Occupational Accidents and Risk Management in Malaysian Manufacturing Industries: A DOSH Statistics Perspective (2022-2025)

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ABSTRACT

This study presents a rigorous analysis of occupational accidents and risk management practices within the manufacturing sector of Malaysia, utilizing comprehensive data provided by the Department of Occupational Safety and Health (DOSH). Focusing on the DOSH statistics, the study investigates accident frequency, severity, and underlying causes in the Malaysian manufacturing sector. By scrutinizing DOSH records, the research uncovers patterns and trends that inform our understanding of accident dynamics and risk mitigation strategies. The role of human factors, technological interventions, and regulatory frameworks are examined within the context of DOSH statistics, enabling a detailed assessment of their impact on accident prevention and overall workplace safety. Moreover, the manuscript underscores the socio-economic implications of accidents on workers and the environment, utilizing DOSH data to quantify the costs and consequences. The integration of advanced technologies such as data analytics and automation is explored through the lens of DOSH statistics, providing insights into their efficacy in bolstering safety protocols and emergency responses. Drawing from the DOSH statistics analysis, the manuscript concludes by offering practical recommendations for policymakers, industry practitioners, and relevant stakeholders to enhance safety standards and risk management practices in Malaysian manufacturing industries. The insights gleaned from this research contribute not only to the improvement of domestic manufacturing safety but also serve as a valuable reference for international counterparts seeking to elevate their own industry safeguards.

Keywords: manufacturing industries, accidents, risk management, DOSH statistics, Malaysia

INTRODUCTION

Background and context

Rapid economic growth via industrialization has given not only significant impact in terms of income distributions and quality of life, but it has also resulted in increasing number of accidents at workplace. Worldwide, the rate of occupational injuries remains troubling [5,6]. The International Labour Organization (ILO) estimates that around 395 million workers sustain work-related injuries annually, while approximately 2.78 million fatalities occur due to occupational accidents or work-related illnesses [16]. Therefore, Occupational Safety and Health (OSH) have become pressing concerns globally, particularly in developing economies such as Malaysia, where the industrial sector continues to expand rapidly [12]. The manufacturing industry in Malaysia serves as an essential driver for the nation's economic progress, significantly contributing to both its Gross Domestic Product (GDP) and national employment levels. Despite the rapid growth of the manufacturing industry, data from relevant agencies indicate the rising number of accidents that highlights the recurrence and

criticality of safety issues that have remained unresolved over the years. It remains a high-risk industry due to the inherent dangers of operating heavy machinery, managing hazardous materials, and executing complex production processes [6].

An industrial accident is defined as a personal accident that is harmful to an employee which has been caused by an unplanned accident or an occupational disease that can cause serious physical damage, fatality or health effects to the employee. The industrial accidents are unexpected events in industry that occurred while the employee is performing jobs [12]. The industrial accidents have a great impact on the reduction of the profitability of the companies. Even though some of the companies in Malaysia have implemented the Occupational Safety and Health Act (OSH), provided safety programs and training, enforce rules and regulations regarding safety at the workplace, there are still some cases of industrial accident being reported by Department of Occupational Safety and Health (DOSH) from year by year [10].

The objective of this study is in line with the objective of Occupational Safety and Health Act (OSH) which is to encourage a safe work environment for the employee at their workplace [4]. This research study will give benefits to the industries as they can analyze the factors of the industrial accident and implement the suitable precaution steps to prevent it. The main objectives of this study are to review the occupational accidents occurrence in the industries around Malaysia.

This study also will help to enhance the knowledge of society, manufacturing employees and employers regarding safety and health policy. Manufacturers or non-manufacturers are able to understand the causes of workplace accidents and injuries and the consequences of workplace hazard. It also serves as an important guide to the human resource department regarding the contributors of reducing workplace accidents and injuries as they are able to measure a new benchmark during recruitment and selection purposes [33].

