

Handbook of Smart Manufacturing 1st Edition

Forecasting the Future of Industry 4.0



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17 Safety Management with Application of Internet of Things, Artificial Intelligence, and Machine Learning for Industry 4.0 Environment

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17.1 INTRODUCTION

Industrialization has experienced several mutations since its evolution. Steam power replaced electricity in machinery to reduce human efforts and was termed the first industrial revolution. First industrial revolution was founded on the concept of power distribution from a central location. Machines then became rigid and light with faster operation rates in the second industrial revolution. Electronic-based automation with a focus on performance optimization started the third industrial revolution. Ergonomics, safety, and flexibility are strengths of automation and are featured with optimization and improvement capabilities. It is one of the primary outcomes of strategic initiatives by Chinese government in 2015 [1]. It is the trend name of automation with data or sensor and security in production systems. The term IIoT [2,3] is powered with the introduction of a new industrial revolution. IIoT is a new definition to industrial engineering. Artificial intelligence (AI) and cloud and Internet of Things (IoT and IIoT) are the main features of IIoT. IIoT aims to develop and transform machinery into adaptable and responsive modes. Generally concerned that the IIoT vision needs to be spread worldwide. It aims to achieve an increase in productivity with reduction in production cost and lead times for real-time data, and data communication, big data analysis, machine learning, monitoring and control in real time, machine-to-machine interactions, and machines with decision-making capabilities.

Safety norms and codes also need to be updated philosophically, strategically, and technologically in the manufacturing and production philosophies, strategies and technologies get updated. More than a hundred recent industrial accidents prove that the lives of men, women, and children are always at risk due to the location of machines and machines near residential areas and the hazardous working conditions. There is an urgent need to upgrade safety norms and codes in line with updated technological developments in IIoT. Safety in IIoT aims to develop digital safety representation of an activity, process, or system. Changes in the organizations are not to be identified. Presently, industrial safety systems safeguard time and resources. Large enterprises are oriented to protect assets, and the maintenance of safety components. Also, a line to comply with safety regulatory standards. Technological developments require updating of the safety standards and to upgrade the safety systems. Industrial IOT [2,3] has created new opportunities for integration of safety with compliance. The data collected through sensors is transmitted to the cloud via internet connectivity with inherent security. Real-time analysis is then conducted, which facilitates software to generate alerts and escalation plans in the case of any accident or emergency, providing real-time monitoring capabilities to safety systems. The demand for industrial safety is expected to grow with the adoption of IIoT in industrial safety compliance standards. In addition to financial, manpower, accuracy, environment, and technology, sustainability has evolved as a new pillar of development [2]. Sustainability, safety, agility, and high efficiency are considered four primary objectives of IIoT [2]. Health and safety are the prime foci of sustainability and IIoT, with a focus on hazard, safety, accident reduction, environment, and spreading safety knowledge [2] in all events with emerging risks and safety requirements [2].

Though workplace conditions have improved a lot with the application of labor regulations, in fact, integration of safety in working has always better outcomes. Hence, labor laws and regulations need to be updated for IIoT technologies.

Essentiality developments in safety are the need of the hour. Safety guidelines for changed technological processes and tools methods need to be called out. Safety should shift focus to prevent accidents, rather than generations after accidents. Any business remains healthy until it is safe to work in that business environment. Safety needs to be systematic for IIoT with decentralized information and decision-making systems. Intelligent systems are emerging as key safety tools [2].

It is time to analyze existing safety norms, as safety consequences of the fourth-generation industrial revolution needs to be revisited. Organizations to focus like productivity gain, marketing influence, and required applications are necessary for integration of safety into IIoT.

IIoT, AI, and ML have emerged as major tools and technologies for today's complex systems with a wide range of applications in manufacturing, planning, supply chain management, vendor management, marketing, finance, design, automation, operations management, safety management, disaster management, resource management, and all fields of business, technology, management, government, social sciences, and humanities, with a focus on data across the production of assets and processes and their management. Safety management with an application of IIoT, AI, and ML for the IIoT environment is the focus in the present article. The objective of this research article is to first analyze the literature published on industrial safety in the context to IIoT, to outline the major findings in context to safety and technology; and the need to revise the safety standards under IIoT dimension.

17.2 BACKGROUND

The fourth-generation industrial revolution is rewriting history with internet, IIoT, AI, and ML, but the picture is still not very clear. Literature availability for IIoT safety is limited to a very few articles and applications. Safety or health with logical combinations in digital manufacturing, smart manufacturing, smart production, factory of the future, smart industry, smart factory, advanced manufacturing, etc. are some buzzwords for IIoT. Table 17.1 presents some definitions associated with IIoT.

TABLE 17.1
Definitions Associated with IIoT

Category

Definition

Machina 1 version 3.0.1. In the middle of numerous alternatives to internet, itself automatically through automation.



Chapter

A Study on Adoption of Information and Communication Tools in Emergency Disaster Management

By Sandeep Chhillar, Ranbir Singh, Pankaj Sharma

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General (983)



Current Status and Future Aspects in the Field of Public Health

978-620-6-84343-6

The book "Current Status and Future Aspects in the Field of Public Health" describes the new plan for general well-being in India and incorporates epidemiological progress, demographical progress, natural changes, and social determinants of well-being. The job of the public authority in affecting populace well-being isn't restricted inside the well-being area but additionally by different areas outside the well-being frameworks. This book is a review of general well-being needs in India, its prosperity, constraints, and future extension. Wellbeing framework reinforcing, human asset advancement, and limit building and guideline in general wellbeing are significant regions inside the wellbeing area. Commitment to the well-being of a populace likewise comes from social determinants of well-being like day-to-day environments, nourishment, safe drinking water, sterilization, schooling, early youngster improvement, and government-backed retirement measures. Written by experts in the field, this book increases our understanding of the various developments that occurred in the different fields of Public Health.

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