

Case study in the textile sector to assess resistance to change and the skills needed to implement Industry 5.0

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Staying competitive in the business world is becoming more challenging due to rapidly growing digital technologies. Manufacturers are competing to meet changing market demands. This requires production lines to be adaptable, smart, and flexible enough to meet updated requests. As technological advances consolidate, human operators also experience an increase in the complexity of their daily tasks: they are required to be highly flexible and demonstrate adaptive capabilities in a very dynamic work environment.

The fourth industrial revolution focused on process automation and the introduction of intelligent computing through data collection and management, resulting in challenges for the business world, such as a shortage of adequate skills in human resources, security issues in communication technology, reliability of the stability of production machines, resistance to change, and an increase in unemployment due to automation. The core of this revolution was to improve process efficiency. Industry 5.0 proposes a human-centered approach, balancing economic progress and solving social problems through a highly connected system between cyberspace and the real world. While Industry 4.0 focuses on automation, Industry 5.0 promotes synergy between humans and collaborative machines.

This economic and professional transformation requires an in-depth understanding of the necessary human skills. Automation and artificial intelligence redefine work requirements, demanding advanced cognitive skills. Critical thinking becomes crucial for analyzing complex data, while creativity is essential for problem-solving. Continuous learning is fundamental, highlighting adaptability as the key to staying ahead of innovations in a rapidly changing landscape. Emotional intelligence gains prominence, as understanding and managing emotions become crucial in dynamic environments. Effective collaboration in global teams requires empathy and intercultural skills, while leadership must be characterized by motivation. Digital literacy is now a basic skill, with professionals needing to understand new technologies and use advanced digital tools. Basic programming, previously restricted to IT specialists, becomes valuable for many professionals looking to automate simple tasks. Digital security is vital to protecting personal and corporate data in an increasingly interconnected world.

Although Industry 5.0 proposals are promising, the occurrence of resistance during the implementation and use of new technologies in production systems is expected, either due to the need for personal adaptation or other fears. Literature regarding the disruptions caused by such resistance is scarce, and few sources address appropriate management strategies to deal with this issue. This research aims to investigate, in practice, effective strategies to address resistance to the adoption of

advanced technologies in the industry, focusing on the integration and active participation of human workers in interconnected production systems.

In line with dual education principles, we developed an immersive approach that was conducted by a PhD student who is developing “action-research” within a company. First, we conducted a literature review and identified sources of resistance and management approaches. Sources of resistance, according to the literature, include feelings of excessive supervision, unclear values, feelings of inadequacy, concerns about the loss of power and jobs, and work overload. Suggested management approaches are communication, participation, and training.

Two case studies were carried out in a textile company in France. The studies considered the impacts of cultural differences and technological transition in mostly manual environments.

The first case involved the implementation of a station with a collaborative robot (cobot) in the clothing sector. The innovation of this project stands out due to the technological gap in the textile sector compared to other economic segments, resulting from the phenomena of production relocation since the 1950s. This phenomenon not only resulted in a deficit of innovation but also generated fears of loss of jobs among employees, perpetuating resistance to technological innovations. In this study, we present practical solutions to effectively address this issue with employees, promoting acceptance of new technology through active participation, clear communication, and training. The results were an exceptionally efficient production process, with added value, reliable autonomy, and a significant reduction in waste and associated costs. In this case, the cobot transcended the function of a programmable machine for repetitive tasks, becoming a true work partner.

The second case study validates the statement that innovative companies that invest in the continuous training of their employees reap the benefits of rapid adaptation to the demands of Industry 5.0. The project was conducted in the dyeing sector and consisted of implementing real-time production control systems. Several sources of resistance were identified, the main one being the feeling of excessive supervision. In this scenario, employees' skills were tested, requiring adaptation to new technologies. Line managers, operators, maintenance personnel, and managers needed to adjust to new information systems, methods for obtaining production data, procedures to improve machine profitability, and new practices for reporting losses, and failures, and resolving small issues concerning everyday technical problems. The results of this case study were significantly positive, with a 6% increase in the overall performance of the equipped machines over six months of use, demonstrating genuine engagement from everyone involved. This was possible through a cohesive approach to resistance management.

These practical projects revealed challenges, from resistance to change to disparities in internal skills. However, they also highlighted opportunities for professional and personal growth, emphasizing employees' capacity for innovation and adaptation when there is a welcoming environment. The success of Industry 5.0 requires an emphasis on flexibility, continuous learning, and business ethics to shape human-centered production centers, even in the face of technological revolution.