METHODOLOGY

Data collection

This study's research methodology is based on a comprehensive data collection approach that relies on numerous sources to achieve a strong and well-rounded analysis. The primary data source is the Department of Occupational Safety and Health (DOSH) statistics, which contain a plethora of information on accidents, incidents, and safety breaches across Malaysia's numerous manufacturing sectors [10]. These figures give a solid foundation for understanding the number, severity, and types of incidents that have happened in the manufacturing landscape.

Accidents And Risk Management In Malaysian Manufacturing Industries: A Dosh Perspective

Overview of manufacturing sectors in Malaysia

Manufacturing sectors is an important sector in Malaysia as it contributed a huge amount of income distribution to the country’s Gross Domestic Products (GDP) [6]. There are different classifications of manufacturing industry too. The various types of industry such as automotive, textile, wood based, electronics and many others. Manufacturing industry refers to the industry that involved in the manufacturing and processing of items and transforms them into new items. In other word, manufacturing industry is the industry that converts the raw materials into finish products. The finished products can either serve as the finished goods to fulfill customer requirement and satisfaction or as the intermediate goods that is used in the production of the industry [4].

Malaysian manufacturing sector remains one of the most hazardous industries, with frequent reports of accidents due to heavy machinery use, unsafe working conditions, and hazardous material handling [13,14]. Despite government efforts through the Occupational Safety and Health Act (OSHA) 2022 Amendment and enforcement by the Department of Occupational Safety and Health (DOSH), accident statistics in manufacturing consistently show high injury rates, including fatalities and permanent disabilities [2]. These incidents not only cause human suffering but also disrupt productivity and impose significant costs on organizations, underscoring the urgent need to understand the organizational factors that shape workplace safety behavior.

Analysis of DOSH Statistics

According to Department of Occupational Safety and Health, industrial and occupational accidents in Malaysia saw a sharp post-pandemic upward trend between 2022 and 2023, primarily driven by economic recovery and increased industrial activity [10]. However, broader national insurance figures from the Social Security Organisation (SOCSO) indicated a slight 2.4% contraction in overall work-related claims by 2024 [28]. Official data is compiled collectively by the Department of Occupational Safety and Health (DOSH) and the Department of Statistics Malaysia (DOSM) [10].

This study adopts a timeline spanning 2022 to 2025 based on the availability of published data from the Department of Occupational Safety and Health (DOSH) [10]. The year 2026 is excluded as the annual statistics remain unreleased. Furthermore, the 2025 data reflect only partial-year figures (up to May), which is the latest update provided by the DOSH's website. The public services and statutory authorities accounted for the highest number of incidents with 12275 cases. Second is manufacturing with number of incidents 12275 cases. Other sectors included construction (5290), finance, insurance, and real estate (2668), transport, storage, and communications (2780), and hotels and restaurants (727) [10]. Figure was extracted from Department of Occupational Safety and Health Malaysia website and Bernama based on sectors [8,10].

