Controlling Risks Through Ergonomics Participatory in Industry of Processed Meat Products Certified Halal

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***Abstract*— The halal certified processed meat industry in Banten province reaches 147 industries spread across eight districts / cities in Banten Province. Evaluation of the HAS-2300 implementation has been carried out periodically, but there are still various weaknesses that result in the company's performance being not optimal. Risk control has also been implemented to anticipate various contaminants and activities that may harm employees, but there are still errors in implementing work procedures. Risk control through participatory ergonomics is needed to find the most critical point in the halal meat processing industry. Respondents in this study were determined based on purposive sampling technique. The results showed that the greatest risk comes from social-technical factors, namely that humans are the main factor at the critical point of materials. Although the process of slaughter has been assisted by the adoption of technology, the existence of humans is not replaced by machines. Animal slaughter techniques are the key to meeting the critical point of meat products.**

Keywords*—risk control, participatory ergonomics, halal certification, meat products*

1. Introduction

Along with the existence of the law on Halal Assurance System (HAS) in effect in Indonesia, various moslem communities are increasingly critical and ask for high guarantees of the halalness and quality of the products they will consume. Every company that certifies its products as halal has an obligation to implement the Halal Assurance System (HAS) according to HAS-23000 Standard. This system aims to maintain the consistency of the halalness of the products produced.

However, in the field there are many weaknesses and gaps between procedures during the implementation of HAS. This condition creates a risk that products that have been certified are not guaranteed to be halal. Efforts to solve the problem have been done a lot, but until now there is no model that has a significant impact.

HAS implementer is a team formed and assigned by the company. It is this team that controls and evaluates the implementation of HAS to ensure that every procedure is implemented properly. A participatory ergonomic approach is needed to obtain a clear picture of the needs and desires of the user so that the risk of deviation from the application of Standard Operating Procedures (SOP) and the risks caused by work activities can be minimized.

The implementation of the Halal Assurance System (HAS) for each company is different, even though they are in the same type of industry. This difference is influenced by the business processes implemented by company management which have an impact on the company's supply chain management. Researchers have not received much attention from controlling risk in inbound supply chains. Most researchers focus on ergonomic analysis of inventory, transportation and distribution systems [1,2,3], and packaging products [4,5,6,7]. Losses due to a decrease in the quality of raw materials during the distribution process from suppliers to consumers are still a risk that must be borne by consumers, where the dimensions of quality, reliability, durability, conformance and quality that are consumer needs cannot be fully met by suppliers [8,9]. Companies need to plan, organize and control risky activities based on participatory ergonomics. An important stage in risk management is identifying activities that have the potential to cause risk, by doing participatory ergonomics of the risks that occur, the

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sources of the causes of risks where the risks are and how those risks arise [10].

The tip of this activity is that company management can reduce the impact and likelihood of a risk [11]. Risk control can be done by reducing risks, transferring risks to third party organizations, exploiting risks, and avoiding risks [12,13].

The main cause of risk in the supply chain is the behavior of supply chain elements in maintaining the cleanliness of the product processing and transportation processes product [14,15]. More in-depth identification of the causes of risk and mitigation in the supply chain caused by certain factors has not been widely discussed in previous studies. There is a need for a risk control model in the supply chain for halal-certified processed meat products by applying the socio-technical framework, followed by designing a socio-technical system decomposition model. This socio-technical system approach will prioritize the use of participatory ergonomics so that activities identify, evaluate, and determine risk control strategies based on the needs of users or company management.

2. Materials and Methods

Data collection was carried out in three stages using three types of questionnaires. The first stage questionnaire was used to identify the activities of the raw material procurement process. The second stage questionnaire is used to identify the risks that occur in each activity, as well as the impact caused by these risks and the frequency or likelihood of risk occurring in one procurement process period. The third stage questionnaire is used to analyze risks in order to obtain an assessment score for each risk.

Respondents in this study were determined based on purposive sampling technique. Purposive sampling technique is a method of sampling in accordance with the required sample requirements such as traits, characteristics, characteristics, criteria. Based on the purposive sampling technique, the samples or respondents used are staff, procurement managers, PPIC heads and operators who are the people who know the most about the actual process conditions in the raw materials department.

The specification is determined by benchmarking. Risk evaluation is carried out to determine risks that have a significant impact and become a top priority in risk control. The risk level is calculated by multiplying the impact and likelihood.

Five categories of risk levels are applied, including: very high risk (20-25), high risk (15-20), medium risk (10-15) and low risk (5-10), and very low risk (<5). In this study, the risk that will be the priority for handling is determined based on the results of the calculation of the predicate score of the possibility and the impact of the loss into the risk level map.

