview process and data collecting from oracle, there are several types of risks on Table 1:

Table 1 Risk Identification Based on Deep Interview

Types of Operational Risks	Risks
Human Resource Risk	less careful in ensuring the expiration date of the material so it looks at oracle if the material is close to expiration date, the procedure must be repeated again
	lack of human resources who understand the oracle in the MVP department so that if there are some human resources absent in the day, it can cause the delay of sending data to admin preparation
	lack of socialization to employee about precise rules of MBPR (Material Bulky Picking Request)
	an error occurred on the MBPR (Material Bulky Picking Request)
	the system in the admin can not issue a prescription because of unavailability of data from other departments
System Risk	the production batch must be canceled even if the barcode is scanned and the material must be returned to the picking area manually
	disruption of the oracle system so it reverse the transaction
	If there is 1 barcode can not be scanned then it must be reset from the center so it takes time
	label is not attached from palette
Production Risk	the changing availability of fresh milk where fresh milk can not wait long for production so that the proportion of the recipe will change and cancel the production batch
	accumulation of material in the dumping area
	Power failure
Other Risks	Wi-fi malfunction
	ASRS stacker error
Machine Risks	Disturbance in the ASRS warehouse
	Printer error
	Filling machine error
	damage to the sterilization machine

Table 1 shows the results of operational risks identification that is obtained from deep interview to employees PT. XYZ that involves in Barcoding Project

Table. 2. Risk Identification Based on Oracle's Data

Types of Risks	Risks
Barcode System Risks	on hand is not found on the dumping preparation
	no PB does not fit the dumping preparation
	there is consumption type on "automatic by step" in batch on dumping preparation
	there is an unsuitable quantity for the item in the dumping preparation
	allocate move order is error in picking
	item cannot be released
	Batch status is not pending
	an error occurred while publishing a batch

Table 2 shows the results of operational risk identification that is obtained from data collection in oracle system.

B. Risk Assessment

Table. 3. Severity Measurement

Severity		
Level	Effect	Description
5	Very high/catastrophic	disrupt the process of production, so it takes more time because it must improve the impact of risk
4	high	interfere with the effectiveness and efficiency of the production process
3	prevention/medium	interrupt the effectiveness of the production process
2	low	the impact is small and does not cause material loss
1	Very low/insignificant	the impact is very small and it can be handled on routine activities. Losses are very small and do not affect the production process

Severity can be defined as the effect of operational risks occurs. Severity measurement has been adjusted with the condition in PT. XYZ. The level of severity used in this research has been agreed with Department IT of PT. XYZ and it has just adjusted with the condition that occurs in production floor of PT. XYZ.

Table. 4. Occurrence Measurement

Occurrence Measurement			
Level	Descriptor	Example Detail Description	Frequency
5	almost certain	the event is expected to occur in most situations	≥ 7 times in 1 week
		the event may appear in most situations	$1 > x < 7$ times in 1 week
4	frequent	the event should appear at the same time	$= 1$ time in 1 week
		the event appeared at the same time	$1 > x \leq 0.25$ times in 1 week
3	moderate	the event appears in certain circumstances	$0/25 > x \leq 0.08$ times in 1 week
		Very rare	
2	rare		
1	Very rare		

Occurrence is another word for the events from the risks that is obtained and measured with the frequency of operational risks. Frequency is a probability measurement of the risk events[5]. Occurrence measurement has been with the condition in PT. XYZ.

Based on the calculation of the questionnaire that filled up by employee of IT Division PT XYZ, there is the result of operational risk weighted that obtained from *priority factor* result where human resource risk get a weight of 13,25 %, machine risk get a weight of 15.77%, system risk get a weight of 13,81%, barcode system risk get a weight of 16,51%, production risk get a weight of 27%, and other risk get a weight of 13,24%. If the risks are sorted, obtained the order of risk weight from the largest to the smallest there is production risk, barcode system risk, machine risk, system risk, human resource risk, and other risk.

Table. 5. Total Risk Result

Risk	Total Risk	Weight	Total
Human Resource Risk	0.53 %	13.24%	0.07%
Machine Risk	1.20%	15.77%	0.19%
System Risk	3.05%	13.81%	0.42%
Barcode System Risk	0.06%	16.51%	0.01%
Production Risk	1.09%	27.41%	0.30%
Other Risk	0.10%	13.23%	0.01%
TOTAL	6.06%	100%	1.00%

Table 5 is the result of the total risk that obtained from all the operational risk that happened in Barcoding Project in IT Division PT. XYZ, before doing weighting risk process obtained total risk of 6.06% therefore, after doing level of importance weighting processes with Analytical Hierarchy Process (AHP) method, there is total risk of 1.00%, this condition happens because the result of the sum of the risk from any kind of risk which has small total risk's result has big level of importance weight as if barcode system risk which has total risk of 0.06% but has level of importance weight of 16.51%.

