CHAPTER 2
LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This chapter provides insights into the research topic, consisting of a literature review and theoretical foundations. The literature review comprises a collection of reference sources from journals or research reports previously conducted that are relevant to the topic under study. Meanwhile, the theoretical foundations include concepts, theories, or approaches used as a basis for analysing and interpreting the data obtained.

2.1. Literature Review

This research adopts insights derived from several similar studies that have been conducted previously. Information about these prior studies can be found in Table 2.1. The previous studies have correlations or connections with the problem topic that will be investigated. Several of the mentioned studies employed the HIRARC (Hazard Identification Risk Assessment and Risk Control) method, conducted by Bahtiyar, M. H., Nuraini, H., Cyrilla, L., and Aditia, E. L. (2022) in a Slaughterhouse, Dewi, R. N. (2023) in the Fish Meatball Industry, Magdalena, S., Mansur, H. M., Kurniasari, D. E., and Miharja, J. (2022), and Poernomo, Y. R. S., and Sutapa, I. N. (2019) at PT. X. These studies similarly resulted in solutions to problems related to hazards and workplace accidents using the HIRARC analysis method.

There is another study that was also conducted using the HIRADC (Identification Risk Assessment and Determining Control) method by Saputra, W. S., and Palela, I. (2023). These research journals reveal results and conclusions that are not significantly different; namely, that the application of existing methods can be implemented to avoid health and safety risks. This is because not only companies in the oil and gas or electricity sectors have a high risk of workplace accidents, but the livestock industry also faces significant factors related to accidents and health issues.

Additionally, there are references to research journals that employ analytical methods. These studies were conducted by Ratnasari, I., Afif, I., and Novita, S. (2023), as well as Dewi, S. N., and Wahyuningsih, A. S. (2023). This research delves deeper into the relationship between the workload of workers and their productivity in the subjects being studied.

All the existing literature will be utilized to formulate policies or improvement proposals that can be applied to Pig Farm “X”. Thus, these references will influence the decision variables designed during the research based on the methods deemed suitable for implementation. Information about these prior studies can be found in Table 2.1.

Table 2.1. Literature Review Mapping

Author	Object	Method
Bahtiyar, M. H., Nuraini, H., Cyrilla, L., dan Aditia, E. L., (2022)	Slaughterhouse	HIRARC (Hazard Identification, Risk Assessment and Risk Control)
Dewi, R. N., (2023)	Fish Meatball Industry	HIRARC (Hazard Identification, Risk Assessment and Risk Control)
Dewi, S. N., dan Wahyuningsih, A. S., (2023)	Farm	Analytical observational study with a cross-sectional design
Magdalena, S., Mansur, H. M., Kurniasari, D. E., dan Miharja, J., (2022)	Harbor	HIRARC (Hazard Identification, Risk Assessment and Risk Control)
Poernomo, Y. R. S., dan Sutapa, I. N., (2019)	Company X	HIRARC (Hazard Identification, Risk Assessment and Risk Control)
Ratnasari, I., Afif, I., dan Novita, S., (2023)	Farm	Verificative analysis
Saputra, W. S., dan Palela, I., (2023)	Broiler Chicken Farm	(HIRADC) Hazard Identification Risk Assessment and Determining Control

2.2. Theoretical Framework

There are fundamental theories that serve as references for the application of the methods and designs to be developed in this research. The foundations of these theories are as follows.

2.2.1. Workplace Accidents

The theory regarding workplace accidents proposed by Goetsch (2015) positions human factors as a series of events that lead to workplace accidents. There are three factors that contribute to workplace accidents, which are as follows:

1. Excessive Workload (Overload). This refers to the imbalance between an individual's capacity at a specific time and the workload assigned to that individual under certain conditions.
2. Inappropriate Responses and Mismatches. When an individual responds in a certain situation, it can either lead to or prevent an accident. This occurs when a person detects a hazardous condition but fails to take any action to correct it, thereby responding inappropriately.
3. Inadequate Activities. This refers to human errors that may result from inadequate activities. An example of inadequate activity is when someone performs a task without knowing how to do it properly.

2.2.2. Hazards

Hazard (danger) according to Goetsch (2015) can be defined as a condition or a combination of conditions that, if left uncorrected, can lead to accidents, illnesses, or property damage. Every identified hazard should be addressable or minimized through the use of appropriate personal protective equipment (PPE).