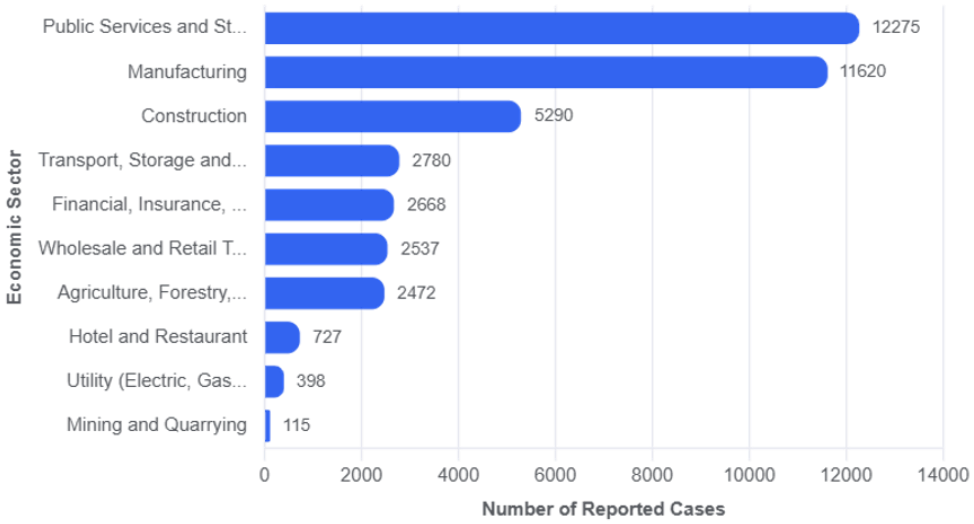


Figure 1: Comparison of Industries workplace accidents and injuries reported to DOSH from 2022 to 2025

Meanwhile, Table 2 shows that the national occupational injury rate per 1,000 workers rose from 2.22 in 2022 to 2.46 in 2023. These statistics are based on the data provided by the Department of Occupational Safety and Health (DOSH), Social Security Organisation (SOCSO) [28].

Table 2. Overall National Statistics Overview from 2022 to 2025

Year	**Total Occupational Injuries**	**Non-Fatal Injuries**	**Fatal Injuries**	**Overall Injury Rate (per 1,000 workers)**
2022	34,216	33,899	317	2.22
2023	38,950	38,626	324	2.46
2024 (SOCSO)*	66,574	N/A	N/A	Decreased by 8.9% (Industrial)
2025(Jan-May) *	4,409	4,315	94	N/A

Based on the data provided, occupational hazard distributions and frequency rates fluctuated notably over a four-year period. During 2022, the country established a baseline of 34,216 total occupational injuries, comprising

33,899 non-fatal injuries and 317 fatalities. This resulted in an overall injury rate of 2.22 per 1,000 workers. For 2023, as economic and industrial operations normalized post-pandemic, total injuries rose by 13.8% to 38,950 cases (38,626 non-fatal; 324 fatal). The national injury rate consequently climbed to 2.46 per 1,000 workers.

After that, for 2024, the total reported cases experienced a sharp statistical expansion to 66,574 cases. This spike is heavily attributed to a shift to broader Social Security Organisation (SOCSO) claims data tracking [28]. Notably, while total raw claims rose due to wider coverage parameters, the localized industrial accident rate actually registered an 8.9% decrease. Lastly, 2025 five-month data captured 4,409 total injuries, separating into 4,315 non-fatal incidents and 94 workplace fatalities [8].

Evaluation of Existing Risk Management Practices

In Malaysian manufacturing industries, risk management practices play a crucial role in creating value for projects and improving project performance in terms of cost, time, and quality [11]. Risk management has evolved into an organizational discipline in Malaysia, as highlighted in a case study that explored sustainable risk management practices in organizations [11]. The study identified five main factors that contributed to the transformation of risk management into an organizational discipline, including leadership commitment, risk culture, risk management framework, risk management process, and risk management tools and techniques.

However, despite the importance of risk management, systematic risk management is not widely practiced in the construction industry in Malaysia [18]. This suggests that there is room for improvement in terms of adopting systematic risk management practices in certain sectors. One study focused on sustainable risk management practices in organizations in Malaysia, highlighting how risk management has evolved and transformed into an organizational discipline [3]. Another review paper discussed the application of risk management in the construction industry in Malaysia, providing information on the process and methodologies involved. The paper highlighted the importance of identifying, assessing, and managing risks throughout the project life cycle, as well as the need for effective communication and collaboration among project stakeholders.

Enterprise Risk Management (ERM) has also been recognized as an organized and systematic approach to managing risk throughout an organization. Recent research has explored the impact of ERM practices on the performance of Malaysian public higher educational institutions [22]. The study found that ERM practices had a positive impact on the financial and non-financial performance of these institutions.

