

# Enhancing Industrial Safety in India: The Imperative for Robust Safety Management System

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**Abstract-** In India, industrial safety remains a prominent concern, characterized by a distressingly high incidence of worker fatalities and injuries. Safety Management Systems (SMS) hold the potential to mitigate the risk of accidents, yet their effective implementation faces significant challenges, particularly within small and medium-sized enterprises (SMEs) due to limited resources and awareness. Predictive models like regression analysis and Data-driven Systematic Accident Models (DSAMs) can be valuable tools for identifying risk factors and enhancing safety measures. Nonetheless, the success of an SMS hinges on its proper integration, and issues such as a lack of employee engagement and commitment can impede the development of a robust safety culture. The unwavering commitment of top management to safety initiatives is pivotal, and organizations should consider introducing incentives and engage in proactive discussions with employees regarding safety concerns. Moreover, innovative approaches such as safety intelligence and sensor-based safety management systems hold promise in bolstering safety management efforts. While the implementation of these methods may pose challenges due to their complexity, the potential benefits, including the reduction of accidents and the improvement of safety performance, make them worthwhile endeavors.

**Index Terms-** Industrial Safety, Safety Management System, Safety Intelligence, Safety performance.

## I. INTRODUCTION

In India, industrial safety is a paramount concern for both management and the government. Disturbingly, statistics from the first half of 2022 reveal that 199 workers lost their lives, and 348 were injured, as reported by IndustriAll. This translates to a tragic average of three worker fatalities and eleven injuries every single day within Indian factories, based on data gathered from the Ministry of Labour and Employment's Directorate General Factory Advice Service and Labour Institutes (DGFASLI). It is important to note that these figures pertain solely to registered factories, while more than 80% of the workforce is engaged in the unregistered informal sector.

The motivation for workers to engage in high-risk occupations is closely tied to an industry's compliance with the safety regulations recommended by the government. Occupational safety predominantly hinges on the active implementation of a safety management system (SMS), which is designed to minimize or prevent accidents. In essence, the quality of management directly correlates with safety within industries. Unfortunately, safety often becomes a priority for management only after an accident occurs and is sometimes viewed as secondary to the core profit-generating processes.

Safety management systems can generally be categorized into two types, as outlined by Provan in 2020[1]. "Safety I" entails centralized procedures where management dictates the steps to achieve safety goals. In contrast, "Safety II" involves a decentralized approach where workers adapt to their working conditions to maximize safety with the available resources and facilities. Notably, many small and medium-sized enterprises (SMEs) have been found to lack adequate safety management practices. Factors driving the implementation of these practices include market competitiveness, increased efficiency, risk reduction, and compliance with stringent regulations. Conversely, challenges such as financial constraints, insufficient awareness, resistance to change, and inadequate employee training are significant barriers to their adoption[2].

Accident rate predictions often rely on the implementation of safety management systems and the level of worker engagement, both independently and in combination[3]. Regression models are commonly employed for accident prediction, wherein dependent and independent variables are identified and analyzed. Another approach involves Data-driven Systematic Accident Models (DSAMs), which operate sequentially and systematically utilize precursor data to quantitatively estimate the likelihood of future accidents. DSAMs also offer insights into the failure probabilities of safety barriers and the prediction of future outcomes[4].

## II. CHALLENGES IN ENFORCING SAFETY MANAGEMENT SYSTEM

A Safety Management System (SMS) has the potential to serve as a tool for establishing organizational legitimacy. However, it's important to recognize that simply having an SMS documented on paper and implementing it to meet regulatory requirements may not always yield the expected outcomes. When similar functions and recurring tasks within the SMS are not seamlessly integrated, it can lead to breakdowns in the system. Such breakdowns can result in reduced confidence in both the SMS itself and the authorities responsible for its enforcement. Moreover, it can increase the workload and administrative burden, ultimately diminishing the overall effectiveness of the SMS[5].

Creating a positive safety culture is paramount for the successful implementation of an SMS, while the absence of such a culture can pose a significant obstacle. One major challenge faced by management systems is the limited participation and engagement of employees. Encouraging employees to be actively involved and increasing their awareness can be difficult due to a lack of confidence in these practices. Without a strong commitment to improving safety rooted in the organization's values and beliefs, gaining employee

support for safety initiatives can be challenging. The effectiveness of an SMS and its practices in reducing accident rates hinges on the degree of safety-focused cognitive and emotional engagement exhibited by workers. Research suggests that if an organization does not prioritize safety, employees and subunits may feel disconnected from the larger system. Consequently, they may hesitate to take on safety responsibilities, blame others, including colleagues, other departments, and top management, and resist any attempts at change. This can result in negative attitudes towards safety and hinder the overall safety culture within the organization.

The commitment to safety demonstrated by top management can significantly influence various aspects of an organization's safety culture. This includes the willingness of employees to report safety incidents, the organization's ability to learn from such incidents, the presence of a fair and just culture, and the organization's adaptability to evolving safety needs. Ultimately, a positive safety culture within the organization depends on the commitment of top management to safety. It's worth noting that the aging workforce can increase the likelihood of accidents. Therefore, organizations should conduct timely and proper new recruitments to ensure safety within their operations[6].

### III. RECOMMENDATIONS TO ENFORCE SAFETY MANAGEMENT SYSTEMS

The initial step in effective safety management involves maintaining better housekeeping practices and ensuring the proper utilization of Personal Protective Equipment (PPE), as emphasized by Kim in 2019[7]. To enhance safety performance and successfully implement a safety management system, organizations should introduce safety incentives and engage in regular safety discussions with their employees. These measures contribute to the improvement of the safety climate within the industry. One recommended approach is the adoption of an integrated system that combines quality and safety management, as proposed by da Silva and Amaral in 2019[8]. In a more recent development, Wang in 2021 introduced the concept of Safety Intelligence (SI)[9], which aims to transform available safety data and information into actionable safety measures. The SI model provides valuable support for safety management.

### IV. CONCLUSION

Industrial safety stands as a paramount concern for both Indian management and government, given the distressingly high number of worker fatalities and injuries witnessed each year. The effective implementation of a safety management system holds the promise of reducing accidents and fostering a culture of safety within organizations. Nevertheless, several challenges hinder the successful adoption of these practices, including limited employee engagement, financial constraints, insufficient awareness, and resistance to change.

The commitment of top management plays a pivotal role in realizing a successful Safety Management System (SMS) and cultivating a positive safety culture. Both management and workers must regard safety as a fundamental requirement for the organization, promoting a contented working environment. To achieve this, it is imperative to provide adequate motivation and training to employees, enabling them to recognize the significance of safety protocols and performance.

Embracing appropriate technologies, such as sensor-based safety management systems, can significantly enhance safety performance within organizations. Furthermore, the integration of safety management with quality management can yield superior safety outcomes.

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