Chapter 3
Leadership, Employee, and Workplace Fostering Revolutionizing Sustainability:
Life Cycle Assessment as a Catalyst in the Evolution of Industry 5.0

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ABSTRACT

In Industry 5.0, Leadership, employee engagement and workplace idealization are key enabling technology to transform viability using Life Cycle Assessment (LCA). At the core, visionary leaders lead the way for the adoption of LCA by establishing clear sustainability goals and encouraging an environment of environmental responsibility. They support Sustainable Development Goals by training employees in Life Cycle Assessment (LCA) tools and methods so that individuals can contribute to sustainable practices. By placing the human at the core, we can ensure that these developments contribute to the wellbeing of employees and the practice of ethical work, while keeping the larger sustainability goals in mind. LCA serves as the engine to help drive industries to scale sustainability nationally and globally with its focus on leadership, workforce collaboration, and intelligent tools while balancing profitability with planetary health.

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1. INTRODUCTION

Industry 5.0 represents a turning point in the industrial revolution by moving away from just tech developments towards a human-centric solution. The new paradigm highlights the need for human well-being, creativity, and sustainability to be fully integrated into industrial processes. Industry 5.0, however, goes beyond automation and the mere implementation of digital technologies to improve efficiency and productivity as was the goal of its predecessor, Industry 4.0; instead, it aims to address the interplay between humans and machines by promoting the understanding that great technology should be about augmenting humans, not replacing them, since they are still a critical part of the manufacturing process. This evolution is not just a tech upgrade; it is an essential rethink of how whole sectors function, create value, and operate in a way that benefits society. Industry 5.0 combines humans and smart manufacturing technologies like Artificial intelligence (AI) and robotics to build customized and sustainable products. It has led the way so far, with the first steps towards it coming from the European Commission, which has already required the industrial world to adopt such a mindset where the pursuit of economic profit goes hand in hand with social responsibility and ecological care (Sharma & Gupta, 2024).

Industry 5.0 is expected to highlight the key principles of human-centricity, sustainability, and resilience. As a result, industries can create an environment that promotes innovation but also creates production in an intense balance with our planet's limited resources when human needs come first in the production process. In this context, human-centered innovation is key as it acknowledges the unique characteristics that humans add to the workforce creativity, emotional intelligence, and problem-solving skills (Hasan et al., 2024). Collaborative workplaces, the use of LCA concepts in the decision-making process, motivate companies to be efficient with their resources and generate less waste while developing greener products and processes. In Industry 5.0, enabling technologies like AI and IoT complement LCA by automating data collection and analysis and providing actionable insights for sustainable innovation. Whereas automated systems will perhaps be missing such traits, human agency is regarded as indispensable in enabling innovation and promoting efficiency. It enables remote working, which has increased production and job satisfaction whilst allowing us to tackle some of the challenges that we face in the modern world such as climate change and the depletion of resources. This transition is in line with the sustainability paradigm identified in Industry 4.0 by embedding sustainability in manufacturing operations. It involves embracing circular economy principles that prioritize waste reduction, material reuse, and resource recycling. Thus, Sustainability in Industry 5.0 is more than just following regulations; it is a strategic opportunity for businesses to innovate and set themselves apart in a competitive market. Focusing on sustainability allows organizations to build a strong reputation, attract eco-conscious customers, and secure profitability over a long time. Additionally, sourcing raw materials sustainably and transitioning to renewable energy sources within the production process is crucial for reducing carbon emissions and achieving global climate goals (Jin et al., 2024).

The standard for assessing the ecological footprint of industrial operations is Life Cycle Assessment (LCA). LCA is a systematic approach for evaluating the environmental attributes and potential effects of a product throughout its lifecycle from raw material extraction through to production, use, and disposal. This holistic approach allows industries to recognize opportunities for decreased resource utilization and waste minimization at each segment of the product life cycle. In this regard, when transitioning into Industry 5.0 where companies are developing sustainable practices, LCA will become more significant than ever. This is because, by knowing the environmental impact of their processes, organizations can make data-led decisions that factor into their sustainability objectives. In addition to this, the LCA helps