
Human and Organizational Factors in Occupational Accidents: An HFACS-Based Analysis at Company X in Japan

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Abstract:

Occupational Safety and Health (K3) is a crucial aspect of the food manufacturing industry, which carries a relatively high risk of occupational accidents. This research aims to describe the factors that cause occupational accidents among workers at Company X in Japan using the Human Factors Analysis and Classification System (HFACS) approach. This study employs a quantitative method with an analytical descriptive design and involves the entire working population of 74 individuals through a total sampling technique. The variables analyzed include worker status, work shifts, compliance with the use of personal protective equipment (PPE), compliance with standard operating procedures (SOPs), and work areas. The results show that most workers (95.5%) had never experienced an occupational accident; however, the potential risk of accidents remains. The majority of workers are classified as compliant in the use of PPE (67.6%), but all respondents (100%) are recorded as non-compliant with SOPs. Most respondents were interns (58.1%) and worked in the packaging area (62.1%), with a relatively balanced distribution of work shifts between day and night shifts. Based on the HFACS analysis, the unsafe acts factor is indicated by non-compliance with PPE use; preconditions for unsafe acts are influenced by work shifts and work areas; unsafe supervision is reflected in the weak implementation of SOPs; while organizational influences are related to the predominance of interns and organizational policies. This study concludes that the potential for occupational accidents is influenced by both worker behavior and organizational systems.

Keywords: *Personal Protective Equipment, HFACS, Occupational Accidents, Safety, Occupational Health*

INTRODUCTION

Occupational safety and health (OSH) is a crucial aspect of the industrial world, aimed at protecting workers from the risks of accidents and injuries (Arana-Landín et al., 2023; Asiedu et al., 2025; Botti et al., 2022; Briones-Bitar et al., 2025; Opolska et al., 2026; Wedagedara & Dissanayake, 2024). Although K3 regulations and policies have been widely implemented, the reality shows that workplace accidents still occur in many companies due to noncompliance with the use of personal protective equipment (PPE) and safety procedures (Salsabia, 2025). Workplace accidents remain a significant public health and occupational safety and health (OSH) problem in many developed countries, including Japan. Trend analyses and comparisons of mortality and injury burdens show that, despite declines in some registries, the manufacturing and construction industries still record relatively high morbidity and mortality rates, thus demanding the strengthening of prevention strategies (Kimura et al., 2022).

Compliance with personal protective equipment (PPE) use and safety procedures is also an important component of safety behavior (Al-Bayati et al., 2023; Alim et al., 2024; KM & Cikaliung, 2023). Quantitative research on production workers shows that the occupational safety climate and safety knowledge significantly influence safety behavior, which includes PPE compliance and adherence to safe work procedures (Sukmana, 2022). In addition, many

studies show that workers' knowledge and attitudes are significantly correlated with the level of compliance in PPE use. For example, research in Indonesia shows that workers with a high level of knowledge and a positive attitude toward occupational safety tend to be more compliant in using PPE (Sukma et al., 2023).

However, knowledge and attitudes alone do not always guarantee optimal compliance; factors such as PPE availability, comfort, safety culture, and management support also play an important role (Lavinaliya et al., 2025). Compliance with standard operating procedures (SOPs) is another important element. The implementation of SOPs and the consistent use of PPE are believed to reduce the risk of workplace accidents. A study in the garment industry showed that K3 training, PPE use, safety signage, and compliance with SOPs were significantly related to lower rates of workplace accidents (Alfidyani et al., 2020). The combination of hazard perception, worker behavior (PPE and SOP compliance), and a healthy work environment forms the foundation of workplace accident prevention. A preliminary study conducted at Company X in Japan, which is engaged in food production (taiyaki), shows that the company employs a total of 74 workers, consisting of 43 local Japanese workers and 31 interns. The workforce is distributed across two shifts: 38 workers on the day shift and 36 workers on the night shift. Based on workplace accident records, the most common types of accidents are burns from the cooking process and falls due to slippery floor conditions or behavioral inconsistencies among workers when moving within the production area. These inconsistencies include unsafe actions such as walking in a hurry, failing to pay attention to slippery floor conditions, not following designated pathways, and using footwear that does not meet safety standards. These conditions increase the risk of slip-and-fall accidents in the production area.