In summary, while risk management is recognized as an important aspect of project and organizational management in Malaysian manufacturing industries, there is still room for improvement in terms of adopting systematic risk management practices in certain sectors. The transformation of risk management into an organizational discipline and the application of ERM practices are some of the ways in which risk management is being improved in Malaysia.

Human Factors And Safety Culture

Human error as a contributing factor

There are many factors that lead to the industrial accidents and occupational disease in manufacturing industry. For example, some companies do not apply safety culture at their workplace. Lack of safety culture can cause unexpected accidents and injuries to the employees [15]. Next, non-compliance of the requirement of Occupational Safety and Health Act (OSHA) 1994 also will lead to the industrial accidents [15]. Besides that, most of the employees do not aware of the potential hazard that might occur at the workplace [4]. Hazard is a potentially harmful situation that may cause injury to the worker [3]. Examples of hazards are explosive materials, toxics, radiation, flammable materials and electric charge [10]. Lastly, the employees that work in the manufacturing industry might involve in the different operation of handling machine and equipment such as lathe machine, milling machine, welding operation and forklift which may lead to the unexpected occupational accident [3].

Importance of training and awareness programs

Training is a systematic process through which organizations provide development opportunities to enhance the capabilities of new and existing employees [20]. Proper safety training plays a vital role by identifying fatal accident patterns which can help in preventing unexpected accidents, injuries and prepare employees to respond appropriately to workplace hazards [25]. DOSH can enhance standard working procedures for fatal accidents, with a particular focus on general workers as a vulnerable group, aiming to improve their awareness and working conditions [25]. Effective training ensures that workers and employers are compliant with legislation, thereby avoiding potential legal issues and claims for compensation. Employees that provided with safety knowledge will feel secure in their workplace, hence they can focus more on their tasks. This can lead to increased productivity as they are less distracted by safety concerns [7].

Organizational factors and safety culture enhancement

The safety culture will help the employees to understand and realize the importance of working in a safe workplace environment. The importance of safety culture is to provide belongingness, trust and cooperation among the employees through their cohesiveness and enrollment [7]. They remind each other on the importance of safety and improve the communication through teamwork. Furthermore, safety culture provides direction of safety practices in a workplace [19]. Besides that, implementing the safety culture at a workplace can also improve the productivity and profitability of an organization. For example, when the top management provides the safety culture at a workplace, they will indirectly convince their employees that the workplace has a safe environment to perform their task. A safe workplace will encourage the employees to perform their task without a doubt, improve the productivity and reduce the unexpected accident at a workplace. Hence, the profitability of the organization also will be increase [9].

Technological Interventions And Regulatory Framework

In Malaysia's industrial industry, regulatory frameworks and technological innovations are essential for managing risks and raising safety standards. The study has investigated the integration of cutting-edge technology, such as data analytics and automation, through the prism of DOSH statistics. This analysis sheds light on how well these technological initiatives have supported safety procedures and emergency responses [11]. Sensors, for instance, can assist identify hazardous circumstances and notify workers to take appropriate action, while cutting-edge technology like artificial intelligence and machine learning can analyse data to find trends that can reduce the risk of accidents [14].

On the other hand, regulatory frameworks are crucial in ensuring that safety regulations are followed and putting best practises into place to avoid accidents. A thorough evaluation of the regulatory frameworks' effects on accident prevention and overall workplace safety is made possible by the study's examination of their function in the context of DOSH statistics. In order to manage risks and raise safety standards in the manufacturing industry, regulations and standards are crucial [17]. In major industrial locations, they contribute to the development of integrated risk assessment and management guidelines [35]. Potential hazards can be efficiently detected and managed by putting in place a legislative framework for risk management, which raises safety standards in Malaysia's manufacturing sectors [11].