C. Risk Matrix

Table. 6. Result of Severity & Occurrence

Operational Risks				
Types of Operational Risk	No	Risks	Occurrence	Severity
Human Resource Risk	A1	less careful in ensuring the expiration date of the material so it looks at oracle if the material is close to expiration date, the procedure must be repeated again	2	2
	A2	lack of human resources who understand the oracle in the MVP department so that if there are some human resources absent in the day, it can cause the delay of sending data to admin preparation		
	A3	lack of socialization to employee about precise rules of MBPR (Material Bulky Picking Request)	3	3
	A4	an error occurred on the MBPR (Material Bulky Picking Request)	2	1

Table. 7. Result of Severity & Occurrence (Continue)

Operational Risks				
Types of Operational Risk	No	Risks	Occurrence	Severity
Barcode System Risk	B1	the system in the admin can not issue a prescription because of unavailability of data from other departments because of unavailability of data from other departments	4	3
	B2	the production batch must be canceled even if the barcode is scanned and the material must be returned to the picking area manually	3	3
	B3	disruption of the oracle system so it reverse the transaction	2	2
	B4	If there is 1 barcode can not be scanned then it must be reset from the center so it takes time	4	3
	B5	on hand is not found on the dumping preparation	5	3
	B6	no PB does not fit the dumping preparation	4	3
	B7	there is consumption type on "automatic by step" in batch on dumping preparation	4	3
	B8	there is an unsuitable quantity for the item in the dumping preparation	2	2
	B9	allocate move order is error in picking	4	3
	B10	item cannot be released	5	3
	B11	Batch status is not pending	3	3
	B12	an error occurred while publishing a batch	4	3
Production Risk	C1	label is not attached from palette	5	3
	C2	the changing availability of fresh milk where fresh milk can not wait long for production so that the proportion of the recipe will change and cancel the production batch	3	3
	C3	accumulation of material in the dumping area	3	3
Other Risk	D1	Power failure	1	1
	D2	Wi-fi malfunction	3	3
Machine Risk	E1	ASRS stacker error	1	1
	E2	Disturbance in the ASRS warehouse	1	1
	E3	Printer error	1	1
	E4	Filling machine error	3	3
	E5	damage to the sterilization machine	3	3

Table 6 shows severity and occurrence measurement of each operational risk that happened in Barcoding Project in IT Division PT.XYZ. The risk matrix is based on Australian standard AS/NSZ 4360 2004 [3]. Operational risk that happened in Barcoding Project on PT. XYZ are at the category low risk, medium risk, and high risk. Operational risk in the low risk category are the risk with the number A2,A4,A5,E1,E2,E3 and D1. Operational risk in the medium risk category are the risk with the number B9, A1, B3, B8, A3,E4,E5,B2, B11,C2,C3, and D2. Operational risk in the low risk category are the risk with the number B5,B10,C1,B4,B6,B7, and B12.



Note: **Low Risk** **Medium Risk** **High Risk** **Extreme Risk**

Figure 3. Risk Matrix

D. Risk Control

Table 7 shows the category of the operational risks that happened in Barcoding Project PT. XYZ

Table 7. Risk Control

Level	No	Risks Name	Risk Control
High Risk	B5	on hand is not found on dumping preparation	Risk reduction with separate the materials which is inputted manually in order to mixed with another material which is inputted with barcode
	B10	Item cannot be released	Risk reduction with checking raw material quantity manually
	C1	label is not attached from palette	Risk reduction with changing the glue with another glue that suited to sticked in all places
	B1	the system in the admin can not issue a prescription because of unavailability of data from other departments	Risk reduction with update systematics of data delivery. So there is no delay in data delivery
High Risk	B4	If there is 1 barcode can not be scanned then it must be reset from the center so it takes time	Risk reduction with holding handheld use training, so if there is failure in barcode scanning, employees can try to fix it first by their self
	B6	no PB does not fit dumping preparation	Risk reduction where the manager do a employee's performance evaluation so, the employees can increase their performance and to minimize the mistakes
	B7	there is consumption type on "automatic by step" in batch on dumping preparation	Risk reduction where IT division resetting the barcode system that consumption should be counted manually
	B9	There is error allocate move order on picking	Risk reduction with doing a performance evaluation for the human resource which served for stick the barcode so that is no error for scanning the barcode

Table. 7. Risk Control (Continue)

Level	No	Risks Name	Risk Control
	B12	an error occurred while publishing a batch because the is automatic by step for WP (work processed) item and for RM (raw material has been checked on release process)	Risk reduction where IT division resetting the barcode system that consumption should be counted manually
	A3	lack of socialization to employee about precise rules of MBPR (Material Bulky Picking Request)	Risk reduction where management held a periodically every MBPR's renewal
	E4	Filling machine error	Risk reduction with periodically maintenance with preventive maintenance
	E5	Sterilization machine error	Risk reduction with periodically maintenance with preventive maintenance
	B2	The production batch must be canceled even if the barcode is scanned and the material must be returned to the picking area manually	Risk reduction with machine maintenance and held a human resource training in MVP department
Medium Risk	B8	there is an unsuitable quantity for the item in the dumping preparation	Risk reduction with renewal of the availability of raw materials in the field
	B11	Batch status is not pending because the employees enter the wrong Production Batch number	Risk reduction where management do a employee's performance evaluation so that employee can always correcting their errors and increase their performance
	C2	the changing availability of fresh milk where fresh milk can not wait long for production so that the proportion of the recipe will change and cancel the production batch	Risk reduction with confirm to fresh milk's supplier due to total fresh milk that will delivered every process of delivery of fresh milk
	C3	accumulation of material in the dumping area	Risk reduction with make a space for materials that queue in dumping area, do machine maintenance
	D2	Wi-fi malfunction	Risk reduction with expanding wi-fi coverage area
	A1	less careful in ensuring the expiration date of the material so it looks at oracle if the material is close to expiration date, the procedure must be repeated again	Risk reduction with make clearer and bigger expired date label in raw materials, so it can see clearly

