

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1. Inductive Study

The first research was conducted by Amir-Abbas Yazdani, Reza Tavakkoli and Moghaddam with the title of “Integration of the fish bone diagram, brainstorming, and AHP method for problem solving and decision making-a case study” in 2012. This research aims to let the manager of a company to recognize the value of group decision making methods in organizations, to let the manager explore the organization's problems in one process of problem overcoming method, and to have the most appropriate approach for it in the soap production line known as Tage Co. The methods used in this research are participatory to collect useful information regarding the ongoing problem in the field. It is continued by framing the information using fish bone diagram. Finally, the useful information is integrated into the analytical hierarchy process to synthesize the priority to be an outcome for the manager to decide.

Second research was conducted by Bialas A. in 2016 which concerned about the advance risk management in the security domain. With the title of “Cost-benefit aspects in risk management”, the research had a special focus on the cost-benefit assessment (CBA) of proposed security measures. The approach is based on traditional risk assessment, financial cost-benefit analysis, and hidden non-financial factors which may affect the environment of security measures operation. The result in the research shows that the decision making process in the security domain is quite complex because each decision requires a trade-off between many factors of diversified nature. In addition, there is some unclarity and uncertainty in the process. However, with the help of the proposed three pillar approach, it solves this issue, with one of the pillars, which is CBA pillar that effectively contributes to the toolset.

The third research with a title of “Application of fishbone analysis for evaluating supply chain and business process - A case study in KMART” was conducted by Islam, M., Naisara, S., Pritom, S.T., and Rahman, Md. A. in 2016. The research intends to evaluate the efficiency of K-Mart’s value chain and business process by using fishbone analysis. It provides problem

visualization that associates with software, process, people, material, environment, and management. The result indicates that with fishbone diagram analysis, the major problem for the company is supply chain management. There is different sub-cause that influences the K-Mart problem with the problem that brought down Kmart among retail giants has almost been solved. In short, the research argues that adjustment to the current competition is important to be sustained in business.

The fourth research discusses the cost and benefit analysis that was conducted by Valeria Villa, Genserik L. L. Reniers, and Valerio Cozzani was carried out in 2016. The research with a title of “Application of cost-benefit analysis for the selections of process-industry related security measure” aims to talk upon the fundamental terms of cost-benefit analysis within the specific framework of process-industry security with its focus on estimating the probability of threat, physical security system cost and performance assessment, and the evaluation of the cost of losses derived from either perspective or retrospective accidental scenarios. The cost-benefit analysis is applied to an illustrative case-study based on hypothetical sabotage to a storage tank in process facility which leads to a major accident. The objective of this study is to prove whether or not the application of cost-benefit analysis provides economic aid or criterion for selecting additional security measures in the process plant. According to the study result, it is proven that cost-benefit analysis may offer relevant support in security risk analysis and its related decision-making process in the chemical and process industry domain.

In the fifth research was conducted by Tongyuan Luo, Chao Wu, and Lixiang Duan with the title of “Fishbone diagram and risk matrix analysis method and its application in safety assessment of natural gas spherical tank” in 2018 is to quantitatively measure the opportunity of happening. The methods used in this research are the fish bone diagram, risk matrix, analytical hierarchy process, fuzzy mathematical theory, and fault tree model. This research results on the analysis of the spherical tank leak level with the thinking of happening opportunity and sequence dangerous. In addition, this research also submits the detail gauge for a reason events that have bigger happening opportunity to terminate or lower the hazard.

In the sixth research was conducted by Volden G. H. in 2019, the research presents an empirical study of cost-benefit analysis (CBA) practices in Norway. The title of the research was “Assessing public projects’ value for money: An empirical study of the usefulness of cost-benefit

analysis in decision making”. This research aims to increase the knowledge of the quality and usefulness of CBA as a basis for project selection. The research method is quantitatively based on a case study of 58 projects. The result indicates that CBA does offer a clearly defined interpretation of project success. However, there is a need for a consistent assessment of non-monetized benefit and recommendation to increase CBA usefulness in the future.

## **2.2. Deductive Study**

### **2.2.1. Participatory Approach**

A participatory approach is an approach that enables every people in all level to play an active and influential role in a decision that will affect their lives. According to Carmeli, et al. (2008), a participatory approach in decision making involved a high level of participation from employees and supervision in a decision that affects their work. Hence, this indicates that the participatory approach enables mutual knowledge and experience for both low-level people and high-level people in making a decision. By giving the sense of the power of mutual knowledge and experience, both parties will be empowered to partake in the strategic decision.