In conclusion, technological advancements and legal frameworks are essential for risk management and raising safety standards in Malaysia's industrial industry. The study highlights how crucial it is to make use of DOSH statistics to comprehend how these factors affect accident prevention and workplace safety. Policymakers, industry professionals, and key stakeholders can improve safety standards and risk management procedures in Malaysian manufacturing industries by integrating cutting-edge technologies and putting in place strong regulatory frameworks. This will ultimately improve domestic manufacturing safety and serve as an invaluable resource for international counterparts looking to improve their own industry safeguards.

Alignment with international safety standards

For worker safety and accident prevention in Malaysia, the manufacturing industry must apply international safety standards. Based on the provided search results, the following are some important points regarding international safety standards in Malaysia:

1. Enforcing OSH regulations: In Malaysia, small and medium-sized businesses (SMEs) are thought to be responsible for 80% to 90% of reported workplace accidents and injuries. This emphasises the necessity of strong occupational safety and health (OSH) regulation enforcement across all categories of industrial enterprises to guarantee adherence to global safety standards [13].

2. Occupational Disease and Injury: Injuries and illnesses related to the workplace might result from occupational hazards and risks. Annual reports on occupational illness and poisoning in Malaysia are released by the Department of Occupational Safety and Health (DOSH), and they are crucial for developing preventive programmes at the national level and workers' compensation [10]. These studies assist in identifying and managing workplace risks in accordance with global safety standards.

3. Safety Culture: Promoting worker safety in the industrial industry requires a strong safety culture. The rise in occupational noise-induced hearing loss recorded by DOSH indicates that Malaysia's manufacturing industry wants to lower workplace accidents [24]. In order to create sustainable safety cultures among employees and stakeholders at all levels, organisations enforce training standards and undertake daily toolbox talks about safety.4. This emphasis on safety culture is consistent with global safety standards, which stress the value of a proactive safety mentality.

4. Risk Management Techniques: Effective risk management techniques must be put into place in order to guarantee worker safety. In order to create a favourable and secure work environment, risk management procedures are crucial, as demonstrated by a Malaysian case study [23]. Organisations can detect and reduce possible dangers in the manufacturing sector with the aid of risk management practises that are impacted by regional culture and global safety standards5. This is consistent with the emphasis placed by international safety standards on the necessity for risk-based management of occupational safety and health.

In summary, developing a strong safety culture, addressing occupational diseases and injuries, implementing risk management procedures, and effectively enforcing OSH legislation are all necessary to bring Malaysia's manufacturing industry into compliance with worldwide safety standards. These initiatives help to raise workplace security, lower accident rates, and guarantee that Malaysia's industrial industry complies with global safety standards.

Technological innovations for accident prevention

The manufacturing sector in Malaysia has the potential to considerably benefit from technological advancements in accident prevention. For instance, UNCTAD's Review of marine Transport 2022, which examines the marine sector, highlights the value of technological improvements in boosting efficiency and safety. Improved communication technologies, automated machinery, and cutting-edge navigational devices are a few examples of these developments. A study that was published in PMC - NCBI in relation to sustainable energy management highlights the creation of a new integrated model for long-term sustainable energy management in power plants2. Performance shaping factors (PSFs) are incorporated into this model to improve energy systems and lower the possibility of accidents. The concept attempts to improve safety and prevent accidents in the energy sector by using technical solutions, such as cutting-edge monitoring and control systems [6].

The International Atomic Energy Agency (IAEA) stresses the significance of technical innovations in risk management effectiveness guidelines for integrated risk assessment and management in large industrial areas3. These recommendations promote the use of cutting-edge technology, including automation and data analytics, to spot and eliminate potential risks in industrial operations. The manufacturing industry can raise safety standards and reduce accidents by employing these technologies [36].

Additionally, developing a strong safety culture is crucial for preventing accidents. The significance of providing a comfortable and secure working environment is highlighted in a research paper on safety culture in the Malaysian manufacturing sector. Robotics and automated technology can assist in reducing the reliance on manual labour for hazardous jobs, hence lowering the risk of accidents and injuries [36].

