IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 08, Issue 7 (July. 2018), ||V (V) || 01-08

Operational Risk Management Design In X.Ltd Using House of Risk Method

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Abstract- X Ltd. is an industry that carries out 2 years, 4 years maintenance and repair of train operating in Java Island. But currently X Ltd. has never conducted risk identification and risk management to overcome operational risks that may occur. This research will design a risk management framework for X. Ltd by applying Enterprise Risk Management (ERM). The approach used to implement Enterprise Risk Management (ERM) in this research is SNI ISO 31000: 2011. The risk management design process is through stages of risk identification, risk analysis, risk evaluation, risk treatment, monitoring and review. In this study the method used to analyze the potential operational risks that exist in X. Ltd is the House of Risk model (HOR). The result of risk event identification on operational business process of X. Ltd obtained 22 risk events including 8 risk events in the planning process, 4 risk events on the processes of procurement, storage and distribution of spare part, 6 risk events in the production process, and 4 risk events on quality processing. Then, the result of risk agent identification gotten is 40 triggers of risk agent. After the calculation of phase 1 of HOR model to calculate the ARP value, the next stage using the pareto diagram application. Based on the results from the pareto diagram the cumulative total percentage of ARP was obtained, there is 1 selected risk agent that is (A 37), the employee who was less competent in his work. However, based on brainstorming with the management of X. Ltd the risk agents that will be priority in preventive actions are 13 risk agents with highest ARP value. In the determination of preventive actions, there were 20 preventive actions, which were then incorporated into the Phase 2 HOR model to rank the most effective prevention actions based on cost and resources. From the result of phase 2 HOR, then brainstorming with the management of X. Ltd was conducted, and 10 immediate preventive actions were selected.

Keywords: Enterprise Risk Management, SNI ISO 31000, House of Risk.

Date of Submission: 11-07-2018 Date of acceptance: 23-07-2018

I. INTRODUCTION

X Ltd. is an industry that carried out 2 years, 4 years maintenance and repair of train operating in Java Island. Currently the policy of the parent company is that the application of Corporate Management (*Enterprise Risk Management*) and Establishment of Corporate Risk Management Implementation Team (*Enterprise Risk Management*), so the risk management must gradually be implemented. However, until now X. Ltd has never conducted risk identification and risk management to address possible risks within the company. It was finally realized by X. Ltd because there have been several unexpected and harmful events related to the company's operations. Some of the incidents are excessive amount of *buffer stock* so there are some idle stock of spare parts, lack or unavailability of spare parts, there is still burdens or return of train repair from depot and monthly production target that is not reached.

Based on the explanation above, the purpose of this research was to design a risk management framework for X. Ltd by applying *Enterprise Risk Management* (ERM). Implementation of *Enterprise Risk Management* (ERM) is a very important thing for the company, because the risks that occur can be managed and minimized in achieving the company's objectives [6]. The approach used to implement *Enterprise Risk Management* (ERM) in this research is NSI (National Standards of Indonesia) ISO 31000: 2011. The risk management design process is through risk identification stage, risk analysis, risk evaluation, risk treatment, monitoring and review [2]. Potential risks measurement and identification are focused upon existing operations at X. Ltd, because the risks faced can be seen in the company's operations.

This research is in identification, analysis, evaluation and risk treatment using *House of Risk* model (HOR). This model is a *framework* developed by Pujawan and Geraldin (2011) by developing *Failure Mode and Effect Analysis* (FMEA) method and *Quality Function Deployment* (QFD) method [8]. Broadly speaking the advantages of this method is the stages in this framework was already included into a method that can be used to perform risk management analysis. *House of Risk* (HOR) is divided into two phases the first phase is risk identification the development of *Quality Function Deployment* (QFD) method. Then second phase is *risk*

treatment the development of *Failure Mode and Effect Analysis* (FMEA) method. The risk identification phase is the phase in which the *risk event* and *risk agent are* identified, measured and prioritized. The risk treatment phase is the phase in which the risk agent being selected, based on high priority level in the output of first phase HOR. After that is identification of the relevant actions to prevent the occurrence of risk and determine the relationship between preventive actions on each risk triggers (*risk agent*). Then, the calculation of the degree of effectiveness and measurement of the difficulty level of each action that used as a form of response or risk mitigation [5].

By this research on the design of risk management framework it will be expected to assist the company in conducting risk management based on NSI ISO 31000: 2011. So, it can meet the needs of X. Ltd in finding the risks of the company and managing each company's risk appropriately.