A participatory approach is considered a good approach in decision making due to the fact that all level of people that are affected by the decision is involved in making the decision. Most companies have tried to implement this approach and the result tends to be satisfied (Parnel and Crandall, 1999). One way that a participatory approach increases the decision-making result by involving many different people in its decision making. By involving many different kinds of people, different perspective, experience, and knowledge will occur. This could help the decision maker by considering all of the possible outcomes. According to Fredrickson and Mitchel (cited in Parnel and Crandall, 1999), participatory approach increases decision quality by applying comprehensiveness and extensive measure. This will surely make a lot of decision possibilities. This possibility can be complicated and complex. This is where the risk assessment method happens. By ranking the possibilities of decision emerge, the risk assessment can reduce the complexity of the decision to a series of comparison. This surely will help the decision maker to choose the decision possibility by emerging the most optimal decision from all of the complicated appeared decision.

The root cause problem commonly is escorted by suggestions from the manager and real persons who are experiencing the field. This approach is well known as participatory move. This allows a responsible or in charge person to look out deeper the problem as an opportunity to increase the revenue of the company's business by involving the workers to fill the input.

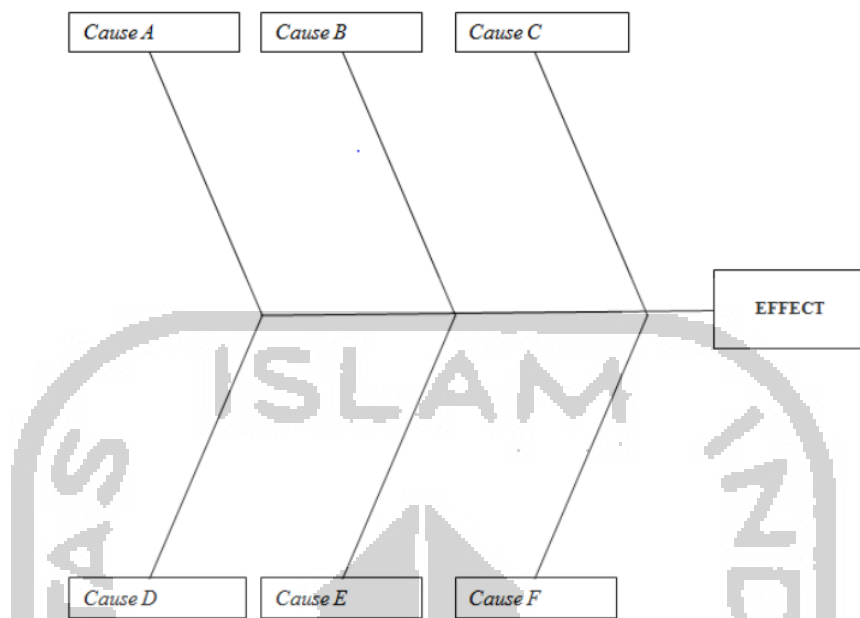
One of the ways to escort the approach of participatory is to have a simple forum group discussion (FGD). This method requires involved persons without a restricted number of people to join in and to have sharing thoughts in a forum to enrich the information. Escalada (2014) uttered that forum group discussion should be established by orders to maximize the expected outcome, such as:

1. Narrow the goals and insight requires of the forum.
2. Boxing the outline into themes.
3. List down the probe questions, and
4. Highlight the steps and remove irrational questions.

These steps will aid the observer to find useful information and let to explore deeper insight that might not emerge for the first time. Thus, this review is considerably required to be conducted in processing primer data. However, the participatory attitude used in this research is approximate up to level 8 of participation, which is decision-making authority.

### **2.2.2. Fishbone Diagram**

Fishbone diagram presents several specific events or phenomenon in the form of a graphical technique. It is commonly used for cause and effect analysis to acknowledge a complex correlated of causes for certain problem or event. This systematic tool was under a finding of Japanese researcher, named Ishikawa in 1990 (Coccia, 2017). The portrayed graphical technique proposed by Ishikawa simulates of fish skeleton and each of bone aims different outline of the cause, thus this is popular with the Fishbone Diagram compared to the Cause and Effect Diagram.



*Figure 2. 1 Fishbone Diagram*

According to Ilie & Ciocoiu (cited in Basic Tools for Process Improvement, 2009) Fishbone diagram commonly appears to be a model of suggestive presentation for the connection between an event and its choices happening causes. The connected skeleton in the fishbone diagram aids responsible readers think in a structural way. Other purposes provided by a fishbone diagram are that it can decide the root causes of a problem or quality of attitude applying the arranged approach, drive group engagement and activate group insight of the process, acknowledges areas where subjects should be accumulated for further finding.

The core problem in an identical fishbone diagram is located on the head as a means to say that it is the one requires to be tackled and causes are designed to be the bones in which smaller bones aim to create resemblances of the sub causes. This diagram later will show a comprehensive evaluation of the causes of the core problems and also utters the root causes referred to Islam, Naisra , Pritom, & Rahman, (cited in Balanced Scorecard Institute, 2007).

