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Information and Communication Technology management of operations in Latin America: Challenges and opportunities for Industry 5.0

João Pedro dos Santos Paiva[1], Juliane Moura Chales Pariva[2].

ABSTRACT

Over the past few decades, Latin America has evolved from the first mechanized industries to the digital age of Industry 4.0, facing structural challenges and opportunities for technological innovation. Now, the region is moving closer to Industry 5.0, which promotes close collaboration between humans and machines, aiming for mass customization and sustainability. This article analyzes the challenges and opportunities of Information and Communication Technology (ICT) management in Latin America's industrial operations in the context of Industry 5.0, discussing how emerging technologies can be integrated to promote efficient human-machine collaboration, as well as addressing ethical considerations and practical examples in the region.

Keywords: Latin America, Industry 5.0, Sustainability, Information and Communication Technologies (ICT), Industrial transformation.

INTRODUCTION

Over the past few decades, Latin America has undergone industrial transformations, evolving from the first mechanized industries to the digital age of Industry 4.0. This trajectory is marked by structural challenges and opportunities for technological innovation. Currently, the region is on the verge of yet another industrial revolution: Industry 5.0. Unlike Industry 4.0, which focused on machine automation and connectivity, Industry 5.0 proposes closer collaboration between humans and machines, aiming at mass customization and sustainability. In this context, exploring how Information and Communication Technology (ICT) management can be adapted to meet the challenges and seize the opportunities of this new industrial era in Latin America is essential.

The industrial transition in Latin America has been influenced by several factors, including economic policies, foreign investment, and the evolution of technologies. Initially, the region benefited from mechanization and basic industrialization, which allowed for a significant increase in productivity. However, with the arrival of Industry 4.0, which brought automation and digitalization, many Latin American countries faced challenges in terms of infrastructure and technological capacity. Now, with Industry 5.0, the region has the opportunity to reinvent itself, adopting a more humanized and sustainable approach to managing industrial operations.

[1] Veiga de Almeida University – RJ
[2] Cruzeiro do Sul University – SP

OBJECTIVE

The objective of this article is to analyze the challenges and opportunities of ICT management in industrial operations in Latin America in the context of Industry 5.0. I intend to discuss how emerging technologies can be integrated in a way that fosters efficient collaboration between humans and machines, highlighting practical examples and ethical considerations. In addition, this study aims to identify the main barriers faced by businesses in the region.

METHODOLOGY

Para conduzir a revisão da literatura, utilizei operadores booleanos para identificar artigos em inglês em bases de dados acadêmicas. O operador *booleano* AND foi empregado para combinar os seguintes termos específicos: *Information Systems AND Supply chain; Business Intelligence AND Supply chain; Technology Management AND Supply chain; Operations AND Supply chain; Information Systems AND Industry 5.0; Business Intelligence AND Industry 5.0; Technology Management AND Industry 5.0; Operations AND Industry 5.0; Information Systems AND Fourth Industrial Revolution; Business Intelligence AND Fourth Industrial Revolution; Technology Management AND Fourth Industrial Revolution; Operations AND Fourth Industrial Revolution; Information Systems AND Fifth Industrial Revolution; Business Intelligence AND Fifth Industrial Revolution; Technology Management AND Fifth Industrial Revolution; Operations AND Fifth Industrial Revolution*. Este método permitiu uma seleção criteriosa dos artigos mais relevantes para a análise.

DEVELOPMENT

CHALLENGES IN THE IMPLEMENTATION OF INDUSTRY 5.0 IN LATIN AMERICA

The implementation of Industry 5.0 in Latin America faces some challenges. First, the technological infrastructure in the region is often not prepared to support the new demands of connectivity and advanced automation. According to Hilbert (2016), ICT infrastructure is one of the main obstacles to digital development in developing countries, including many in Latin America. In addition, there is a shortage of skilled labor to operate and maintain new technologies.

According to Gera and Singh (2019), Industry 4.0 has already brought significant changes in the labor market, and the transition to Industry 5.0 can exacerbate these challenges, requiring new competencies and skills.

Another challenge is resistance to change. Many companies in the region still operate with traditional business models and may be reluctant to adopt new technologies and processes. According to Pereira et al. (2018), there is a need to change the managerial mindset so that companies can fully take advantage of the benefits of Industry 4.0 and, consequently, Industry 5.0.

INDUSTRY 5.0 OPPORTUNITIES

Despite the challenges, Industry 5.0 offers several opportunities for Latin America. Human-machine collaboration can lead to greater personalization of products and services, increasing the competitiveness of the region's companies in the global market. According to Peruzzini et al. (2023), the integration of

of advanced technologies with human expertise can result in smarter and more adaptable manufacturing systems, improving efficiency and quality.

In addition, Industry 5.0 can promote sustainability, an increasingly important aspect of industrial operations. Suciu et al. (2023) highlight that sustainability is one of the pillars of Industry 5.0, with a focus on creating not only economic, but also environmental and social value. This could be particularly beneficial for Latin America, where environmental conservation is a priority due to the region's rich biodiversity.

PRACTICAL EXAMPLES IN LATIN AMERICA

Practical examples of initiatives in Latin America can illustrate how ICT management is evolving in the region. For example, manufacturing companies in Brazil and Mexico are beginning to adopt artificial intelligence (AI) and Internet of Things (IoT) technologies to optimize their operations. According to Dalenogare et al. (2018), these technologies can significantly improve industrial performance by increasing efficiency and reducing operating costs.

In addition, research and development projects at Latin American universities are exploring new applications for emerging technologies in the industry. Del Castillo and Arza (2021) discuss how

Digital science is being applied in various areas, from agriculture to manufacturing, creating new opportunities for innovation and sustainable development.

ETHICAL CONSIDERATIONS

The implementation of advanced technologies in Industry 5.0 also raises important ethical considerations. It is important to ensure that technologies are developed and used in a way that benefits all *stakeholders*, including workers, consumers, and society at large. Loizaga et al. (2023) emphasize the need for a human-centered approach, where technologies not only increase efficiency but also improve the quality of life for workers.

Additionally, data protection and privacy are critical concerns in the digital age. Companies must adopt robust data governance practices to protect sensitive information and ensure consumer trust. Gonzales and Wareham (2019) argue that trust in the use of *business intelligence systems* is critical to their adoption and success.

FINAL THOUGHTS

I conclude that the adoption of Industry 5.0 technologies in Latin America has significant potential to transform industrial operations, promoting efficiency and personalization. However, challenges related to infrastructure, workforce training, and ethical considerations need to be addressed. Human-machine collaboration must be planned carefully to maximize benefits and minimize risks. As suggested by Loizaga et al. (2023) and Grosse et al. (2023), a people-centered approach is essential to ensure that technology serves human well-being and sustainability. Thus, Industry 5.0 can offer a unique opportunity for Latin America to position itself as an innovative and competitive region on the global stage.

The integration of advanced technologies and human-machine collaboration can transform industrial operations in Latin America. Technological infrastructure and workforce upskilling are important challenges to overcome. However, with a people-centric approach and an emphasis on sustainability, Industry 5.0 can create new opportunities for innovation and economic growth in the region.

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