Mitigating Human Error in Maintenance Operations in Flour Milling, Aviation, and Maritime Industries: A Review

Osama Mohammed Elmardi Suleiman Khayal[1], Nafea Mostafa Maki Nafea [2], Khawla Ameir Mohammed Alamin Mohammed[3]

[1,3]Department of Mechanical Engineering, Faculty of Engineering and Technology, Nile Valley University, Atbara – Sudan and Elsheikh Abdallah Elbadri University, Berber – Sudan

[2]Engineer at Atbara Flour Mill Factories – Sudan

Email: osamamm64@gmail.com

Abstract

The review discusses the critical impact of human error in maintenance operations across various industries, particularly in flour milling, as well as aviation and maritime sectors. It highlights those human errors, often stemming from inadequate training, poor communication, and flawed equipment design, significantly contribute to equipment failures and operational inefficiencies. The importance of comprehensive training and effective maintenance protocols is emphasized to enhance safety and performance. By applying analytical frameworks like the Swiss Cheese Model, organizations can better understand the relationship between active and latent failures, enabling them to address root causes and promote a safety-oriented culture. Proactive measures such as structured training, careful planning, and regular assessments are essential for minimizing human error risks, thereby improving reliability and efficiency in maintenance practices.

Keywords: Human Error; Maintenance Operations; Training; Safety; Operational Inefficiencies

1. Introduction

Human error in maintenance has historically been underexplored, particularly in Flour Mill Factories, which have not effectively managed it despite its significance (Dhillon, Bikram & Liu, 2006), [1]. This dissertation investigates the impact of human error on maintenance quality, especially within the Sudanese flour industry, crucial for the country's economy.

Human fallibility indicates that all systems are prone to failure, highlighting the need for regular maintenance to prolong equipment life. The reliability of mechanical components largely depends on the maintenance team, as various human errors can compromise this reliability. (Drury, 2000) [2] differentiates between active failures, which directly cause incidents, and latent failures, which can lead to active failures. (Dhillon and Liu, 2006) [1] define human error as the failure to execute tasks or performing unauthorized actions that can disrupt operations or damage equipment.

Factors contributing to human error include inadequate skills, insufficient training, poor communication, and substandard equipment design, among others. These errors can lead to equipment failures, accidents, and ineffective maintenance practices.

The objectives of the present study could be summarized as mentioned below:

1. To examine the role of human error in maintenance operations across various industries, with a focus on the flour mill sector.
2. To identify key contributors to human error, including insufficient training, ineffective communication, and poor equipment design.
3. To highlight the impact of human errors on equipment failures, accidents, and operational inefficiencies.
4. To emphasize the need for comprehensive training and robust maintenance protocols to enhance safety and operational performance.
5. To utilize analytical frameworks, such as the Swiss Cheese Model, for understanding the interactions between active and latent failures.
6. To develop strategies that address the underlying issues contributing to human error.
7. To foster a culture of safety and continuous improvement within organizations.
8. To implement proactive initiatives, including structured training programs, meticulous planning, and regular evaluations, aimed at reducing risks associated with human errors.
9. To increase reliability and efficiency in maintenance practices through the reduction of human error-related risks.

2. Human Errors in the Maintenance of Mechanical Systems

Human errors in the maintenance of mechanical systems are prevalent and concerning, especially as technology grows more complex. Operators often struggle to fully comprehend and predict system behavior, leading to mistakes that can have severe consequences, including equipment damage, environmental risks, and loss of life. This highlights the need for a comprehensive analysis of the root causes of these errors, [3] – [10].

Human error refers to the improper execution of tasks or unacceptable actions, leading to operational disruptions and potential damage. It is classified as an unintended mistake that can cause immediate system failures. Additionally, there are latent errors that pose a risk to the integrity of technical systems, [6] and [11].

Research by Myszewski, [12] indicates that human errors frequently reflect organizational shortcomings. Errors are classified into three types: slips and lapses, which result from unintentional distractions or lapses in concentration, and violations, which are deliberate deviations from procedures often driven by the expectation of rewards. This classification is consistent with frameworks from Reason and Siu, [13] and [14].

Organizations often blame individuals for accidents, but this approach overlooks environmental factors that contribute to errors. Instead, human error is the result of a complex mix of various factors, not just the individual's actions, [15].

This research aims to investigate the various factors that lead to human error in maintenance activities, contributing to poor mechanical system performance and potentially resulting in incidents and serious accidents. Studies indicate that human error is responsible for 70-80% of equipment failures and accidents, with maintenance-related errors accounting for about 15-20% of these events, [15], [6], [16], [17], [3].

Research by Dhillon and Liu, [18] and [1] highlights human error as a major issue in maintenance, stemming from various stages of mechanical operations such as assembly, design, and inspection. These errors can persist into the maintenance phase, and failing to identify these underlying issues can result in negative consequences.

There is a need for maintenance departments to identify and address human errors, which are often predictable. By understanding the causes and impacts of these errors, departments can take a comprehensive approach to minimize them and improve the reliability of mechanical systems.

3. Exploring Past Research on Human Error in Maintenance Practices

3.1 The Impact of Human Error on Maritime Operations

The shipping industry has mainly focused on the hardware of maritime operations, prioritizing vessel integrity and advanced equipment systems. While this has resulted in highly reliable marine engineering, the frequency of marine accidents remains concerning, raising safety and environmental issues among stakeholders in the sector, [19], [20], [21], [22] and [23].

The maritime industry is increasingly recognizing that advancements in ship design and equipment alone are inadequate for ensuring safety and protecting the oceans. A comprehensive approach is needed that combines technological innovations with attention to human factors, regulatory frameworks, and operational protocols. This approach requires collective commitment from all stakeholders and the establishment of a robust safety culture at all operational levels. Rigorous training for crew members and comprehensive risk management strategies are essential for addressing potential hazards.

Maintenance processes are particularly vulnerable to errors due to their complexity, often leading to serious accidents. The tragic Erika incident in 2000 highlighted the consequences of maintenance failures. This paper focuses on the issue of maintenance errors within the context of Human Factors (HF), introducing an HF guidance package specific to maritime maintenance and inspection. It advocates for "designing for maintainability," which applies HF principles to simplify maintenance tasks, improve operational safety, and reduce errors.

The discussion emphasizes the need for meticulous attention to detail in maintenance work, given its inherent challenges and pressures. Effective communication, continuous skill development, and systematic practices are crucial for minimizing mistakes and ensuring the reliability of maritime systems. This holistic approach is vital for enhancing safety standards in the maritime industry and protecting marine ecosystems for future generations, [24], [25], [26] and [27].

The effectiveness of maintenance tasks is heavily influenced by both the design of the tasks and the equipment being serviced. Complex equipment can increase the likelihood of maintenance errors, particularly when mistakes go undetected due to a lack of error-tolerant features. Undetected errors can compromise maintenance integrity and lead to serious consequences, including equipment failure.

To improve maintenance performance, designs should prioritize user-friendliness and error prevention through clearer indicators and simpler assembly processes. Maintenance errors are often classified as latent failures, meaning their consequences may not be immediately apparent, which poses risks to safety, economic performance, and public trust, particularly in critical fields like aviation and healthcare.

To mitigate these risks, organizations must implement strong maintenance protocols, comprehensive training, and foster a culture of safety and accountability. This approach can enhance economic viability while ensuring the safety and trust of the public in their operations.

Below are the most significant industrial accidents and their causes:

1. **1988 Clapham Rail Collision**: A signal failure due to poor maintenance practices led to this railway disaster, emphasizing the need for rigorous maintenance protocols.
2. **1988 Piper Alpha Explosion**: A gas leak caused by a maintenance error, compounded by organizational failures, resulted in an explosion on an oil platform that claimed 167 lives and led to stricter safety regulations in the industry.
3. **1984 Union Carbide Bhopal Disaster**: A release of toxic gas due to operator error, inadequate maintenance, and system malfunctions caused thousands of fatalities and highlighted the need for improved safety protocols in hazardous industries.
4. **2000 Erika Oil Spill**: The sinking of an oil tanker led to a catastrophic oil spill, attributed to poor maintenance organization and safety protocol violations, raising concerns about maritime safety regulations and corporate responsibilities.

Overall, these incidents stress the importance of proper maintenance, robust safety measures, and effective training in preventing industrial disasters.

Maintenance errors arise from a combination of task design and broader organizational factors that impact performance. Key influences include interpersonal communication within the organization, as poor communication can lead to misunderstandings and errors. Inadequate monitoring systems further exacerbate the issue by failing to provide insights for improvement. Organizational culture, particularly the attitudes of senior management towards maintenance, plays a crucial role; neglecting effective maintenance can undermine equipment reliability and overall organizational performance.

Other contributing factors include the operational environment, equipment condition, and the adequacy of training and documentation. Challenges such as hazardous materials, unsuitable equipment, and insufficient training can hinder maintenance effectiveness and safety.

By addressing organizational issues such as enhancing communication and promoting a safety-oriented culture, companies can reduce maintenance errors and improve performance. This is especially important in safety-critical industries like maritime, where a significant percentage of incidents i.e. between 75% and 96% are associated with human error, with inadequate maintenance playing a major role in creating hazardous conditions and increasing crew fatigue, [28].

The review emphasizes the importance of continuous training, strict maintenance protocols, and a strong safety culture in maritime operations to improve safety and reduce accidents. It points out that commercial pressures often influence maintenance procedures, leading to rushed decisions that can increase the risk of errors and regulatory violations. While maintenance errors may not always directly cause accidents, they are significant contributing factors in many cases and can lead to substantial economic losses and operational delays. Therefore, adhering to rigorous maintenance and safety standards is crucial for safeguarding personnel and maritime assets, [29].

Awareness of Human Factors (HF) is increasing in the maritime industry, highlighting their significant impact on maintenance performance. Earthy and Sherwood-Jones emphasize the need for ship surveyor training programs to include a deeper understanding of HF and their connection to maintenance practices. By enhancing surveyors' knowledge, they can better assess ship procedures and equipment, leading to improved operational efficiency and safety in maritime operations, [30].

3.2 Strategies for Tackling Human Factors in Maintenance and Inspection

The Civil Aviation Authority's publication, CAP 716, has significantly contributed to the development of best practices in human factors (HF) related to maintenance and inspection. It emphasizes the importance of training maintenance personnel to address HF issues that can lead to errors, particularly highlighting the negative effects of fatigue on performance. Organizations are encouraged to implement strategies to improve staff well-being and effectiveness. Moreover, interviews with industry professionals reveal the necessity of designing equipment with maintainability in mind to reduce human error and optimize performance. By focusing on user-friendly maintenance tasks and incorporating HF considerations in training and design, organizations can enhance safety and efficiency in maintenance operations, [31], [32], [33], [34] and [35].