Several previous studies have examined factors causing workplace accidents using various approaches. Abbyzard et al. (2025) investigated the impact of night shifts, work-life balance, and ergonomic factors on occupational accident risk, finding that night shifts have a significant positive influence on accident risk across various industrial sectors. Wachid et al. (2025) examined factors related to workplace accidents in mall construction projects, revealing that workers with lower safety knowledge had a much higher risk of occupational accidents than those with higher safety knowledge. Putri and Rahman (2021) and Sari et al. (2022) found that noncompliance with PPE use is associated with an increased incidence of workplace accidents, especially in the manufacturing and food processing sectors. Wijaya and Kurniawan (2023) demonstrated that workers with a strong understanding of safety and who operate under consistent supervision tend to show higher levels of PPE compliance.

The company's production workflow, which involves cooking hot ingredients, moving dough, operating a printing machine, and transferring goods between lines, increases the potential for physical hazards such as heat exposure, slippery surfaces, and tripping risks. These conditions reinforce the importance of strong hazard perception, consistent PPE use, and strict SOP compliance. Given the high operational risks and documented accident records within the company, a quantitative analysis is needed to evaluate the relationship between hazard perception, PPE use, and SOP compliance with workplace accident incidents. This study aims to provide an empirical overview of K3 conditions at Company X in Japan and to offer data-driven recommendations for improving occupational safety programs.

The Human Factors Analysis and Classification System (HFACS) is a relevant theoretical framework for systematically analyzing workplace accidents. HFACS categorizes the factors contributing to accidents into four levels: unsafe acts, preconditions for unsafe acts, unsafe supervision, and organizational influences (Reason, 1990; Shappell & Wiegmann, 2000). This framework views workplace accidents not merely as individual faults but as the result of complex interactions among human factors, working conditions, supervisory weaknesses, and organizational system failures. In the context of this study, PPE use and SOP compliance represent the level of unsafe acts; work shifts and work areas reflect preconditions for unsafe acts; SOP compliance is also related to unsafe supervision; and worker status reflects organizational influences.

Based on the high operational risks and the existence of workplace accident records at Company X in Japan, this study aims to describe the characteristics of factors causing workplace accidents among workers, particularly those related to PPE use and the level of compliance with standard operating procedures (SOPs), through an HFACS-based quantitative descriptive approach. The results of this study are expected to provide an empirical picture of occupational safety and health (K3) conditions within the company and to serve as a basis for data-driven recommendations for improving occupational safety programs.

RESEARCH METHODS

This study employed a quantitative research design with a descriptive analytical approach to objectively measure and statistically analyze variables related to occupational accidents at Company X, a food manufacturing company in Japan specializing in *taiyaki* production. The study was conducted over a specified period to ensure comprehensive data collection. The population comprised all 74 workers at the company, including both local Japanese workers and international interns, and a total sampling technique was employed, whereby the entire population was included as research respondents.

The variables examined were categorized based on the Human Factors Analysis and Classification System (HFACS) framework, with work accident occurrence as the dependent variable and worker status, work shift, compliance with personal protective equipment (PPE) use, compliance with standard operating procedures (SOPs), and work area as independent variables. Data were collected through multiple techniques, including a structured questionnaire administered to all workers, documentation of company records related to work accidents and safety procedures, and direct observations in production and packaging areas to assess actual working conditions and worker behavior.

The questionnaire, developed in both Japanese and Indonesian, underwent content validity through expert review and reliability testing through a pilot study, yielding a Cronbach's alpha coefficient of 0.82. Data analysis was conducted using SPSS version 22 and consisted of descriptive analysis to present frequency distributions and percentages of respondent characteristics, as well as HFACS-based analysis to examine factors contributing to work accidents across four levels: unsafe acts, analyzed through PPE and SOP compliance; preconditions for unsafe acts, analyzed through work shift and work area; unsafe supervision, analyzed through SOP enforcement; and organizational influences, analyzed through worker status and organizational policies.

The study adhered to strict ethical principles, including informed consent from all respondents, confidentiality of participant identities, voluntary participation rights, and institutional approval from company management. Validity and reliability were ensured through content validity, construct validity based on established theories, internal consistency reliability using Cronbach's alpha, and triangulation of data from multiple sources to validate the findings.