Table. 7. Risk Control (Continue)

Level	No	Risks Name	Risk Control
<i>Low Risk</i>	B3	disruption of the oracle system so it reverse the transaction	Risk reduction with routine maintenance, planning oracle capacity, make data backup if there is error on hard disk
	A4	an error occurred on the MBPR (Material Bulky Picking Request)	Accept the risk with requires accuracy from users who input MBPR data in system, therefore do evaluation for human resource performance which served to input the data
	E1	ASRS stacker error	Accept the risk and do routine check and maintenance to ASRS stacker
	E2	Disturbance in the ASRS warehouse	Accept the risk and checking ASRS system in terms of equipment and control devices periodically
	E3	Pinter error	Accept the risk and checking the printer periodically, and buy another printer so if one of them crashing there is no need to wait for repair
	D1	Power malfunction	Accept the risk and do genset maintenance
	A2	lack of human resources who understand the oracle in the MVP department so that if there are some human resources absent in the day, it can cause the delay of sending data to admin preparation	Accept the risk and do routine socialization to human resource in MVP department

Table 7 shows the action that need to control the operational risks that happened in Barcoding Project PT. XYZ. The operational risk that happened in Barcoding Project PT. XYZ divided to three category that is high risk, medium risk, and low risk. The risk control is focused on the risk on high risk and medium risk category, for the risks with high risk category there is need to reduce the risk and the senior management should monitor the risk reduction processes and for the risks with medium risk category there is need to reduce the risk and management should monitor the risk reduction process. The risks with low risk categori can be accepted with routine management procedures because the impact of low risk is not give the major impact to the company.

E. Risk Information & Communication

To optimize risk control, it is necessary to have a good information and communication process in each unit involved in Barcoding Project, a form of information channeling and good communication can reduce the risk

and accept the risk if it does not have a big impact, if the risk has been reduced at the beginning of the process then the risk will not continue to the next process.

F. Risk Monitoring

Monitoring process on risk control needs to be done so that the risk control process is really done and can be controlled. The frequency of risk monitoring process varies greatly depending on the risk, for risks with high risk categories requiring monitor from senior management and should be controlled monthly, while for medium risk category requiring detailed management handling and monitoring is required every 3 months, and risk in the low risk category is required to monitor risk with a frequency of 6 months, because the risk with low risk category is acceptable and only routine management procedures are required.

V. CONCLUSION

Operational risk in Barcoding Project IT Division PT XYZ divide to 26 operational risks with many source of operational risk that is 4 risks of human resource, 4 risks of system, 8 risks of barcode system, 3 risks of production, 5 risks of machine, dan 2 risks of another risk. The result of risk assessment in Barcoding Project PT. XYZ divided to three category of risk with details 9 risks in high risk category, 11 risks in medium risk category, and 6 risks in low risks category.

The result of operational risk measurement before weighting process in every type of risk is 6.06%. after level of importance weighting every type of operational risk with AHP method the result of operational risk measurement of Barcoding Project PT. XYZ is 1%, this condition happens because the result of the sum of the risk from any kind of risk which has small total risk's result has big level of importance weight as if barcode system risk which has total risk of 0.06% but has level of importance weight of 16.51%. Operational risk control in Barcoding Project PT. XYZ focus to the risk with high risk category and medium risk category that is with risk reduction and get handling from senior management and for operational risks with low risk category the risk can be accepted and only needs routine management procedures.

REFERENCE

- [1] COSO, "Enterprise Risk Management – Integrated Framework Executive Summary," 2004.
- [2] D. Herman, "Manajemen Risiko Edisi 2," 2016.
- [3] D. Ristic, "A Tool for Risk Assesment," in Safety Engineering Review Article, vol. III, 2013, pp. 121–127.
- [4] F. Muhammad, "Manajemen Risiko Edisi Revisi," 2014.
- [5] H. Mamduh, "Manajemen Risiko Edisi 3," 2016.
- [6] S. Budi, "Manajemen Proyek Konsep & Implementasi" 2009.
- [7] S. Thomas L "The Fundamentals Of Decision Making and Priority Theory With The Analytical Hierarchy Process" RWS Publication University of Pittsburgh.
- [8] W. Sudarso Kaderi, Suharto "Analisis Risiko Operasional di PT TELKOM Dengan Pendekatan Metode ERM," Jurnal Manajemen Teknologi. vol. 7, pp. 58–90, 2008