3.3 Contents of the Guidance Package

The guidance package is intended for those responsible for managing and improving maintenance operations in maritime maintenance depots. It addresses human factors (HF) that contribute to human error and poor maintenance performance. The package includes an archive of best practices and a formal three-step process for identifying and addressing HF issues, along with various tools to assist in applying the recommended approach. Figure 1 below illustrates a systematic approach to HF: 3 step systematic process for applying HF to maintenance operations

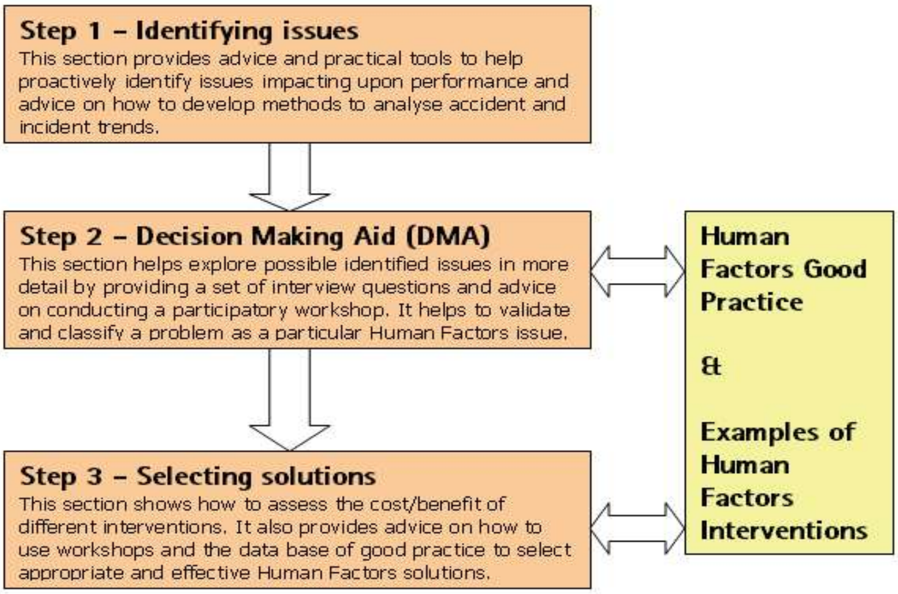

Figure 1: A Systematic Approach to HF: 3 Step Systematic Process for Applying HF to Maintenance Operations

The systematic approach emphasizes the importance of integrating human factors across three key stages to enhance maintenance performance and reduce errors and rule violations. It argues that not considering human factors can lead to ineffective interventions. By embedding human behavior principles into each phase, practitioners can improve understanding of operational outcomes and effectively address performance challenges. Recognizing the role of human factors is crucial for creating tailored strategies that ensure better results and a safer, more efficient working environment.
The guidance package emphasizes the importance of recognizing Human Factors (HF) in incident and accident investigations, arguing that human error should be seen as a symptom of deeper issues within the work system rather than the primary cause of accidents. By focusing on underlying elements such as environmental conditions and procedural design, organizations can better understand the complexities of human behavior and prevent future errors. Instead of simply providing basic training to maintenance personnel, a more comprehensive investigation into the influence of external pressures like time constraints would yield more effective solutions for enhancing workplace safety.
The guidance package emphasizes the importance of addressing time pressure as a significant factor contributing to errors in maintenance tasks. Instead of solely focusing on training staff, organizations should reassess task timelines and acknowledge the impact of unrealistic deadlines. Implementing strategies such as adjusting schedules, providing additional resources, and redesigning workflows can help reduce stress on employees and enhance safety and efficiency.
The guidance package mentioned also aids responsibly in the implementation of these strategies by offering practical tools for individuals and teams, ensuring that recommendations are clearly understood and effectively executed in real-world situations. This comprehensive approach aims to

improve employee performance and organizational safety by recognizing the interplay between human factors and operational challenges.

3.4 Tools to Facilitate the Integration of Human Factors (HF)

This section provides an overview of the essential tools designed to apply Human Factors (HF) principles effectively. These tools support practitioners in enhancing user experience, ensuring safety, and improving overall system performance by considering human behavior and system design interactions. Key tools include checklists for evaluating design processes, user feedback mechanisms to gather insights on system usability, and modeling software that simulates human interaction in various operational contexts. These instruments play a crucial role in identifying potential issues early in the development process, thereby minimizing risks and facilitating more user-centered design approaches. In addition to these tools, workshops and training programs are also emphasized, empowering teams to thoroughly understand HF concepts and apply them effectively in their projects. By leveraging these tools, organizations can prioritize human needs, accommodate diverse user capabilities, and create efficient, safe, and approachable systems for all users. The strategic incorporation of these resources enables stakeholders to instill Human Factors considerations into their design and operational methodologies, ultimately fostering a culture of safety, usability, and innovation, [36], [37], [38], [39] and [40].

3.4.1 Event Categorization System

To enhance incident analysis, we created an event classification system based on the Managing Event Data Analysis (MEDA) framework, commonly used in aviation. MEDA promotes a thorough investigative approach that goes beyond identifying errors to focus on the complex nature of Human Factors (HF) and their influence on events. This holistic perspective allows investigators to gain deeper insights into the circumstances of each incident, [4], [41], [42], [43], [44] and [45].

A rigorous classification of incidents is crucial as it promotes consistency in information gathering, enabling systematic knowledge accumulation. Detailed incident categorization facilitates comparisons between events, helping to identify recurring patterns or trends and pinpoint areas needing attention. By adopting a comprehensive event classification system aligned with the principles of MEDA, organizations enhance their incident investigation processes and cultivate a culture of continuous learning and improvement. This proactive method improves understanding of the factors contributing to incidents, ultimately enhancing safety and operational performance.

3.4.2 Maintenance Personnel Questionnaire: A Proactive Approach to Accident Prevention

Improving event classification and understanding the role of human factors in accident causation allows for a more thorough analysis of incidents, but it is primarily reactive. To proactively address potential issues, a method such as administering questionnaires can be effective. One specific tool, the Maintenance Personnel Questionnaire, aims to gather insights from personnel directly involved in equipment and facility maintenance about challenges they face and suggestions for improvements. This proactive approach helps identify potential problems early, enabling targeted interventions to prevent accidents. By promoting transparency and openness, the questionnaire encourages maintainers to voice their concerns and recommendations, ultimately enhancing workplace safety and efficiency, [46], [47], [48], [49], [50] and [51].

Table 1 presents a variety of example questions intended for use in a maintenance personnel questionnaire. These questions aim to engage and resonate with the experiences of maintenance staff and can be customized to align with the specific objectives and requirements of the organization.

Table 1: Sample Questions Intended to Aid in Creating the Maintenance Personnel Questionnaire

Question Number	Question
1	What are the main difficulties you face when performing your maintenance duties?
2	How do you prioritize your tasks and manage your time efficiently?
3	Have you experienced any equipment or system failures that affected your ability to carry out maintenance tasks? If so, could you describe the situations and the outcomes?
4	Are there specific safety procedures or protocols that you believe are ineffective or could be improved?
5	How do you stay informed about updates to procedures, equipment, or policies that affect your maintenance responsibilities?

Integrating a safety and risk management questionnaire allows organizations to proactively identify potential hazards and vulnerabilities in their operations. This strategic approach enables companies to assess daily risks employees and processes may encounter. By systematically gathering insights, organizations can uncover specific concerns that may otherwise be overlooked, allowing them to implement targeted measures such as enhanced training, reinforced safety policies, or upgraded equipment. This not only reduces workplace accidents but also fosters a culture of safety prioritizing employee well-being. Moreover, utilizing such tools reflects a commitment to safety that enhances employee morale and trust, leading to a valued and protected work environment. Ultimately, the routine application of the questionnaire promotes continuous improvement in safety practices, helping organizations comply with regulations and exceed safety standards, which enhances overall workplace safety and efficiency.

3.4.3 Decision Making Aid Questions

The research findings highlight that while there is awareness of human factors (HF) issues, interventions often fail to effectively address these challenges. This underscores the need for a thorough investigation before implementing solutions. To facilitate this process, the Decision-Making Aid Questions (DMA) have been introduced as a tool to enhance understanding during the initial identification phase of problems, typically arising from questionnaire data or incident investigations. The DMA questions help maintenance personnel explore the root causes of issues, allowing them to focus from broad concerns to specific human factors problems. For instance, if communication is identified as a concern, the DMA can fine-tune this issue to examine communication gaps during shift transitions.

A series of questions is presented in Table 2 to guide users in understanding the issue and human factors involved. The goal is to enable successful interventions and improve the approach to addressing workplace maintenance challenges.

Table 2: A Series of Illustrative Questions

Question Number	Communication
1	Are the chosen communication methods and media appropriate for the specific situation and environment, or do factors such as background noise or distractions hinder their effectiveness?
2	Are the maintainers informed about the changes happening in the workplace?
3	Do maintainers receive regular updates about any ongoing issues that could affect their work?
4	Do managers provide performance feedback to maintenance teams, including assessments on fleet effectiveness?
5	Is management approachable and receptive to communication?

The study emphasizes the importance of consulting the high-fidelity (HF) best practices archive during decision-making, as it provides insights into issues and effective strategies for resolution. Additionally, utilizing workshops as collaborative platforms enhances this process by allowing stakeholders to discuss challenges and brainstorm innovative solutions. Together, these resources equip decision-makers to better understand complexities and make informed choices, ultimately leading to more effective solutions, [52], [53], [54], [55], [56], [57], and [58].

3.4.4 Templates for Workshops

The guidance package provides thorough insights for conducting workshops, featuring two distinct templates for different discussion topics. One template focuses on specific tasks like engine overhauls, while the other targets broader issues such as organizational communication. These resources are designed to engage participants deeply and promote productive discussions. Each agenda includes structured steps that begin with an effective introduction, followed by interactive exercises that foster dialogue, creative thinking, and collaboration, creating an inclusive environment for sharing diverse perspectives.

As discussions progress, participants share insights related to the topic, facilitating knowledge exchange and innovative idea generation. At the workshop's conclusion, key takeaways, action items, and a comprehensive action plan are developed, ensuring that the momentum continues beyond the session. The workshops capitalize on the diverse experiences of maintenance personnel, promoting shared decision-making and collaboration, which ultimately leads to more effective solutions for challenges faced by the team.

Facilitated forums also play a critical role in fostering open communication, providing a safe space for maintainers and managers to discuss issues without fear of blame. This encourages understanding of procedural inconsistencies and facilitates conflict resolution, allowing managers to address root causes proactively. By creating a blame-free culture, organizations can enhance collaboration, drive continuous improvement, and unlock their employees' potential leading to a more efficient and harmonious workplace. Open communication channels allow managers to explain their expectations, while maintenance personnel can share challenges, promoting a collaborative approach to enhancing productivity and operations overall, [59], [60], [61], [62] and [63].