RESULTS AND DISCUSSION

Variable Distribution

Table 1. distribution of work accidents in Japan X Company

No	Work Accidents	Frequency (f)	Percentage (%)
1.	Never	71	95,5
2.	Ever	3	4,1
	Quantity	74	100

Source : Primary Data (2025)

Based on Table 1 shows the distribution of work accidents in Japan X Company. The majority of respondents (95.5%) stated that they had never experienced a work accident, while a small percentage of respondents (4.1%) had experienced a work accident. These findings indicate that although the incidence of work accidents is relatively low, the potential risk of accidents still exists so that the implementation and supervision of occupational safety and health (K3) need to be continuously improved to prevent future accidents.

Table 2. Distribution of Worker Frequency by Research Variables

Research Variables	Category	n	%
Employee Status	Japanese Local Workers	31	41,9
	Intern	43	58,1
Work Shifts	Afternoon	38	51,4
	Night	36	48,6
PPE Compliance	Compliant	50	67,6
	Non-compliant	24	32,4
SOP Compliance	Compliant	0	0,0
	Non-compliant	74	100,0
Work Area	Production	28	37,8
	Packaging	46	62,1
Work Accidents	Ever	3	4,1
	Never	71	95,5

Source : Primary Data (2025)

Based on the results of a descriptive analysis of 74 worker respondents at Company X Japan, an overview of respondent characteristics and factors related to work accidents was obtained. The distribution of variables in this study includes worker status, work shifts, PPE compliance, SOP compliance, and work area. The table above shows that the majority of workers working at Japan X Company are local Japanese workers. In Japan X Company, most

of the respondents were interns (58.1%), while Japanese local workers amounted to 41.9%. The distribution of workers is relatively balanced between the day shift (51.4%) and the night shift (48.6%). Based on compliance with the use of personal protective equipment (PPE), the majority of workers are classified as compliant (67.6%), while the other 32.4% show non-compliance. All respondents (100%) were recorded as non-compliant with the standard operating procedures (SOPs) set. In terms of work area, workers who became respondents worked in the production area as much as (37.8%), and in the packaging area as much as (62.1%).

The Human Factors Analysis and Classification System (HFACS) groups the factors that cause work accidents into four main levels, namely unsafe acts, 1 precondition for unsafe acts, unsafe supervision, and organizational influences (Reason, 1990; Shappell & Wiegmann, 2000). The HFACS framework views workplace accidents not as the result of a single factor, but rather as the result of complex interactions between individuals, working conditions, supervisory systems, and organizational policies. With this approach, accidents are understood as systemic failures that occur when various layers of safety defenses do not function optimally.

1. Unsafe Acts

The variable of the prevalence of the use of Personal Protective Equipment (PPE) in this study is directly related to the level of unsafe acts in the framework of the Human Factors Analysis and Classification System (HFACS). The results showed that although most of the respondents had complied with using PPE, there were still 32.4% of workers who did not use PPE according to the provisions. This condition indicates the existence of unsafe acts that have the potential to increase the severity of injuries if a work accident occurs. These findings are in line with the results of previous research which stated that non-compliance with the use of PPE is related to an increase in the incidence of work accidents, especially in the manufacturing and food processing industry sectors (Putri & Rahman, 2021; Sari et al., 2022).

From the perspective of HFACS, non-compliance with the use of PPE is categorized as a routine violation, which is a form of safety violation that is repeatedly committed as part of daily work habits. These violations generally do not occur incidentally, but are influenced by various situational factors such as work time pressure, high productivity demands, and low risk perception of hazards in the work environment. Therefore, even though workers have known the importance of using PPE, working conditions and habits that are formed can encourage the occurrence of repeated safety violations.

Previous research has also shown that the level of compliance with the use of PPE is influenced by various factors, including occupational safety knowledge, workers' attitudes and perceptions of risks, work experience, and the effectiveness of supervision and management's commitment in the implementation of K3. Workers who have a good understanding of safety and are in a consistent supervision system tend to show a higher level of PPE compliance than workers who receive less safety coaching and supervision (Wijaya & Kurniawan, 2023). In addition, previous studies confirmed that workers who do not consistently use PPE have a higher risk of injury when a work incident occurs, even though PPE facilities have been provided by the company (Sari et al., 2022).

Shappell and Wiegmann (2000) emphasized that repeated safety violations cannot be seen solely as individual faults, but rather as indicators of weaknesses in the organization's

supervisory system and safety culture. Thus, the non-compliance with the use of PPE that is still found in this study indicates that the safety control system has not been fully effective, especially in the aspects of supervision, rule enforcement, and internalization of occupational safety values in the organizational environment.