In conclusion, technological advancements have the potential to considerably aid Malaysia's manufacturing industry in accident avoidance. The industry can raise safety standards and reduce risks by integrating cutting-edge navigation systems, automated equipment, better communication systems, and performance shaping variables. Adoption of cutting-edge technologies, such as data analytics and automation, can also efficiently identify and reduce risks. Together, fostering a strong safety culture and implementing technical solutions increase workplace safety in the manufacturing industry and help reduce accidents.

Challenges and opportunities in implementing advanced technologies

Malaysia's manufacturing sector faces opportunities and challenges while using modern technologies. The difficulties and possibilities connected with the application of modern technology are broken down as follows:

The opportunities might come from; 1). Government Support: The Malaysian government actively promotes the integration of cutting-edge technology in the manufacturing sector through programmes like Industry4WRD. Businesses may incorporate cutting-edge technology like cloud computing, AI, robotics, and the Internet of Things thanks to extensive government support 2). Increased Workplace Safety: The use of cutting-edge technology, such as robotics and automated machinery, can assist prevent the need for employees to do risky jobs, hence improving workplace safety. These innovations raise overall safety standards in the manufacturing industry by lowering the likelihood of mishaps and casualties [12] 3). Enhanced Productivity and Efficiency: Modern technology can improve the productivity and efficiency of manufacturing processes. Adopting Industry 4.0 technology, for instance, can streamline operations, enhance communication systems, and optimise supply chains. Cost reductions, increased competitiveness, and improved overall performance can result from this. 4). Innovation and Growth: The incorporation of cutting-edge technologies in the manufacturing sector enhances the competitiveness and innovation capacity of the country [36]. It boosts national productivity, propels growth in manufacturing GDP, and generates chances for skilled employment. Adopting new technologies can help Malaysia become a leader in the world's manufacturing sector [12].

The challengers were from; 1). Low Implementation in SMEs: Malaysian manufacturing SMEs (small and medium-sized firms) integrate modern technologies like Industry 4.0 rather slowly [19]. SMEs confront a number of difficulties, such as scarce resources, ignorance, and lack of technology readiness. 2. Lack of knowledge: The adoption of sophisticated technologies may be hampered by a lack of knowledge regarding businesses successfully utilising them in the manufacturing industry. Companies could be reluctant to invest in new technologies if their efficacy and benefits are not clearly demonstrated, and 3). New technologies must be capable of adapting to the unique needs and specifications of various industries [5]. In order to guarantee their compatibility and efficiency in tackling industry-specific dangers, the devices and solutions must adhere to industry norms and regulations.

In conclusion, integrating new technologies in Malaysia's manufacturing sector poses difficulties due to low adoption in SMEs, a lack of knowledge, and adaptation to industry demands. Government backing, increased worker safety, increased effectiveness and productivity, and support for innovation and growth are just a few of the many prospects available. A technologically advanced manufacturing sector that is safer, more effective, and globally competitive can result from overcoming these obstacles and taking use of the opportunities.

Case Studies: Successful Integration of Technology in Risk Management

Numerous case studies demonstrate how well technology has been incorporated into Malaysia's manufacturing sector's risk management. The International Atomic Energy Agency promotes the use of cutting-edge technology, such as data analytics and automation, to identify and reduce possible dangers in industrial operations [1]. These guidelines for integrated risk assessment and management in broad industrial areas. The manufacturing industry can raise safety standards and reduce accidents by employing these technologies. The creation of a new integrated model for long-term sustainable energy management in power plants is highlighted in a paper published in PMC – NCBI [3]. Performance shaping factors (PSFs) are incorporated into this model to improve energy systems and lower the possibility of accidents. The approach strives to improve safety and reduce accidents in the energy sector by using technical solutions, such as sophisticated monitoring and control systems.