3.4.5 Human Factors Framework

Human Factors (HF) significantly influence workplace operations, encompassing task design, communication, procedures, equipment use, and environmental factors. A cohesive framework has been developed, highlighting nine key areas:

1. **Task Design** focuses on structuring tasks for efficiency and employee confidence.
2. **Work Planning** ensures logical task organization and resource allocation to minimize risks and errors.
3. **Safety Culture** promotes a shared responsibility for safety across all levels.
4. **Training and Competency** involve providing comprehensive and ongoing education to maintain high performance.
5. **Procedures and Documents** offer clear guidelines that standardize processes for operational consistency.
6. **Tools and Equipment** must be appropriate and regularly assessed to enable effective and safe task performance.
7. **Fitness to Work** entails ensuring employees are physically and mentally prepared for their roles.
8. **Environment** focuses on creating a healthy workspace, considering ergonomics and accessibility.
9. **Communication** enhances collaboration through effective information sharing among staff and management.

Each topic includes subcategories for detailed understanding. The framework helps organize HF information, formulate targeted questions, and connect issues with solutions. For instance, addressing inadequate communication during shift handovers can involve formalizing protocols, streamlining information, improving skills through training, clarifying terminology, and encouraging feedback. This HF framework aims to identify issues systematically, enhancing organizational performance, safety, and employee satisfaction, [64], [65], [66], [67], [68] and [69].

3.4.6 Designing for Maintainability: A Crucial Aspect of Ship Design

Designing for maintainability is crucial for enhancing the accuracy, safety, and cost-effectiveness of maintenance and inspection tasks. Early consideration of maintenance requirements during the design phase ensures efficiency and minimizes risks. Key practices include creating accessible layouts for components, using standard replacement parts, ensuring proper labeling, implementing quick fastening mechanisms, and incorporating self-test indicators for easier fault identification. Additionally, reducing human error by minimizing system adjustments and adhering to safety regulations is vital. Feedback from maintenance crews to designers can lead to improvements in design. The maritime industry, like other safety-critical fields, must address human factors in ship maintenance to enhance performance, ultimately making design for maintainability a priority for improved safety and efficiency, [70], [71] and [72].

3.5 The Critical Role of Human Error in Aviation Maintenance: A Comprehensive Analysis

Aviation maintenance is a complex process that demands meticulous attention to detail, adherence to procedures, and a high degree of expertise, and despite robust safety protocols and quality control measures, human error remains a significant contributor to maintenance defects and incidents. Studies have extensively examined the effects of human error in aviation maintenance, providing valuable insights into the causes and consequences of these errors, with a comprehensive analysis of 122 maintenance errors showing that omissions, incorrect installations, wrong parts, and other error types were responsible for 56%, 30%, 8%, and 6% of errors respectively. The Civilian Aviation Authority identified eight common maintenance errors, including incorrect installations and fitting of wrong parts, which are often attributed to human error. Further investigation into in-flight engine shut downs on Boeing 747s in 1991 revealed recurring mistakes such as missing or incorrect parts, incorrect installation of parts, and careless installation of components. Other notable causes included foreign objects being dropped into engines, water entering the fuel or oil system, and not loosening or tightening connections as required. These findings highlight the frequency and variety of human errors that occur during aviation maintenance, posing a significant risk to aircraft safety and undermining the effectiveness and efficiency of maintenance operations. As such, addressing human error through targeted interventions, improved training programs, procedures, and safety protocols is essential to prevent maintenance-related incidents and ensure the continued safety and reliability of air travel, [73], [74] and [75].

3.5.1 Several Major Categories of Human Errors in Maintenance and Inspection Tasks

The 1992 study by Prabhu and Drury examined human errors in maintenance and inspection tasks at a major US airline, revealing key error categories that affected operational safety and efficiency. The research identified defective components, such as worn cables and fluid leaks, which could threaten critical systems' functionality. Missing component errors arose from human oversight, like failing to secure a bolt-nut, emphasizing the need for meticulous record-keeping and quality control. Additionally, errors involving incorrect components, such as wrong pitot static probes, posed potential safety hazards due to improper part selection or labeling.

The study also addressed procedural and functional defects within maintenance tasks, such as incorrect assembly sequences leading to performance issues, and highlighted sensory-related errors, like failing to secure seats properly, which could create safety risks. Lastly, the significance of following established protocols was stressed, notably the need to ensure the nose landing gear door was securely closed to prevent equipment failure and enhance aircraft safety. Overall, the study underscored the critical importance of accurate procedures and attention to detail in aviation maintenance, [45], [76], [77], [78], [79] and [80].

3.5.2 Accidents Caused by Maintenance Errors

Maintenance errors in aviation can vary in severity, leading to accidents that result from both significant oversights and subtle mistakes that, when compounded with other factors, cause incidents. Research indicates that maintenance-related issues contribute to a notable percentage of aviation accidents, with a study showing they were implicated in about 12% of international accidents from 1959 to 1983, and faulty maintenance practices as the primary cause in around 3%. Additionally, analysis from Boeing suggests that improvements in maintenance and inspection protocols could have prevented nearly 16% of hull losses and about 20% of all accidents between 1982 and 1991, during which maintenance-related issues were associated with 47 accidents that led to 1,481 fatalities, [81], [82], [83], [84], [85], [86] and [87].
The passage emphasizes the vital role of thorough maintenance and inspection in the aviation industry, suggesting that enhanced practices can lead to improved safety. It highlights how human errors in these areas have contributed to significant aviation accidents, including an incident involving an L-1011 jet where improperly installed O-ring seals caused oil leaks, leading to engine shutdowns. Thankfully, the pilot managed to restart one engine and safely land the aircraft, [88].
An incident involving a Continental Express EMB-120 underscored the vital need for clear communication and effective handover procedures in maintenance operations. In this case, crucial maintenance information was not properly communicated to the next shift of technicians, resulting in forty-seven screws for the left horizontal stabilizer not being replaced. This failure led to the stabilizer's leading edge separating during flight, resulting in the tragic loss of fourteen lives, [89] and [90].
A tragic incident involving a DC-10 aircraft occurred due to a failure to detect a pre-existing metallurgical defect, which allowed a fatigue crack to form in a critical part of the engine's fan disk. This oversight was worsened by the inability to identify the crack during routine inspections. During flight, the crack caused the rotor assembly to separate and discharge, resulting in catastrophic engine failure and severing the aircraft's flight control hydraulic systems. The incident led to the tragic loss of 111 lives and many injuries, [91].
The Aloha Airlines accident highlights the severe repercussions of poor inspection practices, where undetected damage from cracks led to hull failure and an emergency crash landing. The aircraft was ultimately lost, but the pilots' exceptional performance prevented a potentially greater tragedy and saved lives, [91].
These incidents emphasize the urgent need for stringent maintenance protocols, effective communication, and thorough inspections to ensure aviation safety and prevent accidents. It discusses how organizational factors, driven by management decisions embedded in corporate culture, can lead to latent failures that increase the risk of incidents. Such failures often arise from inadequate communication, poor training, and non-compliance with safety standards, remaining hidden but ultimately undermining safety measures. When these latent failures emerge, they can overshadow even the most robust safety systems, illustrating the complex relationship between organizational dynamics and safety in aviation. The text stresses the importance of cultivating a proactive safety culture within aviation organizations to identify and address potential failures. Two specific incidents, the Continental Express accident and the Sioux City accident, exemplify how human error and oversight in quality assurance and inspection processes can have disastrous consequences, highlighting the need for enhanced vigilance from both air carriers and regulatory bodies like the FAA, [92].
The Aloha Airlines accident highlights the critical need for thorough maintenance and inspection protocols. Although proper maintenance might have averted the tragedy, the NTSB identified several contributing factors, such as inspectors' inability to detect structural cracks and shortcomings in

fatigue models that failed to predict crack growth accurately. Drury (1996) points out that these issues illustrate the inherent risks of depending on predictive models in maintenance, as they can result in misinterpretations that attribute complex technical failures to basic human errors in inspection or repair, [93].

Routine inspections and periodic replacements or repairs are crucial in aircraft design to prevent catastrophic failures, and these inspections are scheduled at pre-defined intervals based on reliable data from models of crack propagation. These models, which rely on principles from structural and materials fracture mechanics, help determine the intervals at which inspections should be conducted. However, while these models are designed to enhance safety, there is a risk of creating a disconnect between actual failures and perceived human error, as cautioned by Drury, who notes that when predictions don't align with observed outcomes, this can lead to confusion between predicted and actual failure patterns, [94] and [95].

The TWA Flight 843 accident is a prime example of the delicate balance between technology and human oversight in the aviation industry. The disaster occurred when a malfunctioning angle-of-attack sensor led to an aborted takeoff, highlighting the importance of rigorous maintenance and quality assurance programs that can promptly identify and address intermittent malfunctions. If TWA's maintenance and quality assurance systems had been more effective, it's possible that the disaster could have been averted. This incident, along with others like the one in Eastern Airlines, sheds light on the complex interplay between human factors, technological systems, and regulatory oversight. These interactions serve as stark reminders of the need for diligence in maintenance, quality assurance, and effective communication in aviation operations to ensure safety and prevent future catastrophes. In this context, an independent and vigilant regulatory agency plays a crucial role in ensuring that airlines adhere to stringent safety protocols and regulations by serving as a critical check and balance, [96].

The passage emphasizes the critical role of independent regulatory agencies in ensuring safety within the aviation industry. Without their thorough oversight, airlines and manufacturers may exploit regulatory loopholes, endangering passenger and employee safety in the quest for economic efficiency. Regulatory agencies are essential for enforcing strict safety protocols, promoting transparency, and holding airlines accountable. To effectively monitor industry practices, these agencies must have adequate resources and authority. Ultimately, while self-regulation by airlines and manufacturers is important, the vigilance of regulatory bodies is vital in maintaining a safe and accountable aviation environment.

3.5.3 Additional Consequences of Human Errors in Aviation Maintenance

Human errors in aviation maintenance pose significant risks to safety, potentially leading to serious accidents, although such incidents are infrequent. Maintenance errors often go unnoticed and can remain latent within systems, contributing to future risks. These errors can undermine safety protocols, creating a false sense of security, and their implications extend beyond accidents to eroding trust, increasing regulatory scrutiny, and incurring significant costs for corrective actions. The cumulative effect of minor mistakes can disrupt operations and compromise safety culture in aviation organizations. To mitigate these risks, the aviation industry must emphasize preventative strategies, including robust training, improved communication, and advanced technologies, fostering a culture of continuous improvement. A notable example is the investigation of China Airlines Flight 583, where a maintenance error involving a rubber plug in the slat control system led to an in-flight incident, illustrating the complexities of aviation maintenance safety, [97].

Engineers from Douglas Aircraft Company discovered that a rubber plug, which should have been removed after maintenance, did not affect the slat system's operational functionality, highlighting the significant implications of maintenance errors in aviation. Such oversights can often go unnoticed due to built-in safety mechanisms that prevent immediate consequences, thereby obscuring potential vulnerabilities within aviation safety. This incident underscores the need for continuous training and strict adherence to maintenance protocols to mitigate risks.

Minor errors, often perceived as trivial, can lead to severe incidents when combined with other operational factors, exemplifying the concept of "sneak-path accidents." Even if a mistake appears harmless, it may indicate deeper issues that could result in larger errors. This calls for careful analysis of even minor oversights to identify systemic weaknesses.