However, the relatively high level of PPE compliance in most workers indicates that at the level of unsafe acts, the majority of workers have become aware of the importance of self-protection. However, the presence of non-compliant workers reflects a gap in the last layer of defense of the safety system, which is supposed to serve to prevent or minimize the impact of work accidents. This non-compliance can be caused by various factors, including low risk perception, discomfort when using PPE, established work habits, pressure on job targets, and weak supervision and discipline enforcement. This condition shows that individual awareness alone is not enough, so it is necessary to strengthen it from the management side through consistent supervision, continuous education, and a stronger work safety culture. In the framework of HFACS, this condition shows that unsafe acts that arise do not stand alone, but are the result of interaction with factors at a higher level, such as work pressure, optimal safety culture, and weak enforcement of safety rules by organizations and supervision (Wiegmann & Shappell, 2003).

2. Precondition for unsafe action

Based on the distribution of work shifts, respondents who worked on day shifts were 38 people (51.4%) and night shifts were 36 people (48.6%). This relatively balanced proportion shows that the potential for work accidents does not only occur during certain working hours. However, from the perspective of the Human Factors Analysis and Classification System (HFACS), work shifts are an important factor that can affect the physiological and psychological condition of workers. Night shifts have the potential to cause fatigue, circadian rhythm disturbances, and decreased concentration and alertness, which can further increase the occurrence of unsafe actions in the workplace. Empirical research shows that night shifts have a significant positive influence on the risk of work accidents in various industrial sectors, although the effect is influenced by work-life balance and ergonomic conditions of work (Abbyzard et al., 2025).

In the framework of HFACS, work shifts are categorized as preconditions of Unsafe acts, because they are directly related to the internal conditions of workers that can affect work performance. Reason (1990) stated that circadian rhythm disturbances and fatigue due to night work can reduce decision-making skills and increase the risk of work errors. The cumulative effects of fatigue and sleep disturbances due to night shifts can increase the chances of unsafe conditions, which in turn trigger work incidents (Abbyzard et al., 2025). Therefore, although the distribution of workers in the day and night shifts is relatively balanced, night shift workers still have a higher potential risk of work accidents than day shift workers.

In addition to work shifts, work facts are also an important part of the analysis of preconditions for the study showing that most of the respondents work in the packaging area as many as 46 people (62.1%), while the rest work in the production area as many as 28 people (37.8%). The packaging area generally involves repetitive work activities, high working speeds, and direct interaction with machines. These conditions have the potential to create a

risky work environment, especially if they are not balanced with good ergonomic settings and adequate hazard control.

The dominance of workers in the packaging area indicates exposure to ergonomic risks and repetitive physical workloads, which in HFACS are categorized as working environment conditions that can support unsafe actions. Repetitive activities and pressure of production targets can cause physical and mental fatigue, increasing the occurrence of work errors. Thus, both work shift factors and work areas interact with each other as preconditions for unsafe acts that can increase the chances of work accidents if they are managed optimally through the regulation of working hours, worker rotation, and improvement of work environment conditions.

Unsafe Supervision

Non-compliance with the Standard Operating Procedures (SOP) found in all respondents in this study shows that there are fundamental problems in the work safety system. All respondents (74 people) were categorized as non-compliant with the SOPs, and not a single worker was found to fully implement the work procedures as set. This condition indicates that SOPs have not been effectively internalized in daily work practices, so workers tend to make procedural adjustments based on habits, work demands, or personal perceptions of risks.

The non-compliance is not solely caused by the negligence of workers, but is influenced by several systemic factors, such as SOPs that are considered less practical to be implemented in the field, time constraints due to production target pressure, and lack of real consequences for procedural violations. In these conditions, workers tend to prioritize work efficiency over compliance with formal procedures, especially when violations of SOPs have become a practice that is considered reasonable and indirectly accepted in the work environment.

Within the framework of the Human Factors Analysis and Classification System (HFACS). Non-compliance with this comprehensive SOP is closely related to the category of unsafe supervision. HFACS explained that unsafe supervision can arise due to a lack of active supervision of the implementation of work, the failure of supervisors to reprimand or correct unsafe behavior, and the existence of tolerance for procedural deviations. When supervisors do not consistently enforce SOPs, workers will form the perception that compliance with procedures is not a top priority in the execution of work.