II. RESEARCH METHODOLOGY

2.1 Identification of Fundamental Issues

At this stage the problems were identified with the aim to know and understand the main problem that would be used as an object of research that is the design and analysis of operational risk management at X. Ltd. In addition, at this stage the objectives of the study and the concept of study to be used was being set, including operational risk management by using the method of *house of risk*. The description of operational business process of X. Ltd is also required to be used as a basis for identification of *risk agents* and *risk events*.

2.2 Identify *Risk Agent* and *Risk Event*

This stage consisted of identification of *risk agents* or risk triggers that can cause more than one *risk event* in the operational activities of X. Ltd. Identification of*risk events*that may occur in each business process. The results of *risk agent* identification and *risk event were* obtained from literature study, previous research which discussed operational risks and field observations. The identified risks are then verified by conducting interviews on experts of various fields from the businesses' each related process unit.

2.3 Risk Analysis

This stage were data collection and recapitulation of operational risk which included*risk agent* and also *risk event* that was contained in operational activities of X. Ltd. Risk variables that was being used in the study, were obtained from the verification results through interviews on some people who have experience and specific expertise in the fields in accordance with the topic of discussion. Then, the FGD (*Focus Group Discussion*) with experts of each of the relevant units to determine the magnitude of the level of risk probability (*occurrence),* the impact of the risk (*severity)* and the correlation (*correlation*).

The Impact (*severity*), the correlation (*correlation*) between the occurrence of the risk and the risk agent, as well as the possible impact arising (*occurrence*) were combined to determine the level or risk rating. The process of risk analysis is done by analyzing the cause of the risks that have been identified to calculate the value of *Aggregate Risk Potential* (ARP) using House of Risk Model Phase 1. This ARP value was obtained from the sum of the multiplication of the *severity* level with the *occurrence* level. The results of this risk analysis phase were risk priorities, then they were used as a reference for the preparation of risk management plans.

2.4 Risk Evaluation

The preparation of risk mitigation design served to provide an alternative solution in preventing the occurrence of operational risk with optimum cost. In this study, the design of risk mitigation would be shown in House of Risk phase 2. At this stage, it focused on determining what step that would bethe most appropriate thing to do, first by considering the effectiveness of the *resource that would be*used and the level of performance of the related object.

2.5 Preparation of Risk Management Framework

This stage would design a risk management framework for X. Ltd by applying *Enterprise Risk Management* (ERM). Implementation of *Enterprise Risk Management* (ERM) is a very important thing owned by the company, because the risks that occur can be managed and minimized to achieve corporate goals. The approach used to implement *Enterprise Risk Management* (ERM) in this research is SNI ISO 31000: 2011. The risk management design framework went through several stages including risk identification, risk analysis, risk evaluation, risk treatment, monitoring and review. In this research is the stage of risk identification, risk analysis, risk evaluation and risk treatment were used the method *House of Risk* (HOR).

III. RESULT AND DISCUSSION

3.1 Determining The Context of Risk

The identification and measurement of the potential risk was focused on existing operational activities in X Ltd., because the risks faced can be seen in the company's operational part. The operational part that is the core business process (*core process*) in X. Ltd ranging from the maintenance planning process, spare parts procurement process, spare parts storage and distribution process, maintenance and repair production process, quality management process and supporting process (financial administration, work facility management, human resource management, and information technology management).

3.2 Identify *Risk Agent* and *Risk Event*

Based on the results of risk identification through *literature* study and *brainstorming*with X. Ltd at the stage of data collection the 22 *risk events* that influence the sustainability of operations of X. LTD have been obtained. These risk variables were found in each business process: 8 risk events in the planning process, 4 *risk events* on procurement process, storage and distribution of spare parts, 6 *risk events* in production process, and 4 *risk events* in quality management process. Then, the identified *risk factor* identified 40 risk triggers that came from all units.

3.3 Aggregate Risk Potentials

After identification had been completed, the risk analysis was done by giving the *severity rating* that is the severity of a risk *event*, *the occurrence* assessment is the chance level of the occurrence of a *risk agent in* accordance with the predetermined scale of within the interval of 1 – 5. Then, *correlation* assessment was conducted thatin this case isthe assessment of the existence of relationship between the risk *event* and the risk *agent*. If the *risk agent* causes the occurrence of a *risk event*then it is said there is a correlation. The c*orrelation*assessmentbased on the correlation values of 0,1,3,9. Where 0 represents no correlation and 1, 3, and 9 represent, respectively, low, moderate, and high correlations.

The next step is data processing by using House of Risk model phase 1. This stage determines the *risk agent* ranking. The following can be seen in Figure 1. *House of Risk* Phase 1 model.