2.2.3. Hazards Identification

Hazard Analysis (Hazard Identification) as described by Goetsch (2015) is an effort or action to systematically process and identify existing hazards, as well as to recommend corrective actions to be taken. The types of potential hazards are categorized into several categories, including:

1. Mechanical Hazards
2. Ergonomic Hazards

3. Psychological Hazards
4. Biological Hazards
5. Falling Hazards
6. Hazards of Temperature Extremes
7. Pressure Hazards
8. Electrical Hazards
9. Fire Hazards
10. Radiation Hazards
11. Noise and Vibration Hazards

2.2.4. Risk Analysis

Risk Analysis, as defined by Goetsch (2015), is an analytical methodology that is typically associated with insurance and investment. However, risk analysis can also be applied to workplace analysis, hazard identification, and the development of strategies to address those hazards. The basic principle of risk analysis is that risk can be reduced by decreasing the frequency and severity of events associated with the hazard.

2.2.5. Risk Assessment

As stated by Goetsch (2015), in his book regarding Risk Assessment, in this context, it is a process for calculating the level of risk associated with the operation of a particular machine or process. There are four aspects that pertain to the issues involved. These issues include the following:

1. How severe the level of injury that is likely to occur.
2. How often workers are exposed to potential hazards.
3. The likelihood of avoiding the hazards.
4. How likely injuries are to occur if safety control systems fail.

2.2.6. Risk Control

Risk management, according to Goetsch (2015), consists of various activities and strategies that an organization can use to protect itself from situations, conditions, or events that may threaten its security. On the other hand, according to the standards set by the National Institute for Occupational Safety and

Health (NIOSH), the steps that can be taken for risk control may include the aspects illustrated in the following Figure 2.1.

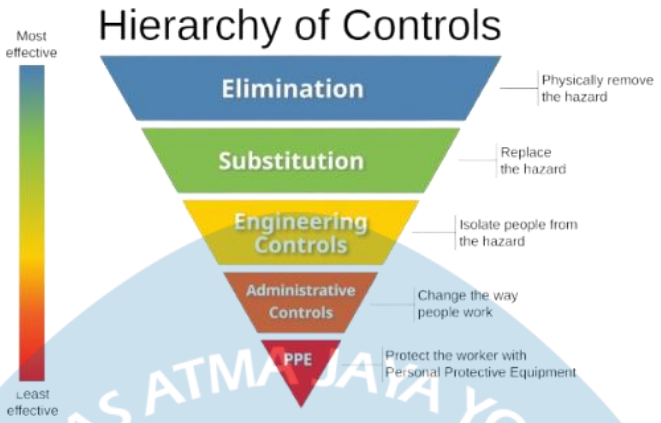

Figure 2.1. Risk Control Hierarchy

(Source: NIOSH)

Based on the image above, the steps for risk control in the hierarchy of risk control are as follows:

a. Elimination

Elimination is a method used to remove hazards from their source. This includes changing work processes to stop using toxic chemicals, heavy objects, or sharp tools.

b. Substitution

Substitution is a method used as a safer alternative for the source of the hazard. Substitution can be the most challenging action to implement in existing processes. This method is best used at the design or development stage of work processes, workplaces, or tools.

c. Control Engineering

Control engineering is a method employed to reduce or prevent hazards from meeting workers. Engineering controls may include modifying equipment or workspaces, using protective barriers, ventilation, and more.

d. Administrative Control

The administrative control method establishes work practices that reduce the duration, frequency, or intensity of exposure to hazards. This may include training on work processes, job rotation, or restricting access to hazardous areas or machinery.

e. Personal Protective Equipment (PPE)

The use of Personal Protective Equipment (PPE) refers to equipment worn to minimize exposure to hazards. Examples of PPE include gloves, safety goggles, hearing protection, helmets, and respirators.

2.2.7. Establishment of OSH Policy

As stated in Article 7, Section Two, of Presidential Regulation No. 50 of 2012 concerning the Occupational Safety and Health Management System (SMK3), it is mandated that in formulating policies as referred to in paragraph (1), employers must at least:

a. Conduct an initial review of OSH conditions, which includes:
    1. Identification of potential hazards, risk assessment, and risk control;
    2. Comparison of OSH implementation with better-performing companies and sectors;
    3. Review of cause-and-effect relationships of hazardous incidents;
    4. Compensation, disruptions, and previous evaluation results related to safety;
    5. Assessment of the efficiency and effectiveness of provided resources.
b. Consider continuous improvement of OSH management performance; and
c. Consider input from workers/employees and/or worker unions.

2.2.8. First Aid for Workplace Accidents

First Aid for Accidents in the Workplace, hereinafter referred to as First Aid in the Workplace, is an effort to provide prompt and appropriate first aid to workers/labourers and/or other individuals present in the workplace who are experiencing illness or injury at work. (Minister of Manpower Regulation No. 15 of 2008)

2.2.9. Safety Signs

Management is required to display all mandatory safety signs and other construction materials in the workplace they oversee, in locations that are easily visible and legible, according to the instructions of safety inspectors or occupational safety experts. (Presidential Regulation No. 50 of 2012, Section 6.4.4.)