

Chapter 2

The Human Factor in Digital Manufacturing: A Social Work Perspective on Workforce Transition and Well-Being

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ABSTRACT

The digital transformation of manufacturing industries presents unprecedented opportunities for innovation and efficiency, yet it simultaneously creates significant challenges for workforce adaptation and well-being. This chapter examines the human dimensions of digital manufacturing through a social work lens, emphasizing the critical need for comprehensive support systems during technological transitions. Drawing from social work theories and frameworks, this analysis explores how person-in-environment perspectives, systems theory, and strengths-based approaches can inform more humane and effective strategies for workforce development in the digital age. The chapter presents practical interventions, policy recommendations, and integrated frameworks that prioritize worker well-being while supporting organizational transformation. By centering human needs within technological advancement, this work contributes to a more holistic understanding of sustainable digital manufacturing that benefits both organizations and communities.

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1. INTRODUCTION

The Fourth Industrial Revolution has fundamentally altered the landscape of manufacturing, introducing artificial intelligence, robotics, Internet of Things (IoT), and advanced automation systems that promise unprecedented levels of efficiency and innovation (Schwab, 2016). However, beneath the technological optimism lies a complex web of human challenges that demand urgent attention. As manufacturing organizations worldwide embrace digital transformation, millions of workers face uncertainty about their roles, required skills, and future employment prospects (Manyika et al., 2017).

The COVID-19 pandemic has accelerated digital transformation across industries, with manufacturing experiencing particularly rapid changes as companies sought to maintain operations amid global supply chain disruptions and health safety requirements (Chen et al., 2021). This acceleration has intensified both the opportunities and challenges associated with digital transformation, creating an even more urgent need for comprehensive approaches that address human factors alongside technological implementation (Kumar et al., 2022).

Recent developments in artificial intelligence and machine learning have introduced new dimensions to digital manufacturing transformation, with predictive analytics, autonomous systems, and human-robot collaboration becoming increasingly prevalent (Zhang et al., 2023). These technologies offer unprecedented opportunities for productivity improvement and quality enhancement, but they also create new forms of worker displacement and skill obsolescence that require careful consideration and proactive intervention (Rodriguez & Thompson, 2024).

Traditional approaches to technological implementation often prioritize technical specifications and operational efficiency while treating human factors as secondary considerations (Kane et al., 2019). This chapter argues for a paradigm shift that places human well-being at the center of digital manufacturing transformation. By applying social work principles and methodologies, organizations can develop more comprehensive, ethical, and ultimately successful approaches to workforce transition.

The social work profession's commitment to human dignity, social justice, and systemic change provides a unique perspective on the challenges and opportunities inherent in digital manufacturing evolution (National Association of Social Workers, 2021). Social workers understand that technological change is not merely a technical process but a profound social transformation that affects individuals, families, communities, and entire economic systems (Hudson, 2016). This understanding is crucial for developing interventions that support not only successful technology adoption but also human flourishing during periods of significant change.

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