Business Proscesses	**Risk Event**	**Risk Agent (Aj)**					**Severity of Risk Event**
	(Ei)	**A1**	**A2**	**A3**	**A4**	**A5**	**i(Si)**
Planning	E1	R11	R12	R13			S1
Logistic	E2	R21	R22				S2
Production	E3	R31					S3
Quality Kontrol	E4	R41					S4
Occurance of agent j		O1	O2	O3	O4	O5	
Aggregate risk potential j		ARP1	ARP2	ARP3	ARP4	ARP5	
Priority rank of agent j		P1	P2	P3	P4	P5	

Figure 1. Model *House of Risk* Phase 1

Descriptions:

- E1, E2, E3, ... En = *risk event* (identified risk events)
- A1, A2, A3, ... An = *risk agent* identified
- R11, R12, ... Rnn = correlation between risk agent and *risk event*
- S1, S2, S3, ... Sn = Value of *severity risk event*
- O1, O2, O3, ... On = *Occurance risk agent value*
- ARPj = *Aggregate Risk Potential* Value (ARP)
- P1, P2, P3 = *Risk* rating *agent* based on ARPj value
- ARPj $= Oj \sum Si \ . Rij$ (1)

After the processing of*House of Risk*phase 1and ARPj value was gotten, the next step is mitigation of risk with *House of Risk* phase 2 that meansdoing *preventiveaction*. *The* identified *Risk agent* thathas the largest

ARPj value which was determined by the pareto diagram will be the input on HOR phase 2 that is the priority *risk agent* to be mitigated.

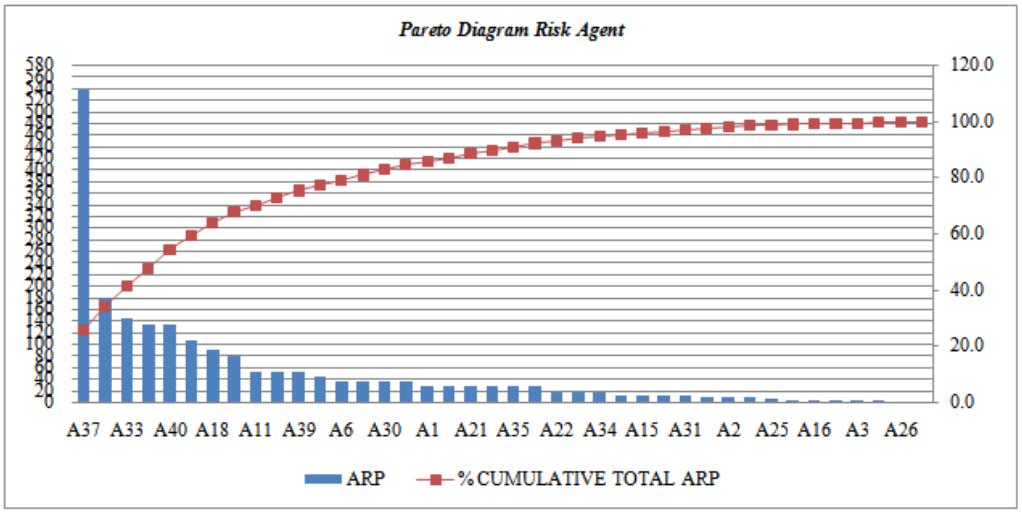

Figure 2. Pareto Diagram *Risk Agent*

Based on the results of application of the pareto diagram on risk are 80% of the company's losses are caused by 20% risk perceived to impede the company's objectives. By focusing on the perceived 20%, the corporate risk impact of 80% can be resolved. After the application of pareto diagram above, that was obtained from the cumulative total percentage of ARP there is 1 selected *risk agent* that is (A 37). An employee who are less competent in his work. However, based on *brainstorming* with the *management*of X. Ltd, the *risk agents*that will be the priority *risk agent* for *preventive action are the* 13 top*risk agent* ranking. Due to the *management of* X. Ltd that *risk agents*, was considered to be an obstacle to the goals to be achieved by company.

Table 1.*Risk Agent* Priority that is mitigated

Rank	RA	Risk Agent	ARP
1	A37	An employee who are less competent in his work	540
2	A5	Some of the required parts are hard to find in the market	180
3	A33	The working of upper frame is more complex than the bottom frame	144
4	A27	The existence of some spare parts that has 2 different material number in the same spare part	135
5	A40	High production target / overload	135
6	A20	Do not have special tool room for each part production	108
7	A18	Employees work not in accordance with work procedures / SOPs	90
8	A36	There had been no specific JO standards for some specific works	81
9	A11	Negligence ofworkers (Human error)	54
10	A29	Unavailability of spare parts in inventory warehouse	54
11	A39	There is no evaluation of the machine performance and the amount of mass production / production performance	54
12	A10	The service office does not exchange other facilities to the depot	45
13	A6	Auction failure occurs in the procurement of spare part items	36

