

Chapter 13

Integrating Artificial Intelligence and Public Educational Reforms: Advancing Education 4.0 in Costa Rica

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ABSTRACT

This chapter explores the synergy between public educational reforms and artificial intelligence within the context of Education 4.0 and the Fourth Industrial Revolution, with a focus on Costa Rica. It highlights how public initiatives, including the Bicentennial Educational Network and the Ministerial Platform, address structural challenges such as connectivity, digital infrastructure, and educational management. The analysis reveals that AI plays a critical role in enhancing both learning and administrative processes, creating more personalized and efficient education systems. Moreover, it discusses how these reforms and AI can reduce educational inequality by improving access and tailoring education to diverse student needs. The study offers insights into the transformative potential of AI-driven education systems and emphasizes the importance of integrating technology to support sustainable, inclusive development in Costa Rica's education system. The findings can serve as a model for other developing nations seeking to adapt to the demands of the Fourth Industrial Revolution.

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1 INTRODUCTION

Since the late 1980s, Costa Rica has actively sought to incorporate digital technologies into its public education system. These policy efforts directly responded to the technological advances that defined the Third Industrial Revolution, which introduced sweeping changes across economic, social, and productive sectors globally. This revolution, characterized by the rapid development of electronics, information technology, and telecommunications infrastructure, required nations to rethink how education could prepare their citizens for increasingly automated and interconnected workplaces (Schwab, 2017). Costa Rica's response has evolved into a long-term, consistent policy framework, built through public-private partnerships, most notably the collaboration between the Ministry of Public Education (MEP) and the Omar Dengo Foundation (FOD). This framework is still evolving but faces significant challenges, including the need to compete for limited public resources and attention amidst a broader landscape of public policy priorities.

Costa Rica's public education policy framework, developed during the Third Industrial Revolution, has recently expanded its scope to address the rapid technological changes brought about by the Fourth Industrial Revolution, also referred to as Industry 4.0. This revolution represents a significant departure from previous industrial transformations, as it builds upon the advancements made during the Third Industrial Revolution, but at an exponentially faster pace and with far-reaching consequences (Lee, & Lee, 2021). The Fourth Industrial Revolution is not merely about increased automation; it fuses the digital, physical, and biological worlds, enabling unprecedented levels of interconnectivity and interaction between virtual and real systems (Li, 2020).

Central to this revolution is artificial intelligence (AI), a transformative force that is driving innovations and reshaping economic sectors across the globe. According to Dingli et al. (2021), AI plays a critical role in Industry 4.0 by enabling automation, optimizing supply chains, supporting predictive maintenance, and fostering the development of intelligent robotics. These AI-driven advancements have far-reaching implications, not just for industries but for educational systems as well. As AI continues to permeate various sectors, the challenge for education becomes clear: how can we prepare future generations to navigate a world where humans and machines work together, and where data literacy, technological fluency, and critical thinking skills are indispensable?

Costa Rica's public education system, with its established focus on integrating digital technologies, is uniquely positioned to address this challenge. However, as this chapter will demonstrate, there is still much work to be done. The transition from the Third to the Fourth Industrial Revolution presents new and complex demands that Costa Rica's education system must meet if it is to continue fostering innovation,

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