Reason (1997) emphasizes that latent failures in organizational systems are often the main root cause of work accidents. In the context of this study, the latent failure is reflected in the weak supervision system, low enforcement of SOPs, and lack of optimal management commitment in building a culture of occupational safety. The non-compliance of SOPs experienced by all respondents is thus a manifestation of systemic failure, where the organization has not been able to create a work environment that encourages and facilitates safe work behavior consistently.

In line with this, research by Alfidyani et al. (2020) states that compliance with SOPs has a significant relationship with a low rate of work accidents. Consistent implementation of SOPs can only be achieved if procedures are prepared realistically, easy to understand, and supported by strict supervision and enforcement. Therefore, it is necessary to evaluate and refine SOPs

to suit actual working conditions, accompanied by an increased role of supervisors in ensuring the implementation of safety procedures in the field.

Overall, these findings confirm that non-compliance with SOPs cannot be viewed as the fault of individual workers alone, but rather as a result of weak supervisory functions and organizational systems. Without improvements at the level of unsafe supervision and strengthening of management commitments, compliance with SOPs will be difficult to achieve and the risk of work accidents will remain high, even though workers have basic knowledge about occupational safety and health.

Organizational Influences

Based on the results of the study, most of the respondents were interns, namely 43 people (58.1%), while local Japanese workers amounted to 31 people (41.9%). This distribution shows that the intern workforce has a larger proportion than permanent workers. The dominance of interns indicates the potential influence of organizational factors on work safety, especially in the context of labor policies, training systems, and supervisory mechanisms implemented by companies.

Within the framework of the Human Factors Analysis and Classification System (HFACS), the status of workers is closely related to the level of organizational influences, especially in the aspects of human resource policy and safety culture. Interns generally have more limited work experience and an understanding of occupational safety and health (K3) aspects that are not optimal. This condition can increase susceptibility to work accidents if not balanced with adequate safety training and strict supervision (Reason, 1997). For example, research on construction projects found that workers with lower safety knowledge had a much higher risk of occupational accidents than workers with high safety knowledge, with a statistically significant prevalence ratio. These findings show that knowledge is an important factor influencing the safe behavior of workers in risky work environments (Wachid et al., 2025).

Some previous studies have also shown that workers with non-permanent status, such as interns or contract workers, tend to have more limited access to K3 training, safety information, and work supervision than permanent workers (Shappell et al., 2017). In the context of HFACS, these limitations can create latent conditions in organizational systems that ultimately contribute to the emergence of insecure actions at the individual level.

The larger proportion of interns than Japanese local workers indicates that companies need to pay special attention to the management of the intern workforce, especially in terms of safety briefings, work assistance, and enforcement of K3 rules. Without adequate organizational intervention, this condition has the potential to increase the risk of work accidents through suboptimal organizational influence channels, as described in the HFACS model.

Thus, the results of this study confirm that worker status is not just an individual characteristic, but is part of an organizational factor that plays an important role in shaping the level of occupational safety. Efforts to prevent work accidents need to focus not only on worker behavior but also on organizational policies in managing, training, and supervising the intern workforce in a systematic and sustainable manner.

CONCLUSION

Research at Japan's X Company X concluded that the risk of work accidents, especially burns and fall incidents, is caused by the interaction between a risky work environment and behavioral system failure. Although the majority of workers (67.6%) complied with the use of PPE, there were critical findings where 100% of workers did not comply with SOPs. This condition is exacerbated by the status of the majority of respondents as interns (58.1%) who have limited experience, as well as fatigue factors due to the night shift system. Based on, accidents occur due to the accumulation of failures in the layers of administrative supervision and unsafe actions of workers in the production area. Based on the findings, it is recommended that Company X Japan conduct a comprehensive evaluation and revision of SOPs to ensure their practicality and applicability, implement mandatory and regular SOP training for all workers with special emphasis on interns, strengthen supervisory systems to consistently enforce safety rules, develop targeted interventions for night shift workers to mitigate fatigue-related risks, enhance safety programs specifically designed for intern workers through extended orientation and mentorship, and improve the physical work environment particularly in the packaging area. For future researchers, it is suggested to expand the scope to include multiple companies for comparative analysis, employ longitudinal designs to examine changes over time, incorporate qualitative methods to explore underlying reasons for non-compliance, examine additional variables such as psychological and organizational factors, conduct intervention studies to test the effectiveness of specific safety programs, and perform cross-cultural comparative studies in multicultural workplace settings.

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