3.4 Identification and Prioritizing Proactive Actions

Afterthe *risk agent* thatwill be mitigated was known, the following is the designing stage of mitigation strategy with HOR phase 2. The steps are, determining of the mitigation strategy plan that will be done, obtaining of 20 *preventive action*/precautions then, doing the calculation of ETD value. Next, the ranking according to the highest ETD value to the lowest. ETD value is used to know the level of effectiveness of mitigation strategy for reducing or mitigating*risk agent*. The smaller the value of ETD,the lesseffective mitigation action is in reducing or mitigating*risk agents*concerned. Also, on the contrary, the greater the ETD value of mitigation action, the more effective it is in reducing or mitigating the risk agent concerned. The following is the description for the Phase 2 *Risk* Phase 2 model as follows;

Description:

- A1, A2, A3 ... An = *risk agent* selected for mitigation
- PA1, PA2 ... Pan = action / mitigation strategy to be performed
- E11, E12, ... Enm = correlation between mitigation strategy with *risk agent*
- ARP1 , ARP2..ARPn = *Aggregate Risk Potential* (ARP) from *risk agent*
- TE1, TE2 ... TEn = is the total effectiveness of each mitigation action
- D1, D2, D3, ... Dn = the level of difficulty in performing each mitigation action
- ETD1, ETD2, ... ETDn = Total Effectiveness (Tek) with difficulty level *Difficulty* (Dk)
- R1, R2, R3 ..Rn = rank of each action, ranking based onvalue ETD, first rank shows action with highest ETD.
- Tek = $\sum_j ARPj \ . Ejk$ (2)
- ETDk = $Ek \ / \ Dk$ (3)

Table 2. Model *House of Risk* Phase 2

		Benchmarking manufacturer of tools	Conducting the market survey first before procuring components	Designing a spare parts procurement program three months before	Making an evaluation / monitoring of facilities maintenance program	Making a punishment policy for works not according to SOP	Setting and applicating SOP for treatment of machine tools / work facilities	Designing the creation of special tool roomin each production area	Creating Material Number List of Spare Parts then notify it to Logistics Center to delete it from Master Data list SAP Compilations	Analyzing Material Management	Planning of substitute spare parts that available in the warehouse	
		Preventive Action (PA k)										
Risk Agent	Risk Agent (Aj)	PA 1	PA 2	PA 3	PA 4	PA 5	PA 6	PA 7	PA 8	PA 9	PA 10	Aggregate Risk Potential (ARPj)
Some of the required spare parts are hard to find in the market	A5	9	9									180
Auction failure in the procurement of spare parts items	A6			3								36
The Service Office doesn't exchange any facilities to Depot	A10				3							45
Negligence of Workers (Human Error)	A11					9						54
Workers didn't do according to SOP	A18					9	3					90

Do not have a by Special Tool room for each part of production	A20							3				108
Total effectivity of action k (Tek)		1620	1620	108	135	1296	270	324	405	486	54	
Degree of difficulty performing action k (Dk)		3	3	4	3	4	4	4	3	5	3	
Effectiveness to difficulty ratio (ETD)		540	540	27	45	324	68	81	135	97	18	
Rank of priority		3	4	19	18	7	15	14	9	12	20	

The following results of HOR phase 2 in the selection of *preventive action* that were ranked according to the top ranking of the value of ETD (*Effectiveness to Difficulty Ratio*) among others, (PA 15) transferring employees to other sections according to expertise, (PA 16) increasing the competence and skill of employees, (PA 1) benchmarking Manufacturer of tools, (PA 2) surveying market first before making program, (PA 13) evaluating facility by looking at physical condition of the facility, (PA 19) maximizing the existing supervision, (PA 5) creating a punishment policy to whom that does not perform its work according to SOP, (PA 20) developing a maintenance program according to production capacity, (PA 8) creating a List of *material numbers*of spare parts to notify them to the Central Logistics to be removed from the master data list SAP components, (PA 18) establishing the performance evaluation of the machine, (PA 12) conducting the organizational structure changes in the production unit, (PA9) analyzing material management, (PA 11) hanging the layout of X. Ltd, (PA 7) designing special tool room in eachproduction area, (PA 6) Preparing a ndapplying SOP in the treatment of machines, tools, or facility, (PA 14) re-evaluating JO standard of each treatment program (PA) 17) scheduling of *daily check* and *preventive* actions for prolonging life time of machines, (PA 3) Designing a spare parts procurement program 3 months before, (PA 10) Planning of substitute spare parts that available in the warehouse.