Human errors in maintenance can result in a range of repercussions beyond immediate accidents, including equipment malfunctions, operational inefficiencies, financial losses, and reputational damage. Such errors can erode trust among stakeholders and lead to regulatory penalties, emphasizing the importance of vigilance in maintenance activities. In aviation, inadequate maintenance practices account for about 50% of flight delays and cancellations linked to engine issues, illustrating the critical connection between maintenance quality and operational efficiency. Similarly, military aviation reports that one-third of equipment malfunctions stem from substandard maintenance, highlighting the widespread impact of proper maintenance adherence across the sector, [98] and [99].

Maintenance failures in airlines can lead to operational setbacks that negatively impact customer satisfaction and company productivity. Delays and cancellations frustrate passengers, damaging the airline's reputation. Moreover, ongoing maintenance issues can raise operational costs and reduce profitability. Therefore, maintaining high maintenance standards is crucial for safety and maintaining a competitive edge, making effective maintenance practices essential for improving customer experience and ensuring financial stability in the airline industry.

3.5.4 The Negative Consequences of Human Error in Aviation Maintenance: A Critical Analysis of Causes and Solutions

The devastating effects of human error in aviation maintenance are profoundly evident in the alarming statistics of accidents, incidents, and operational inefficiencies that plague the industry. A comprehensive study of incidents and accidents in the aviation sector has conclusively established that subpar maintenance practices are a primary contributing factor to these catastrophic occurrences. This highly regulated and hazardous industry is not exempt from the pitfalls of human error, which can have far-reaching consequences, including loss of life, damage to reputation, and substantial financial losses. A thorough examination of the history of human error in various industries, including aviation, reveals a concerning trend that rather than attempting to alter human nature to prevent errors, organizations can focus on improving the working conditions and anticipating their consequences by adopting a proactive approach. By doing so, industries can mitigate the risks associated with human error and create a safer and more efficient working environment. Studies have consistently shown that human error in maintenance is often the result of a combination of factors, including inadequate training, insufficient resources, and poor communication, which can be effectively addressed through the implementation of programs and strategies to prevent human error and reduce the likelihood of accidents and incidents.

Successful programs to mitigate human error in maintenance include enhanced training for employees on procedures and safety, standardized maintenance procedures for consistency, routine audits and inspections to identify risks, fostering open communication for reporting concerns, and encouraging error reporting to learn from mistakes. By implementing these strategies, organizations can create a safer and more efficient workplace, significantly reducing the risk of accidents and improving overall safety and effectiveness, [100], [101], [102], [103], [104], [105], and [106].

3.5.5 Managing Human Error in Aviation Maintenance

In pursuit of achieving zero accidents in aviation, significant strides have been made in aviation safety, particularly concerning maintenance operations, where human error is a crucial factor in incidents. The 1995 National Safety Conference highlighted the need for research into human factors in aviation maintenance, leading to initiatives such as the creation of a national database for tracking human error incidents to inform safer practices. Additionally, the conference advocated for a maintenance error analysis tool prototype to help personnel systematically analyze and address errors, focusing on root causes like miscommunication and inadequate training. It also recommended adapting Crew Resource Management (CRM) principles, known for enhancing safety in the cockpit, to the maintenance environment to improve communication, situational awareness, and decision-making skills among maintenance staff. This section will explore ongoing advancements in managing human error in aviation maintenance, reflecting a shared commitment to enhancing safety and realizing the goal of zero accidents through collaboration and innovation, [107], [108], [109], [110] and [111].

3.5.6 Managing Human Error in Flour Mill Industry

The flour mill industry depends on effective maintenance for the smooth functioning of its machinery. However, human errors frequently disrupt maintenance activities, resulting in equipment failures, accidents, and decreased productivity and revenue. This section identifies common maintenance-related human errors in flour mill factories and suggests potential solutions to address these challenges, [5], [112], [113], [114], [115], [116] and [117].

A. Maintenance Task Notes Done During Planned Maintenance Shutdowns

During planned maintenance shutdowns, some equipment or components are often left out due to time pressure, improper pre-planning, and incorrect identification of faults, resulting in costly equipment failure, reduced productivity, and increased maintenance costs. Bearing-related issues such as under-greasing or over-greasing are common consequences of this type of human error, as seen in the numerous bearings on a conveyor system in a flour mill factory that may be overlooked or inadequately maintained if the maintenance team is rushed or lacks the necessary resources, [118], [119], [120], [121], [122] and [123].

To address this issue effectively, it is important to properly plan maintenance activities, provide the maintenance team with adequate training and resources, and conduct thorough pre-planning to anticipate potential problems.

B. Improper Installation of Equipment Components

Improper installation of equipment components can result in serious issues such as equipment damage, higher maintenance costs, and decreased productivity. Common installation errors include misalignment of pulley shafts, improper belt tension, incorrect gap size in crushers, wrong motor direction, and insufficient tightening of bolts. To mitigate these risks, equipment manufacturers can use clear checklists to provide maintenance teams with detailed installation guidelines, thereby reducing the likelihood of human errors, [113], [124], [125], [126], [127], [128] and [129].

C. Improper Lubrication of Bearings

Proper lubrication of bearings is vital for the efficient functioning of equipment, while improper lubrication can result in significant issues such as bearing failure, shortened equipment lifespan, and higher maintenance costs. Common problems include under-greasing, over-greasing, using the wrong lubricant grades, and neglecting lubrication intervals. To address these challenges, it is essential to educate maintenance personnel on the importance of regular lubrication, create a detailed lubrication schedule, and ensure the correct lubricant grade is applied for each specific use, [130], [131] and [132].

D. Foreign Object Damage (FOD)

Foreign Object Damage (FOD) poses a major threat in flour mills, as the accumulation of flour dust and water can cause equipment failures, decreased productivity, and higher maintenance costs. To combat this problem, it is crucial to establish regular cleaning protocols, perform detailed inspections for potential water leaks, and create a thorough maintenance plan to address FOD issues promptly, [133], [134] and [135].

E. Utilization of Deteriorated Parts

Using deteriorated parts can cause equipment failure, lower productivity, and higher maintenance costs, with common examples being worn-out screws and deteriorated machinery components like v-belt springs. To address these issues, it's crucial to develop a comprehensive inventory management system to monitor parts' condition, establish a logistics strategy for timely replacements, and educate the maintenance team on the significance of regular inspections and replacements, [136], [137] and [138].

F. Equipment Parts Damaged During Maintenance

Damage to equipment parts during maintenance can result in serious issues like equipment failure, decreased productivity, and higher maintenance costs. Common causes of damage include improper alignment and the forced use of tools. To address these problems, it is crucial to implement a comprehensive training program for the maintenance team, foster a culture prioritizing safety and proper equipment handling, and encourage prompt reporting of any damage or issues, [119], [125] and [139].

G. Improper Inspection and Identification of Fault

Improper inspection and fault identification can result in equipment failure, reduced productivity, and higher maintenance costs, often stemming from inaccessible parts and inadequate training for maintenance personnel. To address these problems, it is crucial to implement a comprehensive training program for the maintenance team, foster a culture that prioritizes thorough inspections and accurate fault identification, and encourage prompt reporting of inspection-related issues, [140] and [141].

H. Injury to Personnel

Injuries to personnel can cause serious issues such as decreased productivity, higher maintenance costs, and adverse publicity. Common causes include poor ergonomics planning and the use of inappropriate or unsafe tools. To address this, it's important to create a comprehensive safety program for maintenance teams, foster a culture that prioritizes ergonomics and equipment handling, and encourage prompt reporting of safety concerns, [142] and [143].

3.6 Summary of Human Errors in Maintenance of Flour Mill Factories

Human errors in maintenance are prevalent in flour mill factories and can result in equipment failure, decreased productivity, and higher maintenance costs. By recognizing these errors and applying effective solutions, flour mill factories can reduce the risk of such mistakes and maintain the efficient operation of their equipment.

4. Existing Human Error Program/Model in Maintenance

4.1 The Swiss Cheese Model of Accident Causation

The Swiss cheese model of accident causation is a widely recognized approach in risk analysis and management, comparing human systems to slices of Swiss cheese with holes representing vulnerabilities. While multiple layers seem to provide a barrier against threats, the holes indicate that individual defenses can fail, highlighting the limitations of any single measure. Introduced by James T. Reason, the model suggests that stacking various defenses improves overall protection from risks, leading to its acceptance as the "cumulative act effect", [144].

The Swiss cheese model is widely applied in various fields to enhance safety and risk management. In aviation, it helps ensure air travel safety by emphasizing multiple protective layers against catastrophic events. Engineers apply the model to design safer systems by pinpointing potential failure points and incorporating protective measures. In healthcare, professionals use the model to improve patient safety by addressing possible failures in medical procedures and implementing risk mitigation strategies. Emergency service organizations utilize it to create layered responses to crises, ensuring that no single failure disrupts overall operations. Additionally, the model informs computer security practices, promoting a robust defense by establishing multiple layers of protection against potential cyber threats, [145].

The Swiss cheese model is a popular tool for explaining human errors and risk, but it faces several criticisms. One major concern is its overreliance, as it can simplify complex issues and ignore other contributing factors. Additionally, critics suggest that the model should be used alongside other frameworks to enhance its explanatory power. Its broad application across various fields raises concerns about overgeneralization, as its shortcomings may become apparent in specific contexts. In conclusion, while the Swiss cheese model is useful for understanding risk and protective layers, its use should be complemented by other models and a careful acknowledgment of its limitations. Figure 2 illustrates The Swiss Cheese Model of Accident Causation: Understanding the Interplay of Defenses and Hazards.

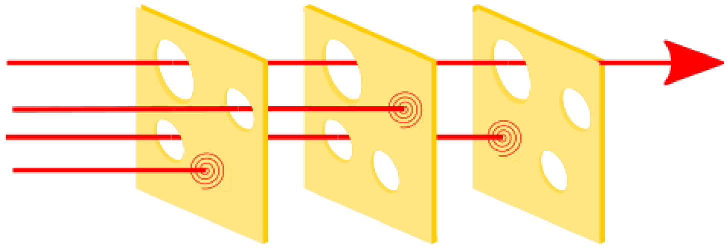

Figure 2: The Swiss Cheese Model of Accident Causation

The Swiss cheese model of accident causation, introduced by James T. Reason in 1990, illustrates how multiple layers of defense can prevent accidents despite inherent weaknesses in each layer, represented as 'holes.' The model depicts three distinct hazard vectors that, when intercepted by the appropriate defenses, can neutralize potential hazards and avert accidents. However, if the imperfections in these defenses align, a hazard may slip through, leading to an accident. This concept emphasizes the need for continuous improvement and maintenance of safety systems and promotes a proactive approach to hazard management. Ultimately, the Swiss cheese model highlights the unpredictable nature of human performance and the flaws in our defenses, encouraging the development of resilient safety cultures that can effectively address unexpected events and reduce accident risks.