Additionally, a study on safety culture in Malaysia's industrial industry emphasises the significance of maintaining a comfortable and secure workplace environment [23]. The company is attempting to create an enduring safety culture among its workforce and other important stakeholders at every level. By enforcing training requirements and completing a daily safety toolbox before the start of the day's work, the organisation is attempting to develop a strong safety culture and awareness of hazards among employees [23]. By reducing the need for physical labour for hazardous jobs, new technology like robots and automated machinery can help lower the likelihood of accidents and injuries. These case studies show how technology has been successfully incorporated into risk management in Malaysia's manufacturing industry, raising safety standards and reducing accidents.

Socio-economic impact of manufacturing accidents

Manufacturing accidents have a substantial socioeconomic impact in Malaysia, hurting both workers and the national economy. High accident rates in SMEs would have an effect on the economy. Small and medium-sized businesses (SMEs) are thought to be responsible for 80% to 90% of reported workplace accidents and injuries in Malaysia [13]. This shows how vulnerable SMEs are and how these companies need to strengthen their safety procedures.

On the other side, a decline in occupational injuries has a large socioeconomic impact. In Malaysia, fewer non-fatal occupational injuries have been documented, which suggests some improvement in workplace safety2. However, there is still a sizable socioeconomic cost associated with occupational accidents.

The other effects will be occupational sickness and injury. Manufacturing industry employees are at risk for occupational diseases and injuries due to workplace risks. Annual reports on occupational illness and poisoning in Malaysia are released by the Department of Occupational Safety and Health (DOSH), and they are crucial for developing preventive programs at the national level and workers' compensation [10,26]. The rise in reported instances underscores the necessity of efficient risk management and preventative measures.

Directly measurable effects on the economy include: The economy may suffer from manufacturing accidents, which may result in higher healthcare expenses, decreased productivity, and significant legal obligations for businesses [14]. These mishaps may cause lost workdays, medical costs, and compensation claims, which could have an impact on both the health of the wounded employees and the viability of the company's finances.

Last but not least, international workers may also be impacted by manufacturing mishaps. Foreign workers have been crucial to Malaysia's economy, but their involvement in industrial accidents raises questions about compensation and workplace safety [27]. Maintaining a fair and secure workplace requires making sure that foreign workers are fairly compensated and protected.

In conclusion, manufacturing accidents in Malaysia significantly affect the socioeconomic environment. The high rate of accidents in SMEs, the prevalence of occupational diseases and injuries, and the financial repercussions underline the need for better safety protocols and risk management techniques. The manufacturing industry in Malaysia may become more sustainable through increasing productivity, improving worker well-being, and reducing accidents.

Recommendations For Enhancing Accidents And Risk Management In Malaysian Manufacturing

The critical importance of maintaining a safe and secure environment within Malaysian manufacturing industries necessitates a proactive approach to occupational accidents and risk management. This section presents a series of targeted recommendations aimed at fortifying safety measures, reducing accidents, and fostering a culture of risk mitigation and prevention.

Policy implications and regulatory revisions:

Effective accident and risk management necessitate a robust regulatory framework that sets clear guidelines and standards for industries to follow. Policymakers should collaborate with relevant stakeholders to continually review and update regulations, ensuring they are reflective of the evolving manufacturing landscape.

Consideration should be given to incorporating new technologies, best practices, and lessons learned from both domestic and international contexts. Regular audits and inspections, coupled with stringent enforcement mechanisms, can help ensure compliance and drive a proactive safety approach across all manufacturing sectors [11]

Strengthening safety culture:

Fostering a strong safety culture is pivotal to accident prevention. Industries and organizations should invest in comprehensive training programs that educate employees about potential hazards, safe work practices, and emergency procedures. Cultivating a sense of personal responsibility for safety among workers is essential, and this can be achieved through regular safety briefings, workshops, and initiatives that encourage reporting of near misses and potential risks [7]. Management should lead by example, demonstrating a commitment to safety in all operations. Recognition and rewards for safety-conscious behaviors can further reinforce a positive safety culture.