Based on *brainstorming* with X. Ltd of the 20 (twenty) preventive *measures* which have been prepared above, but only 10 (ten) *preventive actions* can be done immediately. Preferred *preventive actions* include (PA 15), (PA 16), PA 1, PA 2, PA 13, PA 19, PA 5, PA 20, (PA 8), (PA 18). This is due to several factors such as spent expenses, time, and the central office management policies.

3.5 Stage of Control and Monitoring

The last stage are the control and monitoring stage that is done as a process of observing the results of the implementation of the risk response that has been prepared. In this stage, of the probability of new risks are identified as the project progresses. In the process of control, the measurement or evaluation of the effectiveness of the action of each risk response is also carried out. The following are control and monitoring actions that will be undertaken in planning of the implementation of mitigation actions;

Table 3. Action Control and Monitoring

Ranking	PA	Preventive Action	Responsible	Monitoring and Control Measures
1	PA15	Moving employees to other sections according to their expertise	General Manager and Head Office	Creating of competency mapping as an information extraction on competence of resources owned by X. Ltd, which will be monitored regularly, and as a justification if the management rolling an employee's position.
2	PA16	Increasement of employee's competency and skill	Human Resources Unit	Creating competency mapping as information extraction on competence of resources owned by X. Ltd, to be monitored and evaluated regularly, in order to propose a budget for *training* each year.
3	PA1	Conducting of benchmarking to tools manufacturers	Planning Unit	Setting and determining of what will be a benchmark and determine what is measured, then do data collection, data analysis, and the results will be the standards.

Ranking	PA	Preventive Action	Responsible	Monitoring and Control Measures
4	PA2	Conducting of market survey first before making procurement program of parts / components	Work Continuity (Planning Unit)	Coordination with the Depot, in determining the facilities that will go to X. Ltd for maintenance / repair.
5	PA13	Evaluating facilities by looking at the physical condition of the facility	General Manager	Coordination with the head office in preparing the program maintenance / repair facilities at X. Ltd.
6	PA19	Maximizing of supervision of the existing subordinates	Production Unit	Creating of a work completion target form for each individual in each section, which will then be evaluated during the morning briefing by each assistant manager of each section
7	PA5	Creating of a punishment policy for whom that does not perform its work according to SOP	Human Resources Unit (Human Resources) and Production Unit	Coordination with each unit head unit for routine monitoring to employees who do not perform work according to SOP and give punishment warning if there is a violation.
8	PA20	Arrangement of maintenance program according to production capacity	Palnning Unit and Production Unit	Coordination with head office to consider production capacity at X. Ltd.
9	PA8	Creation a List of spare parts that have double Material number, then notify it to Central Logistics to be deleted from Master Data List of SAP Components	Logistic Unit and Head Office	Coordination with the head office to evaluate the material number on a regular basis of spare parts that has been unused and removed.
10	PA18	Make evaluation of machine performance	Facilities (Planning Unit)	Monitoring of machines performance on a regular basis, then will be evaluated every month to find out is the level of availability, level of performance, and the level of quality of a machine

IV. CONCLUSION

Results of identification of *risk events* in the operational business process of X. Ltd earned 22 risk events (*risk event*) and 40 triggers of risk (*risk agent*) which had processed with the *House of Risk* phase 1. Based on the application of Pareto diagram above, obtained from the cumulative total percentage of ARP is 1 *risk agent* selected i.e. (A 37),an employee who is less competent in his work. However, based on *brainstorming* with the management of X. Ltd *risk agent* that would be the priority *risk agent* for *preventive actionswere* 13 top*risk agents* ranking of ARP values. Furthermore, the processed results in the Phase 2 model of *House of Risk* had obtained 20 *preventive actions* that wereperformed by the ranking the calculation of the ETD value. However, through *brainstorming* with the management of X. Ltd, only 10 (ten) preventive actions (*preventive action*) were selected namely (PA 15), (PA 2), (PA 13), (PA 19), (PA 5), (PA 20), (PA 8), (PA 18)that can be done immediately. These happened due to several factors such as expenses incurred, time, and central office management policies. Then,the monitoring and review stage is a necessary thing to do, because the development

and implementation of each stage of risk management needs to be monitored to ensure the creation of risk management optimization.

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IOSR Journal of Engineering (IOSRJEN) is UGC approved Journal with Sl. No. 3240, Journal no. 48995.

Ajengretna Maharani "Operational Risk Management Design Inx.Ltd Using House of Risk Method." IOSR Journal of Engineering (IOSRJEN), vol. 08, no. 7, 2018, pp. 01-08