4.2 Holes and Slices

The Swiss cheese model illustrates an organization's defenses against failures or accidents through a series of layered barriers, represented as slices of Swiss cheese with characteristic holes. Each slice symbolizes a specific component of safety or risk management, while the holes indicate dynamic weaknesses within these layers. These vulnerabilities fluctuate based on changing organizational conditions and external factors. Failures occur when holes align across slices, creating a pathway for hazards to pass through all defenses, leading to incidents. This alignment is described by James Reason as a "trajectory of accident opportunity," highlighting how potential failures could be prevented if the defenses were more robust, [146], [147], [148], [149] and [150].

Frosch expands on Reason's model using mathematical principles and percolation theory, focusing on a Bethe lattice to analyze the flow of risks and failures in interconnected networks of safety measures. This perspective highlights how vulnerabilities can spread within a system and underscores the importance of ongoing assessment and reinforcement of defenses to prevent catastrophic failures. The Swiss cheese model further emphasizes the need for organizations to maintain vigilant oversight and adaptability in their safety systems, acknowledging that while protective measures are in place, the risk of failure is always present. By fostering a culture of continuous improvement and proactive risk management, organizations can reduce the likelihood of dangerous alignments and enhance resilience against failures, [151].

4.3 Active and Latent Failures in the Swiss Cheese Model

The Swiss Cheese Model, developed by James Reason, offers a comprehensive framework for understanding the causes of accidents and errors. At its core, the model identifies the presence of various types of failures that can converge to cause an accident, including active and latent failures, where active failures refer to immediate, direct events that lead to an accident, whereas latent failures represent underlying, more systemic issues that can also contribute to the accident causation process, [152] and [153].

4.3.1 Active Failures

Active failures are unsafe actions, either intentional or unintentional, that directly lead to accidents or near-misses and can be attributed to particular individuals or groups within a system. In aviation, such failures can manifest as navigation mistakes, poor decision-making, or lack of effective communication among crew members, serving as the immediate causes of an accident.

4.3.2 Latent Failures

Latent failures, often hidden or dormant, are underlying factors that contribute to accidents but are not directly related to the immediate cause, remaining undetected for a significant period of time before an adverse event occurs. These failures encompass the initial three domains of failure in James Reason's model, including human fallibility, inadequate procedures, and organizational factors, and can manifest as inadequate training, incomplete or poorly maintained systems, or ineffective organizational culture and policies.

4.4 The Swiss Cheese Model's Evolution

The Swiss Cheese Model underwent significant development in the late 1980s to early 1990s, during which attempts were made to merge James Reason's multi-layer defense model and Willem Albert Wagenaar's tripod theory of accident causation, resulting in a temporary alteration to the model's representation, where the cheese slices were labeled as active failures, preconditions, and latent failures, but this change ultimately led to confusion and inaccuracies that still persist today, [150], [154], [155], and [156].

4.5 A Correct Understanding of the Swiss Cheese Model

To improve the understanding of accidents, a revised interpretation of the cheese slicer model is proposed. In this updated depiction, the slices of cheese represent barriers that fail to prevent accidents, while the holes signify various causes of failure. These causes of failure are categorized into three main types: immediate causes, which are direct actions or decisions contributing to an accident; preconditions, such as equipment failures or inadequate policies, that facilitate the occurrence of an accident; and underlying causes, which are deeper, often hidden, factors contributing to an accident, including human error, inadequate procedures, and organizational factors. By distinguishing between these types of failures, organizations can identify and address the root causes of accidents proactively, thereby reducing the likelihood of adverse events, [157], [158] and [159].

4.6 Applications of the Framework

The framework has proven to be versatile and effective in various fields, with key applications in aviation safety, engineering, emergency services, and cybersecurity. In aviation, it enhances safety protocols by providing a structured approach to risk management, ensuring safer air travel. In engineering, the framework supports design processes and operational reliability by helping professionals assess and manage risks. Emergency service organizations utilize its principles to improve preparedness and response to crises, optimizing resource use and coordination. Additionally, in cybersecurity, the framework underpins layered security strategies, known as "defense in depth," which help organizations implement multiple security controls to better mitigate risks and combat cyber threats, [160], [161] and [162].

The application of this framework across various sectors enhances safety and efficiency, while also promoting a culture of proactive risk management and continuous improvement, making it a valuable tool for organizations to navigate a rapidly evolving environment, [163].

The model has been utilized in various healthcare sectors to uncover the complex factors contributing to medical errors, such as latent failures caused by similar medication packaging and storage. Such oversights heighten the risk of administering the wrong drug, leading to serious consequences. This research has shifted the understanding of medical errors away from individual failings, highlighting instead the significant influence of systemic issues in healthcare delivery, like unclear labeling, insufficient training, and flawed workflows, which create conditions conducive to mistakes, [164].

The perspective discusses the importance of addressing systemic failures in healthcare rather than blaming individual healthcare professionals for medical errors. Recognizing that such errors stem from complex systemic vulnerabilities can lead to improved safety protocols and a culture of accountability, thereby enhancing patient safety and empowering healthcare workers. The Swiss cheese model, widely adopted in process safety, visually represents the necessity of multiple layers of defenses in preventing accidents, with each slice symbolizing a safety-critical system. This model is particularly relevant in the oil and gas industry, where understanding safety factors is crucial for managing risks and supporting processes like asset integrity management and incident investigation, [155].

Asset integrity management focuses on proactively identifying and controlling hazards that may threaten the safe operation of assets like pipelines and production facilities. The Swiss cheese model is utilized to pinpoint vulnerabilities and implement risk mitigation measures. Similarly, in incident investigations, this model aids in uncovering the factors contributing to an incident, examining the interplay of various systems and cumulative vulnerabilities. Through this analysis, investigators can better understand the root causes of incidents and formulate recommendations to prevent recurrence, [159] and [165].

5. Conclusion

The shipping industry has traditionally prioritized hardware integrity, leading to dependable marine engineering; however, ongoing marine accidents highlight the necessity for a comprehensive safety approach that encompasses more than just technological improvements. This paper presents a Human Factors (HF) guidance package focused on maintenance, using the Erika incident as a case study to exemplify maintenance failures. It calls for the design of maintenance tasks to be simpler and advocates for a strong safety culture through thorough training and risk management. The review elaborates on how maintenance errors, often unnoticed latent failures, can critically endanger safety and maritime trust. Solutions involve clear task designs, user-friendly equipment, and effective communication. Key aviation accidents are referenced to show the consequences of neglecting maintenance, stressing the importance of training and environmental factors in risk mitigation.

To integrate HF principles into maintenance practices, the paper suggests proactive measures like questionnaires and workshops to enhance communication and hazard identification. It emphasizes the vital role of communication, task design, and training in improving safety through a comprehensive HF framework and utilizes the Swiss Cheese Model for understanding accident causation. The review also highlights human error in maintenance across various sectors, particularly in the flour mill and aviation industries, attributing it to inadequate training, poor communication, and substandard equipment design. By advocating for comprehensive training, strong maintenance protocols, and a focus on human factors, the discussion aims to boost safety and operational performance. Through strategic initiatives and regular assessments, industries can minimize risks associated with human errors, leading to enhanced reliability and efficiency in maintenance practices.

References

[1] B.S. Dhillon, Y. Liu, Human error in maintenance: a review, Journal of Quality in Maintenance Engineering 12(1):21-36 (2006).

[2] C.G. Drury, Human Factors in Aircraft Maintenance, New York: RTO AVT (2000). [6] S. H. Begur, J.A. Babu, Human Factors in Aircraft Maintenance, International Advanced Research Journal in Science, Eng and Tech 3(3):14-17 (2016).

[3] D. Pons, K. Dey, Aviation Human Error Modelled as a Production Process, The Ergonomics Open Journal 8(1):1-12 (2015).

[4] B S Dhillon 2014 IOP Conf. Ser.: Mater. Sci. Eng. 65 012031DOI 10.1088/1757-899X/65/1/012031.

[5] Ido Morag, Peter Chemweno, Liliane Pintelon, Mohammad Sheikhalishahi, Identifying the causes of human error in maintenance work in developing countries,

International Journal of Industrial Ergonomics, Volume 68, 2018, Pages 222-230, ISSN 0169-8141.
[6] I.M. Dumitru, M. Boşcoianu, human factors contribution to aviation safety, Brasov: International Conference of Scientific Paper (2015).
[7] Yunos Ngadiman and et al., Relationship between Human Errors in Maintenance and Overall Equipment Effectiveness in Food Industries, Proceedings of the 2016 International Conference on Industrial Engineering and Operations Management Kuala Lumpur, Malaysia, March 8-10, 2016.
[8] Bao, Y., Guo, J., Tang, J., Li, Z., Pang, S., & Guo, C. (2014). Analysis of Power System Operation Reliability Incorporating Human Errors. Paper presented at the 2014 17th International Conference on Electrical Machines and Systems (ICEMS), Hangzhou.
[9] Alsyouf, I. (2007). The role of maintenance in improving companies' productivity and profitability. International Journal of Production Economics, 105(1), 70-78.
[10] Arturo Garza-Reyes, J., Eldridge, S., Barber, K. D., & Soriano-Meier, H. (2010). Overall equipment effectiveness (OEE) and process capability (PC) measures a relationship analysis. International Journal of Quality & Reliability Management, 27(1), 48-62.
[11] D. Virovac, A. Domitrovic, E. Bazijanac, the influence of human factor in aircraft maintenance, Promet – Transport Interaction 257-266 (2017).
[12] J.M. Myszewski, Management responsibility for human errors. The TQM Journal 24(4):326-337 (2012).
[13] J. Reason, Human Error, Cambridge: Cambridge University Press (1990).
[14] N. Siu, Risk Assessment for dynamic systems: an overview, Reliability Engineering Systems Safety 43-73 (1994).
[15] NOPSEMA, Human error risk reduction to ALARP, Perth: National Offshore Petroleum Safety and Environmental Management Authority (2015).
[16] S. H. Begur, J.A. Babu, Human Factors in Aircraft Maintenance, International Advanced Research Journal in Science, Eng and Tech 3(3):14-17 (2016).
[17] D.A. Wiegmann, S.A. Shappell, A Human Error Approach to Aviation Accident Analysis, Burlington: Ashgate (2003).
[18] Dhillon, Bikram. (2014). Human error in maintenance: An investigative study for the factories of the future. IOP Conference Series: Materials Science and Engineering. 65. 012031. 10.1088/1757-899X/65/1/012031.
[19] Dominguez-Péry, C., Vuddaraju, L.N.R., Corbett-Etchevers, I. et al. Reducing maritime accidents in ships by tackling human error: a bibliometric review and research agenda. J. shipp. trd. 6, 20 (2021).
[20] Grech, Michelle & Horberry, Tim & Smith, Andrew. (2002). Human Error in Maritime Operations: Analyses of Accident Reports Using the Leximancer Tool. Proceedings of the Human Factors and Ergonomics Society Annual Meeting. 46. 10.1177/154193120204601906.
[21] Javier Sánchez-Beaskoetxea, Imanol Basterretxea-Iribar, Iranzu Sotés, María de las Mercedes Maruri Machado, Human error in marine accidents: Is the crew normally to blame? Maritime Transport Research, Volume 2, 2021, 100016, ISSN 2666-822X.
[22] Che Ishak, Ismila & Azlan, Mohamad & Ismail, Shaiful & Mohd Zainee, Norhayati. (2019). A study of human error factors on maritime accident rates in maritime industry. Asian Academy of Management Journal. 24. 17-32. 10.21315/aamj2019.24. s2.2.
[23] Krzysztof Wróbel, Searching for the origins of the myth: 80% human error impact on maritime safety, Reliability Engineering & System Safety, Volume 216, 2021, 107942, ISSN 0951-8320.
[24] James Reason and Alan Hobbs 'Managing Maintenance Error, A Practical Guide' Ashgate 2003.
[25] Maternová, A., Materna, M., Dávid, A., Török, A., & Švábová, L. (2023). Human Error Analysis and Fatality Prediction in Maritime Accidents. Journal of Marine Science and Engineering, 11(12), 2287.