### **2.2.3. Risk Assessment**

Risk assessment is commonly conducted by using normative resolution. This is due to a lack of the finite knowledge and experience from the experts in comprehending the instrument. Comprehensive understanding of the project risk may not be equally understood by participants

so that they find it difficult to assess (Grimaldi, Rafele, and Cagliano, 2012). Industrial management thrives on overcoming this issue by arising the method of risk assessment and dividing them to very distinctive ones, by peering it per case. On the other hand, it means that risk assessment will require special treatment for each case that it deals with. This, in a nutshell, utters that risk management can be as important role as an industrial activity that by time always goes diverse and develops.

Risk management is an aspect of the overall management function that determines and implements a safety policy. With risk management, the organization can determine and understand what risk that could happen and prepare the anticipation or reduce their impact (Ennouri, 2013). The system emphasizes on identifying hazards as early detection in the foundry and it subsequently plans appropriate health management system to eliminate or control the potential hazards in the workplace. It formulates the principal of severity and likelihood in which it becomes the foundation of determining risk ranking. This concept provides useful information to upper level management to read and seek mitigation and available alternatives which can benefit the company in long term perspective.

Francisco & Associates (2004) divides a performing risk analysis into 2 parts, it is risk assessment and risk management. This is due to risk analysis performance applies the idea of probabilistic of an event that is combined with the detail activity which starting from planning to the result of the agenda. these reasons have led to two specific studies, called risk assessment and risk management.

		Potential consequence						
		People	Injuries and diseases that do not require medical treatment	Minor injuries that require first-aid only	Severe injuries that require hospitalization or multiple medical treatment	Life-threatening injuries or multiple injuries that require hospitalization	Death or multiple injuries that pose threat to life	
E – Extreme risk – detailed action plan required H – High risk – needs senior management attention M – Medium risk – specify management responsibility L – Low risk – manage by routine procedures Extreme and high risk demand more detailed plan to reduce risk to medium or low risk.		Reputation	Internal control	Observation by internal controls to prevent escalation	Observing that require external executors or investigation	Intense public or political significance	Publicity	
		Business process and systems	Minor errors within the systems or processes that require corrective action	Failure to procedures in the process	The requirements for one or more responsibilities are not met	Strategies are not in accordance with the national plan	Critical system failure, bad policy advisory	
		Finance	1 % of budget	2.5 % of budget	> 5 % of budget	> 10 % of budget	> 25 % of budget	
			Insignificant	Minor	Moderate	Major	Catastrophic	
			1	2	3	4	5	
Likelihood	Probability	Historical						
	>1 in 10	Is expected to occur in most circumstances	5	Almost certain	M	H	H	E
	1 in 10 – 100	Will probably occur	4	Likely	M	M	H	E
	1 in 100 – 1000	Might occur at some time in the future	3	Possible	L	M	M	H
	1 in 1000 – 10000	Could occur but doubtful	2	Unlikely	L	M	M	H
1 in 10000 – 100000	May occur but only in exceptional circumstances	1	Rare	L	L	M	H	

## *Figure 2. 2 Instrument of Risk Assessment*

Risk assessment is broad terms that it may refer to diverse industrial fields. According to the Federal Transit Administration of the United States Department of Transportation in its methodologies and procedures pointed out that “risk management is critical feedback from the project’s scope, cost, and schedule. The aim is to check out whether it is reasonable, accurate representations of the project” (Francisco & Associates, 2004).

The concept of risk mitigation cannot be segregated with the analysis of root problems. Logically, this concept of mitigating risk requires a number of relatable information counted from the root of causes, triggered problems and even until available solutions. This action will determine the revenue of the company later, either it will have profit or deficit which depends on the accuracy on finding the root cause of the problem. One of the effective movements to have a good solution as output is by detecting the root cause of the problem. This way allows detecting the branch of correlated causes so that we may find a tangible problem. Thus, it is considered as an effective movement and useful action that needs to get done by the company.

### **2.2.4. Cost-Benefit Analysis**

Quantitative methods run on numbers, including financial values. They are more feasible than cost-benefits assessments/analyses. When it comes to the combination of qualitative assessment and numbers approach, it needs other methods like ISO 31000, which refers to the use of cost-benefit analyses/assessment. Another standard (ISO/IEC 31010, 2009) forms about 30 risk assessment methods for different applications, (Bialas, 2017).

According to Bialas (cited in Cellini Riegg and Kee, 2010), cost-benefit analysis (CBA) is an old continuously used method in business for years. Estimating the strengths and weaknesses of alternative proposals, actions, perquisites, etcetera have been applied and well utilized by this structured approach. This approach activates to choose one of the available options for certain internal area. This provides the best approach in a feasible way to determine presented internal area, such as the one with the enormous amount of benefits in terms of labour, time, preserve, and others. CBA approximates the cost and benefits from the available options and compares the

outcomes to make a good decision. The decision may take into account the countermeasures of a selection during the risk management process.