3. Results and Discussion

Risk is the possibility of suffering or loss [16]. Risk management is the concept of an organization in managing risks to the company by planning, organizing and controlling risky activities. An important stage in risk management is to identify activities that have the potential to cause risk by brainstorming about the risks that occur, the sources of risk, where the risks are and how those risks arise [17,18]. Strategies for determining risk mitigation include activities to control and monitor risk, create mitigation measures, reduce the impact and likelihood of a risk [19,20]. Types of risk control are reducing risk, transferring risk to third party organizations, exploiting risk, and avoiding risk [21].

Companies must be aware of risks that can jeopardize the company's short or long-term safety, such as risks in the supply chain, namely material delays that can harm the company. Risk evaluation is a risk ranking and determining risk priorities so that the most influencing risks can be identified. Mitigation includes activities to control and monitor risks, create mitigation measures, reduce the impact of risks, and reduce the likelihood of a risk occurring [22].

The identification of mitigation activities against the threat of terrorism has been discussed [22,24]. Meanwhile, the application of the socio-technical system in measuring the supply chain resilience in agriculture is modeled [25,26], where safety and environment are two important perspectives added to risk identification [27,28].

Table 1. Identification of Risks in Inbound Logistics

Code of Activities	Code of Risks	*Task*	Risks	Perspective	Impact	Causes
A1	k1	Checking animal health from physical characteristics	Animals that do not meet the qualifying requirements are slaughtered	Goal	Animal does not meet the criteria	Communication and contract errors
A1	k3	Checking slaughtering tools	The slaughtering process is not in accordance with islamic law	Technology	Non-halal animal	Don't understand the juleha procedure
A1	k4	Checking voltage (if slaughtering method of stanning)	Animals can die not because of the slaughter process (carrion)	Technology	Non-halal animal	Wrong choice of technology
A2	k11	Ensuring the slaughtering position is according to the procedure	Improper slaughtering technique	Safety	Non-halal meat	Wrong technique of using tools
A2	k12	Setting a button (can be a sign) warning in each number of animals that have been set	Incorrect when reading bismillah	People	Non-halal meat	Does not have a juleha certificate
A2	k13	Slaughtering according to procedure	Incorrect slaughtering technique (carrion)	People	Non-halal meat	Does not have a juleha certificate
A2	k14	Ensuring the voltage (stanning) has been set according to the specified limits	The tool cannot be used as a tool for the animal stunning process	Safety	The basic conditions for deduction are not met	Adoption of inappropriate technology
A2	k15	Post-treatment inspection on voltage, animals can still move	Dead animals are not due to the correct slaughtering process according to islamic law	Safety	Non-halal meat	Adoption of inappropriate technology
A3	k19	Ensuring all the hairs are pulled out correctly	Animal hair is consumed by the customer	Safety	Animal hair is not safe for consumption	Technology and inspection processes are not in accordance with procedures

3.1 Socio-technical Risk Management

The socio-technical risk management model generated from this study is used to test the validity of the model. The material ordering stage is the initial stage in purchasing meat product materials. The activities and risks that occur are described in Table 3. In general, the activities carried out by the company are pre-slaughtering treatment (A1); Slaughtering process (A2); Post slaughtering treatment (A3); Separation of each piece of meat (A4); Packaging (A5); Freezing Treatment (A6); Product transportation to consumers (A7). There were 54 identified risks that were classified into eight perspectives on the socio-technical system.

Risk analysis is carried out to assess the risks that have been identified. Risk evaluation is carried out to determine which risks will be the priority for treatment. Mapping of risks is carried out based on an assessment of risk levels. This risk management strategy identification stage is used to determine the treatment strategies that can be used to deal with these risks. The identification of risk management strategies is based on four approaches, namely reducing risks, transferring risks, creating new strategies, and avoiding risks. Thus the company can minimize losses caused by the risk of losing raw materials.

The implementation of a socio-technical system in risk management can assist management in controlling risk. The results of the application of socio-technical risk management have an important role, namely based on the results of the risk assessment it is known that the highest risk is failure in the slaughtering technique.

Companies are recommended to implement the socio-technical risk management system that has been carried out in research and to review the risks that are likely to occur. This is expected to help companies control and mitigate risks. Further research can be continued on the establishment of a socio-technical risk management information system, especially on technology adoption. Thus the company can manage the system optimally.