[26] Bea R. (1999). Risk Assessment & Management (RAM) of Marine Systems: Past, Present, Future. Paper presented at the Proceedings of the State-of-the-Art Pipeline Risk Management Conference, Perth, Western Australia.
[27] Caridis P. (1999). Casualty Analysis Methodology for Maritime Operations (Final Report for Publication C01.FR.003). Athens.
[28] Roth Blum, A. 'Human Error and Marine Safety', U.S. Maritime Human Factors Conference, 2000.
[29] Card, J. C., Baker, C. C., McSweeny, K. P., and McCafferty, D. B. 'Human Factors in Classification and Certification' SNAME Marine Technology Conference and Expo, 2005.
[30] Kapoor, Mrs & Maxwell, Amita. (2019). SHIPPING COMPANY AND HUMAN RESOURCE PERFORMANCE MANAGEMENT. Review of Research. 8. 1-4.
[31] CAP 716 Aviation Maintenance Human Factors (EASA /JAR145 Approved Organizations) Safety Regulation group CAA 2003.
[32] Drury, Colin. (2001). Human Factors in Aircraft Maintenance. 9.
[33] Kara A Latorella, Prasad V Prabhu, A review of human error in aviation maintenance and inspection, International Journal of Industrial Ergonomics, Volume 26, Issue 2, 2000, Pages 133-161, ISSN 0169-8141.
[34] Shanmugam, A. & Robert, T., (2015). Human factors engineering in aircraft maintenance: A review. Journal of Quality in Maintenance Engineering. 21. 478-505. 10.1108/JQME-05-2013-0030.
[35] Anand K Gramopadhye, Colin G Drury, Human factors in aviation maintenance: how we got to where we are, International Journal of Industrial Ergonomics, Volume 26, Issue 2, 2000, Pages 125-131, ISSN 0169-8141.
[36] Cullen, L., (2007). Human factors integration – Bridging the gap between system designers and end-users: A case study. Safety Science. 45. 621-629. 10.1016/j.ssci.2007.01.002.
[37] Greig, Michael & Village, Judy & Dixon, Shane & Salustri, Filippo & Neumann, W., (2019). Assessing human factors and ergonomics capability in organizations - The Human Factors Integration Toolset. Ergonomics. 62. 1-30. 10.1080/00140139.2019.1572228.
[38] Patrick Waterson, Stephven Lemalu Kolose, Exploring the social and organizational aspects of human factors integration: A framework and case study, Safety Science, Volume 48, Issue 4, 2010, Pages 482-490, ISSN 0925-7535.
[39] Aukstakalnis, S. (2016). Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR. 1st ed. Boston, MA: Addison-Wesley Professional.
[40] Arkes, H. R., and Blumer, C. (1985). The psychology of sunk cost. Organ. Behav. Hum. Decis. Process. 35, 124–140. doi: 10.1016/0749-5978(85)90049-4.
[41] HSE publication 'Improving maintenance a guide to reducing error', HMSO, Norwich. 2000.
[42] Improving Maintenance—a Guide to Reducing Human Error. (2003). Safety and Reliability, 23(3), 36–42.
[43] Bennett, Simon. (2004). Managing Maintenance Error: A Practical Guide. Risk Management. 6. 69-71. 10.1057/palgrave.rm.8240174.
[44] Reason, James & Hobbs, Alan. (2017). Managing Maintenance Error: A Practical Guide. 10.1201/9781315249926.
[45] Sasitharan, D., & Mad Lazim, H. (2020). HUMAN ERRORS IN MAINTENANCE ACTIVITIES: AN OVERVIEW OF SOME CONTRIBUTING FACTORS AND PLANS TO MITIGATE THEIR EFFECTS. Journal of Technology and Operations Management, 11(1), 27–37.
[46] Cheryl Haslam, Jane O'Hara, Aadil Kazi, Ricardo Twumasi, Roger Haslam, Proactive occupational safety and health management: Promoting good health and good business, Safety Science, Volume 81, 2016, Pages 99-108, ISSN 0925-7535.

[47] Oboh, Innocent & Akpan, Anietie & Joshua, Adam & Emberru, Ruth Ekperiware & Onoriode, Augustina. (2023). Proactive Process Safety Management - Key to the Prevention of Incidents in Industry. Journal of Engineering Research and Reports. 25. 31-40. 10.9734/jerr/2023/v25i5909.
[48] Bahukhandi, kanchan Deoli. (2018). Accident Prevention and Control - An Overview of Literature. 7.
[49] Dyreborg J, Lipscomb HJ, Nielsen K, Törner M, Rasmussen K, Frydendall KB, Bay H, Gensby U, Bengtsen E, Guldenmund F, Kines P. Safety interventions for the prevention of accidents at work: A systematic review. Campbell Syst Rev. 2022 Jun 1;18(2): e1234. doi: 10.1002/cl2.1234. PMID: 36911341; PMCID: PMC9159701.
[50] Santos, J. V., & Martins, R. A. (2015). Sistema de gestão de risco aplicado a gestão de ativos. In Anais do 30º Congresso Brasileiro de Manutenção e Gestão de Ativos (pp. 1-16). Rio de Janeiro: ABRAMAN.
[51] Bristot, V. M., Schaeffer, L., & Gruber, V. (2012). Manutenção preditiva em indústria de revestimento cerâmicos. Cerâmica Industrial, 17(1), 29-35.
[52] Hick, H., Angel, HF., Kranabitl, P., Wagner-Skacel, J. (2021). Decision-Making and the Influence of the Human Factor. In: Hick, H., Küpper, K., Sorger, H. (eds) Systems Engineering for Automotive Powertrain Development. Powertrain. Springer, Cham.
[53] "Human Decision Making." National Research Council. 1983. Research Needs for Human Factors. Washington, DC: The National Academies Press. doi: 10.17226/759.
[54] Lehto, M.R., Nanda, G. and Nanda, G. (2021). DECISION-MAKING MODELS, DECISION SUPPORT, AND PROBLEM SOLVING. In Handbook of Human Factors and Ergonomics (eds G. Salvendy and W. Karwowski).
[55] Vasquez HM, Pianarosa E, Sirbu R, Diemert LM, Cunningham HV, Donmez B, Rosella LC. Human factors applications in the design of decision support systems for population health: a scoping review. BMJ Open. 2022 Apr 1;12(4): e054330. doi: 10.1136/bmjopen-2021-054330. PMID: 35365524; PMCID: PMC8977763.
[56] Moura, Raphael & Patelli, Edoardo & Lewis, John & Morais, Caroline & Beer, Michael. (2017). Human factors influencing decision-making: Tendencies from first-line management decisions and implications to reduce major accidents. 44-44. 10.1201/9781315210469-34.
[57] National Academies of Sciences, Engineering, and Medicine. 1983. Research Needs for Human Factors. Washington, DC: The National Academies Press.
[58] Seongkeun Kang, Jaemyung Yu, Poong Hyun Seong, Development of a decision-making support system for the technical support center based on analysis of human performance under severe accident situation, Annals of Nuclear Energy, Volume 166, 2022, 108702, ISSN 0306-4549.
[59] Hapeshi, K., Jones, D.M., Frankish, C.R. (1987) Human factors aspects of template training. Proc. European Conference on Speech Technology, 2397-2400, doi: 10.21437/ECST.1987-204.
[60] Li, Wen-Chin & Harris, Donald & Hsu, Yueh-Ling & Li, Lon-Wen. (2009). The Application of Human Error Template (HET) for Redesigning Standard Operational Procedures in Aviation Operations. 547-553. 10.1007/978-3-642-02728-4_58.
[61] Wiegmann DA, Wood LJ, Solomon DB, Shappell SA. Implementing human factors approach to RCA2: Tools, processes and strategies. J Health Risk Manag. 2021 Jul;41(1):31-46. doi: 10.1002/jhrm.21454. Epub 2020 Dec 19. PMID: 33340179; PMCID: PMC8213862.
[62] Privitera, M. (2020) Human Factors/Ergonomics (HFE) in Leadership and Management: Organizational Interventions to Reduce Stress in Healthcare Delivery. Health, 12, 1262-1278. doi: 10.4236/health.2020.129091.
[63] Salmon, Paul & Stanton, Neville. (2003). Human Factors Design Methods Review Authors.
[64] Licht, Deborah & Polzella, Donald & Boff, Kenneth & Armstrong, Harry. (1989). Human Factors, Ergonomics, and Human Factors Engineering: An Analysis of Definitions. 10.13140/RG.2.1.4367.3365.

