Chapter 8
Applications of Augmented Reality in Industrial Unit Processes

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ABSTRACT

The fourth industrial revolution (4IR) promotes the use of augmented reality (AR) in industrial settings, offering transformative opportunities. This study explores AR's potential in efficiency, safety, and crisis management. AR excels in training, providing virtual simulations for complex processes, accelerating skill development in a safe environment. It enhances maintenance with real-time guidance, reducing downtime. Quality control benefits from AR, as inspectors identify defects more precisely, improving product quality. AR plays a crucial role in safety by offering real-time alerts to prevent accidents. Its integration is promising in the 4IR, but effective crisis management strategies are essential. Organizations should prioritize safety, security, and communication when adopting AR in industrial environments.

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INTRODUCTION

The ongoing technological revolution extends across various fields, including the industrial sector, firmly in the 4th Industrial Revolution (4IR). This revolution drives transformations that nurture the Man-Machine relationship with profound societal, economic, technological, informational, and environmental changes (Coelho, 2016). A notable innovation within this context is Augmented Reality (AR), which modifies our interactive reality by superimposing virtual elements on the physical world, providing diverse user experiences (Mesquita; Moreira, 2018). Gaspari et al. (2013) highlight that AR empowers professionals in operations to handle complex equipment by following augmented instructions. This underscores AR's significance in industrial maintenance, allowing professionals to engage in a broader range of tasks. Amidst the 4th Industrial Revolution, technological advancements demanded machine evolution to facilitate industrial progress. AR bridges the human-machine gap, aiding quicker fault resolution, offering technical support to non-expert users, and addressing complex issues, increasing the need for technicians. Orives (2019) underscores primary industry challenges: high technical visit costs and lengthy local professional training. AR can mitigate these issues by providing technical information, schematics, and safety documentation, projecting the AR environment, and offering risk assessments. In this context, Orives (2019) emphasizes the need for integrated programs to streamline equipment maintenance. This study explores AR's role in industrial support through a literature review, highlighting its advantages. It also delves into AR's potential to enhance workplace safety, human-machine interactions, and organisational employee training. Augmented reality-based systems can monitor and evaluate a range of tasks in an industrial context, from selecting a component from a warehouse stock to sending maintenance procedures to field technicians via mobile devices. This tool becomes indispensable for executing specific tasks, aiding the performer with speed and precision. Furthermore, it enables precise mapping of a given production process. This includes sending technical diagrams of machinery, components, equipment, or processes. Simulations to pinpoint the location of malfunctioning equipment, required spare parts, maintenance procedures, safety measures, and actions are all made possible, simplifying the technician's job. Augmented reality allows the implementation of human-machine interfaces (HMIs) capable of linking information technology assets to operators with instant feedback on equipment status. This physical-digital communication between operator and machine is indispensable for acclimating technicians to the demands and requirements of Industry 4.0. While augmented reality technologies are already in use in numerous companies and prove to be valuable assets, they are still in development. However, they will be of great utility in the new industrial landscape, as the reliability and accuracy of information linked to the operator or responsible technician will result in improved efficiency in their functions, a performance that directly reflects on company results.

Main Objectives

The main objective of this study is to explore the transformative potential of Augmented Reality (AR) technology within the context of the 4th Industrial Revolution (4IR) and its multifaceted impact on efficiency, safety, and crisis management. The study investigates how AR technology can reshape industrial operations, particularly training, maintenance, quality control, and workplace safety. Additionally, the study highlights the significance of proactive crisis management strategies in addressing challenges associated with AR integration, ultimately prioritizing safety, security, and effective communication in responding to AR-related crises. This research aims to understand how Augmented Reality (AR)