Table 2. Risk Assessment by Respondents

Respondents	Code of Risks	Risks	Perspektives	Likelihood	Impact	Risk Level
A1	k1	Animals that do not meet the qualifying requirements are slaughtered	Goal	2	5	10
A1	k3	The slaughtering process is not in accordance with islamic law	Technology	1	5	5
A1	k4	Animals can die not because of the slaughtering process (carrion)	Technology	1	5	5
A2	k11	Improper slaughtering technique	Safety	3	5	15
A2	k12	In correct when reading the bismillah	People	1	5	5
A2	k13	Incorrect slaughtering technique (carrion)	People	1	5	5
A2	k14	The tool cannot be used as a tool for the animal stunning process	Safety	2	5	10
A2	k15	Animals died not due to the correct slaughtering process according to islamic law	Safety	1	5	5
A3	k19	Animal hair is consumed by the customer	Safety	2	5	10
A3	k20	Different parts of the meat are mixed	Procedure	3	2	6
A4	k21	The qualities of animals are indistinguishable	Method	2	3	6
A4	k23	Mismatch size of each part	Goal	2	3	6
A4	k24	All parts of the meat are mixed	Goal	3	2	6
A4	k25	Dirt or other parts of the product	Procedure	2	4	8
A5	k29	Mismatch of meat weight	Technology	2	3	6
A5	k30	Product information discrepancies	Technology	1	3	3
A5	k32	All parts of the meat are mixed	People	2	2	4
A5	k33	Discrepancies in packaging and content	Culture	2	2	4
A5	k34	Difficulty in handling the product	Safety	2	2	4
A6	k37	Mismatch of product quantities	Culture	2	2	4
A6	k38	The quality of the meat will decrease	Environment	2	3	6
A6	k39	Non-conforming product quantity reports	Culture	2	2	4
A6	k40	Difficulty checking products in the warehouse	Process	1	2	2
A7	k41	Difficulty making po	Goal	2	2	4
A7	k42	Uncontrolled product stock in the warehouse	Environment	2	2	2
A7	k43	Damage during product handling	People	3	2	6
A7	k45	Products that have been sold cannot be tracked	People	3	3	9

3.2 Ergonomic Participatory

The term ergonomics comes from the latin: Ergon (work) and Nomos (law), which is defined as the study of human aspects of the work environment in terms of anatomy, physiology, psychology, engineering, management and the design or design of a design. Another definition states that Ergonomics is a "science" or multidisciplinary approach that aims to optimize the human-work system so that a healthy, safe, comfortable, and efficient tool, way and work environment is achieved. Ergonomics is the science of humans in an effort to increase comfort in the work environment [29,30].

Ergonomics has three objectives, namely to provide optimal work comfort, health and safety and to create work efficiency and effectiveness [31]. There needs to be harmony between workers and their jobs, so that humans as workers can work according to their abilities and limitations.

Participatory ergonomics is a process approach that is carried out to carry out programs together so as to improve work performance [32,33,34], participatory ergonomics is an activity of active participation of employees at all levels to implement ergonomics in the workplace so as to improve conditions work environment. The participatory ergonomic approach process is a part of macro ergonomics that emphasizes active participation by related parties.

Macro ergonomics is a top-down sociotechnical approach that is applied to the overall work system design with the aim of optimizing the work system

design and ensuring the work system runs harmoniously [35]. Macro ergonomics is also a study that studies how to optimize the organization and design of work systems by considering human, technological and environmental variables and the interactions between these variables.

In simple terms, micro ergonomics aims to adapt a job to humans (workers), while macro ergonomics aims to adjust between organizations and humans [36]. The principle that is always used in ergonomics is the principle of fitting the task to the man, which means that work must be adjusted to human capabilities and limitations so that the results achieved can be increased [37,38,39]. The application of ergonomics aims to create a healthy, safe, comfortable worker physical and psychological condition to improve performance, safety and user satisfaction [40]. In addition, the application of ergonomics also aims to provide social security for workers while they are still working or at productive age or when they enter post productive age [41].

One method that is often used in solving problems with macro ergonomics is participatory ergonomics. Participation is a concept that always actively involves stakeholders through Focus Group Discussions (FGD) to solve problems. Participatory ergonomics is the process of solving ergonomic problems in a work system by involving related parties. Participatory ergonomics is a concept by involving workers actively to be involved in implementing ergonomic knowledge and procedures in their workplace [42]. The lack of employee participation in designing a work system can cause workplace accidents, the participatory ergonomics concept is able to solve industrial problems [43,44,45].

4. Conclutions

The social-technical factor that is the main consideration is human. Although the process of slaughter has been assisted by the adoption of technology, human existence is not replaced by machines. Re-certification of the Animal Slaughterer (JULEHA) is the key to safeguarding the critical point of meat products

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