[65] Henriksen K, Dayton E, Keyes MA, Carayon P, Hughes R. Understanding Adverse Events: A Human Factors Framework. In: Hughes RG, editor. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Apr. Chapter 5. PMID: 21328766.
[66] D. Chandrasegaran, R.A.R. Ghazilla, Karl Rich, Human factors engineering integration in the offshore O&G industry: A review of current state of practice, Safety Science, Volume 125, 2020, 104627, ISSN 0925-7535.
[67] Gosbee J. Human factors engineering and patient safety. Qual Saf Health Care. 2002 Dec;11(4):352-4. doi: 10.1136/qhc.11.4.352. PMID: 12468696; PMCID: PMC1758019.
[68] Ronco, P. G. (1963). A Bibliography and Overview of Human Factors Reference Works. Human Factors, 5(6), 549-568.
[69] INTERNATIONAL ATOMIC ENERGY AGENCY, Human Factors Engineering Aspects of Instrumentation and Control System Design, IAEA Nuclear Energy Series No. NR-T-2.12, IAEA, Vienna (2021).
[70] Vossen, Christina & Kleppe, Robert & Hjørungnes, Siv. (2013). Ship Design and System Integration.
[71] Najafi, Moslem & Rashidi, Ali. (2024). Designing for Ship Maintainability: Principles and Approaches.
[72] Donaire, F., Durán, O., Vergara, J. I., & Arata, A. (2024). Maintainability Assessment during the Design Phase: Integrating MTA and UNE 151001. Machines, 12(7), 483.
[73] Latorella, Kara & Prabhu, Prasad. (2017). A review of human error in aviation maintenance and inspection. 10.4324/9781315092898-27.
[74] Olaganathan, Rajee. (2024). Human factors in aviation maintenance: understanding errors, management, and technological trends. Global Journal of Engineering and Technology Advances. 18. 092-101. 10.30574/gjeta.2024.18.2.0021.
[75] Kamaleshaiah Mathavara and Guruprasad Ramachandran, Role of Human Factors in Preventing Aviation Accidents: An Insight. Submitted: 15 June 2022 Reviewed: 01 August 2022 Published: 07 September 2022. DOI: 10.5772/intechopen.106899.
[76] Adya, M., & Lusk, E. J. (2016). Development and validation of a rule-based time series complexity scoring technique to support design of adaptive forecasting DSS. Decision Support Systems.
[77] Almgren, J., & Schaurig, C. (2011). The influence of production ergonomics on product quality.
[78] Arnold, J. M., Javorcik, B., Lipscomb, M., & Mattoo, A. (2015). Services reform and manufacturing performance: Evidence from India. The Economic Journal.
[79] Caron, D. J., & Kellerhals, A. (2013). Archiving for self-ascertainment, identity-building and permanent self-questioning: archives between scepticism and certitude. Archival Science, 13(2-3), 207-216.
[80] Gasaway, R. B. (2013). Situational Awareness for Emergency Response: Fire Engineering Books.
[81] Graeber, R.C., Marx, D.A., 1993. Reducing human error in aircraft maintenance operations. In: Proceedings of the Flight Safety Foundation International Federation of Airworthiness46th Annual International Air Safety Seminar. Flight Safety Foundation, Arlington, VA, pp. 147 –160.
[82] Rashid, Hamad & Place, Simon & Braithwaite, G., (2012). Investigating the investigations: A retrospective study in the aviation maintenance error causation. Cognition, Technology & Work. 15. 10.1007/s10111-011-0210-7.
[83] Khan, Fatima Najeeb, Ayiei, John Murray, Glenn Baxter, and Graham Wild. "A Preliminary Investigation of Maintenance Contributions to Commercial Air Transport Accidents." Aerospace 7, no. 9 (September 2, 2020): 129.

[84] Newman, David G. "Factors Contributing to Accidents During Aerobatic Flight Operations." Aerospace Medicine and Human Performance 92, no. 8 (August 1, 2021): 612–18.
[85] Vuorio, Alpo, Robert Bor, Antti Sajantila, Anna-Stina Suhonen-Malm, and Bruce Budowle. "Commercial Aircraft-Assisted Suicide Accident Investigations Re-Visited—Agreeing to Disagree?" Safety 9, no. 1 (March 12, 2023): 17.
[86] Wild, Graham. "A Quantitative Study of Aircraft Maintenance Accidents in Commercial Air Transport." Aerospace 10, no. 8 (July 31, 2023): 689.
[87] Janie, Dyah Nirmala Arum, Tri Agustin Fatmasari, Yulianti, and Abdul Karim. "Capital market reactions to commercial aircraft accidents." In Facing Global Digital Revolution, 191–94. Boca Raton: CRC Press, Taylor & Francis Group, [2020] | "Proceedings of the 1st International Conference on Economics, Management, and Accounting (BES 2019), July 10, 2019, Semarang, Indonesia" -- Title page.: Routledge, 2020.
[88] Strauch, B., Sandler, C.E., 1984. Human factors considerations in aviation maintenance. In: Proceedings of the Human Factors 28th Annual Meeting. Human Factors and ErgonomicsSociety, Santa Monica, CA, pp. 913 –915.
[89] National Transportation Safety Board, 1992. Aircraft Accident Report, Continental Express, Flight 135, Embraer 120, N33701, Eagle Lake, TX, September 11, 1991, (NTSB/AAR-92-04). National Transportation Safety Board, Washington, DC.
[90] Shepherd, W.T., Johnson, W.B., 1995. Human factors in airline maintenance and inspection, In: Proceedings of the International Air Transport Association Maintenance Meeting. International Air Transport Association, Montreal, Canada.
[91] National Transportation Safety Board, 1990. Aircraft Accident Report, United Airlines, Flight 232, McDonnell Douglas, DC-10, Sioux Gateway Airport, Sioux City, Iowa, July 19,1989, (NTSB/AAR-90-06). National Transportation Safety Board, Washington, DC.
[92] Reason, J. Maddox, M.E. 1995. Human error. In: Human Factors Guide for Aviation Maintenance. U.S. Department of Transportation, Washington, DC (Chapter 14).
[93] Drury, C.G., 1996. Automation in quality control and maintenance. In: Parasuraman, R., Mouloua, M. (Eds.), Automation and Human Performance: Theory and Applications. Lawrence Erlbaum Associates, Mahwah, NJ, pp. 407 – 426.
[94] Hagemaier, D., 1989. Nondestructive testing of aging aircraft. In: Proceedings of the Second Annual International Conference on Aging Aircraft. Federal Aviation Administration, Washington, DC, pp. 186 – 198.
[95] Goranson, U.G., 1989. Continuing airworthiness of aging jet transports. In: Proceedings of the Second Annual International Conference on Aging Aircraft. Federal Aviation Administration, Washington, DC, pp. 61 – 89.
[96] Nader, R., Smith, W.J., 1994. Collision Course. TAB Books, Blue Ridge Summit, PA.
[97] National Transportation Safety Board, 1993b. Aircraft Accident Report, Japan Airlines, Inc., Flight 46E, B-747-121, N473EV, Anchorage, Alaska, March 31, 1993, (NTSB/AAR-93-033). National Transportation Safety Board, Washington, DC.
[98] Gregory, W., 1993. Maintainability by design. In: Proceedings of the Fifth Annual Society of Automotive Engineers: Reliability, Maintainability, and Supportability Workshop. Society of Automotive Engineers, Warrendale, PA.
[99] Ruffner, J.W., 1990. A Survey of Human Factors Methodologies and Models for Improving the Maintainability of Emerging Army Aviation Systems. US Army Research Institute for the Behavioral and Social Sciences, Arlington, VA.
[100] A. Hobbs, An Overview of Human Factors in Aviation Maintenance, Canberra City: Australian Transport Safety Bureau (2008).

[101] Karen B. Marais, Matthew R. Robichaud, Analysis of trends in aviation maintenance risk: An empirical approach, Reliability Engineering & System Safety, Volume 106, 2012, Pages 104-118, ISSN 0951-8320.
[102] Helmreich RL. On error management: lessons from aviation. BMJ. 2000 Mar 18;320(7237):781-5. doi: 10.1136/bmj.320.7237.781. PMID: 10720367; PMCID: PMC1117774.
[103] J. C. Williams, HEART – a proposed method for achieving high reliability in process operation by means of human factors engineering technology, Safety and Reliability 35(3) (2015) 5 – 25.
[104] Technical Basis and Implementation Guidelines for a Technique for Human Event Analysis (ATHEANA). NUREG-1624, Division of Risk Analysis and Applications. Office of Nuclear Regulatory Research, US NRC, Washington DC, 2000.
[105] O. Kozhokhina, V. Gribov, S. Rudas, Analytical model of air navigation system operator reliability, in: Proceedings of the IEEE 3rd International Conference on Methods and System of Navigation and Motion Control (MSNMC), Kyiv, 2014, pp. 170–174.
[106] O. Kozhokhina, V. Gribov, S. Rudas, Structural reliability of air traffic controllers, Proceedings of the National Aviation University 4(61) (2014) 50–56.
[107] Guo-Feng Liang, Jhih-Tsong Lin, Sheue-Ling Hwang, Eric Min-yang Wang, Patrick Patterson, preventing human errors in aviation maintenance using an on-line maintenance assistance platform, International Journal of Industrial Ergonomics,
Volume 40, Issue 3, 2010, Pages 356-367, ISSN 0169-8141.
[108] A. DiDomenico et al. Interactive effects of mental and postural demands on subjective assessment of mental workload and postural stability Safety Science (2005).
[109] S. Drivalou et al. Supporting skill-, rule-, and knowledge-based behaviour through an ecological interface: an industry-scale application International Journal of Industrial Ergonomics (2009).
[110] G. Funke et al. The effects of cognitive processing load and collaboration on team performance in a simulated command and control environment International Journal of Industrial Ergonomics (2009).
[111] E.K. O'Neal et al., Effects of work in a hot environment on repeated performances of multiple types simple mental tasks International Journal of Industrial Ergonomics (2010).
[112] Nimgade, Namrata R., and R. K. Kamble. "Flour Mill Workers Occupational Noise Exposure in Chandrapur City, Central India." International Journal of Environment 7, no. 1 (October 12, 2018): 1–13.
[113] P., Seema, Shashi Kumar M., and Deepthi R. "Screening of flour mill workers for respiratory morbidities: a cross-sectional study in rural Bangalore." International Journal of Community Medicine and Public Health 7, no. 6 (May 27, 2020): 2216.
[114] BOCHKOVSKYI, A. P. "MODERN ISSUES OF LABOR SAFETY DEVELOPMENT AND PROMISING WAYS OF THEIR SOLUTION." Grain Products and Mixed Fodder's 18, no. 3 (October 23, 2018): 4–10.
[115] Veber, A. L., S. A. Leonova, N. P. Zhdaneeva, and T. A. Nikiforova. "Development of measures to ensure the quality and safety of the production of bread from wheat flour using a dispersion of sprouted peas and beans of domestic selection." Khleboproducty 30, no. 1 (2021): 44–51.
[116] Półka, Marzena, and Szymon Ptak. "Preventing Air Pollution Connected to the Explosion of Different Types of Flours in Dedicated Storage and Transportation Systems." Sustainability 11, no. 24 (December 17, 2019): 7256.
[117] Lonsky, O. V., and M. Yu Liskova. "Safety issues in the crushing and sorting mills of quarries based on the results of forensic technical examinations." Mining informational and analytical bulletin, no. 3-1 (March 20, 2020): 116–26.
[118] Amir, Khanlari & Mohammadi, Kaveh & Sohrabi, Babak. (2008). Prioritizing equipment for preventive maintenance (PM) activities using fuzzy rules. Computers & Industrial Engineering. 54. 169-184. 10.1016/j.cie.2007.07.002.