Encouraging technological adoption:

Embracing technological innovations can significantly enhance accident prevention and risk management strategies. Industries should be encouraged to integrate advanced technologies such as predictive analytics, IoT sensors, and automation systems into their operations [36]. These tools enable real-time monitoring of equipment, identification of potential hazards, and prompt alerts in case of deviations from safety protocols. Investing in research and development to adapt these technologies to the specific needs of different manufacturing sectors can result in more effective risk mitigation strategies and early intervention to prevent accidents.

Collaboration between government, industries, and academia:

A multi-stakeholder approach is vital for comprehensive and sustainable improvements in accidents and risk management. Collaborative efforts between government agencies, industry players, and academic institutions can lead to the development of innovative solutions and the sharing of best practices. Regular forums, workshops, and knowledge-sharing platforms should be established to facilitate dialogue, information exchange, and joint problem-solving. Research partnerships between academia and industries can contribute to evidence-based policy-making and the development of tailored safety interventions.

CONCLUSION

Summary of Key Findings

In conclusion, the future of manufacturing in Malaysia hinges on a collective commitment to prioritize safety and risk management. By implementing these recommendations, the nation can move toward a safer industrial landscape, where accidents are minimized, risks are mitigated, and the well-being of the workforce takes precedence. These steps, coupled with a sustained dedication to continuous improvement, can pave the way for a resilient and prosperous manufacturing sector that upholds the highest standards of safety and responsibility.

Contributions to the field

This manuscript makes significant contributions to the field of manufacturing safety and risk management, particularly within the context of Malaysian industries. By conducting an in-depth analysis of accidents and risk management practices over the period 2022-2025, with a primary focus on DOSH statistics, this study provides a comprehensive and up-to-date overview of the safety landscape. The comparative approach adopted in this research, which involves examining various manufacturing sectors and juxtaposing domestic findings with international best practices, offers valuable insights that can guide policy decisions, industry practices, and future research endeavors.

One notable contribution lies in the identification of common accident-prone scenarios, which can help industries proactively address specific areas of concern. The analysis of human factors and safety culture enriches our

understanding of the role of organizational behavior and individual attitudes in accident prevention. Furthermore, the exploration of technological interventions through the DOSH statistics perspective highlights the practical implications of technology adoption, providing a roadmap for integrating innovations such as IoT and predictive analytics to improve safety protocols. The socio-economic impact assessment, underpinned by DOSH data, quantifies the tangible costs of accidents, reinforcing the urgency of effective risk management practices.

Future research directions:

Building upon the insights garnered from this study, several promising avenues for future research emerge that can further advance the field of manufacturing safety and risk management. One area of exploration could delve into the long-term impact of safety culture enhancement initiatives and the effectiveness of training programs in reducing accidents over time. Investigating the challenges and barriers that industries face in implementing advanced technologies for risk mitigation, as well as strategies to overcome them, could offer valuable insights for achieving seamless technology integration.

Furthermore, extending the temporal scope of the study to include more recent data beyond 2022 would enable researchers to track trends, assess the impact of policy changes, and evaluate the effectiveness of interventions in real time. Exploring the dynamic interplay between regulatory changes and industry practices could provide a nuanced understanding of how policies influence safety outcomes. Additionally, a qualitative exploration of employee perceptions and attitudes toward safety, informed by the findings of this study, could shed light on the human dimension of risk management.

Ultimately, the knowledge generated by this research can serve as a foundation for interdisciplinary collaborations between academia, government agencies, and industries, fostering a holistic and ongoing effort to enhance manufacturing safety practices. As manufacturing continues to evolve and adapt to new challenges, continuous research endeavors will be crucial in shaping a safer and more sustainable future for the Malaysian industrial landscape and potentially inspiring advancements on a global scale.

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