[119] Wahyukaton, (2020). Preventive Maintenance Scheduling for Shifter Machine in Flour Mills. IOP Conference Series: Materials Science and Engineering. 847. 012031. 10.1088/1757-899X/847/1/012031.
[120] R. Keith Mobley, MAINTENANCE FUNDAMENTALS, 2nd Edition, Elsevier Butterworth–Heinemann, 200-Wheeler Road, Burlington, MA 01803, USA, Linacre House, Jordan Hill, Oxford OX2 8DP, UK, Copyright # 2004, Elsevier Inc. All rights reserved.
[121] SIKA, VINCENT WARIMA, PLANT MAINTENANCE STRATEGIES USED BY LARGE MANUFACTURING FIRMS IN KENYA, A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF BUSINESS ADMINISTRATION (MBA), SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI, OCTOBER, 2014.
[122] Poduval, P. S., Pramod, V. R &Jagathy, R. V. P (2013). "Barriers in TPM Implementation in Industries" International Journal of Scientific & Technology research, volume 2, Issue 5, may 2013.
[123] Ahmed, S. R., Karuddi, I. Azid&Almanar I. (2011). "Maintenance management decision model on preventive maintenance on production equipment)", Journal on industrial engineering 7 (13), 22 – 34 spring 2011.
[124] Peniak, Klaudia & Nowacki, Krzysztof. (2023). Work Safety in the Mill - Case Study. Agricultural Engineering. 27. 135-145. 10.2478/agriceng-2023-0010.
[125] Özbakır, Okan. (2024). Occupational health and safety in flour Mills: A research and risk assessment. International Journal of Agriculture Environment and Food Sciences. 8. 446-459. 10.31015/jaefs.2024.2.18.
[126] gage, fran. "Wheat into Flour: A Story of Milling." Gastronomica 6, no. 1 (2006): 84–92.
[127] Magomedov, M. D., and V. V. Stroyev. "IMPROVING THE TECHNICAL LEVEL OF AGRICULTURAL AND FLOUR MILLS AS A DIRECTION OF INCREASING EXPORTS WHEAT AND ITS PROCESSED PRODUCTS." Scientific Journal ECONOMIC SYSTEMS 13, no. 2 (2020): 124–34.
[128] Martin, Randall, Kaliramesh Siliveru, Jason Watt, Paul Blodgett, and Sajid Alavi. "Pilot Scale Roller Milling of Chickpeas into a De-Hulled Coarse Meal and Fine Flour." Processes 10, no. 11 (November 9, 2022): 2328.
[129] Kalitsis, John. "A Multi-Stream Quality Monitoring and Control System for Flour Mills." Thesis, The University of Sydney, 2022.
[130] Yildiz, Serkan & Apakhan, Murat & Aksoy, Muharrem. (2024). Cost-Effectiveness of an Automatic Lubrication System for Bearings. 199-209. 10.1007/978-3-031-51494-4_18.
[131] Xu, Funing & Ding, Ning & Li, Nan & Liu, Long & Hou, Nan & Xu, Na & Guo, Wei-min & Tian, Linan & Xu, Huixia & Wu, Lawrence & Wu, Xiaofeng & Chen, Xiangfeng. (2023). A Review of Bearing Failure Modes, Mechanisms and Causes. Engineering Failure Analysis. 152. 107518. 10.1016/j.engfailanal.2023.107518.
[132] M.D.M. Neves, A.H.P. Andrade, D.N. Silva, Analysis of the criticality of flaws found in trunnion of grinding ball mills used in mining plants, Engineering Failure Analysis, Volume 61, 2016, Pages 28-36, ISSN 1350-6307.
[133] Spanrad, S. & Tong, J., (2011). Characterization of foreign object damage (FOD) and early fatigue crack growth in laser shock peened Ti–6Al–4V aerofoil specimens. Materials Science and Engineering: A. 528. 2128-2136. 10.1016/j.msea.2010.11.045.
[134] ZHAO, Zhenhua & WANG, Lingfeng & LU, Kainan & LI, Yongjian & CHEN, Wei & Liu, Lulu. (2020). Effect of foreign object damage on high-cycle fatigue strength of titanium Alloy for aero-engine blade. Engineering Failure Analysis. 118. 104842. 10.1016/j.engfailanal.2020.104842.
[135] Payne K, O'Bryan CA, Marcy JA, Crandall PG. Detection and prevention of foreign material in food: A review. Heliyon. 2023 Sep 4;9(9): e19574. doi: 10.1016/Heliyon. 2023.e19574. PMID: 37809834; PMCID: PMC10558841.

[136] Fistes, Aleksandar & Tanovic, Gavrilo. (2013). The effect of using the drum detachers in the industrial wheat flour mills. Acta Periodica Technologica. 44. 49-56. 10.2298/APT1344049F.
[137] Doblado-Maldonado, Andrés & Pike, Oscar & Sweley, Jess & Rose, Devin. (2012). Key issues and challenges in whole wheat flour milling and storage. Journal of Cereal Science. 56. 119–126. 10.1016/j.jcs.2012.02.015.
[138] Meng Ma, Qing-Jie Sun, Man Li, Ke-Xue Zhu, Deterioration mechanisms of high-moisture wheat-based food – A review from physicochemical, structural, and molecular perspectives, Food Chemistry, Volume 318, 2020, 126495, ISSN 0308-8146.
[139] Sarkar, A., & Fu, B. X. (2022). Impact of Quality Improvement and Milling Innovations on Durum Wheat and End Products. Foods, 11(12), 1796.
[140] M.D., Pradeep, Safety First is Safety Always – Opportunities and Challenges on Safety Management of Hazardous Employments in India (June 16, 2019). International Journal of Management, Technology, and Social Sciences (IJMTS), Vol. 4, No. 1, June 2019.
[141] Chapter 3 - Machinery Component Failure Analysis, Editor(s): Heinz P. Bloch, Fred K. Geitner, Practical Machinery Management for Process Plants, Gulf Professional Publishing, Volume 2, 1999, Pages 79-256, ISSN 1874-6942, ISBN 9780884156628.
[142] Bhagat, Ali & Siddiqui, Fida Hussain & Khahro, Shabir & Khoso, Ali & Ali, Tauha. (2017). Health Issues of Flour Milling Industry Workmen.
[143] Elghazally, S.A., Zayet, H.H., Elkholy, M.M. et al. Assessment of respiratory health status of workers in flour mills of Assiut. Egypt J Bronchol 17, 32 (2023).
[144] Reason, James (1990-04-12). "The Contribution of Latent Human Failures to the Breakdown of Complex Systems". Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences. 327 (1241): 475–84. Bibcode:1990RSPTB. 327.,475R. doi:10.1098/rstb.1990.0090. JSTOR 55319. PMID 1970893.
[145] "Revisiting the Swiss cheese model of accidents". Euro control. October 2006.
[146] Reason, James (1990). Human Error. New York, N.Y.: Cambridge University Press. ISBN 978-0-521-30669-0.
[147] Daryl Raymond Smith; David Frazier; L W Reithmaier & James C Miller (2001). Controlling Pilot Error. McGraw-Hill Professional. p. 10. ISBN 0071373187.
[148] Jo. H. Wilson; Andrew Symon; Josephine Williams & John Tingle (2002). Clinical Risk Management in Midwifery: the right to a perfect baby? Elsevier Health Sciences. pp. 4–6. ISBN 0750628510.
[149] Tim Amos & Peter Snowden (2005). "Risk management". In Adrian J. B. James; Tim Kendall & Adrian Worrall (eds.). Clinical Governance in Mental Health and Learning Disability Services: A Practical Guide. Gaskell. p. 176. ISBN 1904671128.
[150] Stranks, J. (2007). Human Factors and Behavioral Safety. Butterworth-Heinemann. pp. 130–31. ISBN 9780750681551.
[151] Robert A. Frosch (2006). "Notes toward a theory of the management of vulnerability". In Philip E Auerswald; Lewis M Branscomb; Todd M La Porte; Erwann Michel-Kerjan (eds.). Seeds of Disaster, Roots of Response: How Private Action Can Reduce Public Vulnerability. Cambridge University Press. p. 88. ISBN 0521857961.
[152] Wiegmann DA, Wood LJ, Cohen TN, Shappell SA. Understanding the "Swiss Cheese Model" and Its Application to Patient Safety. J Patient Saf. 2022 Mar 1;18(2):119-123. doi: 10.1097/PTS.0000000000000810. PMID: 33852542; PMCID: PMC8514562.
[153] Reason, J. & Hollnagel, Erik & Pariès, Jean. (2006). Revisiting the “Swiss Cheese” Model of Accidents. Journal of Clinical Engineering. 27. 110-115.
[154] Wiles, Siouxsie (22 October 2020). "Siouxsie Wiles & Toby Morris: Covid-19 and the Swiss cheese system". The Spinoff. Retrieved 28 October 2020.

[155] CCPS in association with Energy Institute (2018). Bow Ties in Risk Management: A Concept Book for Process Safety. New York, N.Y. and Hoboken, N.J.: AIChE and John Wiley & Sons. ISBN 9781119490395.
[156] Olson, Jay A.; Raz, Amir (2021). "Applying insights from magic to improve deception in research: The Swiss cheese model". Journal of Experimental Social Psychology. 92: 104053. doi: 10.1016/j.jesp.2020.104053. S2CID 228919455.
[157] Shabani, Tapiwa & Jerie, Steven & Shabani, Takunda. (2023). A comprehensive review of the Swiss cheese model in risk management. Safety in Extreme Environments. 6. 1-15. 10.1007/s42797-023-00091-7.
[158] Perneger TV. The Swiss cheese model of safety incidents: are there holes in the metaphor? BMC Health Serv Res. 2005 Nov 9; 5:71. doi: 10.1186/1472-6963-5-71. PMID: 16280077; PMCID: PMC1298298.
[159] Arnold van Huis, Birgit Rumpold, Strategies to convince consumers to eat insects? A review, Food Quality and Preference, Volume 110, 2023, 104927, ISSN 0950-3293.
[160] Kalitsis, John & Minasny, Budiman & Quail, Ken & Mcbratney, Alex. (2021). Application of Response Surface Methodology for Optimization of Wheat Flour Milling Process. Cereal Chemistry. 98. 10.1002/cche.10474.
[161] Williams, Gregory & Rosentrater, Kurt. (2007). Design Considerations for the Construction and Operation of Flour Milling Facilities. Part I: Planning, Structural, and Life Safety Considerations. 10.13031/2013.23453.
[162] Pagani, M.A., Marti, A. and Bottega, G. (2014). Wheat Milling and Flour Quality Evaluation. In Bakery Products Science and Technology (eds W. Zhou, Y.H. Hui, I. De Leyn, M.A. Pagani, C.M. Rosell, J.D. Selman and N. Therdthai).
[163] Taylor, G. A.; Easter, K. M.; Hegney, R. P. (2004). Enhancing Occupational Safety and Health. Elsevier. pp. 140–41, 147–53, 241–45. ISBN 0750661976.
[164] Patricia Hinton-Walker; Gaya Carlton; Lela Holden & Patricia W. Stone (2006-06-30). "The intersection of patient safety and nursing research". In Joyce J. Fitzpatrick & Patricia Hinton-Walker (eds.). Annual Review of Nursing Research Volume 24: Focus on Patient Safety. Springer Publishing. pp. 8–9. ISBN 0826141366.
[165] Thomas Lubnau II; Randy Okray & Thomas Lubnau (2004). Crew Resource Management for the Fire Service. PennWell Books. pp. 20–21. ISBN 1593700067.